

PROJECT REPORT

**O14: Critical review of design and development practices that relate to access for people with disability (universal access):
Part 1 Review of existing policies and guidance - Year 1
(2019/20)**

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SUMMARY

This report aims to review the current policies, standards and guidance published by the Department of Transport and Main Roads (TMR), Austroads and Australian Standards that impact the accessibility of people with disability across the transport network.

In Queensland there is an estimated 906 100 people living with a disability, representing approximately 17.9% of the Queensland population. This means that around 1 in every 5 people in Queensland have a disability that may affect their mobility. People with disability may experience risks and difficulties with accessing and using the transport network that other people without disability are unaware of or do not experience.

The report identifies gaps in guidance relating to the accessibility of the transport network for people with disability and identifies ways to improve practices through the provision of universal access for all.

From this review, the following recommendations are made:

- Throughout most of the reviewed documents, accessibility for people with disability is discussed to some degree; however, the term 'people with disability' is usually not clearly defined. The term should be clearly defined as to what it means to the transport network and what is covered under this term. One method of doing so would be to identify design users, based on the most common impairments and provide clarifying information on how the impairment may impact accessibility and typical considerations used to improve access.
- One term that is rarely used in the reviewed documents is 'universal access'. This term should be clearly defined and used in place of others such as 'people with disability' or 'person in a wheelchair'. This term incorporates all users when designing for accessibility, including people with disability, the elderly, people with injuries, people with vision impairment, and more. The term 'universal access' should be defined alongside 'people with disability' to ensure designers cater to all users.
- The consolidation of all applied guidance into one design guide that emphasises universal access should be investigated. This consolidation may provide a consistent process for the design of universal access and assist designers in easily locating the required knowledge for design, thus reducing the complexity of navigating reference documents. Emphasising universal access in the design process would lead to enhanced accessibility for not only people with disability but for all users of the transport network. It is noted that consultation with designers would be needed to determine if this is a suitable solution.
- Integration of a universal access (or disability access) assessment/audit framework into the design process could enhance accessibility for all users. This would help to integrate design for universal access and people with disability into the design process further to ensure all roadside infrastructure is accessible.
- Consultation should be undertaken with people with mobility and sensory impairments to better understand the difficulties they experience in accessing the TMR transport network. This will help to pinpoint the attributes of the transport network that do not cater well enough for people with disability and where existing legislation, guidelines and standards do not meet expectations. This process will be most effective if a wider range of disabilities are considered.

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- In the future, when presenting or recommending the idea that consideration should be given to certain aspects of design for people living with physical impairments, the approach should reinforce legal obligations as critical criteria. This will emphasise the importance that should be placed on guaranteeing accessibility for all user groups. This could be implemented through a policy statement to ensure the appropriate outcomes of design.
- Design criteria for attributes relating to people with disability should include desirable guidance alongside the minimum design guidance. Designers should be encouraged to use the desirable value or exceed the minimum value when designing for accessibility. This will help to emphasise that the design should cater to the users' needs rather than only complying with the minimum values.
- A review of international policies, guidelines and standards for the design of accessibility for people with disability should be undertaken. This can then be compared against existing Australian practices to determine any areas that may be improved based on international best practices. This review could be undertaken in stages through the NACoE program, with each stage having a more focussed scope to provide desired outcomes.

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GLOSSARY

Term	Definition
Access path	A path that permits independent travel for all passengers within public transport premises, infrastructure or conveyances
Allocated space	Three-dimensional space that can accommodate a wheelchair or similar mobility aid
Brownfield sites	Land that has previously been developed and may already contain structures and infrastructure
Conveyance	Includes any of the following to the extent they are used to provide a public transport service <ul style="list-style-type: none"> • aircraft • buses or coaches • ferries • taxis • trains, trams, light rail, monorails, rack railways • any other rolling stock, vehicle, or vessel classified as public transport (within its jurisdiction by regulation or administrative action of any government in Australia) • does not include: charter boats (water taxis), limousines, self-drive rental cars
Direct assistance	Help which is given by an operator or provider <ul style="list-style-type: none"> • to make public transport accessible to a person with a disability when premises, infrastructure, or conveyances do not fully comply with these standards • to provide non-discriminatory access on request
Disability	The <i>Disability Discrimination Act 1992</i> defines disability as: <ul style="list-style-type: none"> • total or partial loss of the person's bodily or mental functions • total or partial loss of a part of the body • the presence in the body of organisms causing disease or illness • the malfunction, malformation, or disfigurement of a part of the person's body • a disorder or malfunction that results in the person learning differently from a person without the disorder or malfunction • a disorder, illness, or disease that affects a person's thought processes, perception of reality, emotions, or judgment, or that results in disturbed behaviour
Equivalent access	A process involving the provision of direct assistance under which an operator/provider is permitted to vary the equipment or facilities that give access to a public transport service So long as an equivalent standard of amenity, availability, comfort, convenience, dignity, price, and safety is maintained
Greenfield sites	Undeveloped sites allocated for commercial development or industrial projects
Impairment	A condition that limits a person's physical or mental capacity to move, coordinate actions, or perform physical activities.
Infrastructure	Any structure or facility that is used by passengers in conjunction with travelling on a public transport service Does not include any area beyond immediate boarding points
Manoeuvring areas	A space in which a wheelchair or similar mobility aid can turn
Operator	A person/organisation that provides a public transport service to the public/sections of the public A public transport service may have more than one operator
Premises	Structure, buildings, or attached facilities that an operator provides for passenger use as part of a public transport service
Provider	A person/organisation that is responsible for the supply or maintenance of public transport infrastructure
Public transport service	An enterprise that conveys members of the public by land, water, or air Includes: <ul style="list-style-type: none"> • community transport conveyances funded or subsidised by charity/public money that offer services to the public

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- foreign aircraft and vessels that carry passengers to, from, or in Australia and that offer services to the public
 - does not include a service that provides adventure travel

Universal access

The provision of equal access to all users in a fair and dignified way

1 INTRODUCTION

1.1 BACKGROUND

The Queensland Department of Transport and Main Roads (TMR) has committed to improving the provision of accessible transport infrastructure to all users with a significant focus being placed on access for people with disabilities. TMR has refocused its efforts by publishing the revised *Disability Service Plan 2017-2020* and the *Disability Action Plan 2018-2022*, outlining actions to be taken to enhance accessibility (Queensland Department of Transport and Main Roads [TMR] 2015a & TMR 2019a).

The Australian Bureau of Statistics report (2019b) *4430.0: disability, ageing and carers, Australia: summary of findings, 2018* estimates there are currently 906 100 people with a disability in Queensland, representing approximately 17.9% of the Queensland population (ABS 2019a)¹. This means that around 1 in every 5 people in Queensland have a disability, which may affect their mobility.

1 in 5 Queenslanders may have a disability



Universal access is the provision of equal access to all users in a fair and dignified way. People with different levels of mobility or disability should be granted the same dignity, comfort, safety, speed, and capacity when using road or public transport networks (Ajuria 2005). Transportation systems should be designed to meet the widest possible range of needs, including those of people with disability and be used to the greatest extent possible by everyone, regardless of their age, ability, mobility, or status in life.

Concepts of universal access can also be applied to greenfield and brownfield developments. Greenfield sites are undeveloped sites allocated for commercial development or industrial projects. Greenfield developments are considered flexible in design, so may enhance accessibility by implementing universal design concepts from the project's inception. Conversely, brownfield sites refer to land that has been previously developed and may already have infrastructure present. As these sites have been previously developed, they may be limited in the changes that can be made for redevelopment to enhance accessibility. Where practicable, however, retrofitting universal access provisions should always be considered.

1.2 PROJECT AIM AND OBJECTIVES

This project aimed to review road industry practices and competencies with a view of achieving the TMR vision of creating a single integrated transport network capable of providing universal access for all users.

People with disability may experience risks and difficulties that other people without disability are unaware of or do not experience. This project is intended to investigate if and where systematic transport network access failures may be occurring for people with disability.

This project was broken down into three key parts, with a separate report being produced for each part. The final stage of the project was to develop a summary report to summarise the contents of the three key parts. The aims for each part of this project are described below.

¹ Total Qld population = 5 076 500 (ABS 2019a). Population with disability = 906 100 (ABS 2019b).

Part 1: Review of design and development practices that relate to access for people with a disability

This report aimed to identify access issues and recommend key areas of improvement in planning and design policies, training, and guidance. This is intended to adequately inform and lead designers, planners, engineers, and decision-makers to provide a transport network that to the greatest extent possible delivers safe and dignified universal access.

Part 2: Performance-based concepts and training requirements

The second report aimed to identify and review current performance-based concepts/strategies used in the design and planning of universal access and determine whether these may assist in ensuring dignified and defensible accessibility for all users. Training courses available to industry professionals and professional competency requirements were also reviewed, gaps were identified, and improvements were recommended.

Part 3: Investigation of accessibility for people with a disability and NDIS

The third report aimed to identify what provisions need to be put in place when topography results in undignified accessibility for people with disability and to investigate if electric assistance technology and NDIS is changing design user capabilities.

Part 4: Summary report of findings

The final summary report aimed to summarise the findings and recommendations of the entire project into one document.

This report only focuses on Part 1 of the project which was to review existing policies and guidance published by TMR, Austroads and Australian Standards that impact the accessibility of people with a disability within the road network.

1.3 OBJECTIVES

The objective of this project was to identify ways to investigate existing practices and provide recommendations to improve practices in the provision of universal access for all users, including people with disability or movement impairment, and the elderly.

1.4 PROJECT SCOPE

The scope of this project included the following:

- review of existing policies and guidance published by TMR, Austroads and Australian Standards that impact the accessibility of people with a disability within the road network. Identification of gaps or barriers to access for people with a disability and recommend improvements
- identification of performance-based concepts (such as 8 to 80, human-centric design, or universal design) and how these may assist to ensure dignified and defensible accessibility
- review TMR's existing training courses available to industry professionals and professional competency requirements
- identification of what accessibility for people with disability means in the road network
- identification of barriers to access due to topography and provisions needed to ensure dignified and defensible accessibility
- identification of whether electrical assistance technology and the NDIS is changing the capabilities of people with disability.

2 CRITICAL REVIEW

This section presents the critical review of the TMR and Austroads current processes for designing and delivering universal access across the transport network as per Part 1 shown in Section 1.2. Universal access is the provision of equal access to all users in a fair and dignified way. This term, by definition, includes any person with disability.

The following actions were undertaken during this task:

- Review of relevant state and national legislation for the provision of universal access.
- Review of TMR policies and technical guidance for the provision of universal access.
- Review of Austroads technical guidance for the provision of universal access.
- Review of Australian Standards for the provision of universal access.

Areas that were considered as part of the TMR transport network include:

- public road network including pathways
- public transport infrastructure including bus stops/stations and rail stops/stations.

2.1 REVIEW OF THE CURRENT PROCESS AND GUIDANCE

Currently there is no single document that demonstrates a 'start to finish' design framework or guideline document with a sole focus on universal accessibility nor is there a document that is specifically for accessibility for people with disability. The current design process follows the typical road design process outlined by Austroads and/or jurisdictional guidelines, which may not focus on, or put emphasis on universal access design. At the national level, the Austroads guidelines typically deliver limited guidance for universal access design characteristics. When limited guidance is provided through Austroads documents, links to other design sources such as legislation, Australian Standards and others are provided. Documents that have been identified as key documents for universal access design and additional relevant research have been summarised in this section. It provides a broad summary of the processes and guidance for the design and delivery of universal access as part of the TMR transport network and some additional research that was found to be relevant. A more in-depth review of the processes and guidance documents is provided in Appendix A.

2.1.1 LEGISLATION

Three overarching pieces of legislation must be followed in Queensland concerning enablement of people with disability and non-discrimination, these are:

- *Disability Discrimination Act 1992*
- *Disability Standards for Accessible Public Transport 2002*
- *Human Rights Act 2019 (Qld)*.

The aim of the *Disability Discrimination Act 1992* and *Disability Standards for Accessible Public Transport 2002* is to mandate standards in a range of aspects to better accommodate people with disability in their everyday life. These documents exist as accommodation for people with disabilities and may easily be overlooked, which therefore may limit the involvement of people with disability in activities and the use of devices that people without disability undertake or use. The *Human Rights Act 2019* protects the human rights of every person in Queensland when interacting with government organisations (Queensland Government 2020b). Integrating the legislation aims to achieve an outcome in which people with disability have equal rights and opportunities akin to people without disability, by accommodating their needs and allowing them to be included to the greatest extent possible.

The *Disability Discrimination Act 1992* (DDA) provides legislation in Australia that makes it unlawful to discriminate against a person and in this context aims to ensure that people who live with mental, physical, biological (disease), permanent, or even temporary disabilities have the same rights to equality and inclusivity as people without disability. Regarding the TMR transport network, Section 23, Section 24 and Section 31 of the DDA are of importance when designing for universal access.

Section 23: Access to premises states that it is unlawful for a person to discriminate against another person on the grounds of the other person's disability by:

- a. Refusing to allow the other person access to, or the use of, any premises that the public or a section of the public is entitled or allowed to enter or use (whether for payment or not); or
- b. In the terms or conditions on which the first-mentioned person is prepared to allow the other person access to, or the use of, any such premises; or
- c. In relation to the provision of means of access to such premises; or
- d. By refusing to allow the other person the use of any facilities in such premises that the public or a section of the public is entitled or allowed to use (whether for payment or not); or
- e. In the terms or conditions on which the first-mentioned person is prepared to allow the other person the use of any such facilities; or
- f. By requiring the other person to leave such premises or cease to use such facilities.

Section 24: Goods, services and facilities state that it is unlawful for a person who provides goods or services or makes facilities available, to discriminate against another person on the grounds of the other person's disability by:

- a. Refusing to provide the other person with those goods or services or to make those facilities available to the other person; or
- b. In the terms or conditions on which the first-mentioned person provides the other person with those goods or services or makes those facilities available to the other person; or
- c. In the manner in which the first-mentioned person provides the other person with those goods or services or makes those facilities available to the other person.

Section 31: Disability standards states that the Minister may, by legislative instrument, formulate standards, to be known as disability standards, in relation to any area in which it is unlawful under this Part for a person to discriminate against another person on the grounds of a disability of the other person.

- a. The *Disability Standards for Accessible Public Transport 2002* is provided under Subsection 31(1) of the DDA and identifies public transport as a service covered by this Act. The purpose of these standards is to eliminate discrimination against people with disabilities and to enable public transport operators and providers to remove discrimination from public transport services. These standards apply to all people with disabilities, all operators and all the conveyances they use to provide public transport services.
- b. This document provides its own standards for design and incorporates Australian Standards, Australian/New Zealand Standards and Australian Design Rules to define the requirements for accessibility (see Appendix A.1.1 for detailed information). The *Disability Standards for Accessible Public Transport 2002* provides standards for design in the areas shown in Table 2.1 and identifies linkages to other standards or documents.

Table 2.1: Areas covered by *Disability Standards for Accessible Public Transport 2002* and linkages to Australian Standards

Section no.	Title	Linkages to other standards
2.1	Access paths	AS 1428.2
3.3	Manoeuvring areas	AS 1428.2
4.1	Passing areas	AS 1428.2
5.1	Resting points	AS 1428.2
6.1	Ramps	AS 1428.2; AS/NZS 3856.1
7.1	Waiting areas	No linkages

Section no.	Title	Linkages to other standards
8.4	Boarding	AS 1428.2; AS/NZS 3856.1
9.1	Allocated space	AS 1428.2
10.1	Surfaces	AS 1428.1 Supplement 1; AS 1428.2
11.1	Handrails and grabrails	AS 1428.1; AS 1428.2
12.3	Doorways and doors	AS 1428.2
13.1	Lifts	AS 1735.12
14	Stairs	AS 1428.1; AS 1428.2; Australian Design Rule 58/00 – Conveyances
15	Toilets	AS 1428.1
16	Symbols	AS 1428.1; AS 2899.1
17	Signs	AS 1428.2
18	Tactile ground surface indicators	AS 1428.2; AS 1428.4
19	Alarms	AS 1428.2
20	Lighting	AS 1428.2
21	Controls	AS 1428.1; AS 1428.2
22	Furniture and fitments	AS 1428.2
23	Street furniture	AS 1428.2
24	Gateways	AS 1428.2
25	Payment of fares	AS 1428.2
26	Hearing augmentation-listening systems	AS 1428.2
27	Information	No linkages

The *Disability Standards for Accessible Public Transport 2002* is accompanied by the *Disability Standards for Accessible Public Transport Guidelines 2004 (No. 3)* which is meant to assist in the understanding and interpreting of the standards. The guideline also provides additional guidance around the following areas (detailed information is provided in Appendix A.1.2:

- enforcement and action plan
- consultation
- customer service
- due diligence and reasonable precautions
- role of transport authorities
- assumptions about public transport mobility aids.

In the *Disability Standards for Accessible Public Transport 2002*, *Australian Design Rule 58/00* was referred to for the compliance of stairs of conveyances (buses). The Australian Design Rule focuses on design requirements and construction of omnibus vehicles. It does not provide any assistance in the design of or recommendations for universal accessibility in terms of public infrastructure.

The *Human Rights Act 2019 (Qld)* is aimed at protecting fundamental human rights, building a culture in the public sector that respects and promotes human rights and helping to promote dialogue about the nature, meaning and scope of human rights. The Act protects 23 fundamental human rights and freedoms, including (Queensland Advocacy Incorporated 2019):

Civil and political rights

- recognition and equality before the law
- protection from torture and cruel, inhuman, or degrading treatment
- freedom of movement
- freedom of expression
- taking part in public life
- privacy and reputation
- cultural rights – generally
- right to liberty and security of person
- fair hearing of children in the criminal process
- retrospective criminal laws
- right to life
- freedom from forced work
- freedom of thought, conscience, religion, and belief
- peaceful assembly and freedom of association
- property rights
- protection of families and children
- cultural rights of Aboriginal and Torres Strait Islander peoples
- humane treatment when deprived of liberty
- rights in criminal proceedings
- right not to be tried or punished more than once

Economic, social and cultural rights

- right to education
- right to health services

2.1.2 POLICY FRAMEWORKS

TMR currently publishes two policy frameworks to assist in the delivery of accessibility for people with disability across the transport network. These are the *Disability Service Plan 2017-2020* and *Disability Action Plan 2018-2022*. While neither of these documents provides specific guidance to designing for universal access, they discuss past, present, and future policies and actions to deliver better access for people with disability.

As part of the *Disability Services Act (Qld) 2006*, all Queensland Government departments/agencies were required to develop and implement a disability service plan. The *Disability Service Plan 2017-2020* was developed following this and aims to improve access to services across government for people with disability, resulting in a more coordinated response across all departments/agencies. The *Disability Service Plan 2017-2020* identified five priority areas to guide actions:

- communities for all
- lifelong learning
- employment
- everyday services
- leadership and participation.

In the *Disability Service Plan 2017-2020*, the transport network comes under the ‘everyday services’ priority area. The section outlines the eight actions developed for both the whole of government, and TMR to improve accessibility for people with disabilities (see Table A.3 for the full list).

TMR developed the *Disability Action Plan 2018-2022 (Queensland Department of Transport and Main Roads 2015a)* through the recently formed Accessible Transport Networks Team, to improve the usability of passenger transport services for people with disability. The plan identifies that in 2015, almost one in five Australians reported living with a disability and it is projected that by 2056, 22% of the population will be aged over 65 (Queensland Department of Transport and Main Roads 2015a). More accessible passenger transport networks are expected to improve access for all user groups (see Figure 2.1) including the elderly, people with injuries, pregnant women, people travelling with children, people in unfamiliar locations, and people carrying luggage (Queensland Department of Transport and Main Roads 2015a).

Figure 2.1: Public transport user groups



Source: Queensland Department of Transport and Main Roads (n.d.).

The plan focuses on improving accessibility for each phase of the passenger's journey including journey planning, travel to and from the mode of transport, boarding the vehicle, the return journey, and any interchange in between Queensland Department of Transport and Main Roads n.d.). Planned actions are to be targeted at:

- providing more informed journey planning
- providing easier boarding of passenger transport vehicles
- delivering better customer experiences while travelling on the passenger transport network.

The plan identifies 41 actions to improve accessibility across the passenger transport network which are to be implemented between 2018 to 2022 (see Appendix A.2.2).

2.1.3 DESIGN GUIDELINES

Information on universal access design related to the transport network in Queensland is contained in three main design guidelines published by TMR. In most cases, these design guides adopt Austroads guidelines for use in Queensland and may only provide supplemental guidance (sections that provide no additional guidance relating to universal access have been omitted). The relevant documents in Queensland are:

- TMR *Road Planning and Design Manual* (RPDM) (Queensland Department of Transport and Main Roads 2015b)
- TMR *Traffic and Road Use Management Manual* (TRUM) (Queensland Department of Transport and Main Roads 2019b)
- Austroads *Guide to Road Design* (AGRD)
- Austroads *Guide to Traffic Management* (AGTM)
- Translink *Public Transport Infrastructure Manual* (PTIM) (Queensland Department of Transport and Main Roads 2015c).

RPDM, TRUM and adopted Austroads Guides (AGRD and AGTM)

The RPDM and TRUM take precedence over all other design guidelines (including Austroads Guides) within Queensland; however, in some cases these manuals may adopt the guidance provided in the Austroads Guides. The RPDM is the primary reference for the planning and design of roads. This document adopts the design Guides from the AGRD and provides details where TMR practices either supplement or differ from the Austroads Guide. The TRUM is the primary reference for the management of traffic and road use. This document adopts the design Guides from the AGTM and provides details where TMR practices either supplement or differ from the Austroads Guide.

The *TRUM Volume 1 – Guide to Traffic Management Part 4: Network Management* provides guidance on pedestrian networks. In this instance, Queensland adopts the NSW Roads and Maritime Services' document *How to Prepare a Pedestrian Access and Mobility Plan (PAMP)* which is used to plan and coordinate investment in key pedestrian routes (Roads and Traffic Authority 2002) (see Section 2.1.5 for more information).

The AGRD and AGTM are split into multiple parts, each part focusing on a specific area; TMR also provides supplementary documents to some of these parts. This section provides a summary of each part of the AGRD and AGTM (including any TMR supplements) that were found to be relevant to universal access design. A more in-depth review of relevant parts is provided in Appendix A.3 Table 2.4 shows which sections of the Guides are relevant to universal access design and any additional guides or standards that were referred to in each section.

The *AGRD Part 2 – Design Recommendations*, emphasises factors that must be considered when undertaking the planning phase of a project. Consultation with stakeholders is recommended as a way of identifying potential issues and needs of stakeholders. Under the term 'stakeholder', people with disability are named as special road users, although limits are not placed on the term 'people with disability'. It is noted that the provision for universal access or accommodation of needs for people with disability is made under particular requirements and decision-making surrounding road design.

This Guide is at the forefront of what designers may use to get a general overview of what needs to be, or should be, considered in road design planning. It mentions that certain provisions will be made in aspects of road design and traffic management to accommodate people with disability and defines them as people with limited physical abilities. However, physical disabilities are only one type of physical limitation. When the term 'person with a disability' is used, it may be that only people who use wheelchairs for assistance are considered and other forms of physical limitations such as hearing and/or visual impairments are unintentionally disregarded. Under this section, wheelchair users are singled out as the example for people with disability when stating what provisions are available for design requirements. It is recommended that this section should focus on universal access instead and define the user groups which are included within this. User groups that would be included under universal access design include a range of common disabilities such as hearing, visual and mobility impairments, the elderly, the pregnant, and people with injuries. This universal access approach would provide greater benefit to all users as well as people with disability.

In addition to *AGRD Part 2*, several sections in the other Guides related to traffic management or road design do not always use the term 'universal access' to encompass all users. Often the terms 'person with impairment' or 'person with disability', and in some cases only the assistance device itself is named, such as a wheelchair or in some cases wheelchair user. This provides difficulties when determining what aspects of road design or traffic management require consideration for all users, including people with disability. While many of the sections refer to or discuss some form of consideration for accessibility, the term 'universal access' is very rarely used.

The *AGRD Part 3 – Geometric Design* primarily focuses on the guidance of the geometric design of the road alignment. While this part mainly discusses the roadway rather than roadside footpaths, some attributes affect universal access. The part identifies some design criteria for on-street infrastructure such as light rail stops on divided roads and tram stops, on-street parking facilities, footpaths, and bus stops. In most instances, designers are referred to supplementary documents for more information as shown in Table 2.4.

Under Section 8.5: Vertical Alignment the general maximum longitudinal grades for streets (including greenfield developments) are provided, which are based on operating speed and terrain type (Table 2.2). Minimum crossfall grades are also provided (0.5%, though 1% is desirable) to ensure free drainage for roads with kerb and channel. The grade of the road does not take into consideration the use of the road or the accompanying footpath for pedestrian access by those with disabilities or mobility impairments.

Table 2.2: General maximum grades (%)

Operating speed (km/h)	Terrain		
	Flat	Rolling	Mountainous
60	6-8	7-9	9-10
80	4-6	5-7	7-9
100	3-5	4-6	6-8
120	3-5	4-6	–
130	3-5	4-6	–

Source: Austroads (2016a).

The *AGRD Part 4 – Intersections and Crossings: General* provides information about the geometric design of at-grade intersections. Sections include guidance on universal access for public transport, at intersections and pedestrian crossings. In terms of public transport, the Guide refers to supplementary documents for the design of bus stop layouts; however, it does recommend that it cater for persons in wheelchairs but does not refer to any other type of universal access. The pedestrian crossings section provides design considerations that mostly incorporate the consideration of universal access. This section refers designers to additional documentation as shown in Table 2.4 and primarily focuses on crossings on the midblock.

The *AGRD Part 4C – Interchanges* provides design considerations for interchanges on freeways/motorways and major arterial roads. Overall this part of the Guide only briefly discusses disability access for heavy-rail facilities within the median of a freeway and refers the designer to Australian Standards for pedestrian grade separations on pedestrian bridges.

The *AGRD Part 6A – Paths for Walking and Cycling* guides users on the design of paths both within and outside the road corridor. In most cases, the Guide provides a reference to the Australian Standards for design requirements (see Table 2.4 for referrals) or reiterates the information presented in the Australian Standards. AS 1428.1 and AS 1428.2 are referred to frequently in the design of footpaths, especially for universal access.

Footpath gradients are briefly discussed in this part of the Guide; however, it only discusses the ease of uphill travel for cyclists and not people with disability and does not provide recommended gradients. The Guide refers to AS 1428.1, AS 1428.2 and the Australian Human Rights Commission (2013) *Advisory Note on Streetscape, Public Outdoor Areas, Fixtures, Fittings and Furniture*. This information can be attributed to the greenfield design of street grades and is discussed further in later sections of this report.

The *RPDM Volume 3 Supplement to Austroads Guide to Road Design Part 6A: Pedestrian and Cyclist Paths* provides additional guidance regarding universal access. This supplement specifically discusses the separation of cyclists and pedestrians with disabilities, accessibility for pedestrian subways, and the purpose of tactile indicators. The relevant documents and guidance are shown in Table 2.3.

Table 2.3: Summary of TMR supplement and linkages to other documents

Series	Part	Section	Summary	Linkages to other documents
TMR supplement to AGRD	Part 6A	Section 7.5.4	Separated paths	
		Section 11.3.3	Pedestrian/cyclist subways	
		Commentary 14	Tactile indicators	AS 1428.4

The *AGRD Part 6B – Roadside Environments* provides information on the components of roadside areas that may need to be incorporated within a road reserve. This Guide states that pedestrian access and visibility for rest areas and service centres should be designed per the *Commonwealth Disability Discrimination Act 1992*. Signage specifications are linked to other documents as shown in Table 2.4. Design considerations for pedestrian fences are included within the Guide, detailing that certain fence types may cause disadvantages for people with vision impairments (primarily bollard and chain fencing). Telephone

mounting is covered briefly, stating that the handset should be mounted at a height that takes into consideration people with disabilities.

The *AGTM Part 6 – Intersections, Interchanges and Crossings* provide traffic management guidance for all types of intersections, focusing on issues and treatments. The Guide identifies potential issues and treatments for pedestrians with disabilities across various locations including at dedicated crossings, public transport facilities, roundabouts, signalised and unsignalised crossings, interchanges, and rail crossings. An example of this is squeeze points for wheelchairs and pedestrians with prams caused by the location of street furniture and other obstacles. This could be treated by the relocation of street furniture or controlling the use of footpaths through local municipal signs. In most situations, consideration of people with disability is included to ensure they are not disadvantaged.

The *AGTM Part 10 – Traffic Control and Communication Devices* provides guidance on the tools that are required for traffic management and traffic control. The Guide covers various control devices used to regulate and guide traffic, as well as other devices and technologies that convey information and guidance to road users. Warning devices for people with disabilities fall into three major categories: audible cues, visual cues, and physical cues. While the Guide contains information on these devices, additional information is provided in Australian Standards (Table 2.4). Signage schemes for parking on roads are briefly covered, with reference to multiple Australian Standards for more in-depth information (Table 2.4). This part also guides signs and markings for roadworks and temporary situations, specifically around pedestrian access, and discusses additional requirements for people with disabilities (also referring to the Australian Standards). The Guide also briefly discusses universal access for portable/temporary variable message signs (VMS), colour and retro-reflectivity of signs, rumble strips, positioning of signal equipment, and traffic islands (Table 2.4).

The *AGTM Part 11 – Parking* provides guidance on parking management across a range of subjects, including parking policies, demand and supply, data, and on and off-street parking for the different types of parking and parking controls. Provisions and recommendations for people with disabilities are mentioned where considered necessary, such as multi-storey car parks requiring wheelchair-accessible lifts. These sections also refer to Australian Standards for additional provisions and guidance. The information regarding assisting people with disabilities aims to ensure that people with mobility impairments can easily locate designated parking areas as well as being able to take a safe and accessible passage to and from. It discusses methods and techniques on how to achieve this.

Table 2.4: Summary of design guidelines and linkages to other documents

Series	Part	Section	Summary	Linkages to other documents
AGRD	Part 2	Section 1.5	Community expectations	
		Section 2.4.2	Factors that influence design standards – human factors	
		Section 3.1	Factors affecting road design	
AGRD	Part 3	Section 4.9.2	Bus lanes – busways	
		Section 4.9.3	Light-rail vehicles – divided roads	<i>Disability Discrimination Act 1992</i>
		Section 4.9.3	Light-rail vehicles – tram stops	<i>Accessible Public Transport 2002</i>
		Section 4.10.1	General (on-street parking)	AS 2890 AGTM Part 11 AGRD Part 6B
		Section 4.10.6	Parking for people with disabilities	AS 2890
		Section 4.11.3	Urban borders – footpaths	AS 1428 AGRD Part 6A
		Section 4.12.1	General (bus stops)	<i>Disability Discrimination Act 1992</i>
		Section 4.12.3	Rural (bus stops)	<i>Disability Discrimination Act 1992</i>

Series	Part	Section	Summary	Linkages to other documents
AGRD	Part 4	Section 6.3.4	Bus stops – bus stop layout	<i>Disability Discrimination Act 1992</i> <i>Disability Standards for Accessible Public Transport 2002</i>
		Section 8.1.1	General (pedestrian crossings)	<i>How to Prepare a Pedestrian and Mobility Plan: An Easy Three Stage Guide</i> <i>Easy Steps – A Toolkit for Planning, Designing and Promoting Safe Walking</i> <i>Pedestrian Planning and Design Guide</i>
		Section 8.2.1	General considerations for design (mid-block crossings on roads)	
		Section 8.2.3	Kerb ramps for pedestrians (crossings on roads)	AS 1428.1-2009 AS 1428.4.1
AGRD	Part 4C	Section 2.2.5	Public transport facilities – heavy rail	
		Section 4.1.1	General (pedestrian/cyclist grade separations)	AS 5100 AS 1428.1 AS 1657 NZS 4121 (NZ only)
AGRD	Part 6A	Section 3.2.1	Path user considerations – operating space – pedestrians	AS/NZS 3695.1 AS/NZS 3695.2 <i>Australian Disability Standards for Accessible Public Transport 2002</i> AS 1428.1 AS 1428.2
		Section 5.1.2	Design criteria – width of paths – pedestrian paths	
		Section 5.4	Path gradients	AS 1428.1 AS 1428.2 Australian Human Rights Commission (2013) <i>Advisory Note on Streetscape, Public Outdoor Areas, Fixtures, Fittings and Furniture</i>
		Section 5.6.1	Crossfall	
		Section 5.8	Changes in levels	AGRD Part 4 AS 1428.1 AS 1428.2
		Section 7.5.2	Terminal design principles	
AGRD	Part 6B	Section 3.4.3	Siting of service centres and rest areas – pedestrian access and visibility	<i>Disability Discrimination Act 1992</i>
		Section 3.4.5	Signage	AS 1742.6 AGTM Part 10
		Section 4.1.6	Fences – pedestrian fences	
		Section 4.3.4	Design considerations – telephone mounting	
		Section 4.4.1	General – relevant guidelines	AGTM Part 5 AS 1428.1 AS 2890.2 AS 2890.3 AS 4586 AS 2890.1 AS 1158.3.1 NZS 4121 AS 2890.1

Series	Part	Section	Summary	Linkages to other documents
AGTM	Part 6	Section 1.3	Traffic management objectives	
		Section 2.3.1	Intersection selection – introduction	
		Section 2.3.2	Intersection selection – selection process	
		Section 2.3.3	Intersection selection – assessment of intersection control options	
		Section 2.3.4	Intersection selection – intersection type selection – key traffic management considerations	AGRD Part 4C
		Section 2.4.1	Road user considerations – pedestrians	
		Section 2.4.5	Road user considerations – public transport	
		Section 3.4.4	Roundabouts – road space allocation and lane management – pedestrians	<i>Disability Discrimination Act 1992</i> AS 1428 Transport Research Board (2011)
		Section 4.2	Signalised intersections – functional layout	AGTM Part 9
		Section 4.3.2	Signalised intersections – urban arterial road signalised interaction approaches	AGTM Part 3 AS 1428
		Section 4.3.2	Signalised intersections – local road approaches to signalised intersections	
		Section 6.4.1	Road interchanges – road space allocation and lane management	AGRD Part 4 AGTM Part 10 AS 1742.10
		Section 7.3	Rail crossings at grade	
		Section 7.4	Path crossings of railways	AS 1742.7
		Section 8.0	Pedestrian and cyclist crossings	AS 1428.1
		Section 8.2	Mid-block crossings	
		Commentary 19	Additional guidance on signalling roundabouts	
AGTM	Part 10	Section 2.3.2	Considerations for older road users and people with disabilities	AGTM Part 6 AGTM Part 11 AS 1428.4 AS 2890.6 <i>Manual of Traffic Signs and Markings Part 1</i> <i>Manual of Traffic Signs and Markings Part 2</i>
		Section 3.1	Need for signing and marking schemes	
		Section 3.9	Schemes for parking signs on roads	AGTM Part 11 AS 1742.11 AS 2890.1 AS 2890.5 AS 2890.2
		Section 3.11.1	Signs and markings for roadworks and temporary situations – pedestrian facilities at roadworks and building construction sites	AS 1742.3
		Section 4.1	Types of signs	AS 1742
		Section 5.8	Portable/temporary variable message signs	
		Section 6.2.1	Colour and reflectorisation – colour	AS 1742.11
		Section 6.8.3	Tactile ground surface indicators	AS 1428.4

Series	Part	Section	Summary	Linkages to other documents
		Section 8.4.4	Location of signal faces – positioning of signal equipment	<i>Disability Discrimination Act 1992</i> AS 1428.4
		Section 9.0	Traffic islands	
AGTM	Part 11	Section 1.2	Definition of parking	
		Section 2.1	Changing approach to parking	
		Section 2.3.4	On-street parking management	
		Section 4.1.1	Off-street parking	AS 2890.1
		Section 4.1.3	Other categories	
		Section 4.2.2	Parking provision standards – off-street parking provision for people with disabilities	<i>Building Code of Australia</i> AS 2890.6
		Section 5.2	Parking policy objectives	
		Section 6.1	Urban design considerations	
		Section 7.2	Classification of off-street parking facilities	AS 2890.6
		Section 7.3	Parking facility layout	AS 2890.1
		Section 7.5.2	Pedestrian treatments	
		Section 7.6.4	Provision for pedestrians	
		Section 7.15	Parking provision for other road user groups	<i>Disability Discrimination Act 1992</i> <i>Australian Road Rules – Rule 203</i> AS 4586 AS 1743 AS 1428.1 AS 1158.3.1 AS 1680.2.1 AS 2890.6
		Section 8.0	On-street parking – general priorities for allocation of parking space	AGRD Part 3 AS 2890.5
		Section 8.2.5	Disability permit holders	Australian Disability Parking Scheme
		Section 8.3	Commercial centre hierarchy example	
		Section 8.9	Provision of other road users – people with disabilities	<i>Disability Standards for Accessible Public Transport (2015)</i>
		Section 8.10.1	Linear parking control – special-purpose zones	<i>Australian Road Rules (1999)</i> AS 1742.11 <i>Australian Road Rules (2012)</i> <i>Disability Standards for Accessible Public Transport (2015)</i>
		Section 9.1	Rest areas (in conjunction with section c12.6)	<i>Disability Discrimination Act 1992</i>
		Section 11.1	Signs and pavement markings – parking direction signs – pavement markings	AS 1742.11 AS 1428.1 AS 1753
		Section 12.1	Risk and safety – risk management	

Public Transport Infrastructure Manual (PTIM)

The PTIM is intended to provide a practical framework to ensure that the Queensland public transport policies are translated into the planning, design, and delivery of public transport infrastructure. It guides the principles, guidelines, standards, and regulations related to transport infrastructure. It also encourages the consideration of local climates and the use of best practices.

Several supporting materials are mentioned such as legislation, Australian Standards, and other disability guidelines, some of which have already been reviewed in this report.

The PTIM is not explicitly focused on aiding those who have disabilities, but it does mention where and what aspects of transport infrastructure have obligatory requirements or non-obligatory requirements (consideration) for the assistance of people who have a disability. Mention is made about compliance with disability access requirements. Providing disability access requires that any designs be able to:

- direct and have convenient access from a facility entry point to boarding points
- facilitate clear and direct access to buildings or shorelines, providing an effective mean of wayfinding, and minimising the need for other additional aids (e.g. tactile indicators)
- use consistent layouts and design principles
- be the result of engagement with disability reference groups.

Factors that are directly emphasised to link to people with disabilities, accessible design, and standards are:

- demand and supply of disability groups for consultation
- operational impacts such as boarding times for public transport
- space allocation (e.g. pavements and bus stops)
- appropriate use of icons and symbols
- park 'n ride accessibility
- several assistance elements such as tactile ground surface indicators (TGSIs) and wayfinding aids.

The grades of surfaces (e.g. ramps and pathways) are acknowledged to potentially be an issue for people with disabilities in some cases. The document notes that design compliance should be met using Australian Standards, however, it fails to mention which ones are relevant to the subject. This occurs frequently throughout where compliance with standards is underlined as critical; however, standards can be used as minimal requirements. It is not mentioned that the standards can be improved by catering to those who are likely to use the product design (inclusive of those who live with disabilities). Design compliance does not necessarily guarantee a functional or dignified outcome of accessibility for people with a disability. Going beyond minimal designs is important, though this has not been highlighted in the document.

2.1.4 AUSTRALIAN STANDARDS

Australian Standards are documents that are nationally recognised for setting out specifications, procedures, and guidelines that aim to provide assurance that products, services and systems are safe, consistent and reliable. Several Australian Standards have some provisions that directly consider the requirements of people with disabilities including those with visual and hearing impairments. The following list is a selection of the critical standards that were reviewed:

- AS 1428.1: *Design for Access and Mobility – General Requirements for Access – New Building Work*
- AS 1428.2: *Design for Access and Mobility – Enhanced and Additional Requirements – New Building Works*
- AS/NZS 1428.4.1: *Design for Access and Mobility – Means to Assist the Orientation of People with Vision Impairment – Tactile Ground Surface Indicators*
- AS 1428.4.2: *Design for Access and Mobility – Means to Assist the Orientation of People with Vision Impairment – Wayfinding Signs*
- AS 1735.12: *Lifts, Escalators and Moving Walks – Facilities for Persons with Disabilities*
- AS 2890.1: *Parking Facilities – Off-street Car Parking*
- AS/NZS 3856.1: *Hoists and Ramps for People with Disabilities – Vehicle Mounted Product Requirements.*

Like the Austroads guidelines, only some sections of the standards include information and guidance related to people with disabilities. Standards that were found to be relevant to universal access are detailed in Section A.2 and a summary is provided in Table 2.5. Standards such as AS 1428 directly focus on provisions for assisting people with disabilities.

The selected standards for review in this section were identified after an assessment of the AGRD, AGTM, and the legislation. They were identified as a resource that would provide further information on specific aspects of design. Like the Austroads Guides, specific types of disabilities are referenced under specific sections.

AS 1428.1 primarily details provisions for the interior design of buildings and areas to accommodate access and mobility for people with disabilities. Here ‘accessible’ means that a building/area/feature can be used by people with a disability. This standard focuses on common building features such as flooring and path elements, informational navigating tools, and fixtures. See Appendix A.4.1 for specific details.

AS 1428.2 provides additional requirements for elements already listed in AS 1428.1, including extra path and floor elements, informational navigation tools, and fixture elements not listed in AS 1428.1. See Appendix A.4.2 for specific details.

AS/NZS 1428.4.1 provides requirements for the use of warning and directional tactile indicators to assist persons with vision impairments to navigate public spaces and warn them of hazards. It addresses the applicable locations and physical shape and layout requirements of these indicators. See Appendix A.4.3 for specific details.

AS 1428.4.2 focuses on wayfinding signage to assist those who have vision impairments. Wayfinding signage can assist by providing navigation/directional information using tactile/braille signs. It does not limit a person with vision impairments to physically move around and allows for ease of navigation. The standard details the placement and language requirements on the sign. See Appendix A.4.4 for specific details.

AS 1735.12 contains requirements and recommendations for the design and layout of lifts, escalators, and moving walks to assist people with disabilities. These items are elements that can be used under certain circumstances as part of transportation infrastructure. The standard also details specifications or requirements (mainly space dimensions) that would limit the ability of people with disability to navigate an environment. See Appendix A.4.5 for specific details.

AS/NZS 2890.1 contains the minimum requirements and recommendations for the design and layout of off-street parking facilities. The types of parking areas and requirements for pedestrian access inclusive of people with disabilities are outlined.

After a review of all the standards mentioned, it was found that these standards directly influence the access of persons who have mobility and vision impairments and those with hearing impairments. Access assistance for persons with vision and mobility impairments is mainly in the form of physical assistance (e.g. signs and tactile indicators), but assistance for those with hearing impairments is usually in the form of visual assistance (primarily focused on using visual cues to alert people with hearing impairments).

Table 2.5: Summary of standards and linkages to other documents

Standard	Section	Summary	Linked documents
AS 1428.1	6	Continuous accessible paths of travel	
	7	Floor or ground surfaces	
	8	Signage	
	10	Walkways, ramps and landings	
	12	Handrails	
	13	Doorways, doors and circulation space at doorways	
	13.5	Door controls	
	15	Sanitary facilities	
AS 1428.2	17	Grabrails	
	6	Circulation spaces	AS 1428.1 (abutment of surfaces)
	7	Continuous accessible path of travel	
	8	Walkways, ramps and landings	AS 1428.1
	9	Ground and surfaces	AS 1428.1

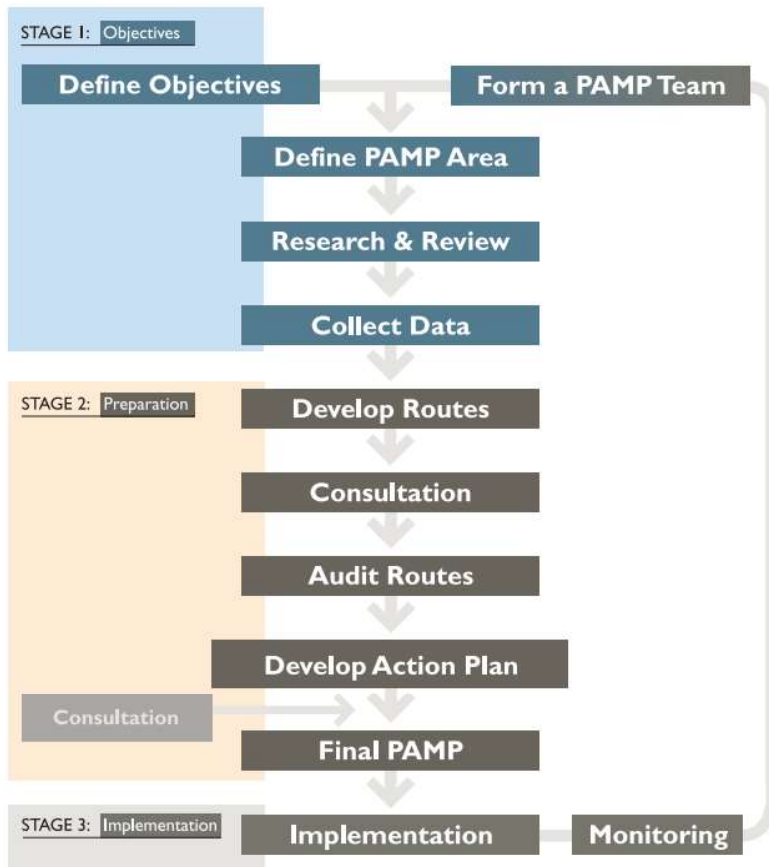
Standard	Section	Summary	Linked documents
	10	Handrails and grabrails	AS 1428.1
	12	Lifts	AS 1735.12
	13	Stairways	
	14	Car parking facilities	AS 2890.1
	17	Signs	AS 1428.1
	18	Warnings	AS 2200.2 (audible alarms) AS 2220.1 (visual alarms)
	19	Lighting	AS 1680.2 (illumination levels) AS 1735.12 (lift illumination levels)
	20	Sounds	AS 2107
	21	Hearing augmentation – listening systems	
	22	Reach and ranges	
	23	Controls	AS 1428.1
	25	Viewing ranges	
	27	Street furniture	
	28	Gateways and checkouts	AS 1428.1 (symbol for access)
	30	Telephones	
	31	Time delay for lights and pedestrian crossings	
AS 1428.4.1	2	Criteria and application for tactile indicators	AS 1428.1 (handrails)
	3	Criteria and application of directional tactile ground surface indicators	
AS 1428.4.2	n/a	N/a	
AS 1735.12	n/a	N/a	
AS 2890.1	1	Scope and general	AS 2890.6 (parking spaces and accessible pedestrian paths)
	2	Design of parking modules, circulation roadways and ramps	AS 2890.6 (parking widths and gradients)
	3	Access facilities to off-street parking areas and queuing areas	
	4	Other considerations	AS 1742.10 (pavement marking) AS 2890.6 (sign posting)
	5	Additional requirements for car parking structures	AS 2890.6 (vehicular parking access)
AS 3856.1	n/a	N/a	

2.1.5 RESEARCH

How to Prepare a Pedestrian Access and Mobility Plan – Roads and Traffic Authority

The previous New South Wales Roads and Traffic Authority prepared this document in partnership with local councils to create comprehensive action plans and strategies to develop pedestrian policies as an investment in safe, convenient and connected pedestrian routes. The initiative, pedestrian access and mobility plans (PAMPs) provides a three-stage framework (Figure 2.2) that applies to pedestrian routes or areas that are identified by the community as important. PAMP development is the responsibility of local councils and common issues that can occur in each stage are highlighted. One of the benefits of a PAMP is that it is believed to improve accessibility for mobility-impaired groups, including elderly people. This initiative could easily be rolled out in Queensland. Currently, the AGRD Part 4 refers to this document for examples of local pedestrian, cycle planning, and design guidelines for pedestrian crossings.

Figure 2.2: Methodology for developing PAMPs



Source: Roads and Traffic Authority (2002).

Easy Steps – Queensland Transport

Easy Steps (prepared by Queensland Transport) is a guide for planning, designing, and promoting safe walking aimed at local governments to increase walking levels in walking environments. The guide describes that the document is a response to the general level of health decline due to society’s increased dependence on motor vehicles. The guide was recommended in AGRD Part 4 for examples of local pedestrian, cycle planning, and design guidelines for pedestrian crossings. No guidance or advice related to universal access is outlined. The framework (Figure 2.3) used for this initiative could be applied to developing a document on universal access.

Figure 2.3: *Easy Steps* structure

Part A Why walking matters	Part B Strategic planning for walking	Part C Planning and promotion	Part D Design, construction, auditing and maintenance	Part E Resource toolbox
A1 Why walking matters	B1 Taking the first step	C1 Planning to walk	D1 Designing good quality pedestrian facilities	E1 Comprehensive resource packages
A2 Benefits of walking	B2 Total quality management	C2 Walking and urban design	D2 Design for accessibility	E2 Pedestrian safety resources
	B3 Walking strategies and local action plans	C3 Developing walking networks	D3 Construction and maintenance of pedestrian facilities	E3 Pedestrian planning and design resources
	B4 Community engagement	C4 Promoting walking	D4 Signage and provision of information	E4 People and skills and walking group contacts
	B5 Funding	C5 Positively influencing travel choices	D5 Monitoring and evaluating pedestrian facilities	E5 Walking promotion resources
	B6 Managing street furniture	C6 Walk safe		
		C7 Planning for pedestrians during special events		

Source: Queensland Transport (2005).

Safe System Assessment Guidelines – VicRoads (now Victoria Department of Transport)

VicRoads released the *Safe System Assessment Guidelines* which recommend designers to undertake both Safe System assessments and road safety audits throughout multiple steps in a project’s development as shown in Figure 2.4. These two processes have been integrated into the design process as complementary tools to maximise road safety outcomes (VicRoads 2019).

Figure 2.4: When to undertake Safe System assessments and road safety audits



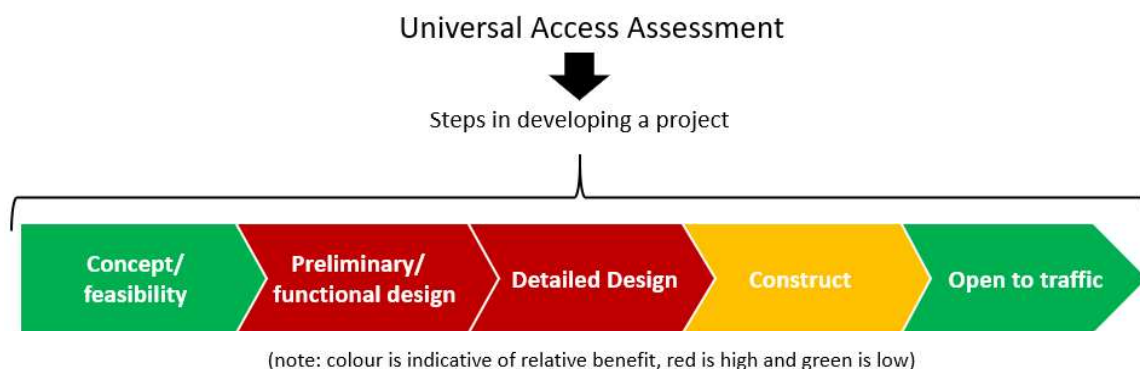
(Note: Arrow widths are indicative of the relative benefit)

Source: VicRoads (2019).

The Safe System assessment process was originally developed by ARRB for the Austroads (2016b) report *Safe System Assessment Framework*. This process could be similarly adopted for designing for universal access, whereby some form of universal access assessment could be implemented in the design process as demonstrated in the modified process shown in Figure 2.5. Alternatively, this could be integrated into another existing process such as road safety audit by placing a greater emphasis on ensuring the safety of persons with disability and/or movement impairment. Road safety audits must be undertaken by an independent team

of at least two people which must include a senior road safety auditor (VicRoads 2017). Team members must have relevant experience (road safety engineering, road design, traffic management, or road user behaviour) and have completed a recognised road safety audit training course of at least two days (VicRoads n.d.). Senior road safety auditors must have at least five years of experience in relevant fields (road design, road construction, or traffic engineering) and have undertaken at least five formal road safety audits (VicRoads n.d.). Implementing a universal access assessment through an existing procedure would reduce duplication and the creation of additional processes, thus reducing the overall design task. This will ensure universal access is considered at multiple points in the development process to provide greater accessibility for all. It is noted that the road safety audit process may not be the best place to integrate a universal access assessment process as it may not provide the right skill set to correctly assess accessibility at a network level.

Figure 2.5: Example of possible universal access assessment



Source: Adapted from VicRoads (2019)

Cycling Aspects of Austroads Guides – Austroads

Cycling Aspects of Austroads Guides (Austroads 2017a) is a compilation of Austroads guidance for cycling. While the document does not directly address universal access, it does demonstrate that all guidance for a particular topic can be condensed into a single document for more streamlined reference. The contents are shown in Figure 2.6 and they provide an overview of the planning, design, construction, and management of cycling facilities. This can assist designers and practitioners by providing an easy-to-follow workflow of what attributes need to be considered and where to find information. There is potential for a similar document to be created to contain all relevant guidance for universal access and provide a design workflow. This could assist in ensuring all user groups are considered at critical phases of the design process.

Figure 2.6: Key cross-references related to planning and traffic management for cycling

Series	Part	Section	Reference source	
Section 2.1 General				
AGRD	Guide to Road Design	6A	Section 2.1	Austrroads (2017c)
Section 2.2: Bicycle Strategies and Strategic Bicycle Plans				
AGTM	Guide to Traffic Management	4	Section 3.6.3	Austrroads (2016b)
Section 2.3: Integrated and Multi-modal Planning				
AGRTP	Guide to Road Transport Planning	General	Section 2.5	Austrroads (2009a)
Section 2.4: Bicycle Network Management				
AGTM	Guide to Traffic Management	4	Section 3.6 and Appendix B	Austrroads (2016b)
Section 2.5: Bicycle Programs				
AGTM	Guide to Traffic Management	4	Section 3.6 and Appendix C	Austrroads (2016b)
AGPE	Guide to Project Evaluation	8	Section 3.10	Austrroads (2006a)
AGRS	Guide to Road Safety	4	Section 6.2.4	Austrroads (2009b)
Section 2.6: Traffic Studies and Bicycle Surveys (also Appendix C)				
AGTM	Guide to Traffic Management	3	Section 2.5.5 and Appendix E.2	Austrroads (2013c)
Section 2.7: Type of Bicycle Facility Required				
AGTM	Guide to Traffic Management	4	Section 3.6.3 and Commentary 8	Austrroads (2016b)
Section 2.8: Combining Bicycle Travel with Public Transport				
AGTM	Guide to Traffic Management	4	Section 3.6.3	Austrroads (2016b)
Section 2.9: Local Area Traffic Management (also Section 4.9)				
AGTM	Guide to Traffic Management	8	Section 7.5.10	Austrroads (2016c)
Section 2.10: Traffic Management in Activity Centres				
AGTM	Guide to Traffic Management	7	Section 2.3.2, 3.8.3 and 3.8.4	Austrroads (2015e)
Section 2.11: Traffic Impacts of Developments				
AGTM	Guide to Traffic Management	12	Section 3.2.7	Austrroads (2016e)

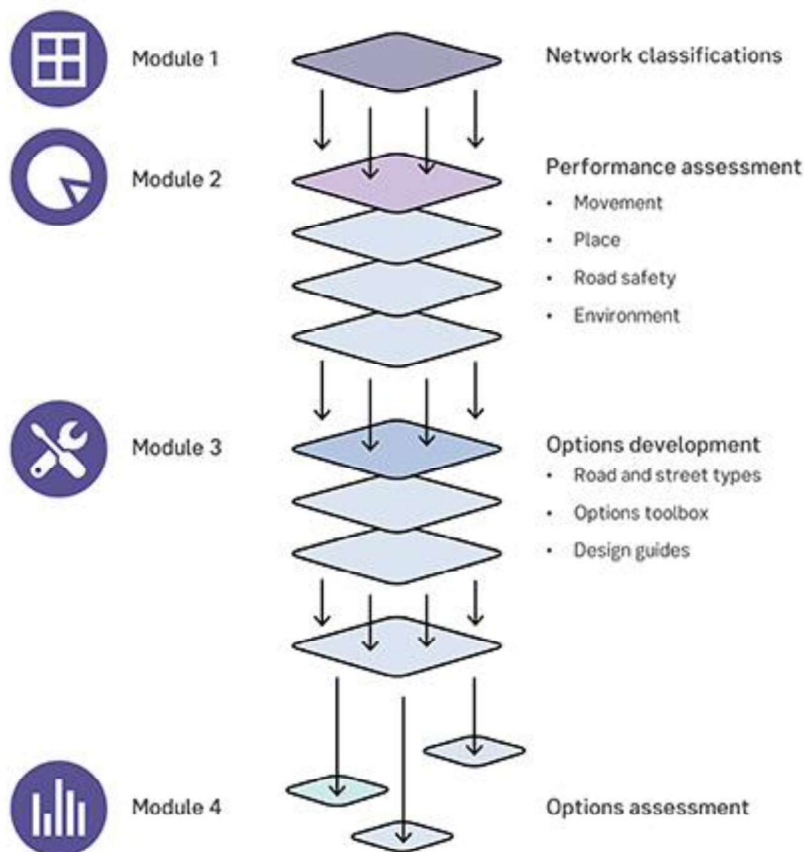
Source: Austrroads (2017a).

Movement and Place in Victoria – Victoria Department of Transport

This document was developed by the Department of Transport in partnership with VicRoads (Victoria Department of Transport 2019). It provides an overview of the movement and place thinking and steps through the four modules in the framework. Movement and place are described as a way of thinking, recognising transportation links as not only a system that gets someone to and from their destination, but a key place/destination in its own right. The document breaks down the framework structure into modules and their relevance to strategic network planning and development levels (Figure 2.7).

Currently, there is no specific framework in Queensland such as in *Movement and Place in Victoria* on when and where universal access should be considered. Any information or advice that pertains to considering the needs of people with disabilities is located in a multitude of documents. In some instances, users are continually referred from one document to the next. Any mention of universal access is often just an added piece of advice or guidance to the discussion of the original subject. A framework that provides a new perspective on designing infrastructure for people with disabilities as a priority could be developed to change the way people with disabilities are considered.

Figure 2.7: Movement and place framework



Source: Victoria Department of Transport (2019).

Safer Road Design for Older Pedestrians – Vic Walks

The *Safer Road Design for Older Pedestrians* user guide aims to improve the safety of elderly pedestrians in road environments (Mantilla & Burt 2016). Analysis of historical crash data in Victoria involving elderly pedestrians is provided to demonstrate their vulnerability and the need for improvement in road environments for the elderly. The statistics and information in the document allow for designers to identify key risks and difficulties that elderly people experience when accessing the transport networks and road environments. Examples are given throughout, providing insight into what surrounding conditions contribute to the increased safety risk to the elderly, such as time of day and type of road sections.

As compliance does not necessarily guarantee a functional or dignified outcome for people with disabilities, formalising a document similar to the *Safer Road Design for Older Pedestrians* user guide that includes insight into the conditions in which universal accessibility is limited, would assist designers in identifying where the bare minimum in design requirements of an accessible element (such as kerb ramps) may not be fit for its purpose or may need to be re-evaluated.

Urban Street and Road Design Guide – Auckland Transport

The *Urban Street and Road Design Guide* (Auckland Transport n.d.) is a new approach to prioritising people first when designing urban roads in New Zealand. It recognises that transport infrastructure is about maximising people's access to the city's opportunities and encourages this by providing advice and guidance to prioritise active transport modes and public transportation. One of the objectives of the guide is to see an increase in safe and reliable accessibility. The framework for transport design is broken down into four sections (see Figure 2.8):

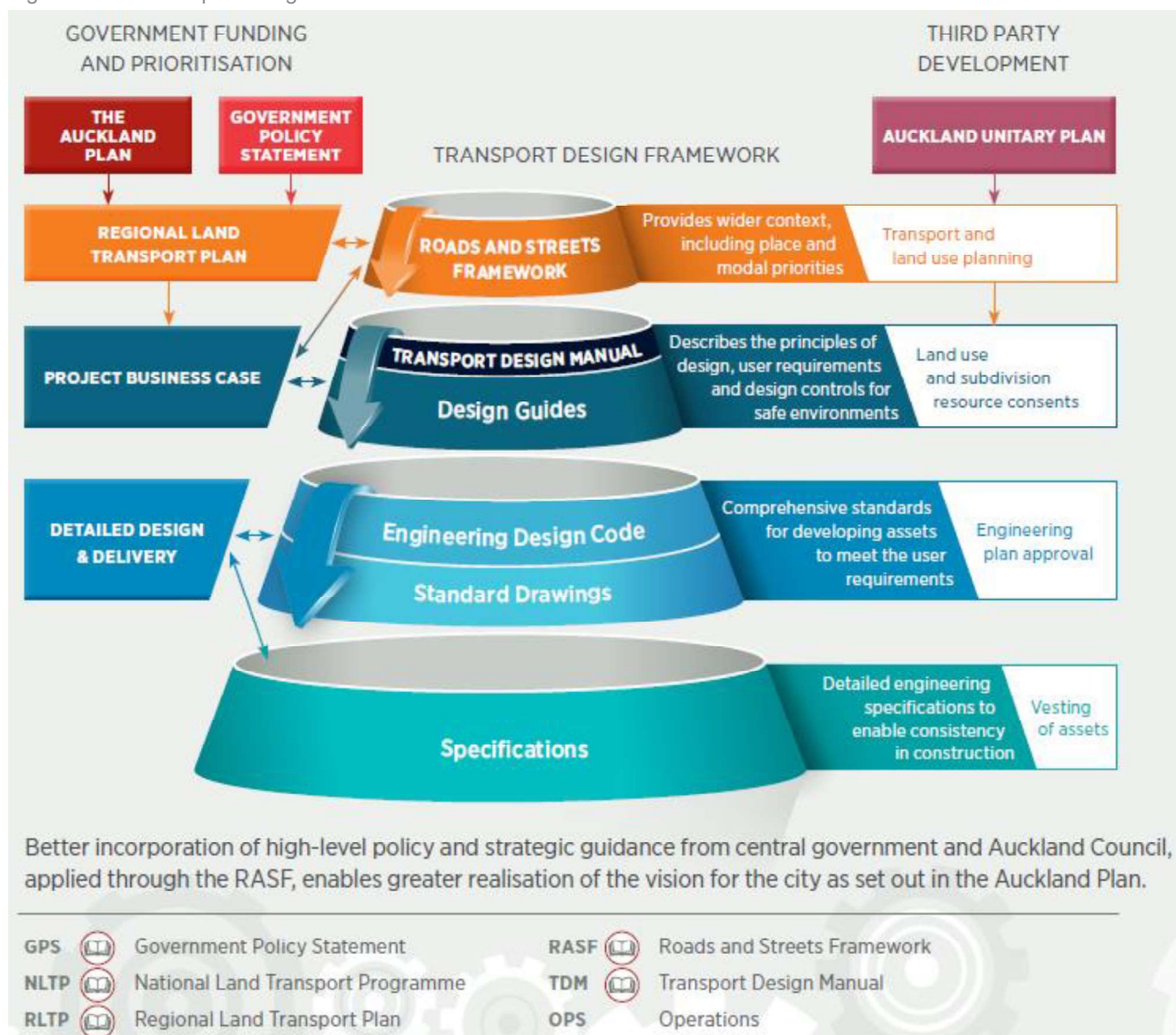
1. Roads and streets framework

2. Transport design manuals and design guides
3. Engineering design codes
4. Specifications.

It details how the design principles of the transport design manuals and guides work as part of the overall design system, and then identifies system elements (Figure 2.8 shows the design system). The idea of combining system elements and principles to deliver planned outcomes is then presented. Elements include neighbourhood design, street users, street types, intersections and design controls. Prioritising people first is a shift in thinking from designing streets for vehicles to designing streets for people, based on knowledge of their behaviour.

The elements of the framework presented in the *Urban Street and Road Design Guide* could apply to the development of a detailed structure that focuses on universal access. A framework where the principles and design elements related to access for people who experience a disability could be identified to assist transport infrastructure designers to create universally accessible designs.

Figure 2.8: Transport design framework



Source: Auckland Transport (n.d.).

Street and Movement Network – Economic Development Queensland

The *Street and Movement Network: PDA Guideline no. 06* (Economic Development Queensland 2019) is intended to be used in the design of priority development areas. It is to be used as a guide to provide

developers and consultants with a clear indication of the form, type and arrangement of proposed developments that are likely to be approved and sets out standards for planning, street design and network movement. Specifications are orientated around street and network types.

Concerning this project, design circumstances are dependent on the types of disabilities, transport networks and times of the day. The discussion around the current framework for transport network design does not include how different circumstances affect the suitability of treatments for universal accessibility.

Universal Design: Streets – American Society of Landscape Architects

Universal Design: Streets (American Society of Landscape Architects 2020) provides factors that contribute to street design, in making streets more accessible. The lack of accessibility is linked to the dominance of road vehicles. The factors are :

- wide sidewalks and pathways
- areas for socialising
- clearly defined spaces
- attenuated acoustic environment
- places of enclosure
- multi-modal paths
- perpendicular tactile paving
- pedestrian safety islands
- flexible seating
- frequent seating with arms
- well-lit and consistent lighting
- green infrastructure

How these factors benefit universal access is described. Universal elements similar to these factors could be provided to designers in Queensland, where the elements are considered and evaluated in terms of accessibility and assisting and benefiting people with disability.

2.2 SUMMARY OF FINDINGS

2.2.1 KEY FINDINGS

From the review of existing documentation, it was found that there is no formalised framework specifically for the provision of access to people with disability or for the provision of universal access to the transport network. Designers are unable to consult one framework that would detail the design process from start to finish, identify all relevant documents and outline when to apply them. Therefore, a general framework for design for universal access has been described in Figure 2.9. This process begins with the application of relevant legislation, followed by the application of design standards, TMR's policy frameworks for universal access, and guidelines.

The creation of a consolidated guide to universal access, similar to *Cycling Aspects of Austroads Guides* and *Safer Road Design for Older Pedestrians* user guide, would provide a framework that may assist in designing for universal access. This consolidated guide would promote consideration of all user groups, especially people with disability (including hearing and visual impairments), during the design process. However, an additional investigation would be required to determine the benefit to designers. Alternatively, a policy document could be created to ensure consideration for all user groups is given and to provide a framework for design.

Figure 2.9: Process of design for universal access



The review of the Austroads Guides and Australian Standards indicated that only limited considerations for people with disability were provided, with occasional reference to design considerations for specific types of impairments (e.g. wheelchair users). Detailed information is not provided regarding why particular user groups with specific impairments may require additional design considerations and the types of difficulties these users are likely to experience. Therefore, designers often do not have a fully informed understanding of the limitations a person with disability experiences, which can lead them to create inadequate designs for universal access. Compliance with the current standards and guides does not mean that the network element is appropriately accessible and serving its intended purpose. Additional detailed information that encompasses requirements for access for users with disability, for each type of impairment and how this contributes to providing a safe, dignified journey, is required to allow designers to ensure accessibility for all users.

It was also found that the majority of the guidance provided on universal accessible design was from the Australian Standards rather than the design guidelines. Generally, the design guidelines briefly discuss a design consideration and then refer to an Australian Standard for the design requirements, guidance and any additional information or advice. The design information for elements that require consideration for people with disability is spread across many standards, guidelines and legislative documents. In a number of these documents, it is identified that people with disability may require additional assistance or special requirements; however, no reference to supporting materials or information is provided. In other sections, additional materials are referred to, but critical information is not mentioned. Additionally, it was sometimes found that the critical information and references to appropriate material were in other sections that related to the design element. Overall, the process of finding specific information for mandatory requirements to ensure designs that consider universal access is confusing, difficult and time-consuming, as no one document consolidates where to find this information. Therefore, designers could easily miss critical information and design a project to inadequate access standards that limit people with a disability.

Regarding the references made to supporting documents for further consideration for people with disabilities under specific aspects of transport infrastructure and accessibility, there were many instances where compliance with the standards is the only guidance given along with prescribed documents that contain the compliance requirements. Compliance with design requirements does not always provide a dignified or functional outcome for the user. Compliance with the minimum requirements should be a starting point for design and should be adjusted appropriately where necessary if people with disability are likely to experience difficulties. Fit-for-purpose design can in some cases be achieved at the same cost as the minimum design standards. A change in approach to accessible design should focus on designers looking at the likely needs of people with disabilities and not just standard compliance. The focus on compliance allows designers to overlook any additional design considerations that could better assist those experiencing a disability. The Australian Standards aim to avoid any discrimination against persons experiencing a disability as part of the requirements in the *Disability Discrimination Act 1992*. Therefore, any guidance should reinforce the notion that discrimination against people with disabilities is unlawful and universally accessible

designs should be focused on avoiding discrimination and providing dignified and defensible access to all users.

The term ‘disability’ is not clearly defined in terms of what it means in a transportation context. The *Disability Discrimination Act 1992* defines the term and provides a list of what overarching conditions are considered a disability. However, some of those listed are unlikely to experience any physical difficulties or limitations when attempting to access the transport network. While the term may be inclusive of all disabilities, the majority of standards and guideline documents pertaining to transport design or management use broad or vague terms such as ‘people with a disability’ or ‘wheelchair users’ to identify physically impaired groups when addressing areas of concern. These terms may not be as inclusive as intended. Elderly pedestrians make up a large portion of people experiencing movement impairments and/or other disabilities, but even elderly persons who are able but are just physically deteriorating (due to natural causes and as a result are slower and weaker), may experience similar difficulties to those with disabilities. It may be that with the current wording used, elderly people and those with other forms of disabilities or conditions are not being included in the existing design process, which could result in the provision of inadequate levels of accessibility. In addition, there are some sections where only the term ‘pedestrian’ is used and this term is implied to be inclusive of all user groups such as people with disabilities, the elderly and children.

A number of the documents reviewed do not always use the term ‘disability’, using the term ‘impairment’ instead, and in other cases naming only the assistance device itself (‘wheelchair’ or ‘wheelchair user’). The use of the term ‘wheelchair user’ limits the provision of access to people with disability as designers then consider requirements specific to this impairment, instead of considering all users including people with all types of disability. This provides difficulties in determining what aspects of road design or traffic management require consideration for people with disabilities.

Several elements are being directly targeted to improve the efficiency and quality of universal access. However, unless a person is already familiar with these elements and the design process for universal access as a whole, it can be difficult to identify what elements are specifically required for universal access or what elements can affect accessibility. Following the current process of design, those who are not familiar with the process will have to seek out what elements exist and understand how these elements assist the people they are intended for. This can make it difficult to be aware of any mandatory requirements and it is confusing, difficult and time-consuming to have to seek the necessary information.

2.2.2 STREET GRADIENTS AT GREENFIELD SITES

One of the key objectives of this review was to investigate if greenfield developments are implementing accessible street gradients. The guidance for street gradient design is spread across multiple key documents, providing varying levels of detail and typically grouping information by road pavement and roadside footpath. The documents that were identified and a summary are presented in Table 2.6.

Table 2.6: Key documents for street gradient and linkages

Document	Summary	Linkages
AGRD Part 3	Provides maximum gradient for road pavement based on operating speed and terrain. The Maximum recommended grade is 10% in mountainous terrain with an operating speed of 60 km/h. See Table A.7 for maximum grades	Refers footpath design to AGRD Part 6A
AGRD Part 6A	Contains the following details from AS 1428:2009: <ul style="list-style-type: none"> Gradients of 1:33 require 1.2 m long rest areas every 25 m Gradients of 1:20 require 1.2 m long rest areas every 15 m Gradients of less than 1:33 require no rest area 	Refers footpath gradient design to AS 1428.1:2009, AS 1428.2:1992 and the Australian Human Rights Commission <i>Advisory Note on Streetscape, Public Outdoor Areas, Fixtures, Fittings and Furniture</i>
AS 1428.1	Contains the following standards:	

Document	Summary	Linkages
	<ul style="list-style-type: none"> • Walkway gradient not steeper than 1:20 • Gradients of 1:33 require 1.2 m long rest areas every 25 m • Gradients of 1:20 require 1.2 m long rest areas every 15 m • Gradients of less than 1:33 require no rest area 	
TMR Technical Note 38	<ul style="list-style-type: none"> • Gradient of 1:8 for step ramp • Gradient of 1:14 for ramp • Gradient of 1:20 for walkways • Gradient of 1:33 for access to public transport infrastructure • At grade of the road for footpath 	Refers to AS1428.1
Australian Human Rights Commission <i>Advisory Note on Streetscape, Public Outdoor Areas, Fixtures, Fittings and Furniture</i>	<p>Contains the following guidance:</p> <ul style="list-style-type: none"> • Have a gradient no steeper than 1:20 	

Source: Austroads (2016a, 2017c), Queensland Department of Transport and Main Roads (2010), Australian Human Rights Commission (2013) and AS1428.1-2009.

Technical Note 38 states that a footpath grade can be at the grade of the adjacent roadway, where the roadway gradient specification is cover in AGRD Part 3 (TMR 2010). Road gradients in low-speed areas (60 km/h) which pedestrians may frequent, can have recommended maximum grades ranging from 8% to 10% depending on terrain. However, as these are only guidelines, designers can exceed these grades if they deem them suitable. No guidance was found specifically for the design of street gradients for greenfield developments. Therefore, the street gradients do not incorporate any decision-making based on universal access design considerations.

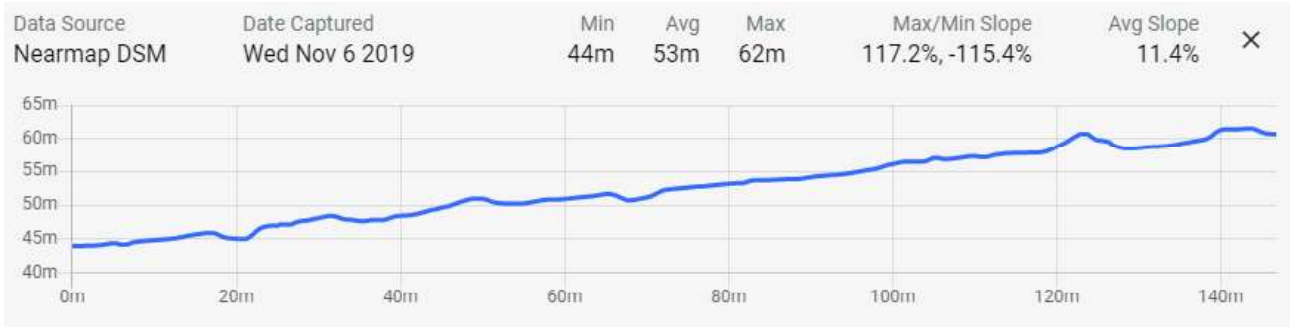
An example of a street gradient in recent greenfield development is shown in Figure 2.10 and Figure 2.11, indicating that the grade can be quite steep even in greenfield developments. It is also noted that the footpaths follow the same gradient as the roadway with no obvious landings. People with disability living in these areas could face 'restricted access to social and cultural events and civic, political and economic opportunities because of inaccessible attributes of the built and natural environment' (Council of Australian Governments 2011). These accessibility restrictions may lead to fewer buyers in greenfield developments especially in the elderly population which makes up approximately 16% of the Queensland population (Australian Bureau of Statistics 2019a).

Figure 2.10: Street view of the gradient at greenfield development



Source: Google (2015).

Figure 2.11: Gradient of street at greenfield development



Source: Nearmap (2019).

In terms of roadside footpaths, the AGRD Part 6A simply states that footpaths should be as flat as possible and mentions that AS 1428.1 has specific standards for pedestrian walkways. AS 1428.1 states that rest areas are required for long sections of walkways with gradients steeper than 1:33 and a walkway gradient is not to exceed 1:20. However, walkways are categorised differently from footpaths and Technical Note 38 states that footpaths can be at the grade of a road.

2.2.3 COMPARISON OF GUIDANCE

Guidance for each aspect of design such as handrails, footpaths, etc. is spread across numerous documents and there is no consolidated design guide for universal access. Table 2.7 identifies the key aspects of universal access design and in what documents the information is located. This shows that while the guidelines used in Queensland cover most aspects of universal access, it may be difficult for practitioners to access all the required information to effectively design for accessibility.

Table 2.7: Distribution of key information across guidance documents

	Austroads Guide to Road Design						Austroads Guide to Traffic Management			Australian Standards			
	Part 2	Part 3	Part 4	Part 4C	Part 6A	Part 6B	Part 6	Part 10	Part 11	AS 1428.1	AS 1428.2	AS 1428.4.1	AS 2890.1
Manoeuvring areas		✓	✓	✓	✓		✓		✓		✓		
Passing areas		✓		✓			✓		✓				
Resting points				✓		✓	✓		✓		✓		
Ramps		✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓
Waiting areas		✓	✓				✓		✓				
Boarding		✓					✓						
Allocated space		✓					✓		✓		✓		
Ground and surfaces		✓	✓			✓	✓	✓	✓	✓	✓	✓	✓
Handrails and grabrails				✓	✓		✓	✓	✓	✓	✓	✓	
Doorways and doors, door controls					✓				✓	✓			✓
Lifts				✓					✓		✓		
Stairs				✓					✓	✓	✓	✓	
Toilets						✓			✓	✓			
Symbols							✓	✓	✓				

	Austroads Guide to Road Design				Austroads Guide to Traffic Management				Australian Standards				
Signage				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Tactile ground surface indicators	✓		✓		✓	✓		✓				✓	
Warnings (audible and visual alarms)					✓						✓		
Sounds													
Lighting					✓		✓			✓			✓
Controls										✓			
Furniture and fittings					✓						✓		
Street furniture			✓		✓					✓			
Gateways and checkouts										✓			
Payment of fares										✓			
Hearing augmentation-listening systems					✓						✓		
Information								✓					
Access paths (continuous accessible paths of travel)	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Walkways, ramps and landings	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Circulation spaces	✓			✓				✓	✓	✓	✓	✓	✓
Car parking facilities and structures	✓			✓				✓	✓	✓	✓	✓	✓

	Austroads Guide to Road Design					Austroads Guide to Traffic Management			Australian Standards			
Reach and ranges				✓		✓	✓	✓			✓	
Viewing ranges				✓		✓					✓	✓
Telephones					✓						✓	
Pedestrian crossings	✓		✓			✓	✓	✓			✓	
Design of parking modules, circulation roadways and ramps		✓			✓	✓	✓	✓				✓
Access facilities to off-street parking areas and queuing areas		✓				✓		✓				✓

3 RECOMMENDATIONS FOR NEXT STEPS

From the review of policies, standards and guidance published by TMR, Austroads and Australian Standards, the following recommendations have been made:

- Throughout most of the reviewed documents accessibility for people with disability is discussed to some degree however the term 'people with disability' is usually not clearly defined. This may lead to designers only catering for a select group of disability types rather than for all people with any form of disability or impairment. The term should be clearly defined as to what it means to the transport network and what is covered under this term. One method of doing so would be to identify design users based on the most common impairments and provide clarifying information on how the impairment may impact accessibility and typical considerations used to improve access.
- One term that is rarely used in the reviewed documents term 'universal access'. This term should be clearly defined and used in place of others such as 'people with disability' or 'person in a wheelchair'. This term incorporates all users when designing for accessibility, including people with disability, the elderly, people with injuries, people with vision impairment, and more. The term 'universal access' should be defined alongside 'people with disability' to ensure designers cater for all users.
- The consolidation of all applied guidance into one design guide that emphasises universal access should be investigated. This could be achieved in a similar way to the Austroads (2017a) *Cycling Aspects of Austroads Guides* document. This consolidation may provide a consistent process for the design of universal access and assist designers in easily locating the required knowledge for design, thus reducing the complexity of navigating reference documents. Emphasising universal access in the design process would lead to enhanced accessibility for not only people with disability but for all users of the transport network. This will also help designers identify what elements of the transport network contribute most to providing access for people with disability. It is noted that consultation with designers would be needed to determine if this is a suitable solution.
- The review of *Safe System Assessment Guidelines* (VicRoads 2019) identified that the ARRB Safe System Assessment framework has been implemented in the project process, alongside the existing road safety audit process. Integration of a similar universal access (or disability access) assessment/audit framework into the design process could enhance accessibility for all users (see Figure 2.5). This would help to integrate design for universal access and people with disability into the design process further to ensure all roadside infrastructure is accessible.
- Consultation should be undertaken with people with mobility and sensory impairments to better understand the difficulties they experience in accessing the TMR transport network. This will help to pinpoint the attributes of the transport network that do not cater well enough for people with disability and where existing legislation, guidelines and standards do not meet expectations. This process will be most effective if a wider range of disabilities are considered.
- In future, when presenting or recommending the idea that consideration should be given to certain aspects of design for people living with physical impairments, the approach should reinforce legal obligations as critical criteria. This will emphasise the importance that should be placed on guaranteeing accessibility for all user groups. This could be implemented through a policy statement to ensure appropriate outcomes of design.
- Design criteria for attributes relating to people with disability should include desirable guidance alongside the minimum design guidance. Designers should be encouraged to use the desirable value or exceed the minimum value when designing for accessibility. This will help to emphasise that the design should cater to the users' needs rather than only complying with the minimum values. This type of guidance is already commonplace throughout the AGRD and AGTM in other areas of design and assists in communicating that compliance does not always indicate a good design.
- A review of international policies, guidelines and standards for the design of accessibility for people with disability should be undertaken. This can then be compared against existing Australian practices to

determine any areas that may be improved based on international best practice. This review could be undertaken in stages through the NACoE program, with each stage having a focus scope to provide desired outcomes.

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STANDARDS LIST

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APPENDIX A CRITICAL REVIEW

A.1 LEGISLATION: CURRENT TECHNICAL GUIDANCE AND STANDARDS

A.1.1 DISABILITY DISCRIMINATION ACT 1992

The *Disability Discrimination Act 1992* aims to ensure that people with disability have the same rights to equality before the law as the rest of the community.

Concerning a person, disability refers to:

- the total or partial loss of the person's bodily or mental functions, or part of the body
- presence of disease or illness-causing organisms in the body
- malfunction, malformation or disfigurement of a part of the person's body
- a disorder, illness or disease that affects a person's thought processes, perception of reality, emotions or judgement or that results in disturbed behaviour.

The objective of the Act is to eliminate discrimination against persons on the grounds of disability in areas of:

- work, accommodation, education
- access to premises (including structures, buildings, aircraft, vehicles or vessels)
- provision of goods, facilities, services (relating to transport or travel) and land
- existing laws.

A disability standard outlines reasonable adjustments, strategies and programs to prevent harassment or victimisation of persons with a disability. Section 23 24 and 31 are relevant to persons with disabilities accessing and utilising the road network.

Section 23: Access to premises states that it is unlawful for a person to discriminate against another person on the grounds of the other person's disability :

- a. By refusing to allow the other person access to, or the use of, any premises that the public or a section of the public is entitled or allowed to enter or use (whether for payment or not); or
- b. In the terms or conditions on which the first-mentioned person is prepared to allow the other person access to, or the use of, any such premises; or
- c. In relation to the provision of means of access to such premises; or
- d. By refusing to allow the other person the use of any facilities in such premises that the public or a section of the public is entitled or allowed to use (whether for payment or not); or
- e. In the terms or conditions on which the first-mentioned person is prepared to allow the other person the use of any such facilities; or
- f. By requiring the other person to leave such premises or cease to use such facilities.

Section 24: Goods, services and facilities state that it is unlawful for a person who provides goods or services or makes facilities available, to discriminate against another person on the grounds of the other person's disability:

- a. By refusing to provide the other person with those goods or services or to make those facilities available to the other person; or
- b. In the terms or conditions on which the first-mentioned person provides the other person with those goods or services or makes those facilities available to the other person; or
- c. In the manner in which the first-mentioned person provides the other person with those goods or services or makes those facilities available to the other person.

Section 31: Disability standards states that the Minister may, by legislative instrument, formulate standards, to be known as disability standards, in relation to any area in which it is unlawful under this Part for a person to discriminate against another person on the grounds of a disability of the other person.

A.1.2 COMMONWEALTH DISABILITY STANDARDS FOR ACCESSIBLE PUBLIC TRANSPORT 2002

The *Disability Standards for Accessible Public Transport 2002* is provided in subsections 31 (3) and (4) of the *Disability Discrimination Act 1992*. The purpose of the standards is to eliminate discrimination against people with disabilities and to enable public transport operators and providers to remove discrimination from public transport services. The standards apply to all people with disability, all operators and the conveyances they use to provide public transport services and all providers supporting premises and infrastructure and:

- acknowledge the rights of passengers, operators and providers
- prescribe how public transport is to be made accessible
- impose responsibilities.

Table A.1 provides a brief description of each section of the *Disability Standards for Accessible Public Transport 2002* which is relevant to the provision of access on TMR's transport network.

Table A.1: Relevant standards for universal accessibility

Section no.	Title	Description
2.1	Access paths	Comply with AS 1428.2. <ul style="list-style-type: none"> • Unhindered passage • Continuous accessibility • Minimum unobstructed width (1200 mm) • Poles and obstacles • Conveyances (minimum width 850 mm) • Extent of path
3.3	Manoeuvring areas	Comply with 1428.2. <ul style="list-style-type: none"> • Circulation space for wheelchairs to turn in (allow for 180-degree wheelchair turn) • Access for passengers in wheelchairs
4.1	Passing areas	Comply with 1428.2. <ul style="list-style-type: none"> • Minimum width (1800 mm) • Two-way access paths (provided every 6 m along any two-way access path less than 1800 mm wide) • Conveyances require at least one passing area for each accessible rail car or ferry
5.1	Resting points	Comply with 1428.2. <ul style="list-style-type: none"> • Must be resting points for passengers along an access path if the walking distance between facilities/services exceeds 60 m • Must provide seats
6.1	Ramps	Ramps on access paths comply with 1428.2. Boarding ramps comply with AS/NZS 3856.1 <ul style="list-style-type: none"> • Minimum allowable width of ramp (800 m) • The slope of external boarding ramps (not exceed 1 in 14 for unassisted access, 1 in 4 for assisted access)
7.1	Waiting areas	<ul style="list-style-type: none"> • Minimum number of seats provided (2 seats or 5% available seats identified as available for passengers with disabilities)
8.4	Boarding	Comply with AS/NZS 3856.1 <ul style="list-style-type: none"> • Boarding points and kerbs (assume passengers boarding at a point that has a firm, level surface where boarding device can be deployed) • When boarding device must be provided (vertical gap exceeding 12 mm, horizontal gap exceeding 40 mm) • Use of boarding device available at all stops • Hail-and-ride service

Section no.	Title	Description
		<ul style="list-style-type: none"> • Width and surface of boarding device (minimum of 800 mm wide, have slip-resistant surface) • Maximum load supported by boarding device (up to 300 kg) • Signals requesting boarding device located in allocated space • Notification by a passenger of need for boarding device
9.1	Allocated space	<p>Comply with 1428.2.</p> <ul style="list-style-type: none"> • Minimum size for allocated space (single wheelchair is 800 mm by 1300 mm) • At least one allocated space provided in each conveyance • Minimum head room in allocated space (1410 mm, after January 2013, 1500 mm) • Buses: provide 2 allocated spaces with 32+ fixed seats • Ferries: provide 2 allocated spaces with first 32 passengers, additional 2 spaces provided for each additional 100 passenger capacity • Train cars: 2 allocated spaces for each rail, tram or light rail car • Aircraft and coaches: operator does not have to provide allocated space if the passenger uses a fixed seat • The international symbol of accessibility displayed • Movement of mobility aid in allocated space contained towards front/sides of conveyance
10.1	Surfaces	<ul style="list-style-type: none"> • Comply with AS 1428.2 clause 9
11.1	Handrails and grabrails	<ul style="list-style-type: none"> • Comply with AS 1428.1 clause 12 • Provided on access paths • Provided on steps • Grabrails provided where fares are paid • Grabrails provided in allocated spaces
12.3	Doorways and doors	<ul style="list-style-type: none"> • Doors on access paths (not a present barrier to independent travel) • Doorways and doors comply with AS 1428.1 clause 13
13.1	Lifts	<ul style="list-style-type: none"> • Comply with AS 1735.12
14	Stairs	<p>Comply with 1428.1.</p> <p>Comply with 1428.2.</p> <ul style="list-style-type: none"> • Stairs not to be the sole means of access
15	Toilets	<ul style="list-style-type: none"> • At least one unisex accessible toilet provided without an airlock • Accessible toilets must be in the same location as other toilets • Accessible toilet complies with AS 1428.1 clause 15 • Allows passengers in wheelchairs to enter, position aid and exit • Minimum dimension (centreline of the pan to near-side wall 450 mm, centreline of the pan to far-side wall 1150 mm, back wall to the front edge of pan 800 mm, and toilet seat 460–480 mm above the floor) • Handwashing facilities provided inside or outside the toilet
16	Symbols	<ul style="list-style-type: none"> • International symbols for accessibility and deafness must be used to identify an access path and which facilities and boarding points are accessible • Must incorporate directional arrows/pictograms to show passengers a way to accessible toilets • Must be clearly visible on the front of accessible buses • Must be clearly visible inside and outside accessible doors on conveyances
17	Signs	<ul style="list-style-type: none"> • Destination signs must be visible from boarding points and displayed on conveyance • Presentation of words/numbers on electronic notices must be visible for at least 10 seconds • Raised letters or symbols must be included at least 0.8 mm above the surface of the sign • If Braille characters included, placed to the left of the raised characters
18	Tactile ground surface indicators	<ul style="list-style-type: none"> • Must be installed on the access path to indicate stairways, ramps, changes of direction, overhead obstructions (below the height of 2000 mm) and hazards • Colour-contrasted tactile indicators must be installed at accessible boarding points (bus stops/zones)

Section no.	Title	Description
		<ul style="list-style-type: none"> • Installation at railway platforms and wharf edges
20	Lighting	<ul style="list-style-type: none"> • Should be at least 150 lux at the entrance and at the point where the passenger pays a fare

Source: *Disability Standards for Accessible Public Transport 2002*.

A.1.3 DISABILITY STANDARDS FOR ACCESSIBLE PUBLIC TRANSPORT GUIDELINES 2004 (NO. 3)

The purpose of the *Disability Standards for Accessible Public Transport Guidelines 2004* is to provide additional information concerning the *Disability Standards for Accessible Public Transport 2002*. Under the standards, public transport services will become more accessible by replacement or upgrading of conveyances, premises and infrastructure according to the compliance timetable.

The standards prescribe outcomes that public transport operators and providers must achieve to make their services non-discriminatory. Table A.2 outlines additional requirements not originally mentioned in the *Disability Standards for Accessible Public Transport 2002* that have relevance to ensuring the public transport network has universal accessibility.

Table A.2: Accessible public transport guidelines

Section no.	Heading	Subheading	Description
27	Information	Formats for providing information	<p>Operators and providers should expect requests for information in the following formats:</p> <ul style="list-style-type: none"> • Standard or large print • Braille • Audio • Touch-tone telephone • TTY • Online computer or disks <p>If operators or providers can't supply information in a particular format, passengers may expect assistance to be provided to enable them to use documentation in the available formats</p>
31	Priority	Location of priority seats	<p>Passengers anticipate that priority seating for people with disabilities will be near an entrance</p> <p>This benefits passengers with restricted movement or coordination difficulties</p>
		Vacating priority seats	<p>Disability standards assume that operators will ensure that relevant passengers are informed of the need to vacate priority seats and spaces for persons with disabilities</p>

Section no.	Heading	Subheading	Description
33.3	Direct assistance	Provision of direct access	<p>The level of assistance provided should be in response to the person's independence and should enable the person to preserve their dignity</p> <p>An operator or provider may give equivalent access through direct assistance to a person over and above that provided to other passengers:</p> <ul style="list-style-type: none"> • Before and after travel • During boarding and alighting • While travelling
		Assistance before or after travel	Provide information about the service and assistance with purchasing and validation of the ticket
		Assistance during boarding and alighting	<p>Provision of assistance through providing:</p> <ul style="list-style-type: none"> • Mobility aids on conveyances where design constraints prevent the use of a person's own mobility • Assistance in moving from a wheelchair to a fixed seat if an allocated space is not provided <p>The operator may decide that passengers with disabilities should board before and alight after other passengers</p>
		Assistance while travelling	<p>Once on board, passengers with disabilities may require assistance with:</p> <ul style="list-style-type: none"> • Information about the approach of their stop • Moving to and from on-board facilities or toilets • Information or advice if there is an unscheduled change to service or the timeframe does not allow for information to be provided in a preferred format
37.1	Customer service	Attitude of staff	<ul style="list-style-type: none"> • Disability standards assume that operators of public transport premises and infrastructure will ensure that their staff are proficient in interacting with passengers in ways that do not discriminate against people with disabilities • Attitude is the main barrier to non-discriminatory access for people with disabilities • Recommended that staff orientation and education programs include components on disability awareness and rights: should enable staff to provide helpful assistance without being patronising in language, attitude or actions <p>Appropriate inclusions in customer service programs:</p> <ul style="list-style-type: none"> • Awareness education of the difficulties a passenger with a disability may face at different stages of a journey • Training in the use and upkeep of accessibility features (boarding ramps, wheelchair lifts, hearing loops, tactile tiling)

Source: *Disability Standards for Accessible Public Transport Guidelines 2004*.

Figure A.1 outlines criteria for mobility aids as referenced in the standards.

Figure A.1 Criteria for mobility aids

Weight	The total weight to be supported by a boarding device needs to be not more than 300 kg
Width	The overall width of the mobility aid needs to be less than 800 mm.
Head height	Until 31 December 2012, the maximum door clearance into a taxi is 1400 mm while the internal head height is 1410 mm. These heights both increase to 1500 mm after that date
Manoeuvrability	The mobility aid would need to be capable of turning through 180 degrees within an area of 2070 mm by 1540 mm
Allocated space	The space for stationary mobility aids is 800 mm wide by 1300 mm long
Wheels	A mobility aid should be able to: <ul style="list-style-type: none"> (a) cross a horizontal gap up to 40 mm wide; and (b) mount a vertical rise (bump) up to 12 mm; and (c) cross grating gaps up to 13 mm wide and 150 mm long
Brakes	Mobility aids need to have effective braking systems to maintain stability and be able to withstand acceleration, braking, cornering and pitching of conveyances
Anchoring devices	If anchoring devices are required by regulation, mobility aids need to be able to accept and travel with anchoring devices fitted
Ramps	Mobility aids should be able to negotiate: <ul style="list-style-type: none"> (a) a 1 in 14 ramp unassisted; and (b) a 1 in 8 grade where the ramp is less than 1520 mm
Batteries	Electric mobility aids may need to comply with regulations governing the carriage of batteries on public transport. Batteries need to be adequately secured while gel or solid state options should be considered

Source: *Disability Standards for Accessible Public Transport Guidelines 2004*.

A.1.4 TMR: RESPONSE TO DISABILITY STANDARDS FOR ACCESSIBLE PUBLIC TRANSPORT 2002

In response to the *Disability Standards for Accessible Public Transport 2002* (hereby referred to as the Transport Standards), TMR issued *Information Bulletin PT601/03.19: Disability Standards for Accessible Public Transport 2002* (Queensland Department of Transport and Main Roads 2019c) which requires that between 2019 and 2032, particular sections of the Transport Standards must be met by public transport vehicles as follows:

- All new vehicles must comply with the Transport Standards.

- Vehicles currently in operation that were purchased before the Transport Standards came into operation (23 October 2002), need to comply with the standards by the target dates outlined in Figure A.2.
- All new public transport systems must comply with the Transport Standards.

TMR states that if an operator is unable to meet the specifications set out in the Transport Standards, they may provide equivalent access without discrimination as far as possible. Equivalent access means that alternative means of access to the public transport service can be provided, with an equivalence of amenity, availability, comfort, convenience, dignity, price and safety. If an operator is considering providing equivalent access, they must consult with passengers with disabilities who use the service, or with organisations representing people with disabilities, about any proposal for equivalent access.

Figure A.2 Target dates for implementation of the Transport Standards (excluding trains, trams and light rail)

Part	Part No	Percentage of compliance required by target date			
		31 Dec, 2007	31 Dec, 2012	31 Dec, 2017	31 Dec, 2022
Alarms	19	100%			
Belongings	30	100%			
Booked Services	28	100%			
Food and Drink Services	29	100%			
Hearing Augmentation	26	100%			
Information	27	100%			
Lighting	20	100%			
Priority Seating	31	100%			
Signs	17	100%			
Symbols	16	100%			
Handrails and Grabrails	11		100%		
Payment of Fares	25		100%		
Surfaces	10		100%		
Access Paths	2	25%	55%	90% 80% (buses only)	100%
Allocated Space	9	25%	55%	90% 80% (buses only)	100%
Boarding Devices	8	25%	55%	90% 80% (buses only)	100%
Controls	21	25%	55%	90% 80% (buses only)	100%
Doorways and Doors	12	25%	55%	90% 80% (buses only)	100%
Manoeuvring Areas	3	25%	55%	90% 80% (buses only)	100%
Ramps	6	25%	55%	90% 80% (buses only)	100%
Stairs	14	25%	55%	90% 80% (buses only)	100%
Toilets (or stops)	15	25%	55%	90%	100%

Source: Queensland Department of Transport and Main Roads (2019c).

A.1.5 NATIONAL DISABILITY STRATEGY

The *National Disability Strategy 2010-2020* (Council of Australian Governments 2011) sets out a plan to improve the quality of life for people with disabilities, their families and carers. The strategy aims to achieve its vision of 'An inclusive Australian society that enables people with disability to fulfil their potential as equal citizens' through six areas of policy action:

- inclusive and accessible communities
- rights protection, justice and legislation
- economic security
- personal and community support
- learning and skills
- health and wellbeing.

Only the first area of policy action (inclusive and accessible communities) is specifically relevant to the provision of universal access in regards to the transport network, the policy areas will not be discussed in this report.

The strategy identifies that people with a disability may have 'restricted access to social and cultural events and civic, political and economic opportunities because of inaccessible attributes of the built and natural environment, and of services and programs'. Implementing a universal access design approach is

recognised as an effective method of removing barriers that may exclude people with disability. Five policy directions are outlined to assist within the 'inclusive and accessible communities' area of policy action:

- increased participation of people with disability, their families and carers in the social, cultural, religious, recreational and sporting life of the community
- improved accessibility of the built and natural environment through planning and regulatory systems, maximising the participation and inclusion of every member of the community
- improved provision of accessible and well-designed housing with choice for people with disability about where they live
- a public, private and community transport system that is accessible for the whole community
- communication and information systems that are accessible, reliable and responsive to the needs of people with disability, their families and carers.

These are accompanied by areas of future action which are shown in Figure A.3.

Figure A.3 Areas for future action

- 1.1 Improve access and increase participation of people with disability in sporting, recreational, social, religious and cultural activities whether as participants, spectators, organisers, staff or volunteers.
- 1.2 Support the development of strong social networks for people with disability.
- 1.3 Monitor adherence to and evaluate the effectiveness of the *Disability (Access to Premises – Buildings) Standards 2010* and *Disability Standards for Accessible Public Transport 2002* and improve the accessibility of reports.
- 1.4 Promote the development of Disability Access Facilitation Plans by airlines and airport operators to improve communication between operators and passengers with disability.
- 1.5 All levels of government develop approaches to increase the provision of universal design in public and private housing in both new builds and modification of existing stock.
- 1.6 Improve community awareness of the benefits of universal design.
- 1.7 Promote universal design principles in procurement.
- 1.8 All governments adopt the mandated conformance levels for web accessibility as a baseline requirement to ensure more people with disability have access to online information and services.
- 1.9 Use the National Broadband Network as an enabling technology platform to deliver innovative services, communication and support for people with disability, their families and carers.

Source: Council of Australian Governments (2011).

A.2 POLICY FRAMEWORKS: CURRENT TECHNICAL GUIDANCE AND STANDARDS

A.2.1 DISABILITY SERVICE PLAN (2017–2020)

TMR's vision is to create a single, integrated transport network accessible to everyone. In accordance with this, the aim of the *Disability Service Plan 2017-2020* (DSP) (Queensland Department of Transport and Main

Roads 2019) is to improve the accessibility of the transport network, making it easier for everyone including people with disability to participate in the community through:

- improving mainstream services and facilities
- giving people with disability increased transport options
- continuing to commit to ensuring all Queenslanders have appropriate transport choices and fair access to the transport system.

The DSP aims to provide opportunities for all Queenslanders. The government has identified five priority areas to guide action:

- communities for all
- lifelong learning
- employment
- everyday services
- leadership and participation.

Transport comes under the priority area 'everyday services.' Table A.3 outlines the actions and measures the whole of government and TMR specifically are committing to.

Table A.3: Transport actions the whole of government and TMR are committed to

Priority area		Action	Overall measure
Transport	<i>Whole of government</i>	Participate and influence national processes and policy that support the removal of barriers for people with disability using public transport	Active participation on national committees: <ul style="list-style-type: none"> National Accessible Public Transport Advisory Committee Disability Standards for Accessible Public Transport Modernisation Committee
		Continue to make the Queensland public transport network more accessible for people with disability and those with limited mobility by: <ul style="list-style-type: none"> continuing to implement the TMR Disability Action Plan - Improving Access (2017) undertaking an end-of-term review of the plan Developing a new disability action plan to demonstrate TMR's commitment to making the passenger transport network more accessible for people with disabilities and those with limited mobility	Completion of actions contained in the Disability Action Plan - Improving Access (2017) <p>Final review report</p> Develop an action plan for 2018–22 in consultation with key stakeholders
		Continue to manage the Disability Parking Permits including improvements to services	Implementation of a new online application lodgement service for Disability Parking Permits customers
		Continue to engage with key stakeholders about issues relating to improving the accessibility of the Queensland passenger transport network through the Transport and Main Roads Accessibility Reference Group	Accessibility Reference Group meetings held quarterly with meaningful agendas that include consultation opportunities for TMR projects
		Continue to ensure that people with disability have access to safe, reliable and affordable personalised transport services, including implementation of an incentive payment to drivers of wheelchair-accessible taxis to meet the needs of certain customers with disability	Implementation of personalised transport reforms, including maximum fare protections for certain customers with disability <p>Ongoing funding of the incentive payment for drivers of wheelchair-accessible taxis to prioritise services to Taxi Subsidy Scheme members identified as requiring a wheelchair to travel</p>
	<i>Transport and Main Roads</i>	Build capability of frontline service staff to meet the needs of customers with disability	TMR Service Centre staff and TransLink Senior Network Officers and Busways Safety Officers can meet the needs of customers with disability
	Review current online service offerings and implement changes to increase the accessibility of information and services provided to customers and employees with disability	TMR's external and internal online services are digitally inclusive and accessible	

Source: Queensland Department of Transport and Main Roads (2019a).

Table A.4 outlines TMR's actions according to priority area.

Table A.4: TMR's actions according to priority area

Priority area	Action	Overall measure
Changing attitudes and breaking down barriers by raising awareness and capability	Review TMR procurement processes to consider the reference to tenders to meet goods and services provisions of the Anti-discrimination Act: Procurement Standard ASEN 301549	Ensure the TMR procurement processes are aligned to ASEN 301549
	Recognise and celebrate events inclusive of people with disability including Disability Action Week and International Day of People with Disabilities	
Accessible places and spaces	Ensure access and inclusion plans are in place and review to ensure the use of inclusive language for all diverse groups	All TMR accommodation has access and inclusion plans in place and use of inclusive language to address diverse groups.
	Where possible use the 'open door' symbol to promote access and inclusion features of a venue/building/centre	The guidance provided to staff about how to choose an accessible venue for an event or meeting All TMR facilities use the 'open door' symbol
Accessible information	Increase staff awareness of services that are available for people with disability	All TMR employees are aware of and promote services and support available for people with disability both as customers and employees
Welcoming and inclusive communities	Continued delivery of specific public transport travel products for customers who: <ul style="list-style-type: none"> • travel with a carer/companion • are vision-impaired • have disabilities and find it difficult to use the South East Queensland transport network • use an assistance animal • are a veteran with a Totally and Permanently Incapacitated (TPI) Pass or Extreme Disablement Adjustment (EDA) • are a school student with disability using the Student Special Program Pass Or are a registered training organisation (RTO) requiring a travel trainer card	Uptake and usage of travel products are aligned with need and reflected in TransLink customer data and quarterly reporting
Respecting and promoting the rights of people with disability and recognising diversity	Regularly promote and recognise the human rights of people with disability Promote and celebrate the contribution made to the department by employees with disability (with permission)	Improved profile of employees with disability (with permission) and highlight community experiences via planned communication messages
Safe, healthy and respectful relationships	Recognise and reward the development and delivery of innovative services and products which uphold the human rights of people living with disability	Innovation services and products nominated for recognition in internal and external rewards

Source: Queensland Department of Transport and Main Roads (2019a).

A.2.2 DISABILITY ACTION PLAN (2018–2022)

TMR is responsible for connecting people, places, goods and services across Queensland. As a result, TMR has established an Accessible Transport Networks Team to assist with steering improvements to the accessibility of the network for all users Queensland Department of Transport and Main Roads 2015a). The aim of this is to make it easier for customers with disability to have easy and seamless access to all modes of transport.

TMR believes that all Queenslanders have the right to participate in their community on an equal basis. It is therefore essential to create a single integrated transport network that is accessible to everyone. Passenger transport often is the only means of independent travel for people with disability. Being able to access passenger transport services can be a critical part of becoming employed and achieving a good quality of life for people with disability.

The *Disability Action Plan 2018-2022* focuses on improving the usability of the passenger transport system for people with disability. The plan focuses on improving the accessibility of the whole of the transport journey (planning, getting to and from the mode of transport, boarding the vehicle, the return journey, any interchanges in between) through actions targeted at:

- more informed journey planning
- easier boarding of passenger transport vehicles
- delivering better customer experiences while travelling on the Queensland passenger transport network.

Actions that have already been taken involve:


- providing funding to upgrade existing and build new accessible passenger transport infrastructure across Queensland
- providing timely and accessible travel information in a range of formats for customers
- working to encourage behaviour that creates a supportive, safe and inclusive environment for people with disability on the passenger transport network.


Additionally, a consultation process is undertaken by TMR through the Accessibility Reference Group enabling TMR to:


- gain an understanding of existing barriers to accessibility on the passenger transport network and how such barriers could be reduced or eliminated
- consider and provide feedback on draft actions.


Actions identified by the *Disability Action Plan 2018-2022* are shown in Table A.5.

Table A.5: Disability Action Plan actions

Priority	Description	Barriers	Action
Planning your journey 	Ability to plan and obtain information needed to confidently complete a journey <ul style="list-style-type: none"> • Planning period before boarding • Being able to move between different types of passenger transport services during a journey • Planning to get home again 	N/A	<ul style="list-style-type: none"> • Improve the accessibility of the TransLink website, including expanding the use of Auslan. • Consider artificial intelligence applications in the provision of journey planner information. • Produce videos to include on the TransLink website which provide simple demonstrations on how to use various aspects of the passenger transport network. • Publicise information on the TransLink website and MyTransLink app about accessibility features of bus stations, park 'n' rides, train stations and ferry terminals. • Involve customers with disability in user-testing phases of MyTransLink app updates to ensure information is accessible. • Provide customers with disability several options in the way they can seek information and provide feedback about passenger transport services. • Develop and communicate educational material on how to use the MyTransLink app. • Provide ongoing updates on significant changes to the passenger transport network to disability advocacy groups to enable them to inform their clients. • Host orientation days for people with disability at selected new passenger transport infrastructure.

Priority	Description	Barriers	Action
Boarding passenger transport 	When a person is at the point of waiting for, or entering, a passenger transport conveyance Initiatives related to infrastructure <ul style="list-style-type: none"> • bus stops • stations • terminals • signage And information or services provided in these areas	Difficulties accessing the boarding point and information to assist with boarding	<ul style="list-style-type: none"> • Promote available resources and initiatives that assist people with disability and people with reduced mobility, to board at bus stops and stations with lead stop arrangements. • Work with delivery partners to investigate ways to provide real-time information at key passenger transport interchanges. • Provide funding through the Passenger Transport Infrastructure Investment Program to upgrade existing, and provide new, accessible passenger transport infrastructure across Queensland. • Investigate options to improve the provision of information regarding temporary disruptions to passenger transport services and infrastructure, for example, planned and unplanned service changes or lift closures. • Investigate and implement technology to enable visual text information to also be provided as audio information at suitable bus stations where there are real-time passenger information displays. • Liaise with the bus industry on the customer benefits of enhancing the visibility of route information on buses, such as using highly illuminated, upper and lower-case text and displaying route numbers on the front, side and rear of buses as relevant. • Implement disability awareness training for passenger transport frontline staff (Customer Liaison Officers, Busway Safety Officers and Senior Network Officers) to ensure the provision of high-quality customer service. • Provide co-contribution funding grants to local government through the Passenger Transport Accessible Infrastructure Program to assist with upgrading passenger transport infrastructure to meet the requirements of the Transport Standards. • Implement Bus Stop Blade Sign Braille Numbers at various bus stops in the network.

Priority	Description	Barriers	Action
Travelling on passenger transport 	<p>When a customer is travelling on a conveyance: bus, light rail, train, ferry or personalised transport vehicle</p> <p>Incorporates the experience a customer has while they are using the service</p>	Lack of disability awareness Feeling unsafe	<ul style="list-style-type: none"> • Provide information to industry organisations and operators to enhance their knowledge and understanding of safe transportation of people with disability and people with reduced mobility. • Produce guidance material outlining how passengers using wheelchairs and mobility scooters can adopt safe travel practices when travelling on passenger transport. • Investigate options for the provision of information on-board buses to enable passengers to identify when they need to disembark. • Investigate initiatives which encourage passenger behaviour that creates a safe and inclusive environment for people with disability when using passenger transport (such as informing all customers about the correct use of allocated space and priority seating on passenger transport conveyances). • Work with key stakeholders to develop a guide to inform the industry about the concerns of people with vision impairment concerning the use of wrap-around advertising on the outside of conveyances and how this limits their visibility – and their ability to identify when they are approaching their stop. • Provide the Taxi Subsidy Scheme to assist eligible people with disability with the cost of accessible transport options. • Provide passenger transport concessions for people with disability, per the concessions' framework. • Consult with disability stakeholder groups about the next generation ticketing system. • Increase operator knowledge and awareness of people with disability travelling on passenger transport services with an approved assistance animal. • Monitor advances in the development of restraint systems for use by people travelling in mobility devices on buses and explore opportunities to share the information with stakeholder groups. • Develop, implement and monitor the effectiveness of driver training requirements in the personalised transport industry.

Priority	Description	Barriers	Action
Working together 	TMR working with relevant stakeholders to deliver high quality, accessible passenger transport services, infrastructure, information and ticketing		<ul style="list-style-type: none"> • Conduct targeted consultation with relevant stakeholders about passenger transport accessibility during the design phase, and throughout the implementation of significant projects. • Update the <i>Public Transport Infrastructure Manual</i> to reflect best practice accessibility and wayfinding design principles and promote the manual to departmental contractors and staff. • Work with delivery partners to improve the accessibility of ferries and ferry terminals. • Work with Queensland government agencies, other jurisdictions and the Commonwealth government to resolve and support the transition of taxi and specialist school transport supports to the National Disability Insurance Scheme. • Consider the expansion of the Taxi Subsidy Scheme to include the provision of services by other personalised transport operators. • Consult with government, industry and disability stakeholder groups on issues relating to improving the accessibility of the Queensland passenger transport network for people with disability and people with reduced mobility, through the TMR Accessibility Reference Group. • Work with other jurisdictions on Commonwealth-led initiatives such as the modernisation of the <i>Disability Standards for Accessible Public Transport 2002</i>. • Work with our delivery partner, Queensland Rail, to improve the accessibility of train stations and trains. • Continue to develop an understanding and insight into the needs of people with disability and their carers using the passenger transport network, through customer insight projects. • Establish an Accessible Transport Networks Team which reports directly to the Director-General, Department of Transport and Main Roads. • Monitor the sustainability of the accessible taxi fleet after the recent reform of the personalised transport industry. • Implement relevant recommendations from the <i>New Generation Rollingstock Train Commission of Inquiry – Final Report</i> and work with other Queensland government agencies where required.

Source: Queensland Department of Transport and Main Roads (2015a).

A.3 DESIGN GUIDELINES: CURRENT TECHNICAL GUIDANCE AND STANDARDS

Access to the transport network facilities and amenities for people who live with or experience a disability should be carried out in the network and route design phase of a project. Pedestrian access and controls are standardised by the Austroads *Guide to Road Design* (AGRD) and the *Guide to Traffic Management* (AGTM) series accompanied by the TMR supplements. However, not all sections in these Guides consider people with disabilities. Only sections that mention those who experience a disability or impairment and/or provide advice or guidance are briefly identified and discussed in the sections below.

A.3.1 AUSTRROADS GUIDE TO ROAD DESIGN PART 2: DESIGN CONSIDERATIONS

The AGRD *Part 2: Design Considerations* provides details about the critical aspects of road design that apply to the design project. These include context-sensitive design, factors that influence road design

(including safe systems) and design objectives that apply to a road design project. The Guide provides practitioners with a range of influences, information, data, criteria and other considerations that may need to be assessed in the development of road projects. Furthermore, it describes the context in which the guidelines should be applied and provides links to other resources that give further guidance on design inputs (Austroads 2019a).

Section 1.5: Community Expectations

This section identifies the need for stakeholder consultation during the planning process as a means to identify all issues and needs of stakeholders that are considered and addressed.

Road user groups such as people with disabilities are recognised as requiring special consideration.

Section 2.4.2: Factors that Influence Design Standards – Human Factors

This section identifies the influence of human input/behaviour as an efficient and safe operation performance indicator of the road traffic system. Understanding road user behaviour can assist designers to better understand the basis of standards when designing.

The behaviour of pedestrians as road users is influenced by whether they are children, the elderly or people with physical disabilities. Thus, no formal lower or upper limits are placed on the age or the physical abilities of these road users. Provision for those with physical disabilities, who most often are operating as pedestrians or wheelchair users, places particular requirements on road design.

Section 3.1: Factors Affecting Road Design

In this section, common considerations in the planning phases of road projects are identified for the assessment of factors that influence design choices. A checklist of common factors is listed in AGRD (Part 2) Table 3.1. The considerations for those with disabilities are summarised in Table A.6.

Table A.6: Summary of provisions concerning design considerations of people with disabilities

Design consideration	Type of information	Why needed	Nature of information	Likely source
Operational factors – provision for special users	Policies/provisions for public transport, non-motorised transport and disabled users	Bus lanes High-occupancy-vehicle lanes Bicycle lanes Truck lanes Crossings	Proposals for use by specialist modes Required provisions for disabled users	Planning authorities Transport agencies (as distinct from road agencies)
Traffic factors – geometric design	Allocation of road space	Provision for special users	High-occupancy-vehicle needs Public transport demand Bicycle, pedestrian and disabled provisions On-road parking needs Breakdown-lane needs	Road agency Public transport providers Planning authorities

Source: Austroads (2019a).

A.3.2 AUSTRADS GUIDE TO ROAD DESIGN PART 3: GEOMETRIC DESIGN

The AGRD *Part 3: Geometric Designs* guides road designers and other practitioners on the geometric design of road alignments. Primarily, the focus is on the design and speed parameters as well as horizontal and vertical alignments.

Section 4.9.2: Bus Lanes – Busways

This section discusses the priority of road-based public transport and the use of high occupancy vehicle (HOV) lanes which include busways. Busways are defined as dedicated sections of roads exclusively for buses which include bus stations/stops. It is noted that it is common for people with disabilities to use buses

as a means of transportation and therefore high-standard bus stations are highly accessible for persons who have a disability and all other passengers.

Section 4.9.3: Light Rail Vehicles – Divided Roads

This section provides a general overview of the requirements of light rail vehicle infrastructure on divided roads such as the dimension and delineation requirements.

On major urban divided highways, trams can be accommodated in their own carriageway within a wide median. In such cases, the median must be wide enough to accommodate tram stops that cater for people with disabilities in the residual median at mid-block and intersection locations. The residual median width is required to comply with the provisions of the *Disability Discrimination Act (1992)*, which in the CBD is 2.9–3.1 m, but desirably 3.7 m; the outer rail clearance to the platform must be 0.7 m.

The delineation between light rail vehicles and general traffic is achieved by providing an unbroken line and raised pavement markers can also be used. An alternative to this option if non-compliance is a concern is the installation of low-profile concrete ‘safety bars’; however, this is not suitable where a high number of pedestrians cross the road as they may trip, and wheelchairs or other physical assistance devices may have difficulties in use.

Section 4.9.3: Light Rail Vehicles – Tram Stops

This section focuses on the required dimensions of a tram stop. Tram stops are categorised as platform or kerbside stops and can be placed at intersections or mid-block between intersections. Platform dimensions must be at least 33 m long and 2.4 m wide; however, mid-block platforms must be at least 4.5 m through high-patronage stops. The standards in *Accessible Public Transport 2002* define the minimum clear width along the platform as 1.8 m. Platform facilities also need to be accommodating for people with disabilities.

Section 4.10.1: General (On-street Parking)

This section provides guidance on the types of considerations that need to be accounted for concerning parking and identifies reference documents. On-street parking consists of parallel kerbside parking, angle kerbside parking and centre-of-road parking. Provisions for parking are set out in the following guides and standards:

- *AS/NZS 2890 Parking Facilities* is the principal source of information regarding parking in Australia.
- *Austroads Guide to Traffic Management Part 11: Parking* (Austroads 2017d) provides additional guidance for on-street and off-street parking facilities.
- *Austroads Guide to Road Design Part 6B: Roadside Environment* (Austroads 2015b) guides the design of off-street parking facilities and rest areas.

In areas with high demand for on-street parking, consideration of the following factors is required when determining the location of disabled parking spaces and access to the destination:

- Provision of adequate end clearances to intersections and driveways
- Preservation of safe and convenient pedestrian access
- Protection of through traffic
- Unsafe parking locations
- Provision of disabled parking and access to the destination.

Section 4.10.6: Parking for People with Disabilities

This section provides practitioners with a brief list of factors that should be considered for different disability parking types (parallel, angled, kerbside), particularly for the provision of wheelchairs. In any parking zone, it is desirable to reserve several parking spaces as disability car parking spaces. The number of reserved spaces is assessed in relation to the total number of parking spaces in a parking lot. Designs must be in accordance with *AS/NZS 2890 Parking Facilities* for the specific design requirements for disabled parking spaces, and accessible travel paths to and from the spaces must be provided.

Section 4.11.3: Urban Borders – Footpaths

This section recognises the minimum width of an urban footpath as 1.2 m but should be increased in cases where:

- high pedestrian volumes are foreseen
- a footpath is beside a traffic or parking lane
- a footpath is linked with bicycle facilities
- the footpath needs to cater for people with disabilities.

The crossfall of a paved footpath should be a minimum of 0% to a maximum of 2.5% (not specific for people with disabilities).

Additional design information concerning paths, surfacing and provisions for people with disabilities can be found in the *Guide to Road Design Part 6A: Paths for Walking and Cycling (Austroads 2017c)*.

Section 4.12.1: General (Bus Stops)

This section describes the importance of bus stops, key considerations for passengers and the need for predictability of bus stop layouts for passengers with disabilities. It recognises that all bus stops should comply with the requirements of the *Disability Discrimination Act 1992*, and any other road or transport agency disability standards. Information is provided on what is usually covered in the standards/guides such as access paths, manoeuvring areas, ramps, waiting areas, surfaces and tactile ground surface indicators (but does not provide the titles of guides or standards). Key considerations listed for people with disabilities are:

- Provision of unobstructed access to both the front and rear doors of the bus, especially for wheelchair access; minimum unobstructed width of 1200 mm should be provided.
- Provision of a hardstand area with a sealed smooth surface, typically situated behind a 150 mm high barrier kerb. Provision of the kerb will enable the typical fold-out ramp from low-floor buses to provide a gradient of less than 1 in 8 which will allow wheelchair users to board the bus without assistance.
- The minimum circulation space for a wheelchair to complete a 180-degree turn of not less than 2070 mm in the direction of travel and not less than 1540 mm wide needs to be provided.

Section 4.12.3: Rural (Bus Stops)

This section outlines that in rural areas shoulder bus stops are more common and have different requirements and constraints to shoulder bus stops found in urban areas. General requirements are discussed. Site selection of shoulder bus stops is considered, and provision of hardstand areas is noted as a requirement for new and upgraded bus stops as part of the *Disability Discrimination Act 1992*. Hardstand areas are reported to provide stable and even surfaces for waiting passengers including those with disabilities.

Section 8.5.3: Maximum Grades

While this section does not apply specifically to universal access, it does apply to the key objective of determining street gradients for greenfield development sites. The section describes the maximum grades of roads over long lengths of road, as shown in Table A.7.

Table A.7: General maximum grades (%)

Operating speed (km/h)	Terrain		
	Flat	Rolling	Mountainous
60	6-8	7-9	9-10
80	4-6	5-7	7-9
100	3-5	4-6	6-8
120	3-5	4-6	–
130	3-5	4-6	–

Source: Austroads (2016a).

A.3.3 AUSTRADS GUIDE TO ROAD DESIGN PART 4: INTERSECTIONS AND CROSSINGS

The AGRD (Part 4) provides information about the geometric design of all at-grade intersections, for road designers and other practitioners. This part contains guidance on the types of intersections, road design considerations and the development and intersection layout design process. Major considerations include the selection of the design vehicles, types of road users and the provision of public facilities. Intersection-type guidance is given for pedestrians, property access and rail crossings.

Section 6.3.4: Bus Stops – Bus Stop Layout

This section outlines considerations for the design layout of bus stops. All new bus stops must comply with the *Australian Disability Discrimination Act 1992* and the *Disability Standards for Accessible Public Transport 2002*. Together they outline requirements for areas such as access paths, manoeuvring areas, ramps, waiting areas, surfaces and tactile ground surface indicators.

Greenfield sites must be as accommodating as possible for the layout to be consistent and predictable to assist passengers with vision or mobility impairments. Furthermore, the design layout should also have sufficient manoeuvring space for a wheelchair adjacent to the doors, as low-floor buses may have ramps at either the front or rear doors.

Barrier kerbs are recommended for flatter surfaces where passengers board buses.

Section 8.1.1: General

This section describes the purpose of pedestrian crossings. Planning a crossing should be done from a road safety perspective and minimising possible conflicts should be a priority.

It is acknowledged that people with disabilities may have difficulties crossing roads at designated crossing areas, resulting in them being reluctant to use the street system. Examples provided are: people with limited or no vision have trouble identifying a location to cross at, and those using wheelchairs or with limited mobility sometimes have trouble entering and exiting crossings or even completing a crossing in the time available.

Designers can use the following as examples for local pedestrian, cycle planning and design guidelines:

- *How to Prepare a Pedestrian Access and Mobility Plan: An Easy Three Stage Guide* (Roads and Traffic Authority 2002)
- *Easy Steps – A Toolkit for Planning, Designing and Promoting Safe Walking* (Queensland Transport 2005)
- *Pedestrian Planning and Design Guide* (New Zealand Transport Agency 2009).

Section 8.2.1: General Considerations for Design (Mid-block Crossings on Roads)

This section lists important design features of pedestrian crossings along with a summary of aspects that should be considered. Only one feature (crossing length) is noted as relevant to people with disabilities and should be taken into consideration.

Good design practice is considered as providing the shortest crossings that are practicable in the circumstances. The length of a crossing is dependent on the carriageway width and the nature of traffic control. A reduction in crossing lengths can be achieved by narrowing carriageways or providing pedestrian refuges for facilitated staged crossing. Pedestrian refuges are desirable where there is high pedestrian crossing activity or high volumes of people with disabilities.

Section 8.2.3: Kerb Ramps for Pedestrians

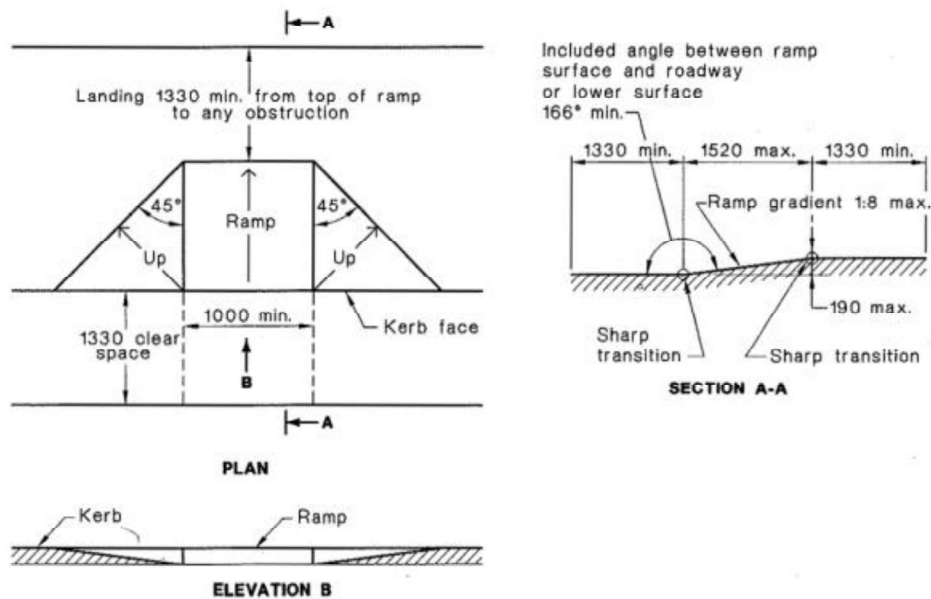
The characteristics of kerbs and types of kerbs are explained in this section. It acknowledges that differences in levels in traditional (general form) kerbs at adjacent footpaths pose difficulties for people with mobility and vision disabilities.

Drop kerbs or kerb ramps are discussed as an alternative to general form kerbs. They allow a smooth transition between the footpath and pavement which is essential for wheelchair users and people with mobility impairments to be accommodated with minimal impediments. For the convenience and safety of pedestrians with vision impairments, kerb ramps must be aligned in the direction of travel for guidance. AS 1428.1-2009 is referred to for further guidance on the design of kerb ramps.

For general form kerb ramps (an example is shown in Figure A.4), footway widths are required to be a minimum of 1500 mm and not be provided beyond the top of the ramp. The maximum gradient of the ramp is 1:8. This is prescribed so that people with vision impairments can identify the change in grade without the aid of tactile ground surface indicators and so that wheelchairs do not tip over. A grade less than 1:8 is less likely to see a wheelchair tipping over but is less likely to be recognised by persons with visual impairment, therefore tactile ground surface indicators are suggested. The indicators must comply with AS/NZS 1428.4.1-2009.

Lips at drainage channels are to be avoided to allow for the free movement of wheelchairs.

Figure A.4 Example of a kerb ramp design



DIMENSIONS IN MILLIMETRES

Notes:

The ramp and sloping sides should be slip resistant and of a colour that contrasts with the adjoining surfaces. Tactile ground surface indicators should be provided in accordance with AS/NZS 1428.4.1-2009 and jurisdictional guidelines.

The kerb ramp should be aligned in the direction of travel.

For guidance on installation of tactile ground surface indicators, refer to AS/NZS 1428.4.1-2009.

Source: Based on AS 1428.1-2009.

Source: Austroads (2017b).

A.3.4 AUSTRADS GUIDE TO ROAD DESIGN PART 4C: INTERCHANGES

The AGRD (Part 4C) provides guidance on the geometric design of interchanges on heavy traffic roads and major arterial roads. Covering the geometric design of all the components of an interchange, it deals with interchanges between freeways and arterial roads, two freeways, and two major arterial roads.

Section 2.2.5: Public Transport Facilities – Heavy Rail

This section suggests that in appropriate circumstances rail services can be placed in the median of a freeway. This would result in the need for railway stations and modal interchanges. Frequent users of modal interchanges are likely to arrive as pedestrians from adjacent developments or bus interchanges. Therefore, the efficient movement of pedestrians, including people with disabilities is essential.

Section 4.4.1: General

This section outlines instances where grade separation is appropriate. This includes circumstances where insufficient, current and/or future crossing demands are unlikely to be met, particularly for people with disabilities, children and the elderly. Dimensions for pedestrian bridges are outlined in AS 5100. Ramp grades and landings suitable to provide access for people with disabilities are covered by AS 1428.1. Stairways are covered by AS 1657. New Zealand practitioners are advised to use NZS 4121 for handrails, slopes and disability rest areas.

A.3.5 AUSTRROADS GUIDE TO ROAD DESIGN PART 6A: PATHS FOR WALKING AND CYCLING

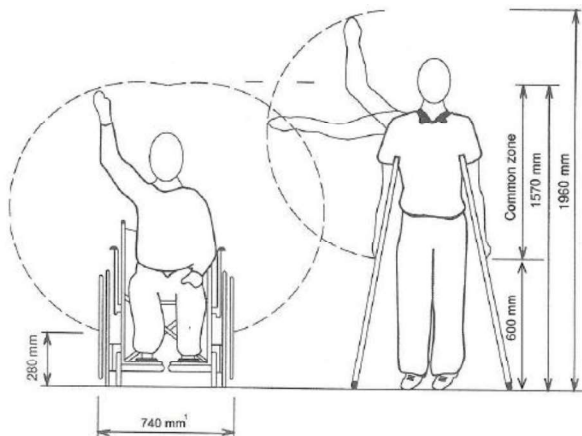
The AGRD (Part 6A) provides guidance on the design of paths for walking and cycling, both within and outside the road corridor. The TMR *Road Planning and Design Manual* (RDPM) acts as a supplement to this Guide, taking precedence if required.

Section 3.2.1: Path User Considerations – Operating Space – Pedestrians

This section identifies the maximum limits of reach and minimum dimensions necessary to accommodate most people with disabilities.

Reach envelopes for wheelchair users and people with mobility difficulties (to interact with holding rails, audio-tactile push buttons, etc.) are approximately 0.6 m to 1.57 m above the ground (Figure A.5).

Figure A.5 Reach dimensions for people with mobility-impairment



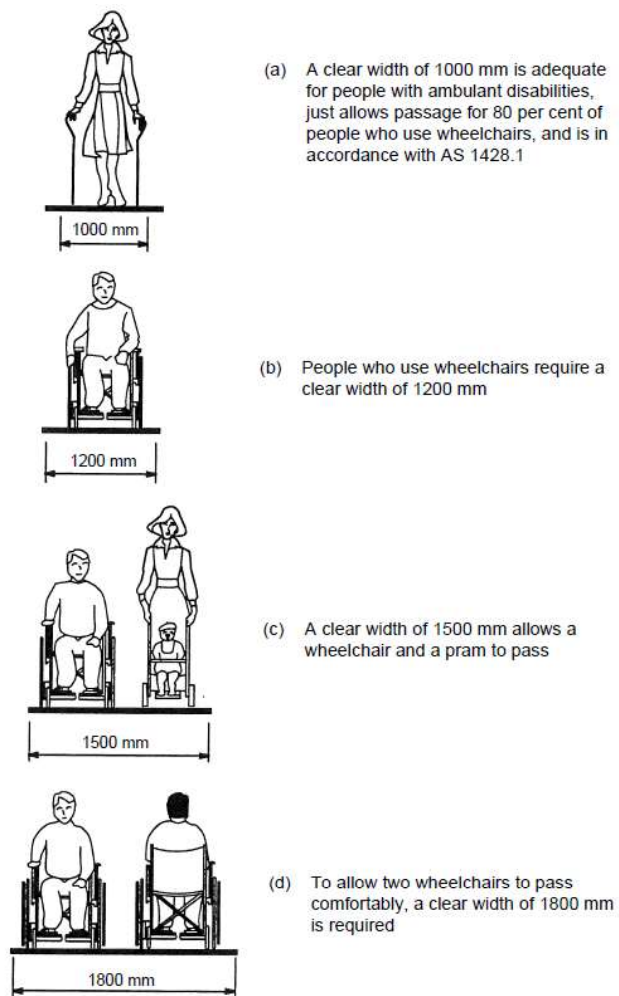
¹ Includes clearance for knuckles of hands.

Source: Austroads (2017c).

The section refers designers to AS/NZS 3695.1:2011 and AS/NZS 3695.2:2013 for additional information on the dimensions of wheelchairs. Manoeuvring space for wheelchairs and mobility scooters is referred to in *Australian Disability Standards for Accessible Public Transport (2002)*, which requires a space of 2.07 m x 1.4 m for a wheelchair or mobility scooter to turn 180 degrees. It is recommended that designers use AS 1428.1:2009 for minimum widths for accessways, walkways, ramps, landings and doorways.

Spatial requirements on paths are outlined for users with mobility impairment as shown in Figure A.6.

Figure A.6 Pedestrian path width requirements for people with mobility impairment



Source: AS 1428.2:1992.

Source: Austroads (2017c).

Section 5.1.2: Design Criteria – Width of Paths – Pedestrian Paths

This section describes the width requirements suitable for pedestrian paths (Table A.8). Figure A.6 illustrates the operating space required for pedestrians with mobility impairment. In addition, it is assumed that most personal mobility devices including scooters can be accommodated by the widths given in Figure A.6.

The absolute minimum width of pedestrian paths is 1.0 m but the desired minimum is 1.2 m. However, widths are recommended to be increased in the cases where:

- high pedestrian volumes are anticipated
- a pedestrian path is adjacent to a traffic or parking lane
- a pedestrian path is combined with bicycle facilities
- the pedestrian path is to cater for people with disabilities
- overtaking of path users is expected.

Table A.8: Width requirements for pedestrian paths (extract)

Situation	Suggested minimum width	Comments
General low volume	1.2 m*	<ul style="list-style-type: none"> The general minimum is 1.2 m for roads and streets Clear widths required for one wheelchair Not adequate for commercial or shopping environments
High pedestrian volumes	2.4 m (or higher based on volume)	<ul style="list-style-type: none"> Generally commercial and shopping areas
For wheelchairs to pass	1.8 m	<ul style="list-style-type: none"> Refer also to AS 1428.1-2009
For people with other disabilities	1.0 m	

**In constrained locations an absolute minimum of 1.0 m should be provided. In these situations, path users should be able to detect other path users with sufficient time to respond and take appropriate actions.*

Source: Austroads (2017c).

Enough space is required so that pedestrians have a clear space in which to operate on roadsides including paths.

When possible, existing constrained widths should be treated and avoided for future paths. In cases where obstacles cannot be removed, absolute minimum widths can be used for small lengths.

Section 5.4: Path Gradients

Path gradients should be as flat as possible and this section provides several resources for the specific requirements for pedestrian path gradients, including gradients suitable for wheelchair users. The resources include AS 1428.1:2009 and AS 1428.2:1992.

In areas where AS 1428.2:1992 cannot be applied for a path due to the topography or location, designers may refer to the Australian Human Rights Commission (2013) *Advisory Note on Streetscape, Public Outdoor Areas, Fixtures, Fittings and Furniture*.

Section 5.6.1: Crossfall

This section briefly discusses the grade of crossfalls for pavements and paths to avoid ponding. Path pavements are described as adequate if below 2.5% as anything higher is considered to be problematic for people using mobility devices

Section 5.8: Changes in Levels

This section describes certain types of changes in levels and their suitability under specific circumstances. It also outlines any considerations that should be addressed. Many of the considerations listed are related to people who use mobility devices and pedestrians with vision impairments. The full list of considerations is shown in Table A.9.

Table A.9: Considerations in relation to changes in levels

Facility	considerations
Kerbing and kerb ramps	<ul style="list-style-type: none"> • Level differences between a roadway and an adjacent pedestrian path pose difficulties for pedestrians, particularly those with mobility or vision impairments. • Provide kerb ramps with a smooth change in the level between the pedestrian path and road pavement to allow safe and easy access for pedestrians including people with personal mobility devices and those with a mobility impairment. • Align kerb ramps in the direction of travel to guide pedestrians who are blind or have vision impairment directly across the road and not out into the intersection. • A typical kerb ramp is illustrated in AGRD Part 4. • A minimum pedestrian path width of 1330 mm should be provided beyond the top of the ramp. • A maximum gradient of 1:8 quoted in AS 1428.1:2009, should be considered as an absolute maximum ramp gradient and only be used in extenuating circumstances. Providing a flatter kerb ramp grade, e.g. 1:10 with tactile ground surface indicators (TGSIs) may provide a smoother transition between the road pavement and the path. Designers should also consult with disability groups on the design of the kerb ramp. • A vertical lip should not be provided at the edge of the drainage channel as it inhibits the free movement of wheelchairs. • Design surface drainage to avoid low points and the accumulation of water where pedestrian crosswalks are to be located. For example, on-road drainage inlets should be placed immediately upstream of ramps to minimise the water that passes through the channel at ramp crossings. • Refer also to AS 1428.1:2009 for guidance regarding the design of kerb ramps
Steps, stairs and ramps	<ul style="list-style-type: none"> • An abrupt change in level can be a problem for pedestrians particularly for those who have vision impairments and need to be warned of the presence of a kerb, a flight of stairs or a ramp. • Ramps should be provided where possible as an alternative or in addition to steps or stairs that are a barrier to people with disabilities and necessary for people in wheelchairs or with prams. On the other hand, some people with impaired mobility cannot use ramps and need shallow steps (AS 1428.2:1992). • Rest areas (i.e. flat sections) should be provided at each change in direction and at intermediate points along ramps to break up long flights. AS 1428.2:1992 suggests that the spacing of rest areas range from 9 m for ramp grades of 1:14 to 15 m for grades of 1:20. This is a most important consideration in the design of overpasses and underpasses. • Provide handrails to assist pedestrians, including those in wheelchairs – on both sides of a set of stairs, or steps, or a ramp – wherever people may need support (e.g. continuously around rest areas and changes of direction). • Generally, two rails at different levels will be required to meet the need of both wheelchair users and other groups. • Ensure inter-visibility between the end of stairs or ramps and intersecting pedestrian paths (e.g. sight distance not obscured by a wall) and an area at the foot of the stairs to minimise the risk of collision. • Provide in all areas used by pedestrians (i.e. above stairs or ramps) a vertical clearance (i.e. headroom) no less than 2.5 m unless significant constraints exist. • Ramp surfaces and treads of stairs should be stable, even and slip-resistant. • Tactile ground surface indicators (TGSIs) should be provided at the top of stairs and foot of stairs to indicate these hazards. • The provision of seating clear of the walking space should be considered on long ramps. Other features such as observation decks should be considered if the path provides tourist/social opportunities. • Recommended maximum crossfall is 1:40 (AS 1428.1:2009).

Facility	considerations
Gradients	<ul style="list-style-type: none"> • Australian Standard AS 1428.1:2009 lists requirements for the design of sloped pedestrian paths. • Where the gradient is 1:33 level rest areas 1.2 m long should be provided at no greater than 25 m intervals whereas at 1:20 the interval should not exceed 15 m. Between gradients of 1:33 and 1:20, the interval should be interpolated. Landings are not required on gradients less than 1:33. Paths with a gradient steeper than 1:20 are to be considered as ramps for design purposes. • Adjacent ground for all pedestrian paths should be within 25 mm of the level of the pedestrian path. • If the adjacent ground has a steep slope, a kerb between 65 mm and 75 mm high should be provided to protect prams and wheelchairs and to guide those people with impaired vision. Handrails may also be provided. • The provision of seating clear of the walking space should be considered on long gradients. Other features such as observation decks should be considered if the path provides tourist/social opportunities. • Consideration should be given to the provision of an alternative shorter route via a staircase if such an alternative can be identified.
Crossfall	<ul style="list-style-type: none"> • Crossfall on pedestrian paths should be as flat as practicable consistent with achieving an adequately drained surface. Excessive crossfall causes problems for some people. • Crowning of the pedestrian path can benefit people using personal mobility devices as they can travel along the middle of the path, experiencing no crossfall. • AS 1428.1:2009 specifies that any crossfall should not exceed 1:40 (2.5%). A flatter crossfall may be adopted provided that drainage is facilitated to avoid any ponding of water within the path.

Source: Austroads (2017c).

Section 7.5.2: Terminal Design Principles

This section states that if a local authority has its own method of terminal design, it should be followed by designers. Otherwise, the design of treatment options should meet the criteria outlined in the section.

Clearance design widths are based on minimum widths but subject to increases to accommodate cyclists and path traffic.

Any terminal treatments must be accessible for pedestrians including people with disabilities. However, it must not become a hazardous feature for any pedestrian group including those with vision impairments.

Tactile line marking can be used as a warning of the terminal device upon approach.

A.3.6 TMR SUPPLEMENT TO AUSTRROADS GUIDE TO ROAD DESIGN PART 6A: PATHS FOR WALKING AND CYCLING

Addition to Section 7.5.4: Separated Paths

This section gives advice on how to separate cyclists from pedestrians on pathways. Methods for separation that consider people with disabilities are summarised in Table A.10.

Table A.10: Methods of separation

Visual separation		
Type	Advantages	Disadvantages
Vertical separation (separation by difference in level)		
Footpath and bicycle path separated by difference in level and standard height or low kerb	<ul style="list-style-type: none"> • Detectable by tactile means • Effective 	<ul style="list-style-type: none"> • Can be a hazard for cyclists if the width is limited • Can be very expensive compared with level surface separation • Likely to be more expensive than barrier separation • Might make maintenance more difficult • Some additional width required • Can be difficult for wheelchair users if the width is inadequate • Can present a barrier for some disabled people

Visual separation		
Physical separation (separation by barrier)		
Row of bollards	<ul style="list-style-type: none"> • Detectable by tactile means 	Can present a significant hazard for cyclists and visually impaired people Likely to be ineffective Can seriously hamper maintenance Significantly reduces effective width so the route will need to be wider overall More expensive than level surface separation Might be visually intrusive

Source: Queensland Department of Transport and Main Roads (2015b).

New to Section 11.3.3: Pedestrian/Cyclist Subways

Here pedestrian subways are not considered a preferred method for grade separation of pedestrian crossings but are in some cases an appropriate alternative. Subways should be accessible by means of ramps or a combination of stairs and/or ramps for accessibility of wheelchairs. Any additional requirements should be implemented to cater for people with vision impairments.

New to Commentary 14 – Tactile Indicators

This section gives a brief description about the purpose and types of tactile indicators used. Tactile indicators of any kind are to conform with AS 1428.4. It is acknowledged that conflicts can arise between the needs of people with visual impairments and wheelchair users, therefore care should be taken.

A.3.7 AUSTRROADS GUIDE TO ROAD DESIGN PART 6B: ROADSIDE ENVIRONMENT

The AGRD (Part 6B) provides guidance on aspects of environmental management on roadside areas which may need to be accommodated within a road reserve. It also provides information on off-street parking and the placement and provision of space for utility services.

Section 3.4.3: Siting of Service Centres and Rest Areas – Pedestrian Access and Visibility

Rest areas and service centres are described as share zones but are required to be designed in a way that minimises any unnecessary interaction between vehicles and pedestrians. Planning should ensure that new rest areas and facilities are developed in accordance with the *Disability Discrimination Act 1992*. Any planned upgrades to existing facilities should accommodate people with disabilities and comply with the Act.

Section 3.4.5: Signage

Signage for rest areas is required to comply with AS 1742.6 and reference is given to AGTM *Part 10: Traffic Control and Communication Devices*.

Facilities for people with a disability should follow signage practices that indicate where such facilities are provided.

Section 4.1.6: Fences – Pedestrian Fences

Pedestrian barriers and fences are required to provide protection from hazards adjacent to roads or facilities and to control entry to road reservations, primarily by vehicles and pedestrians. Barriers or railings are essential to the safety of users and need to take account of the special requirements of people with disabilities and, where relevant, of cyclists.

Bollard and chain fencing can sometimes be used to provide delineation between road traffic and pedestrian activity. It is noted that this type of fence disadvantages people with impaired vision and who use a cane and/or a sound-reflection device for guidance, as they can be confused by the post and chain arrangement.

Section 4.3.4: Design Considerations – Telephone Mounting

The placement and height of a mounted telephone handset should take into consideration people with disabilities, especially where safety barriers or bridge railings exist.

Section 4.4.1: General – Relevant Guidelines

This section indicates that additional guides should be read in conjunction with the Austroads *Guide to Road Design Part 6B: Roadside Environment* when considering parking design.

Additional off-street parking guidance can be found in the Austroads *Guide to Traffic Management Part 5: Road Management* for the following:

- parking policy
- demand and supply
- data and surveys
- on-street and off-street parking from a road user perspective
- types of parking and parking controls.

The Austroads *Guide to Traffic Management Part 11: Parking* (Austroads 2008) provides additional guidance of good traffic management of off-street parking including:

- the location of off-street parking facilities, entrances and exits
- classification of off-street parking facilities
- parking facility layout
- parking facility access design
- general amenities and other considerations
- requirements for car parking structures
- parking payment methods
- parking provisions for other road users (e.g. trucks, bicycles, people with disabilities)
- special event parking.

The guide also indicates that the following standards should also be read in conjunction with the guide:

- AS 1428.1, *Design for Access and Mobility – General Requirements for Access – New Building Work*
- AS 2890.2, *Parking Facilities – Part 2: Off-street Commercial Vehicle Facilities*
- AS 2890.3, *Parking Facilities – Part 3: Bicycle Parking Facilities*
- AS 4586, *Slip Resistance Classification of New Pedestrian Surface Materials*
- AS/NZS 2890.1, *Parking Facilities – Part 1: Off-street Car Parking*
- AS/NZS 1158.3.1, *Lighting for Roads and Public Spaces – Pedestrian Area (Category P) Lighting – Performance and Design Requirements*
- NZS 4121, *Design for Access and Mobility: Buildings and Associated Facilities*.

The guide indicates that the slip resistance of all pedestrian paths is said to be a minimum of Class W as specified in AS 4586.

A.3.8 AUSTRROADS GUIDE TO TRAFFIC MANAGEMENT PART 6: INTERSECTIONS, INTERCHANGES AND CROSSINGS

Part 6 is concerned with traffic management at all types of intersections where road users must join or cross another stream of traffic. It focuses on traffic management issues and treatments related to intersections, interchanges and crossings. It also describes the appropriate use and design of the various intersection types and the techniques that need to be applied if efficient and safe intersections are to be provided to the road user (including people who have vision, mobility or hearing impairments).

Section 1.3: Traffic Management Objectives

Traffic management aims to facilitate the operation of traffic on the roads with safety and efficiency, while taking into account the needs of all road users, including those with sensory or mobility disabilities. This aim is particularly relevant to intersections due to the increased risk they present.

Section 2.3.1: Intersection Selection – Introduction

This section describes factors that may influence the selection process of the type of intersection.

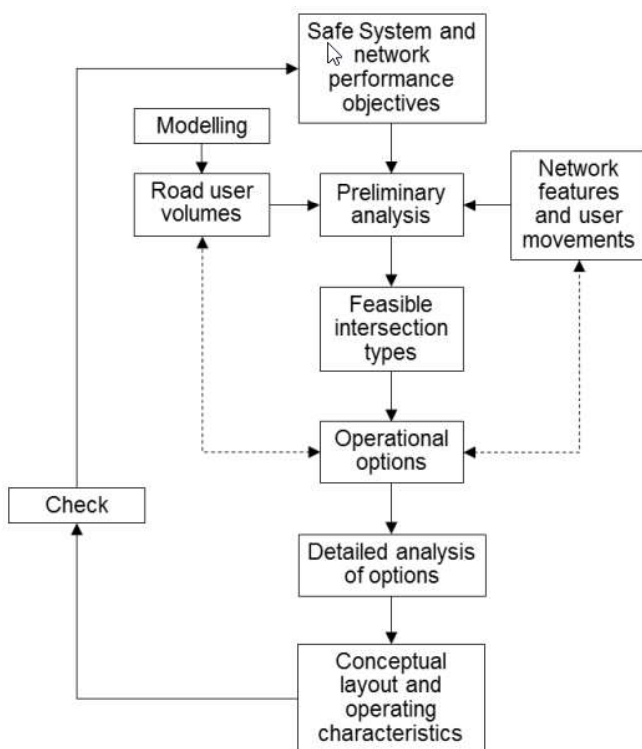
The provision of the safest practicable treatment with an acceptable level of mobility is described as paramount in any situation. Relative safety and the requirements of all road users (including people with disability or mobility difficulty), must be considered as their needs may be a significant factor in the choice of treatment and traffic control adopted.

Greenfield sites are considered very flexible in design, whereas brownfield sites may be limited to changes that can be made.

Section 2.3.2: Intersection Selection – Selection Process

This section provides a framework for the intersection selection process in urban areas (Figure A.7). In some situations, priorities may need to be established based on the volume of special road users such as people with vision, mobility or hearing impairments to achieve a safe system and good network performance.

Figure A.7 Intersection selection process



Source: Austroads (2019b).

Section 2.3.3: Intersection Selection – Assessment of Intersection Control Options

This section advises on traffic control options suitable for different intersection layouts. Intersection control options listed are roundabouts, traffic signals, stop signs and give-way signs, give-way lines only and road rules only. Key traffic and safety considerations are listed for each of these options. Traffic signals require consideration of their suitability for high pedestrian movements which may include people with hearing, vision and mobility impairments.

Section 2.3.4: Intersection Selection – Intersection Type Selection – Key Traffic Management Considerations

This section summarises key traffic management considerations for unsignalised at-grade intersections, roundabouts, conventional signalised intersections and interchanges.

For interchanges, an arterial may need to accommodate pedestrians that may include persons with visual, hearing and mobility impairments. The *Guide to Road Design Part 4C*, Section 6 provides further guidance on interchanges.

Section 2.4.1: Road User Considerations – Pedestrians

This section discusses the types of pedestrians and the issues that are commonly considered. Among those listed are persons with hearing, visual and mobility impairments. Treatments in relation to issues for people with disabilities are outlined in Table A.11.

Table A.11: Treatments for pedestrian issues

Issue	Characteristics	Treatments
<ul style="list-style-type: none"> Squeeze points for wheelchairs and pedestrians with prams. 	<ul style="list-style-type: none"> Location of street furniture and other obstacles. 	<ul style="list-style-type: none"> Relocate furniture to provide a clear path. Control use of footpaths through local municipal laws (e.g. advertising signs, alfresco eating areas).
<ul style="list-style-type: none"> Accessibility for persons who have a vision, mobility or hearing impairment to facilities such as road crossings and public transport stops. 	<ul style="list-style-type: none"> No kerb ramps. Steep footpath gradients or crossfalls. Steep ramp grades or steps. Inadequate public transport stops. 	<ul style="list-style-type: none"> Provide raised pedestrian facility. Provide suitable ramps. Provide flatter ramps. Provide compliant bus/tram stops. Provide tactile paving to guide vision-impaired pedestrians to appropriate crossing locations and to warn them of hazards.
<ul style="list-style-type: none"> Inadequate pedestrian storage areas. Long unprotected crossing distances. 	<ul style="list-style-type: none"> Narrow verges and footpaths. No storage islands. Storage is not suitable for people with disability or mobility difficulty. 	<ul style="list-style-type: none"> Widen verge/path. Provide kerb extensions. Provide median or refuge island. Provide access facilities for impaired persons.

Source: Austroads (2019b).

Section 2.4.5: Road User Considerations – Public Transport

This section discusses the types of issues related to public transport vehicles and users (refer to Section 2.4.1) and what needs to be considered. Issues that are related to persons with disabilities are outlined in Table A.12.

Table A.12: Treatment of issues for public transport

Issue	Characteristics	Treatments
Bus stop location	<ul style="list-style-type: none"> • Can affect passenger accessibility, traffic and bus delays, sight distances and safety 	<ul style="list-style-type: none"> • Bus stops located on the departure side are normally preferred except where not appropriate due to: <ul style="list-style-type: none"> – passenger accessibility requirements – accumulation of buses at the stop could extend back to block the intersection • Bus stops should be located well upstream on the approach side in situations where buses using the stop subsequently turn right at the intersection • Need to consider sight distance restrictions (for other drivers and pedestrians) caused by a bus stationary at the stop, particularly where the bus stop is located on the approach • Need to consider the visibility of traffic signs while the bus is stopped • Bus stop shelters should be located having regard to their effect on sight distances • Pedestrian facilities at the intersection should enable the safe crossing of the roads and safe access to the bus stop. They should also take account of the needs of waiting and disembarking passengers: adequate storage areas are required for passengers waiting to cross a road and/or board a bus
Tram stop location	<ul style="list-style-type: none"> • Can affect passenger accessibility, traffic and tram delays, sight distances and safety • Tram passengers have the same basic requirements as bus passengers with respect to safe, equitable and efficient access to public transport. In addition, the principles that apply to the spacing and general location of bus stops also apply to tram stops 	<ul style="list-style-type: none"> • Similar location principles are applied to bus stops • Have traditionally been located near side streets that serve a passenger catchment area • Locate and design the tram stop to enhance the visibility of tram passengers when boarding and alighting trams • Pedestrian facilities at the intersection should enable the safe crossing of the roads and safe access to the stop. They should also take account of the needs of waiting and disembarking passengers: adequate storage areas are required for passengers waiting to cross a road and/or board a tram • Coordinate with pedestrian crossings to assist in safe access • May comprise kerbside stops or platform stops that provide access for people who depend on wheelchairs or other mobility devices

Source: Austroads (2019b).

Section 3.4.4: Roundabouts – Road Space Allocation and Lane Management – Pedestrians

This section addresses concerns about pedestrians crossing/using roundabout intersections. A roundabout is described as similar to a non-signalised intersection. Conditions suitable for staged and non-staged crossing are discussed. Where staged crossing is not allowed, a straight crossing is preferred as it is more direct and convenient for pedestrians with vision impairments.

A list of design features that improve the level of service and safety for pedestrians is provided. Those that relate to persons with disabilities include:

- splitter islands (type of median) that are large enough to comfortably accommodate pedestrians and enable drivers to anticipate their movement onto the road
- pram crossings that are designed for people with a disability and/or mobility difficulty
- conformance to the *Australian Commonwealth Disability Discrimination Act 1992* or the equivalent NZ Act, also AS 1428 *Design for Access and Mobility* and NZS 4121:2001.

Considerations for pedestrian priority crossings include:

- high pedestrian volumes
- a high proportion of the young, elderly or people with disability or mobility difficulty wanting to cross
- pedestrians who experience difficulty and delays in crossing roads.

Where high pedestrian volumes are likely, an alternative intersection should be considered, especially where there are high percentages of school children, elderly pedestrians or pedestrians who have a vision, mobility or hearing impairment.

Further information on planning techniques is noted in Transport Research Board (2011), which provides guidance on establishing safe crossings at roundabouts for pedestrians generally and people with vision impairments. Issues for pedestrians with vision impairments at roundabouts and treatment solutions are identified. Advice on performing pedestrian/vehicle studies related to these problems, and quantifying pedestrian accessibility at crossings, is also included.

Section 4.2: Signalised Intersections – Functional Layout

This section focuses on factors that affect signalised intersection capacities and safety. Factors considered which relate to people with disabilities are outlined in Table A.13.

Allocation of crossing time to various road user groups is summarised in Section 4.5 of AGTM Part 9.

Table A.13: Factors affecting signalised intersection capacity and safety

Factors	Issues	Comment
Differential speeds	Road users traverse intersections at different speeds that may result in some users not having enough time to clear the intersection Laden trucks consume considerable time on intersection approaches that rise steeply Cyclists have sufficient time to clear intersections during the inter-green time on rising gradients	Provide additional time where a significant number of elderly or pedestrians with disabilities or mobility impairments use signalised crossings Consider the use of detectors to monitor the progress of slow-moving pedestrians Road geometry (gradient horizontal alignment) can influence the speed of vehicles Consider the time required for slow-moving vehicles, especially on rising grades

Source: Austroads (2019b).

Section 4.3.2: Signalised Intersections – Urban Arterial Road Signalised Interaction Approaches

This section focuses on road user requirements and considerations that apply to the allocation of space for arterial road signalised approaches. Factors considered which relates to people with disabilities are outlined in Table A.14.

Table A.14: Road user requirements for arterial road approaches

User group	Context	Guidelines
Pedestrians	Storage area while waiting	Medians should provide adequate pedestrian storage where a staged crossing is adopted. The desirable minimum width is that necessary to accommodate a pedestrian with a pram or a bicycle. At left-turn islands and other traffic islands, designers should provide: <ul style="list-style-type: none"> • an adequate pedestrian storage area • pathways clear of obstructions such as road furniture to enable safe and comfortable passage by pedestrians (including wheelchairs) and sufficient room for road appurtenances and street furniture. Where pedestrian flows are very high, storage areas should be designed to provide adequate stopping sight distance and to maximise the capacity (pedestrian flow) of the pedestrian crossing, taking into account the various pedestrian characteristics and needs.
	Footways serving the intersection	Paths provide the network for pedestrian movement on the approaches to intersections and sometimes within large intersections. They link to the marked foot crossings at signalised intersections. To be effective, the network must provide for pedestrian desire lines and should provide for the convenient, comfortable and safe movement of pedestrians. Barriers to pedestrian movement (e.g. excessive grades, narrow paths, poor surface, and chicanes) will lead to pedestrians choosing an alternative route and not using the facilities. Design for adequate capacity (Part 3 of the <i>Guide to Traffic Management</i> , Austroads 2017a). Pedestrian ramps at all pedestrian crossing points must comply with AS 1428 (<i>Design for Access and Mobility</i>) or NZS 4121:2001.

User group	Context	Guidelines
Cyclists	Bicycle paths, shared paths and separated paths	<p>Where paths exist along a route, they should continue through the intersection desirably via shared pedestrian/cyclist crossings that are appropriately marked. The provision of hard rails to assist cyclists to remain mounted whilst waiting for a green signal should be considered.</p> <p>Median traffic islands should be large enough to accommodate cyclists along with pedestrians, including people in wheelchairs.</p>
Public transport	Bus stops	<p>Bus stops are usually situated on the left verge of a road. They may be fully or partially indented into the verge. However, because of difficulties in re-entering the traffic stream bus companies often prefer to have the bus stop within the left-hand traffic lane.</p> <p>Where a bus must turn right at a signalised intersection, the bus stop may be located some distance upstream from the stop line to enable the bus to access the right-turn lane; often a difficult manoeuvre. For this reason, a bus stop may be incorporated into the approach and a separate signal bus priority phase provided to enable the bus to turn right from the left lane. The stop may be located within a:</p> <ul style="list-style-type: none"> • wide median • left-turn island • traffic island between left-turn lanes and through lanes. <p>A bus stop may be provided on an intersection departure to suit a particular route and/or passenger demands. For further guidance, refer to the <i>Guide to Road Design Part 4</i>.</p>
	Tram (light rail) stops	<p>Tram or light rail stops are often located on the approach to signalised intersections. They may be located at the kerb side or in a safety zone located between the tram tracks and the traffic lanes.</p> <p>Tram stops on the departure side of intersections should be provided only when the tram is in its own reservation.</p> <p>At heavily patronised stops, and to comply with the requirements of the <i>Disability Discrimination Act 1992</i>, special treatments may be required to enable people with disability or mobility difficulty to walk onto the tram without negotiating steps. Tram stop treatments may therefore involve:</p> <ul style="list-style-type: none"> • a raised platform with ramps, located between the trams and traffic lanes or between tram tracks, as a central island stop, with tracks separated to accommodate it • a raised kerb extension whereby the verge is extended to the tram track and cars and trams share a single lane • a form of road hump located in the kerbside lane of a four-lane undivided road to raise the level of the road to tram floor level. In this case, passengers wait behind the kerb line and walk across the hump when both the tram and motor vehicles have stopped. • On existing roads, these stops often require the use of current traffic or parking lane and motor vehicle traffic flow may be restricted to enhance public transport services. • In constrained situations, tram stops are sometimes located on the departure side of intersections to enable width to be created for a right-turn lane on the corresponding intersection approach.

Source: Austroads (2019b).

Section 4.3.2: Signalised Intersections – Local Road Approaches to Signalised Intersections

This section focuses on road user traffic management considerations that apply to the allocation of space on local road approaches to signalised intersections. Information that pertains to people with disabilities is shown in Table A.15.

Table A.15: Road user requirements for local road signalised approaches

User group	Context	Guidelines
Pedestrians	Crossings and footways	Similar requirements to arterial roads. Staging of pedestrians is not usually necessary across local road intersection approaches. However, the provision of well-directed crossings, smooth flat ramps, audio-tactile devices, and tactile ground markings should be considered to assist people with disability or mobility difficulty.

Source: Austroads (2019b).

Section 6.4.1: Road Interchanges – Road Space Allocation and Lane Management

This section discusses the allocation of road space in rural and urban areas, focusing on through and turning movements. Management is mainly through the use of signs and road markings, but special user groups may have to be accommodated such as pedestrians, including people with disability or mobility difficulty. Further guidance is suggested in AGRD Part 4 and AGTM Part 10.

Section 6.4.4 notes ways in which the safety of pedestrians can be achieved at interchanges, for example through the use of barriers. Footpath crossings at ramp terminals are required to be suitable for pedestrian use including pedestrians with disability and/or mobility difficulty to cross intersecting roads and motorway ramps. Further details on pedestrian crossings are provided in AGRD Part 4 and AS 1742.10

Section 7.3: Rail Crossings at Grade

This section focuses on control measures that can be used at at-grade rail crossings by the application of traffic control devices. Information that pertains to people with disabilities is outlined in Table A.16.

Table A.16: Summary of traffic control devices for rail crossings

Device	Notes
Pedestrian and cyclist devices on paths	<p>Passive</p> <ul style="list-style-type: none"> • Provide signs to warn pedestrians and cyclists to look for trains; pavement markings to define footway and safe waiting position. • Where cyclists are permitted to ride over the crossing, provide a cyclist warning sign on approaches to the crossing. • Where cyclists are not permitted to ride over the crossing, provide cyclist must dismount signs on the approaches to the crossing. • Ensure surface condition is safe including flangeway gaps (within practicable limitations). • Where necessary (e.g. urban areas) provide pedestrian mazes or gated enclosures; where mazes are provided, people with vision, mobility or hearing impairments or people pushing prams should be able to easily negotiate them. • Requirements also apply to pedestrian crossings remote from vehicular crossings. <p>Active</p> <ul style="list-style-type: none"> • Provide red symbolic standing pedestrian signals, audible alarms and signs to warn pedestrians and cyclists to look for trains. Also, use pavement markings to define the footway and a safe waiting position. • Where cyclists are permitted to ride over the crossing, provide a cyclist warning sign on approaches to the crossing. • Where cyclists are not permitted to ride over the crossing, provide ‘Cyclist must dismount’ signs on the approaches to the crossing. • Ensure surface condition is safe including flangeway gaps (within practicable limitations). • Where necessary (e.g. urban areas) provide pedestrian mazes or gated pedestrian enclosures; where gated enclosures and mazes are provided, people with vision, mobility or hearing impairments or people pushing prams should be able to easily negotiate them. • Requirements also apply to pedestrian crossings remote from vehicular crossings.

Source: Austroads (2019b).

Section 7.4: Path Crossings of Railways

This section consists of three subsections covering pedestrian path crossings, shared path crossings and impaired persons. Safety measures for pedestrians are also discussed.

For pedestrian path crossings, the four types of suburban rail system pedestrian crossings are outlined. Facilities need to be provided and should accommodate people with disability or mobility difficulties, including those with sight or hearing impairments. Reference is made to AS 1742.7 for further information.

Where pedestrians cross railway lines at grade, a footway at the level of the top of the rail tracks is required. Any railway crossing must be passable and navigable by people in wheelchairs and people pushing prams.

For shared path crossings, under the topic of grade-separated path crossings, difficulties experienced by the elderly and people with physical impairments are the main reasons that grade-separated path crossings are rarely used, although they provide the highest degree of protection from road traffic or trains.

In circumstances where they are used as part of a shared path, the structure must be designed to a standard that is safe for the combined use of cyclists and pedestrians, including users of wheelchairs and people pushing prams. The standards must be adequate according to the following criteria:

- Overpasses and underpasses should have adequate widths.
- Adequate vertical clearance is essential.
- Adequate sight distance must be available (particularly relevant to the entries and exits of underpasses).
- Higher railings, designed not to snag bicycle pedals, are required on overpasses.
- Suitable gradients must be provided.

For persons with impairments, insight is provided into specific design features that must be considered for the convenience and safe passage of all pedestrians, including those with vision, mobility or hearing impairments and the elderly. The design features are summarised in Table A.17.

Table A.17: Design features for path crossings of railways to assist the impaired and elderly

Design feature	Comment
Surfaces	Must be smooth and even. Uneven surfaces and flangeway gaps (where rails intersect paths) can cause the small wheels of wheelchairs to become entrapped, or cause loss of control or tipping of the wheelchair. Vision impaired or aged persons can stumble and fall due to relatively minor level differences.
Manoeuvring space	Crossing layouts and entry treatments (e.g. mazes) should be designed so that the movement of larger wheelchairs and scooters is not too restricted. Crossing pathway should be of adequate width (AS 1742.7).
Warning of trains approaching	Warning times must be adequate to cater for slower pedestrians and wheelchair users to safely cross and clear the crossing.
Visual, audible and tactile warnings	Users may have a range of disabilities and/or mobility difficulties. Crossings should desirably provide visual, audible and tactile warning systems for pedestrians who have poor hearing and/or vision. The use of crossings is made easier for vision impaired persons by the use of appropriate tactile and contrasting visual cues, in addition to warning devices.
Alignment of crossings	Should be at right-angles to tracks wherever practical to do so. Crossings that are not aligned at right angles to the rails may increase the risk of wheelchairs becoming entrapped and can create navigational problems for the vision impaired.
Approaches to crossings	The design of crossings should include consideration of approaches to ensure that well designed and maintained paths connect each crossing to the local footpath network.

Source: Austroads (2019b).

Section 8.0: Pedestrian and Cyclist Crossings

This section discusses the type of considerations involved and the importance of creating crossing points for pedestrians or cyclists. It suggests that concentrating pedestrian and cyclist movements at selected locations is important in aiding those with limited vision or mobility by providing non-visual cues and/or physical aids.

AS 1428.1 is referred to for paths of travel, access and facilities for people with ambulant and sensory disabilities and those who use wheelchairs.

Section 8.2: Mid-block Crossings

This section summarises the categories of mid-block crossings. It is required that they be safe and convenient for the passage of cyclists. They are also required to cater for people with disabilities or mobility difficulties.

Commentary 19: Additional Guidance on Signalling Roundabouts

This commentary suggests (based on research) that signalled roundabouts provide the greatest alignment with Safe System objectives. They were also noted as aiding pedestrians, including those with disabilities and impairments. How they are aided is not mentioned.

A.3.9 AUSTRROADS GUIDE TO TRAFFIC MANAGEMENT PART 10: TRAFFIC CONTROL AND COMMUNICATION DEVICES

This Guide provides traffic management and control guidance for the tools required for transport networks and road users, covering various control devices used for the regulation and guidance of traffic (e.g. pavement markings, delineators etc.).

Section 2.3.2: Considerations for Older Road Users and People with Disabilities

The road design and traffic management needs for those who are classified as elderly are the subjects of research. Elderly people are acknowledged as potentially experiencing a decrease in physical and mental capabilities. Human functions that are subject to deterioration are visual acuity, attention capacity, reaction time and contrast sensitivity.

For people with disabilities, equitable access to transport services is a necessity and should be considered in the development of all transport and traffic management proposals and treatments.

Guidance devices are used to help people with visual impairments or other disabilities navigate with the necessary cues. Three major categories of guidance devices for people with disability are:

- Audible cues – these range from audio-tactile devices at a pedestrian crossing to public-address systems.
- Visual cues – these include maps, signs, lighting, visually contrasting surfaces and guidelines.
- Physical cues – these include audio-tactile devices at pedestrian crossings, surface texture changes (tactile ground surface indicators), guide strips, kerbs and other surface-level changes.

Reference is made to the *Guide to Road Design* for information in relation to the design of facilities as well as the *Guide to Traffic Management Part 6 and Part 11*.

Information is also available from the following:

- AS/NZS 1428.4 *Design for Access and Mobility: Tactile Ground Surface Indicators*
- AS/NZS 2890.6 *Parking Facilities: Off-street Parking for People with Disabilities*
- *Manual of Traffic Signs and Markings (MOTSAM) Part 1: Traffic Signs* (NZ Transport Agency)
- *Manual of Traffic Signs and Markings (MOTSAM) Part 2: Markings* (NZ Transport Agency).

Section 3.1: Need for Signing and Marking Schemes

Signage and marking schemes are part of several planning phases/documents. The schemes must ensure that a logical progression through the traffic system exists for all road users including persons with disabilities.

Section 3.9: Schemes for Parking Signs on Roads

This section provides information on schemes that are currently used in transport networks. The *Guide to Traffic Management Part 11* is referred to for information on parking policies, surveys and guidelines for on- and off-street parking. Requirements for parking control signage are covered in AS 1742.11. Strategies for parking schemes along a road, a route or throughout an area are desirable for providing parking spaces for people with disabilities.

Depending on the nature of the parking area, the applicable standards are: AS/NZS 2890.1 *Parking Facilities: Off-street Car Parking*; AS/NZS 2890.2 *Parking Facilities: Off-street Commercial Vehicle Facilities*; and AS/NZS 2890.5 *Parking Facilities: On-street Car Parking*.

Section 3.11.1: Signs and Markings for Roadworks and Temporary Situations – Pedestrian Facilities at Roadworks and Building Construction Sites

This section addresses the interference of road works to the movement of pedestrians. A situation where the diversion of pedestrians' usual paths is into carriageways is an extreme case of interference. For safe practices for road works, practitioners are referred to AS 1742.3 and any associated jurisdictional variations.

Where disruptions to pedestrian routes occur, the following measures are suggested:

- be well-guarded by continuous barriers
- lamps to be provided at night.

In cases where pedestrians are diverted to carriageways:

- A temporary route should be defined clearly to both drivers and pedestrians by continuous barriers.
- People with sight impairments require solid barriers at a low level for detection; accordingly, free-standing handrails with a rigid bar close to the walkway need to be provided.
- Where practical, solid barriers should be placed at least 1.0 m from the works.
- Barriers should be free of projections or appendages which could be hazards to pedestrians.
- Where a temporary footway is provided, its surface must be of an adequate standard and free from loose materials.

The types of barriers used are dependent on the length of time they are required. Flexible barriers such as those provided by chains, ropes or plastic strips are less favoured as they provide no support should someone fall into them, and people with sight impairments find them difficult to detect.

In cases where pedestrians are diverted across carriageways, adequate provision for pedestrian flow is required. It is mentioned that provision can be made through the use of signs and temporary signals for example. However, some people will be reluctant to cross or not realise the need to cross.

Section 4.1: Types of Signs

AS 1742 provides a range of signs relating to road user groups including people with disabilities.

Section 5.8: Portable/Temporary VMS

This section discusses trailer-mounted signs used for improved traffic management relating to an incident/major event. It provides guidance on conditions of VMS deployment and principles for the legibility, location and sign and message design. One of the aspects for consideration in using and locating portable signs is when placed on footpaths, adequate horizontal and vertical clearance should be provided for pedestrians, including people in wheelchairs.

Section 6.2.1: Colour and Reflectorisation – Colour

This section describes the colours that are used for line marking and provides reasons for their use. White and yellow are mostly used for road markings, while blue is acceptable for parking facilities for people with disabilities (AS 1742.11). The suggested benefit of using blue is that it discourages non-compliant use, even if the contrast between the pavement and line marking is not as evident.

Section 6.8.3: Tactile Ground Surface Indicators – Rumble Strips

This section provides the reasons why tactile ground surface indicators are used. For further guidance and provisions for the indicators, practitioners are referred to AS 1428.4.

New Zealand practitioners are advised to refer to the relevant NZ Transport Agency document for guidance on facilities for pedestrians with vision impairments.

Section 8.4.4: Location of Signal Faces – Positioning of Signal Equipment

This section provides insight into some of the influences on the quality and clarity of traffic signals. It also provides recommendations for signal positions for:

- mid-block signalised crossings
- T-intersections
- lateral post positions
- longitudinal post positions.

Positioning is required to satisfy the requirements of the *Disability Discrimination Act 1992* and AS/NZS 1428.4.

Section 9.0: Traffic Islands

This section describes the function of a traffic island, its purpose and general considerations that should be taken into account in the design and planning phase. The general conditions for traffic islands and medians are that they must be delineated properly and must be visible in any condition.

Sufficient room must be allowed for several pedestrians to seek refuge there and they must cater for the elderly and pedestrians with disabilities.

A.3.10 AUSTRROADS GUIDE TO TRAFFIC MANAGEMENT PART 11: PARKING

This Guide covers parking management matters across a range of situations such as parking policy, demand and supply, data and surveys, on-street and off-street parking, as well as the types of parking and parking control.

Section 1.2: Definition of Parking

Off-street parking is the preferred option for the mass storage of vehicles, while on-street parking is appropriate in city/town centres to service road users with a need for high levels of access, including people with disabilities. Currently, legislation determines where parking is not allowed. Examples include:

- on, or on the approaches to, a footpath, footpath ramp, intersection or pedestrian crossing
- in parking bays for people with disabilities unless displaying an appropriate parking permit.

Section 2.1: Changing Approach to Parking

This section explains traditional approaches to strategic parking management and the benefits of the newest approach of 'demand management'. It aims to reduce the increasing trend in motor vehicle use to share the cost of parking infrastructure equitably. Eventually, public transport is thought to gain a higher share of the transport market. Therefore, adequate road access and safe and appropriate access to parking for pedestrians, including those with disability should be provided.

Section 2.3.4: On-street Parking Management

This section outlines the need for effective on-street parking and the classification of on-street parking types. Disabled parking spaces are categorised as the 'reserved parking' type.

Examples of parking restrictions are provided. Mobility parking is exclusively for vehicles displaying mobility parking permits. Examples (from Auckland Transport) of policies around mobility parking include:

- Providing mobility parking that is physically accessible, affordable and safe to use.
- Mobility parking should be provided, where practical, in angled parking spaces in 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.

Section 4.1.1: Off-Street Parking

This section introduces the four classes of off-street parking and notes that Class 4 covers parking for people with disabilities. Practitioners seeking details of parking size requirements are referred to AS/NZS 2890.1:2004.

Section 4.1.3: Other Categories

This section characterises other categories, one of which is specifically for people with disabilities. Parking for people with disabilities is characterised as an increased space allowance for people to enter and leave vehicles with sufficient extra space required, shared between two spaces or spaces with another purpose.

Section 4.2.2: Parking Provision Standards – Parking Provision Rates for People with Disabilities

This section states that the *Building Code of Australia* mandates that a minimum number of car parking spaces be reserved for persons with a disability. The minimum is dependent on the total number of parking spaces but is usually 1–2% for any park that has 10 or more spaces. Hospitals and medical centres use the higher end of the provision rate. In other cases where demand is expected to be higher than the minimum, allowance should be made in a reasonable manner.

National Disability Services is the Australian peak body for non-government disability services. Each jurisdiction has varying policies and design specifications for disability parking on-street and off-street, although none are identified.

Section 4.2.2: Parking Provision Standards

This section lists additional provisions for parking provision rates for people with disabilities and other circumstances. Bays for people with disabilities need to comply with the *Building Code of Australia* and where applicable, AS/NZ 2890.6:2009. These spaces must be easily accessible to the main entry/lifts/ramps of the destination.

Section 5.2: Parking Policy Objectives

This section indicates that the objectives of parking policy are to document the framework, reflecting the importance of having a car for access to activity centres and the need for the establishment of a sustainable transport system. These objectives target the provision of safe, convenient and efficient parking facilities to meet reasonable demands and achieve acceptable standards for the needs of people with disabilities.

Section 6.1: Urban Design Considerations

This section explains the importance and suggested approaches of designing car parks to fit into the urban design of a development/area/street.

Section 7.2: Classification of Off-street Parking Facilities

This section gives the classification of off-street car parking facilities based on general parking requirements and examples of uses, as seen in Table A.18. The user class is cross-referenced with tables in the AS/NZS 2890.1:2004 to determine the dimension specifications for parking bays and aisles.

Table A.18: Classification of car parking facilities

User	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 of all doors	Minimum for single manoeuvre entry and exit	Long-term city and town centre parking, sports facilities, entertainment centres,

User	Required door opening	Required aisle width	Examples of uses
			hotels, motels, airport visitors (generally medium-term parking)
3	Full opening of 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 of 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: *Austrroads (2017d) adopted from AS/NZS 2890.1:2004.*

Section 7.3: Parking Facility Layout

This section notes that parking facilities should be designed in accordance with AS/NZS 2890.1:2004.

Section 7.5.2: Pedestrian Treatments

This section lists the principal considerations when planning for safe interaction between vehicles and pedestrians. Providing easily accessible connective pathways along the main pedestrian desire lines through car parks is considered good practice.

Section 7.6.4: Provision for Pedestrians

This section notes a few provisions for catering for pedestrian safety comfort and convenience.

Lifts are to be constructed in parking structures that have three levels or greater. Wheelchair accessible lifts should be easy to find through the use of signs and are required in structures higher than ground level for people with disabilities.

Section 7.15: Parking Provision for Other Road User Groups

This section lists some 'other road users' that should be considered when determining off-street parking provision. People with disabilities are included.

Section 8.9 is referred to for further information on parking provisions for on-street parking for other road users.

The following considerations are discussed for people with disabilities:

- They need to park as close to their destination or the wheelchair accessible lift and/or ramp as possible.
- They may need extra space for wheelchairs and walking aids.
- Some activities are hard to manage.
- Slip resistance should be a minimum of Class W (specified in AS 4586:2013).
- Parking signs or pavement markings in reserved disability parking need to follow Australian Road Rules – Rule 203. The sign to identify people with disability parking spots is the symbol number S22 in AS 1743:2001 or the international symbol for access from 1428.1:2001.
- The lighting of parking bays should conform to AS/NZS 1158.3.1:2005 – Category P for outdoors.
- The lighting of parking bays should conform to AS/NZS 1680.2.1:2008 for enclosed car parks.
- Parking bays should be located where people getting in and out of vehicles and moving towards/away from the vehicles who may be at risk from passing traffic can be seen by approaching drivers to avoid conflict.

Any parking requirements should be in accordance with AS/NZS 2890.6:2009.

Reference is given 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*.

Bicycle parking facilities need to comply with the *Disability Discrimination Act 1992* and must not obstruct or hinder areas adjacent to accessible car parking as required by AS/NZS 2890.6:2009.

Section 8.0: On-street Parking – General Priorities for Allocation of Parking Space

This section describes the value of well planned on-street parking and provides additional supporting materials to the design requirement standards. On-street parking is to be prioritised where necessary for special user groups such as people with disabilities. Design requirements are dealt with in AGRD Part 3 and AS 2890.5:1993 *Parking Facilities Part 5: On-street Parking*.

Section 8.2.5: Disability Permit Holders

This section lists the entitlements that people who qualify for the Australian Disability Parking Scheme have, which are:

- 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:
 - If the time limit on the sign
 - is less than 30 minutes; 30 minutes; or
 - is 30 minutes or more but 1 hour or less; 2 hours; or
 - is more than 1 hour; twice the period indicated on the sign; or
 - If another law of this jurisdiction permits the driver to park for a longer period, the longer period.

On-street parking is to be highly prioritised in areas of high demand for people with disabilities such as medical centres. Wherever possible parking bays for people with disabilities should be located off-street for additional convenience and safety of the driver.

Section 8.3: Commercial Centre Hierarchy Example

In commercial centres, parking user hierarchy (Figure A.8) is desirable to support growth and intensify goals. This hierarchy shows that on-street parking for disability permit holders is a low priority due to on-street parking being inconvenient and unsafe. Therefore, parking for disability permit holders is given a high priority in off-street car parks. In outer areas, the hierarchy shows that disability permit holders are considered as a medium and low priority for on-street and off-street parking respectively.

Figure A.8 Commercial centre hierarchy

Priority	Inner core of commercial centre		Outer area	
	On-street	Off-street	On-street	Off-street
Essential 	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: Austroads (2017d).

Section 8.9: Provision for Other Road Users – People with Disabilities

This section lists some ‘other road users’ that should be considered when determining on-street parking provision. People with disabilities are included.

The following considerations are discussed for people with disabilities:

- Bus/coach stop areas should be designed in accordance with the *Disability Standards for Accessible Public Transport (2015)*.
- On-street parking bays for people with disabilities should preferably be provided in angled parking zones.
- Where parking is largely parallel it is often more practicable to provide off-street rather than on-street.
- Where appropriate to provide parallel parking, it can be achieved through raised mountable embayed parking.
- It may be appropriate for a kerb ramp to be provided at the rear of parking bays to facilitate access to the back of vehicles.
- The design of parking bays should comply with the requirements addressed in Section 7.15.4.
- Access to parking bays can be restricted by the application of permit programs.
- Universal access parking bays (accessible by everyone) are intended to be used by people with disabilities, but are not exclusively for their use; this can be useful where short-term access is required.
- Disabled parking for exclusive usage should be signed and marked and ensure that time-limited bays have sufficient turnover to allow people with disabilities to access them.
- Parking concessions may also apply.
- Parking spaces should provide for mobility wheelchair scooters a three-wheeled motorcycle with a flat rear platform onto which a wheelchair can be locked with the disabled person able to operate the handlebar controls.
- Taxi parking should be suitable for people with disabilities. The dimensions of the front of queue spaces should be consistent with this requirement.
- Parking authorities typically allow people with disability to park for no fee or at a reduced rate. All states and territories also accept each other’s parking permits for people with disability.

Parking schemes for people with disabilities are managed by state and territory authorities.

Section 8.10.1: Linear Parking Control – Special-purpose Zones

This section lists the general policies applicable to linear parking control and specific requirements as defined in the *Australian Road Rules 1999* and any supporting legislation.

Information on seven special-purpose zones as described in AS 1742.11:2016 and *Australian Road Rules 2012* is provided. Those which have information in regard to people with disabilities are as follows:

- Bus Zone – should be designed in accordance with *Disability Standards for Accessible Public Transport (2015)*, requiring the installation of tactile ground surface indicators at all new bus stops and a minimum kerb height of 150 mm.
- Permit Zone – for vehicles with authorised permit label displayed.

Section 9.1: Rest Areas (in Conjunction with Section C12.6)

Rest areas are provided on national and state highways and major rural freeways. People with disabilities need to be considered when planning rest areas and they must comply with the *Disability Discrimination Act 1992*. Some of the requirements are indicated such as toilets, parking spaces and appropriately graded footways and ramps.

Section 11.1: Signs and Pavement Markings – Parking Direction Signs – Pavement Markings

Parking direction signs must be in accordance with Section 6 of AS 1742.11:2016. Information on direction signage to disabled parking bays may be included.

All signs for people with disabilities to identify parking areas should include the international symbol of access as specified in AS 1428.1:2001 or Symbol S22 in AS 1743:2001.

Section 12.1: Risk and Safety – Risk Management

This section provides a very basic version of a risk assessment checklist that is described as a starting point for the development of risk management. One of the requirements is the allocation of sufficient spaces for people with disabilities.

A.3.11 PUBLIC TRANSPORT INFRASTRUCTURE MANUAL 2015

Public transport infrastructure is for or associated with the provision of public passenger transport including:

- ferry terminal, jetty, pontoon or landing for ferry services
- bus stop, bus shelter, bus station or bus layover
- busway station
- light rail station
- a taxi rank, limousine rank or limousine standing area
- railway station
- vehicle parking and set-down facilities
- pedestrian and bicycle paths and bicycle facilities
- a road on which a public passenger transport service operates.

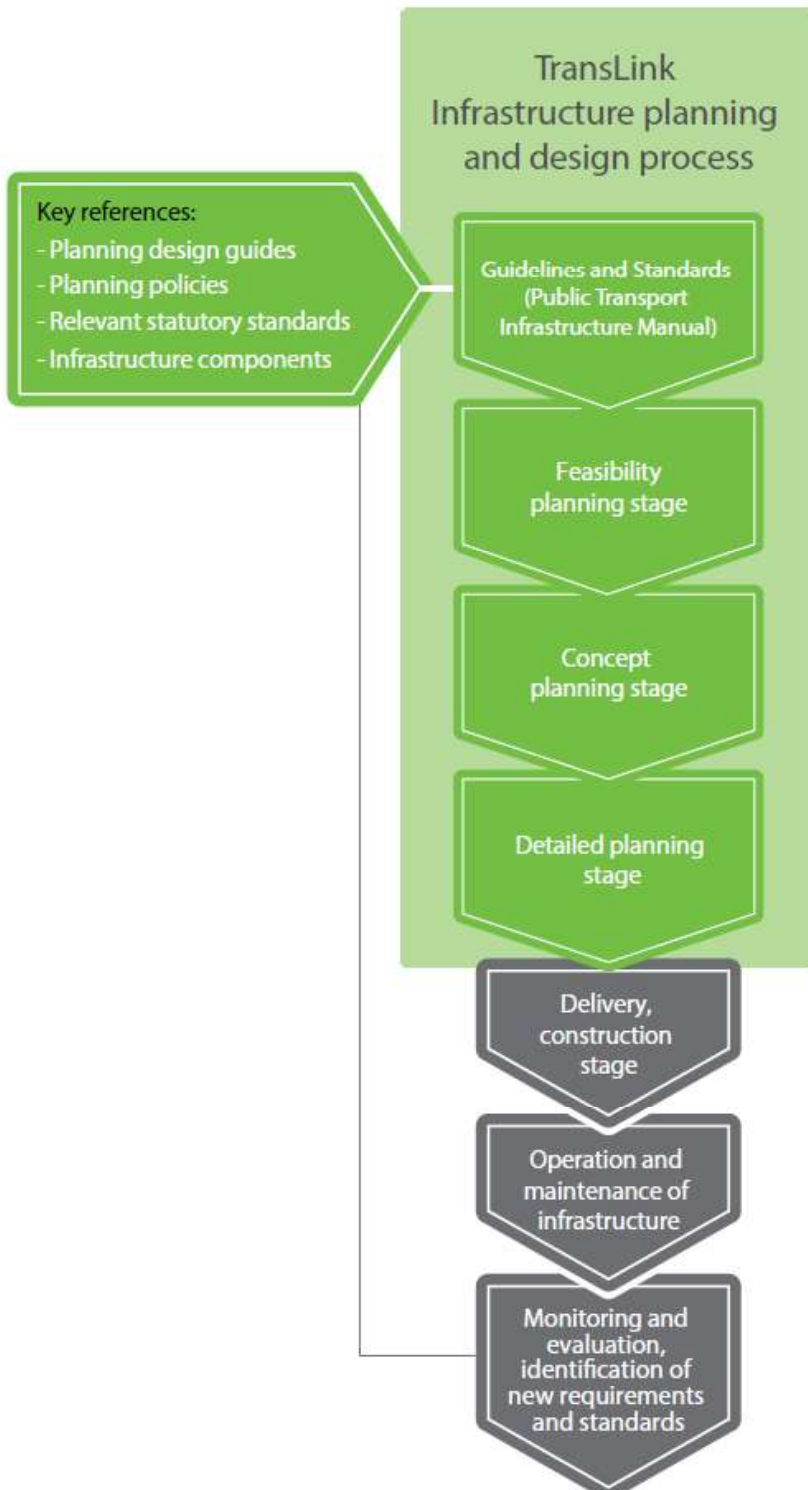
Public transport infrastructure is a critical component of operating an efficient and safe public transport system. The *Public Transport Infrastructure Manual (PTIM) (2015)* establishes the guidelines for planning and design. All public transport infrastructure must comply with the standards and guidelines for disability access (e.g. *Disability Standards for Accessible Public Transport 2002*). Designs should incorporate:

- most direct and convenient access from facility entry to boarding points
- buildings or shorelines to facilitate clear and direct access
- providing an effective means of wayfinding
- minimising the need for other additional aids (e.g. tactile surface indicators (TGS))

- use of consistent layouts and design principles.

The overall process that should be followed is outlined in Figure A.9.

Figure A.9 TransLink infrastructure planning and design process



Source: TMR (2015c).

Factors influencing planning and design include mobility aids, wheelchairs, pram and bicycle boarding as noted below.

Operational impacts

- increase boarding times
- impacts the operational capacity of public transport infrastructure
- needs to be considered in demand forecasting.

Accessible design

- Design must accommodate all public transport and comply with the Disability Standards and Australian Standards.

Pedestrian infrastructure

Planning and design should consider how passengers will access the infrastructure and incorporate appropriate access facilities and infrastructure. This includes identifying the main directions of pedestrian flow into and out of the stop/station and ensuring local pedestrian networks and public transport infrastructure is well integrated. Connections focusing on integrating with existing and anticipated future infrastructure should be accessible, convenient, direct and legible. Elements for consideration include:

- inter-modal conflict – pedestrian crossings
- kerb ramps – connection, provision, quality and configuration
- path width, grade, continuity and alternative paths
- placement of other pedestrian infrastructure – rest points, railings, street furniture
- pedestrian walkway and waiting area shade cover for sun and weather protection.

Table A.19 outlines some key design considerations related to pedestrian access based on the applicable standards and guidelines for pedestrian movement and accessibility.

Table A.19: Key design considerations (pedestrian access)

Considerations	Guideline description
Access paths	Disability and Australian Standards must be complied with for: <ul style="list-style-type: none"> • Doorways and gateways • Stairs, lifts, ramps and landings • Pavement surfaces and use of TGSi
	If changes of grade are required to get to a stop or station: <ul style="list-style-type: none"> • Allow appropriate rest areas at regular intervals on walkways • Allow ramps for mobility-impaired and aged persons
	Where severe grade changes or disproportionate ramp lengths are required: <ul style="list-style-type: none"> • Assisted vertical movement (lifts and escalators) should be provided
	Crossover (kerb) ramps should minimise changes of direction Except where geometry (depth, width or sightlines) is constrained
	Choose path materials that feature ease of cleaning and slip resistance in all weather conditions
	Design paths to avoid pooling or collection of detritus or other unwanted debris
Minimum path dimensions	TransLink prefers minimum path width of 1.8 metres
	Increase path width to accommodate handrails and barriers
	Minimum clearance from all infrastructure for single wheelchair access is 1.2 metres Refer to <i>Disability</i> and <i>Australian Standards</i> for required width for single direction and/or bi-directional path for allowing two wheelchairs to pass each other and a 180-degree turn
Handrails and barriers	Add handrails and barriers near dangerous edges (roadways, cycle paths, carriageway escarpments, batter slopes and walls, steep gradients and steps, through underpasses or tunnels)
Lighting	Refer to appropriate requirements within AS/NZS 1158.3.1:2005 – <i>Lighting for roads and public spaces</i> and the <i>Disability Standards for Accessible Public Transport 2002</i>
	Lighting quality (colour and lux) at waiting points will be consistent with platform lighting Should be bright white light
	Lighting along paths will be bright white light: luminance as per Australian Standards

Considerations	Guideline description
	Luminance contrasts will be consistent with station areas including paths Must comply with minimum contrast with background (as per Disability Standards)
Hazards	Objects must not protrude into any path of pedestrian travel Allow a minimum clearance of 1.2 metres (desirable 1.5 metres) from all infrastructure for single wheelchair access and manoeuvring (around poles, street furniture, raised service pits) Avoid placing grates, frills, service pits or other interruptions to a pavement surface within a pedestrian pathway or paved area Where pits must be placed in the path of travel: <ul style="list-style-type: none"> • Must be flush with the path surface • Covers must meet the same anti-slip and load-bearing performance requirements as the path pavement
Other	Seating along pedestrian access routes (comply with Disability and Australian Standards) Signage and information including the use of Braille and accessibility symbols
Crossings	Designed to favour unconstructed and efficient pedestrian movement <ul style="list-style-type: none"> • At-grade crossings favoured when safety and priority can be maintained (when all intersecting modes are operating in a low-speed, low-volume environment) • Grade-separated crossings considered when at-grade crossings compromise safety to either mode or create unreasonable delays due to: <ul style="list-style-type: none"> – high speed or high-volume intersecting modes or high pedestrian peak volumes – environmental design factors (poor sightlines, steep approach gradients, lack of space for adequate pedestrian capacity at kerb side/median refuges) • Uncontrolled crossings (zebra crossings and shared zones) preferred • Corresponding kerb ramps on a crossing should be directly aligned • Separate pedestrian crossings from cycle crossings

Source: TMR (2015c).

Bus feeder infrastructure design considerations

Bus feeder refers to local/neighbourhood bus services that operate within lower-density urban communities and provide transport connections for passengers looking to interchange with more frequent services along high-frequency-service routes.

Where there is high demand for interchanging, stops/stations should provide additional passenger-waiting capacity and seamless passenger movement (intra and inter-platform). Where less direct interchange opportunities are provided, pedestrian design considerations should be applied to maximise the convenience of the interchange movement by:

- minimising the required walking distance
- maintaining direct sightlines across the facility and services
- providing continuous, seamless high-quality pedestrian connections within the facility
- providing route and timetable information.

Bus access roads and bays should consider:

- the appropriate design for constant heavy vehicle use and manoeuvring
- surface materials designed for ease of cleaning and slip resistance (all weather conditions)
- surfaces designed to avoid pooling/collection of detritus/unwanted debris.

Kiss 'n' ride infrastructure

Kiss 'n' ride facilities describe vehicle drop-off or pick-up zones for passengers arriving from/leaving for public transport service and play a role in providing a key access point for people with mobility impairment. General guidelines for kiss 'n' ride infrastructure is provided in Table A.20. A key factor for the success of kiss 'n' ride facilities is the convenience from which they can be accessed and exited from. Connections between kiss 'n' ride infrastructure and stop/station facilities should be accessible, direct and legible. Kiss 'n'

ride activity should be accommodated within a formal facility. Kerbside facilities should provide sufficient additional footpath space to avoid conflict with pedestrian movements.

Kiss 'n' ride access should be considered for:

- stops/stations outside of the inner city and low-density residential areas
- some high-frequency services and terminus stops with significant demand
- stops/stations serving activity centres within residential areas
 - particularly stops/stations used for interchanging.

Table A.20: Overview of kiss 'n' ride infrastructure

Consideration	Guideline description
Passenger set-down and pick-up bays	For private vehicles, taxis shared or dedicated, kerbside or on-site <ul style="list-style-type: none"> • Indented bays along a kerb-line • Regular kerbside bays (passenger loading zone or short-term (less than 10 minutes) parking) • Allocated angle parking bays within parking lot facility
Pedestrian and vehicle waiting areas	<ul style="list-style-type: none"> • Storage bays and overflow allowances for waiting (pick-up) vehicles • Waiting areas and amenities for public transport passengers • Pedestrian access paths

Source: TMR (2015c).

Table A.21 shows design considerations that should be used when implementing kiss 'n' ride infrastructure into a design.

Table A.21: Design considerations for kiss 'n' ride infrastructure

Consideration	Guideline description
Flow direction	<ul style="list-style-type: none"> • Identify main directions of vehicle flow in and out of stop/station facility area • Consider entry arrangements and location of other Supporting Access Infrastructure (cycle amenities)
Pedestrian movements	<ul style="list-style-type: none"> • Connect pedestrian access routes from kiss 'n' ride facility to stop/station • Provide appropriate capacity and comply with accessibility requirements
Information	<ul style="list-style-type: none"> • Provide public transport information in advance at kiss 'n' ride waiting areas
Safety	<ul style="list-style-type: none"> • Segregate kiss 'n' ride bays and through-lanes from other traffic to limit the complexity of vehicle movements in the area • Provide connections to and from kiss 'n' ride that minimise inter-modal conflict and provide a direct connection to platforms • Kiss 'n' ride should be located near/adjacent to pedestrian crossings that provide direct access to stop/station entry point • Kiss 'n' ride has priority for proximity to the stop/station entry points (when located within larger park 'n' ride site)
Access paths and waiting amenities	<ul style="list-style-type: none"> • Provide a waiting area (hardstand areas with suitable slip-resistant finish) which is in addition to the minimum pathway allowance • Access pathways must meet requirements outlined for pedestrian infrastructure • The pathway must extend the full length of the facility and provide access to the full length of all bays • Where the carriageway and waiting area are at different grades: additional width provided to accommodate kerb ramps • Kerb ramps must be provided at the front or rear of each bay length • Minimise distance between kiss 'n' ride and bus stopping positions • Walking distance between public transport boarding point and kiss 'n' ride area should be 150 metres or less for pedestrians
Dimensions/envelope	Applicable <i>Australian Standards</i> apply for: <ul style="list-style-type: none"> • Non-parallel bays • Minimum kerbside bay width and length (including fully accessible bays for people with disabilities)

Consideration	Guideline description
	<ul style="list-style-type: none"> • Angle parking bay dimensions
Lighting	<ul style="list-style-type: none"> • Should meet applicable platform lighting standards • Lighting levels to meet regulation standards for public transport facilities (AS/NZS 1158.3.1 2005 – <i>Lighting for roads and public spaces</i>)
Hazards	<ul style="list-style-type: none"> • Consider slow vehicles entering/exiting kiss 'n' ride facility when approaching potential points of conflict (intersections, blind curves, crossings) • Clearly identify crossing arrangements (if patrons need to cross a carriageway) • Where cycle access path runs parallel at-grade with kerbside kiss 'n' ride provide additional lane width to the right of the bay • Cycle paths should avoid interaction with kiss 'n' ride bays • Cycle paths should never be led through shared zones for accessible kiss 'n' ride bays

Source: Queensland Department of Transport and Main Roads (2015c).

Park 'n' ride infrastructure

Park 'n' ride facilities are commuter parking areas at public transport stops/stations that allow access to public transport services, general guidelines for infrastructure are provided in Table A.22. Park 'n' ride infrastructure is provided at stops/stations servicing low-density residential areas when the level of public transport is low and also serves a role as a key access point for people with mobility impairments.

Table A.22: Park 'n' ride infrastructure

Consideration	Guideline description
Parking bays (shared or dedicated)	<ul style="list-style-type: none"> • Located kerbside or on-site (off-street) • Specifically allocated for purpose of public transport <ul style="list-style-type: none"> – Indented parallel-bay style provision along the kerb line – Regular kerbside bays allocated as dedicated or shared (by time) – Angle parking bays within the dedicated parking lot – Dedicated motorcycle parking areas
Supporting elements	<ul style="list-style-type: none"> • Overflow capacity • Vehicle access roads • Amenity utilities • Pedestrian and cycle paths

Source: Queensland Department of Transport and Main Roads (2015c).

Table A.23 shows design considerations that should be used when implementing park 'n' ride infrastructure into a design.

Table A.23: Design considerations for park 'n' ride infrastructure

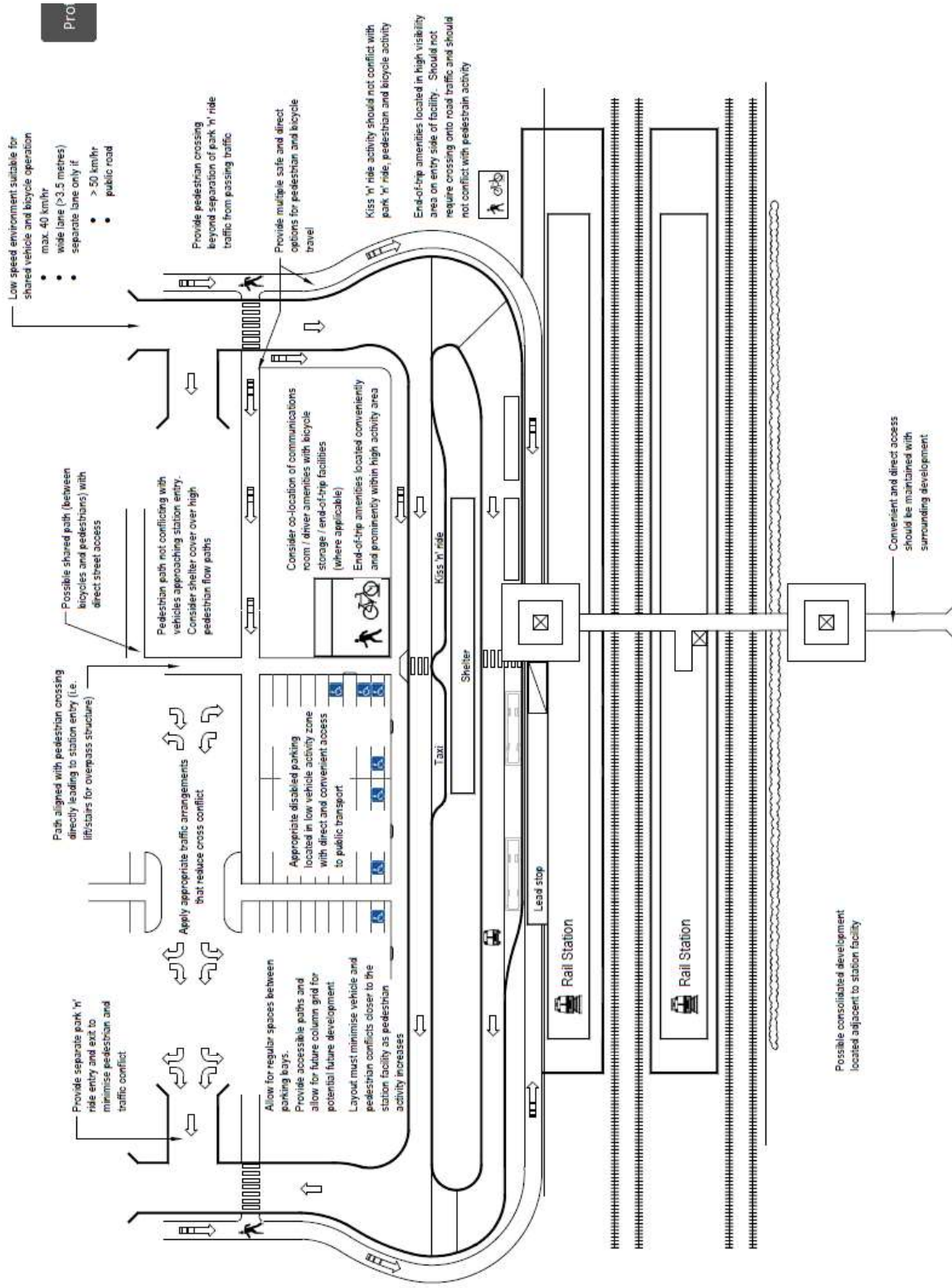
Consideration	Guideline description
Access	<ul style="list-style-type: none"> • Direct access to and from arterial, sub-arterial and distributor roads
Location	<ul style="list-style-type: none"> • Park 'n' ride activity accommodated within a formalised facility

Consideration	Guideline description
Design	<ul style="list-style-type: none"> • Identify main directions of vehicle flow into and out of park 'n' ride site • Consider entry arrangements and location of any other access infrastructure • Design one-way or cul-de-sac aisles to minimise directional conflict • Design circulation network for ease of manoeuvring and safety • Vehicles awaiting entrance to park 'n' ride should be oriented away from the immediate vicinity of the stop/station • Identify the need for operational requirements that potentially share the site (bus layovers, driver amenities) • Minimise interruption of pedestrian and cycle movements • Facilitate safe and direct pedestrian access to stop/station • Provide sufficient width on shared access paths for pedestrians • Minimise the need for physical barriers between modes (avoid fences/barriers) • Park 'n' ride entry and exit points should be located adjacent to or near pedestrian crossings (providing direct access to primary stop/station entry point) • Avoid sharp turns and maintain sightlines • Ensure public transport information provided in advance at transition points (between park 'n' ride and stop/station) • Segregate park 'n' ride access traffic from other stops/station traffic
Access roads and car parks	<ul style="list-style-type: none"> • Carriageway and car park surface materials designed for ease of cleaning and slip resistance (all weather conditions) • Surfaces designed to avoid pooling/collection of detritus • Carriageway designed to withstand limited use by heavy vehicles
Access paths (pedestrians)	<ul style="list-style-type: none"> • Take advantage of site topology: incorporate ramps and overpasses rather than lifts or stairs • Where parking bays and circulation paths are at different grades additional path width should be provided to accommodate kerb ramps • Kerb ramps provided near accessible bays

Source: Queensland Department of Transport and Main Roads (2015c).

Figure A.10 shows an example design of an inter-modal public transport facility equipped with both kiss 'n' ride and park 'n' ride facilities. This design shows how space can be best utilised while also ensuring safety for all users.

Figure A.10 Public transport access infrastructure components: design example



Source: Queensland Department of Transport and Main Roads (2015c).

Bus stop infrastructure

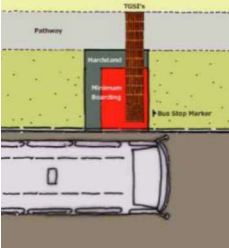
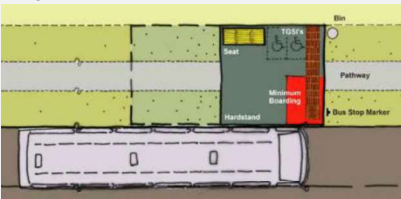
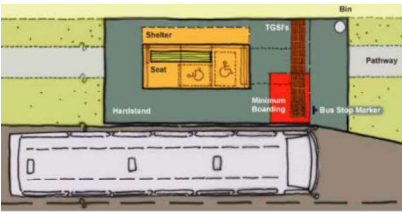
A bus stop is defined as a collector point for pedestrians along a public transport route, allowing for boarding and alighting. It also includes a portion of the roadway for the stopping of a bus, where a bus will need to park at the stop either on the road or indented within a bay.

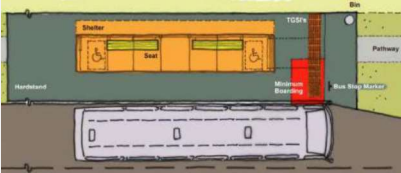
Components included at a bus stop are:

- boarding point
- manoeuvring areas
- signs and information
- tactile ground surface indicators
- street furniture, waiting areas
- allocated space, access paths
- ramps
- surfaces
- handrails and grab rails
- stairs
- symbols
- lighting
- passing areas.

Typically used bus stop categories are outlined in Table A.24.

Table A.24: Bus stop categories

Bus stop category	Description	Inclusions
<p>Minimum boarding point</p> 	<ul style="list-style-type: none"> • Constrained suburban sites with low customer demand • Outbound stops • Low-frequency services 	<ul style="list-style-type: none"> • Hardstand (2070 x 1540 mm) • Bus stop sign/marker (J pole) • Timetable information • Tactile Ground Surface Indicators (TGSIs)
<p>Regular stop</p> 	<ul style="list-style-type: none"> • Low-density suburban/non-urban sites with low customer demand • Low-frequency services 	<ul style="list-style-type: none"> • Hardstand (including minimum boarding point) • Bus stop sign/marker (J pole) • Timetable information • Seating • TGSIs
<p>Intermediate stop</p> 	<ul style="list-style-type: none"> • Main passenger transport corridors with moderate customer demand • Moderate frequency services 	<ul style="list-style-type: none"> • Hardstand (including minimum boarding point) • Bus stop sign/marker (J pole) • Timetable information • Shelter with seating • TGSIs

Bus stop category	Description	Inclusions
Premium stop 	<ul style="list-style-type: none"> • Sites near major attractors with high customer boarding demand • Corridors with high -frequency services • Interchanges 	<ul style="list-style-type: none"> • Hardstand (including minimum boarding point) • Bus stop sign/marker (J pole) • Timetable information • Shelter with seating • TGSs • Bin

Source: Queensland Department of Transport and Main Roads (2015c).

Key considerations for the placement of a bus stop include:

- accessibility and equitable access
 - according to *Disability Standards for Accessible Public Transport 2002* and *Disability Access to Premises - Building Standards 2010* (where the bus stop requires building approval for the provision of a bus shelter or interchange facility)
 - shelter classified as a class 9b building (assembly building) or class 10a building (non-habitable building structure used to provide shelter)
 - according to AS 1428 1, 2 and 4
- proximity to surrounding services and facilities
- frequency or types of the bus service
- routing and future services expectations and network growth.

Figure A.24 provides additional details on the key issues for consideration when planning bus stops and their infrastructure.

Table A.25: Bus stop infrastructure considerations

Factors influencing planning and design	What to consider
Catchment and spacing	<ul style="list-style-type: none"> • Stop spacing 400–800 m in an urban environment
Location	<ul style="list-style-type: none"> • Ensure safe sightlines for vehicles, bus operators and passengers • In High Occupancy Vehicle (HOV) lanes consider indented bus bays • Posted speed limit (for kerbside/on-road facilities) • Sites were chosen where sufficient pavement area for pedestrians to safely walk past the bus stop area • Provide convenient boarding and alighting for passengers • Locate stops <ul style="list-style-type: none"> – Close to community facilities and services that attract a high proportion of people with a disability – Close to significant attractors (shopping centres) – Close to other stops (minimise walking if transferring between services) – Close to dedicated pedestrian road crossings – Away from dense foliage/other objects that hinder direct sightlines – In well-lit areas – In pairs (boarding and alighting happens in close proximity, opposite stop visible)
Intersections and pedestrian crossings	<ul style="list-style-type: none"> • Locate stops <ul style="list-style-type: none"> – Near existing pedestrian crossing facilities – Downstream of pedestrian crossing – Where there is a minimal conflict with parking areas – To provide sufficient sight distance so buses can safely re-enter traffic lane • Bus stops near intersections should be <ul style="list-style-type: none"> – Located on the far side of intersecting street – Located on approach to intersections – Not sited opposite to intersection street (T-intersection)

Factors influencing planning and design	What to consider
Access	<ul style="list-style-type: none"> • Pedestrian infrastructure <ul style="list-style-type: none"> – The interface of the stop with a wider pedestrian network – Provision of appropriate pedestrian crossing facilities – Kerb ramps: connection, quality, configuration – Accessible path width, grade, continuity and alternative paths – Need and placement of pedestrian infrastructure: rest points, railings, street furniture – Pedestrian walkway and waiting shade cover for sun and weather protection
Capacity	<ul style="list-style-type: none"> • Consider known and future number of bus services likely to serve the stop at any one time • Bus dwell and clearance time at the stop influences stop loading area capacity and the likely number of loading areas required • Nearby traffic signals influence the number of buses into or out of a stop and bus arrival profiles • 'Clock-face' type approach to understanding how the frequency of services influence the amount of space required at a stop

Source: Queensland Department of Transport and Main Roads (2015c).

Kerbs installed at a bus stop should be at least 150mm higher than the road surface to ensure on-board bus ramps do not exceed maximum inclines when deployed and should, therefore:

- allow for safe, efficient passenger set down and pick up
- meet the minimum *Transport Standards* height of 150mm
- be a barrier kerb (semi-mountable kerbs should be avoided).

Table A.26 provides additional information on the considerations required when choosing bus stop components.

Table A.26: Bus stop components

Element	Consideration
Stop signage/stop marker	<ul style="list-style-type: none"> • Stop identification marker (J-pole or blade sign) (Figure A.11) • Guides bus driver to optimal stop position for passengers to board and alight safely • Directs passengers to where they should wait to board the bus • Provide highly visible information about services (timetables, route numbers, network map, stop name and number) • Provide directional information (travel options, locality map, visible wayfinding signage, direction of travel for services using stop/station)
Bus zones	<ul style="list-style-type: none"> • Length of the road to which a bus zone sign applied • Use signs when more than one bus required to use bus stop or where other competing road requirements exist (on-street parking) • Should not be less than 30 metres • Located within 20 metres approaching bus stop marker, 10 metres on the far side of stop marker • TransLink's preferred approach length is 25 metres for a 12.5 m bus

Element	Consideration
Accessibility including passenger waiting area	<ul style="list-style-type: none"> • Whole pavement space used by the bus stop and space available for waiting and boarding/alighting a bus service • The waiting area should: <ul style="list-style-type: none"> – Provide accessible, safe access to the bus stop boarding point and buses services the stop – Allow for easy manoeuvring of wheelchairs and prams – Provide compliant access ramp not exceeding maximum gradient and length (gradient less than 1 in 8 for wheelchair users to board without assistance) – Be maintained with 1.2 metres (preferable 1.5 metres) of clear access around and between all infrastructure and obstructions – Be maintained with bus stop boarding points that are flat and stable (maximum gradient of 1:40 across longitudinal and cross fall direction) – Address longitudinal gradient of the adjacent road to ensure safe boarding/alighting at a bus stop – Keep free from clutter (street furniture) – Allow passengers to easily access and view timetables – Allow for pedestrian through-flow – Minimise exposure to direct sunlight (other weather conditions) – Allow for efficient runoff and drainage • TGSIs mandatory for minimum boarding point and should: <ul style="list-style-type: none"> – Guide customers with vision impairment to boarding point and warn of hazards – Be perpendicular to the kerb and across the full width of the access path to the shore line – Have minimum 30% contrast between TGSIs and surrounding ground surface – Kept clear of furniture and hazards (minimum 300 mm clearance)
Bus stop furniture	<ul style="list-style-type: none"> • Located clear of bus stop boarding area and access path • Be set back from length of bus zone (minimum of 600 mm from kerb face) • Ensure a minimum of 30% luminance contrast against the background <p>Seating</p> <ul style="list-style-type: none"> • Placed at least 500 mm clear of accessible path of travel • Located at the rear of the stop • Oriented so passengers face toward the street when seated • Not encroach on minimum boarding point or manoeuvring and circulation area • Able to be bolted to hardstand (concrete) areas • Include backrests and armrests <p>Bins</p> <ul style="list-style-type: none"> • Located minimum of 1.2 m clear of minimum boarding point • If placed at the kerb – a minimum clearance of 600 mm required from the face of the kerb to the bin surface • Should not obstruct boarding, alighting or accessible path • Ensure minimum 30% luminance contrast against surrounding ground surface • Easily maintained, durable, vandal and bird resistant
Lighting	<ul style="list-style-type: none"> • Street lights should be minimum of 2.5 m away on the departure side of the bus markers to ensure buses avoid collision
Wayfinding information	<ul style="list-style-type: none"> • Braille tactile signage should be considered as part of signage at a bus stop • Consider the inclusion of public address system and hearing augmentation

Source: Queensland Department of Transport and Main Roads (2015c).

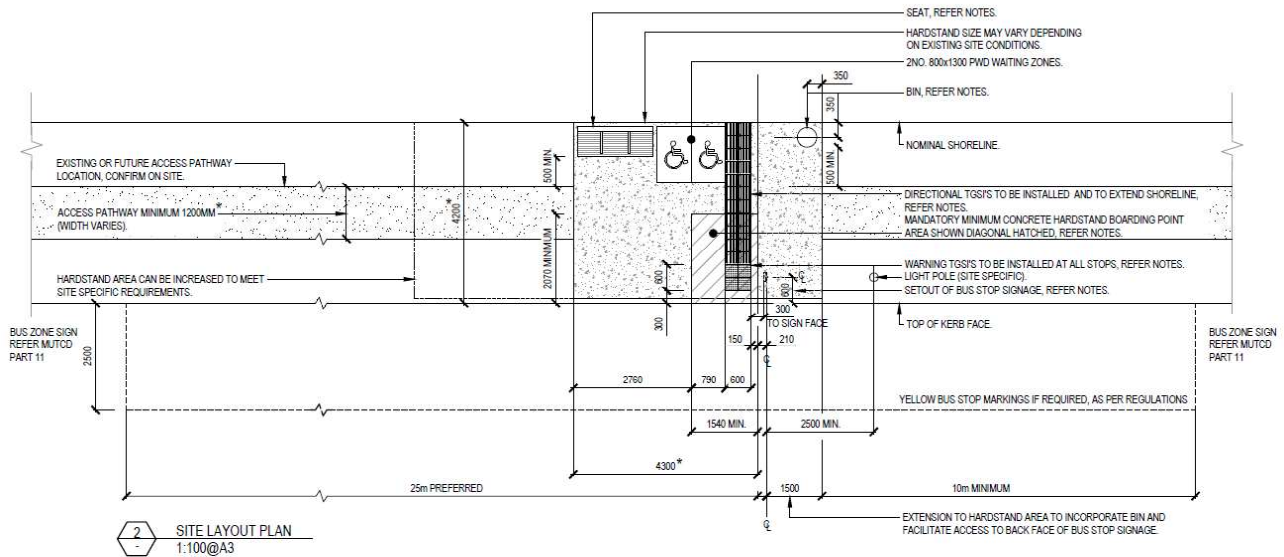
Figure A.11 Bus stop identification markers



Source: Queensland Department of Transport and Main Roads (2015c).

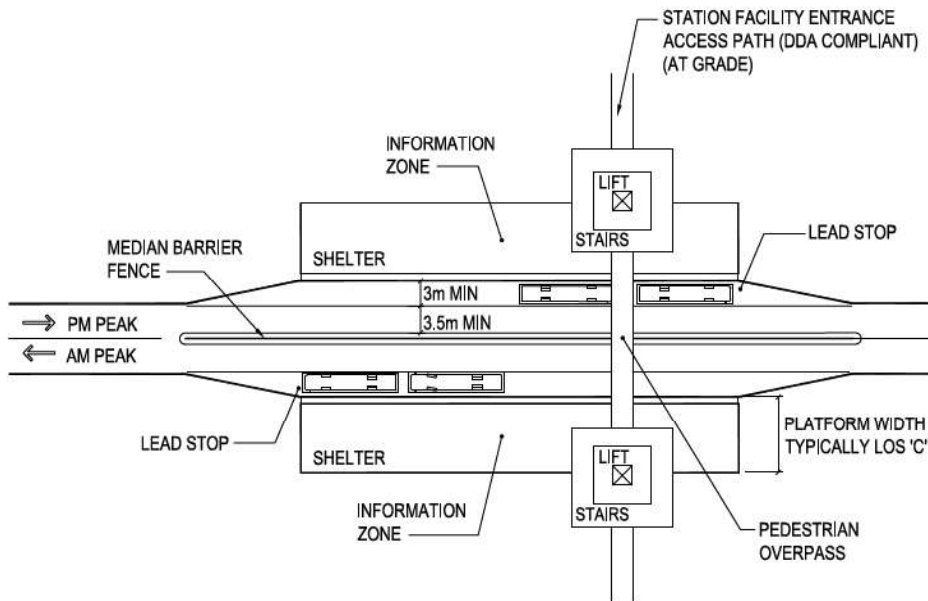
Bus boarding and alighting should adopt an inclusive design. Low-floor fully accessible buses reduce loading time, particularly where a high percentage of passengers (people with disabilities, the elderly, people with prams) benefit from easier vehicle access. Mobility aids, wheelchairs and prams impact loading times and may decrease the operational capacity of a bus station. Stations must be designed to accommodate all public transport users and ensure dignified and equitable access to all members of the community. Figure A.12 and Figure A.13 show example layouts for a bus stop and bus station, respectively. Each example provides suitable components for each facility and provides accessibility and safety for people with disability.

Figure A.12 Example site layout of a bus stop



Source: Queensland Department of Transport and Main Roads (2015c).

Figure A.13 Example site layout of a bus station



Source: Queensland Department of Transport and Main Roads (2015c).

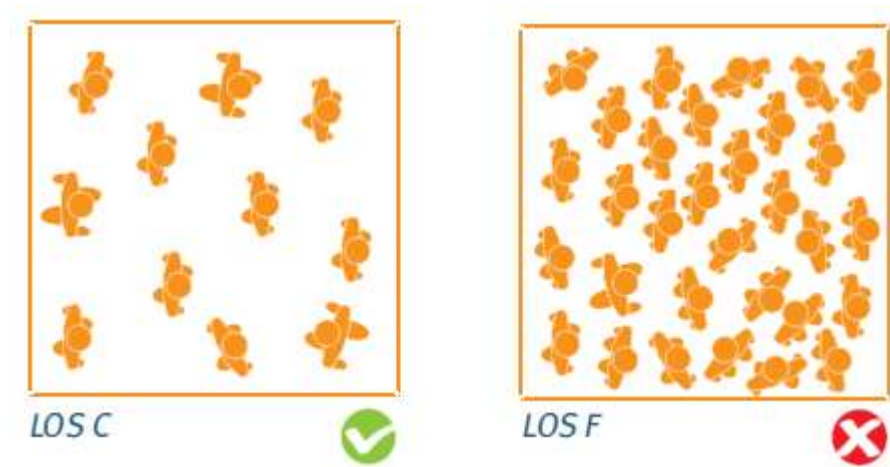
Density of occupation

The density of passengers accommodated should be within the range of personal comfort. The public level of service (LOS) classification ranges from LOS A to F, where A is the least crowded and F is the most crowded. TransLink requires that acceptable MIN LOS be achieved for pedestrian areas including:

- waiting and queuing areas
- seating
- walkways and other circulation areas, overpasses
- stairways, lifts, escalators and travellers
- ramps.

For pedestrian horizontal travel, a LOS C is preferred by TransLink to be achieved as a minimum during peak periods, which equates to between 0.65–0.9 square metres per person of personal space (Figure A.14).

Figure A.14 Density of occupation by passengers



Source: Queensland Department of Transport and Main Roads (2015c).

A.4 AUSTRALIAN STANDARDS: CURRENT TECHNICAL GUIDANCE AND STANDARDS

A.4.1 AS 1428.1: DESIGN FOR ACCESS AND MOBILITY: GENERAL REQUIREMENTS FOR ACCESS – NEW BUILDING WORK

AS 1428.1 describes the basic minimum technical details for accessible buildings to enable general use of buildings and facilities by people with disabilities acting independently. These standards provide information on which classes of buildings are to be made accessible and prescribes specific areas within the buildings where access must be provided. To be considered accessible, the building or area must have features to enable use by people with a disability.

Table A.27 outlines specific standards relevant to universal accessibility.

Table A.27: Australian Standards (1428.1) relevant to universal accessibility

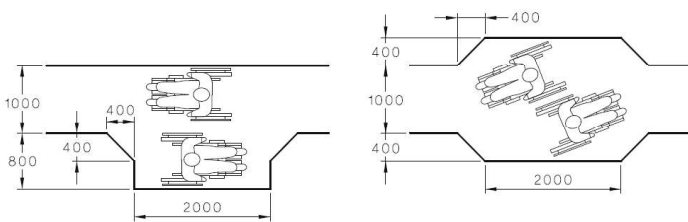
Clause	Title	Description
6	Continuous accessible paths of travel	<ul style="list-style-type: none"> • Minimum unobstructed height (2000 mm) (at doorway 1980 mm) • Minimum unobstructed width (1000 mm) • Passing space for 2 persons using wheelchairs (minimum width 1800 mm, minimum length 2000 mm), see Figure A.15) • Circulation space for wheelchair turn (60–90 degrees) (gradient no steeper than 1 in 40) (1500 mm wide, 1500 mm long)
7	Floor or ground surfaces	<ul style="list-style-type: none"> • Slip-resistant surface
8	Signage	<ul style="list-style-type: none"> • Raised tactile/Braille signage provided • Sanitary facilities identified with raised and visual versions of international symbol of access (see Figure A.17), male and female symbols, raised text (e.g. male toilet), see Figure A.16)
10	Walkways, ramps and landings	<p>Kerb ramps shall have</p> <ul style="list-style-type: none"> • Maximum rise of 190 mm • Length not greater than 1520 mm • Gradient not steeper than 1 in 8, located within or attached to a kerb <p>Profile of ramps shall comply with the following:</p>

Clause	Title	Description
		<ul style="list-style-type: none"> • Design and construction of kerb ramps as shown in Figure A.18 and Figure A.19 • The sloping sides of a kerb ramp shall be tapered or splayed as indicated in Figure A.18 and Figure A.19 • The angle at the base of the kerb ramp shall be a minimum of 166 degrees • Kerb ramps shall have a slip-resistant surface
12	Handrails	<ul style="list-style-type: none"> • The cross-section of handrails shall be circular or elliptical (30 mm – 50 mm in height or width), see Figure A.20) • Top of handrails 865 mm – 1000 mm above the nosing of stairway or plane of the floor of the walkway, ramp or landing • Handrails shall be securely fixed and rigid and their ends shall be turned through a total of 180 degrees or to the ground or returned fully to end post or wall face • Clearance between a handrail and adjacent wall surface or other obstruction (50 mm) – Clearance shall extend above the top of the handrail (600 mm) • Handrails shall have no obstruction to the passage of a hand along the rail
13	Doorways, doors and circulation space at doorways	<p>Clear opening of doorways</p> <ul style="list-style-type: none"> • Minimum clear opening of a doorway on a continuous accessible path of travel shall be 850 mm when measured from the face of the opened door to the doorstep, see Figure A.21) <p>Circulation spaces at doorways on a continuous accessible path of travel</p> <ul style="list-style-type: none"> • Circulation spaces shall be provided at every doorway, gate, entryway on a continuous accessible path of travel • Circulation spaces at doorways shall have a gradient and crossfall not steeper than 1 in 40 • Allow access through doorways in both directions
13.5	Door controls	<ul style="list-style-type: none"> • Door handle allows the door to be unlocked and opened with one hand • Handle shall be such that the hand of a person who cannot grip, will not slip from the handle during the operation of the latch • Clearance between the handle and the back plate or door face at the centre grip section of the handle (35 mm – 45 mm) • 'D' type handles provided on sliding doors • Where snibs are installed, have a lever handle of a minimum length of 45 mm from the centre of the spindle • For doors where a door closer is fitted, the force required at the door handle to operate the door shall not exceed the following <ul style="list-style-type: none"> – To initially open the door = 20 N – To swing or slide the door = 20 N – To hold the door open between 60 and 90 degrees = 20 N • Where an outward opening door is not self-closing, a horizontal handrail or pull bar shall be fixed on the closing face of a side-hung door, see Figure A.22,
15	Sanitary facilities	<p>Accessible unisex sanitary facilities</p> <ul style="list-style-type: none"> • Water taps • WC pan clearances (see Figure A.23) • Seat (load-related 150 kg, full round type with minimal contours) • Backrest (withstands force 1100 N in any direction, height 150–200 mm, width 350–400 mm) • Grabrails (continuous grabrail provided across rear wall and side wall nearest WC pan) (see Figure A.24) • Circulation space – unobstructed circulation space is 2000 mm <p>WC doors</p> <ul style="list-style-type: none"> • Hinged or sliding • Outward opening doors have a mechanism that holds the door closed without the use of a latch • Have in-use indicator and bolt or catch <p>Washbasins provided inside the toilet cubicle – part of an accessible unisex facility</p>
17	Grabrails	<ul style="list-style-type: none"> • Grabrails (30 mm – 40 mm) outside diameter

Clause	Title	Description
		<ul style="list-style-type: none"> • The fastenings and materials and construction of grabrails shall be able to withstand a force of 1100 N applied at any position and in any direction without deformation or loosening or rotation of the fastenings or fittings • The clearance between a grabrail and the adjacent wall surface or other obstruction (50 mm – 60 mm) • Clearance above a horizontal grab rail shall extend above the top of the grabrail by 600 mm • Clearance below a horizontal or angled rail shall be a minimum of 50 mm except at fixing points • There shall be no obstruction to the passage of the hand for the full length of vertical grabrails

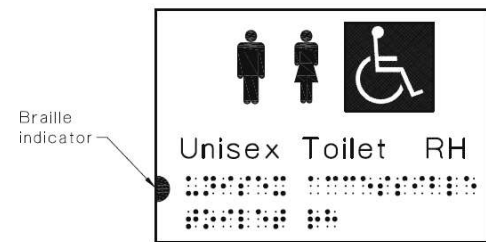
Source: AS 1428.1-2009.

Figure A.15 Passing space for wheelchairs



Source: AS 1428.1-2009.

Figure A.16 Signage for toilets (example)



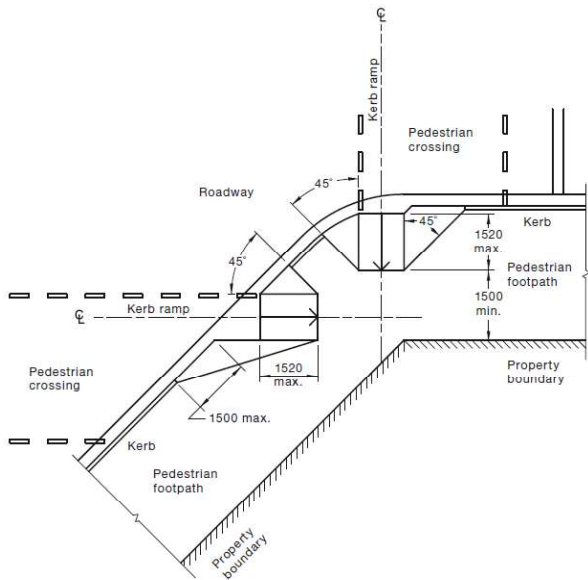
Source: AS 1428.1-2009.

Figure A.17 International symbol for access



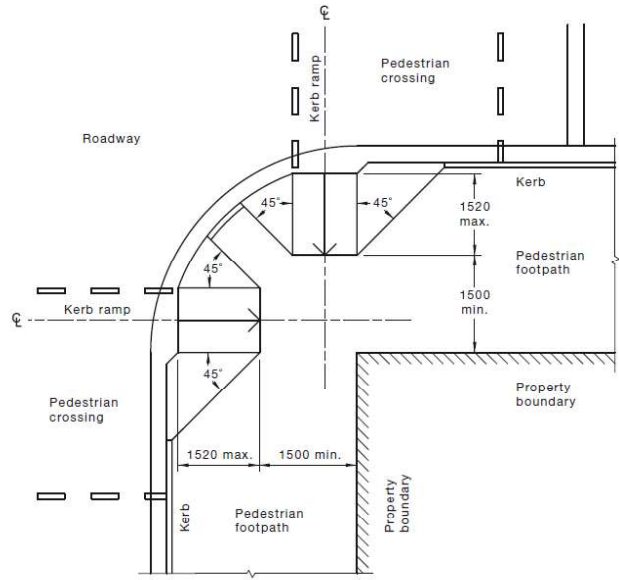
Source: AS 1428.1-2009.

Figure A.18 Kerb ramp dimensions (45° road intersection) Figure A.19 Kerb ramp dimensions (90° road intersection)



- NOTES:
- 1 Centre-line of kerb ramps and pedestrian refuges shall align across the road or vehicular driveway within the building/property allotment.
 - 2 Top and bottom of kerb ramps shall have a sharp gradient transition.
 - 3 For requirements for tactile ground surface indicators see AS 1428.4.1.
 - 4 For requirements for pedestrian lights and push-button assemblies see AS 1742.14.

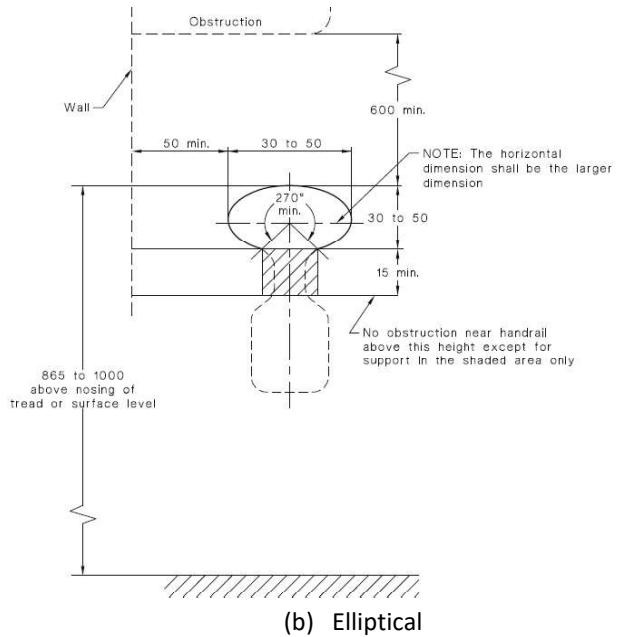
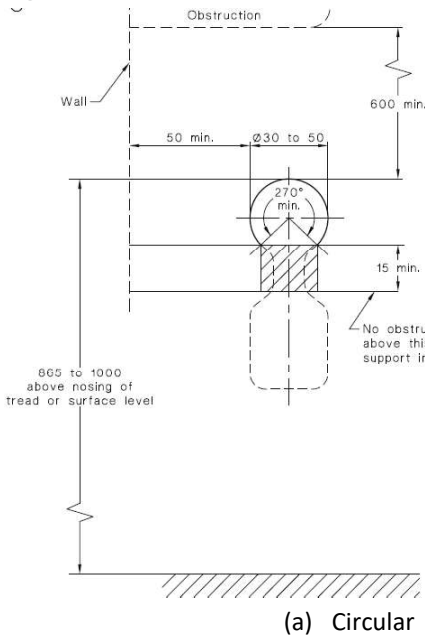
Source: AS 1428.1-2009.



- NOTES:
- 1 Centre-line of kerb ramps and pedestrian refuges shall align across the road or vehicular driveway within the building/property allotment.
 - 2 Top and bottom of kerb ramps shall be aligned at 90° to path of travel.
 - 3 Top and bottom of kerb ramps shall have a sharp gradient transition.
 - 4 For requirements for tactile ground surface indicators see AS 1428.4.1.
 - 5 For requirements for pedestrian lights and push-button assemblies see AS 1742.14.

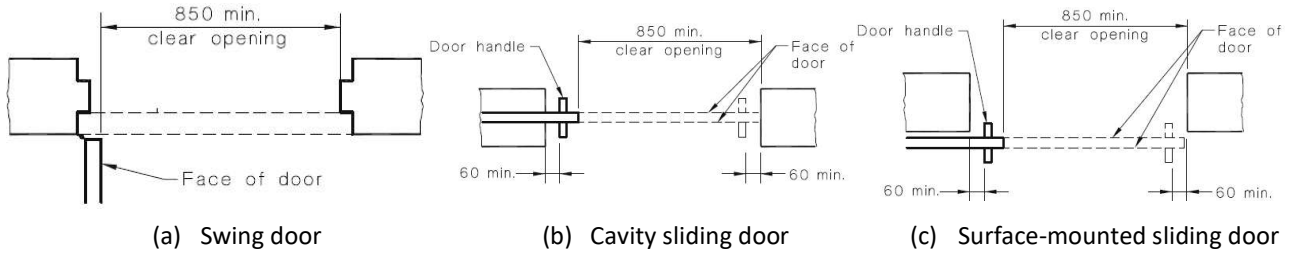
Source: AS 1428.1-2009.

Figure A.20 Dimensions of handrails



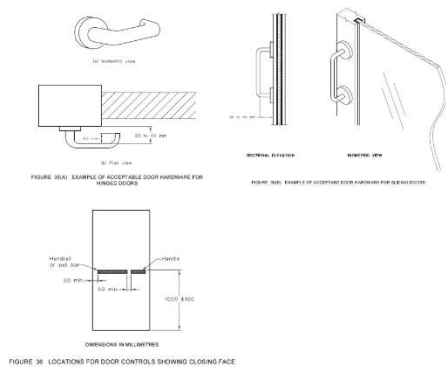
Source: AS 1428.1-2009.

Figure A.21 Clear opening of doorways



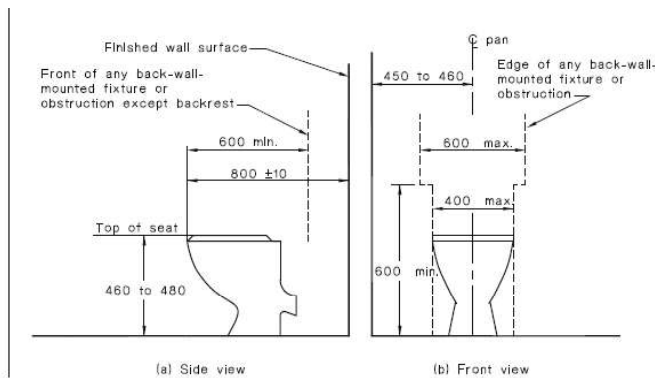
Source: AS 1428.1-2009.

Figure A.22 Dimensions of door handles



Source: AS 1428.1-2009.

Figure A.23 Dimensions of toilet (WC pan clearances)



- NOTES:
- 1 For the purpose of dimensioning, the front of the WC pan has been taken as the datum plane.
 - 2 The dimension of 800 ± 10 mm from the front of the WC pan to the wall is a critical dimension.

DIMENSIONS IN MILLIMETRES

FIGURE 38 WATER CLOSET PAN CLEARANCES, SEAT HEIGHT AND SEAT WIDTH

Source: AS 1428.1-2009.

Figure A.24 Position of grabrails in toilet

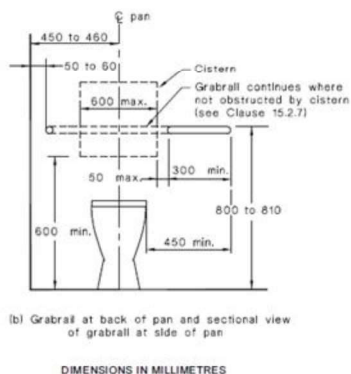


FIGURE 42 POSITIONS OF GRABRAILS IN WATER CLOSETS

Source: AS 1428.1-2009.

A.4.2 AS 1428.2: DESIGN FOR ACCESS AND MOBILITY: ENHANCED AND ADDITIONAL REQUIREMENTS – BUILDINGS AND FACILITIES

The requirements in AS 1428.2 are similar to that of AS 1428.1. It details the minimum technical requirements for accessibility to buildings for general use by people with disabilities but this standard is enhanced from the minimum requirements of AS 1428.1. To be considered accessible, the building or area must have features to enable use by people with a disability.

Table A.28 outlines specific standards relevant to universal accessibility in transport infrastructure.

Table A.28: Summary of AS 1428.2

Clause	Title	Description
6	Circulation spaces	<ul style="list-style-type: none"> • Minimum clear floor or ground space for a stationary wheelchair is 800 mm by 1300 mm (refer to Figure A.25) • Circulation space for 180° wheelchair turn is 2070 mm in direction of travel and not less than 1540 mm wide • Circulation space for 360° wheelchair turn should be no less than 2250 mm by 2250 mm • Passing space for wheelchairs <ul style="list-style-type: none"> – The minimum width for two wheelchairs passing is 1800 mm – If passing space is less than 1800 mm, path intervals of no more than 6 m to be provided (refer to Figure A.26) – Minimum dimensions for a one-sided path of travel and both side path of travel is illustrated in Figure A.27 • Changes in level comply with requirements for abutment of surfaces in AS 1428.1 <ul style="list-style-type: none"> – Changes in level > 3 mm require kerb ramps, ramp or a lift – This does not apply to tactile ground surface indicators • Vertical clearances requirements: <ul style="list-style-type: none"> – Fixture and fittings have a minimum of 2000 mm clearance above trafficable surface • Floor and ground surfaces to comply with Clause 9
7	Continuous accessible path of travel	<ul style="list-style-type: none"> • Accessible paths to be provided: <ul style="list-style-type: none"> – In boundary to transportation stops, accessible parking and accessible passenger loading zones, and public streets or walkways – To connect accessible building facilities and space on site – To connect accessible entrances with all building accessible space and facilities interior and exterior – Minimised distances through accessible elements
8	Walkways, ramps and landings	<ul style="list-style-type: none"> • Shall comply with AS 1428.1 with the addition of: <ul style="list-style-type: none"> – Width no less than 1200 mm

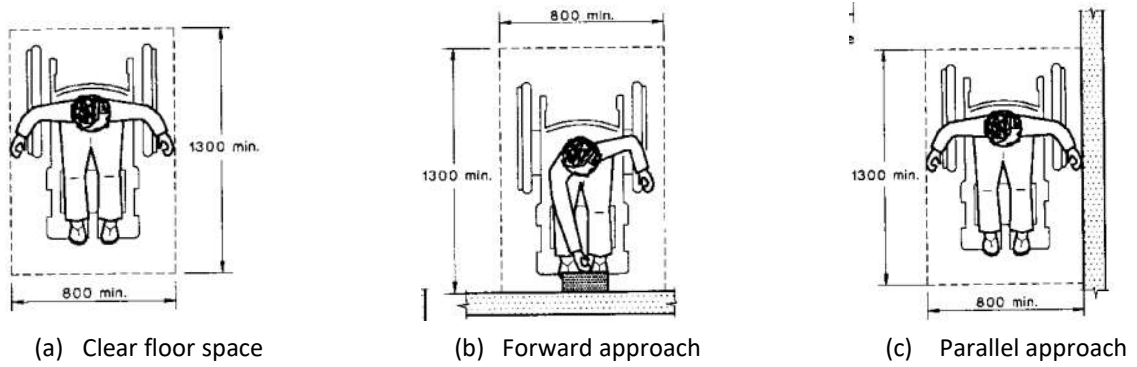
Clause	Title	Description
		<ul style="list-style-type: none"> – Ramp gradients of 1 in 14: 6 m – Ramp gradients 1 in 19: 14 m – Ramp gradients between 1 in 19 and 1 in 14 to be obtained through linear interpolation • Any water must not accumulate on surfaces, see Clause 9 • Ramp handrails comply with Clause 10 • Kerb ramps and steps shall comply with AS 1428.1 with the addition of: <ul style="list-style-type: none"> – Preferred kerb ramp gradient from Figure 8 of AS 1428.1 – Ramp and lading in accordance with Clause 8 – Surface graded to meet each other and tactile directional indicators • Kerb ramps at marked crossings must be contained within marking of a marked crossing, excluding flared sides • Raised islands in crossings must be cut through level with street or kerb ramps at both sides and at least 1200 mm long. • The surface must be slip-resistant and contrasts the colour of the adjoining surface • Tactile warning strip to be provided at top of the ramp, comply with Clause 18
9	Ground and floor surfaces	<ul style="list-style-type: none"> • Comply with AS 1428.1 with the addition of: <ul style="list-style-type: none"> – Abutment of surfaces not allowed: paving bricks with levelled edges/chamfered arises; heavy textures and figured surfaces. – Grating on walkway surfaces must be no more than 13 mm wide and 150 mm long. – If the grating has an elongated ending, a long dimension should be transverse to the dominant direction of travel
10	Handrails and grab rails	<ul style="list-style-type: none"> • Design and construction to comply with AS 1428.1 <ul style="list-style-type: none"> – End of handrail to be: <ul style="list-style-type: none"> – Extended parallel to the surface below for a minimum 300 mm, preferred 450 mm – Continuous, turned down 100 mm or returned fully to end post or wall face – Tactile indicator in form of a dome button must be provided where a handrail is not continued, in accordance with Figure A.28 – Gripping surfaces of handrails must be continuous – Shall not rotate with their fittings – Where there is a high number of short users, second-hand rail to be provided • Stairway handrails to be in accordance with AS 1428.1 with the addition of: <ul style="list-style-type: none"> – Where practicable, outside rails to be continuous through stair flights and around landings – Inside always must be continuous. At landings, the height must be parallel to the finished floor – Background wall, handrails to have luminance contrast factor with the wall of no less than 30% • Grabrails to comply with AS 1428.1 with additions of: <ul style="list-style-type: none"> – Grabrail and adjacent wall surface clearances specified in appropriate clauses of this standard – Cannot rotate within their fittings – In wet areas or outdoors to be slip-resistant when wet
12	Lifts	<ul style="list-style-type: none"> • To comply with AS 1735.12 with the addition of <ul style="list-style-type: none"> – Increase of 300 mm in each floor area direction • Installed in car park buildings with more than one level • Public lifts should have audio, visual and tactile information • Further information on access and mobility in buildings are: AS 1735.7, AS 1735.8, AS 1735.13, AS 1735.14 and 1735.15
13	Stairways	<ul style="list-style-type: none"> • In accordance with Clause 10 • Not to be the sole means of access, lifts and or ramps to be provided as an alternative • Not allowed: spiral and stairways with open risers • Configuration of steps in Figure A.29 • Steps must have nose warning strip as shown in Figure A.29
14	Car parking facilities	<ul style="list-style-type: none"> • To comply with requirements for car parking for people with disabilities in AS 2890.1

Clause	Title	Description
		<ul style="list-style-type: none"> • Vertical clearance for disabled car park no less than 2500 mm from the entrance of car park to 2160 mm from the front of the space, see Figure A.30
17	Signs	<ul style="list-style-type: none"> • To comply with AS 1428.1 • Height of letters in signs to comply with Figure A.31 • Illumination of signs to be in accordance with Clause 19 • Illumination factor no less than 30% • Signs and their content must be visible to people in stand and seating position (Clause 25) <ul style="list-style-type: none"> – Height: not less than 1400 mm, no more than 1600 mm – Places with little space, height may be extended downward 1000 mm – In crowded areas height: no less than 2000 mm • Located at: changes in direction; directional decisions are made; the surface of wall surrounding provides sufficient contrast to the sign
18	Warnings	<ul style="list-style-type: none"> • Tactile ground surface indicators provided at: <ul style="list-style-type: none"> – Stairways, escalators and ramps – Kerb ramps and step ramps – Pedestrian crossings at roadways – Pedestrian crossings in high-use vehicular areas – Vehicle pickup and drop-off areas – Railway platforms – Passenger wharves – Where hazards are within circulation space or adjacent to a path of travel – Where indication of a change in direction is required • Emergency warning systems (applies to traffic or evacuation signals and audible alarms) <ul style="list-style-type: none"> – Audible alarms in accordance with AS 2200.2, but sound should exceed 15 dB over noisiest background sound but no more than 75 dB – Visual alarms to comply with AS 2220.1 in conjunction with audible alarms and flashing frequency approx. 1 Hz • Auxiliary alarm to be connected to building emergency system or standard electrical socket connected to the system • Warning or danger signs to be provided ahead to allow sufficient time to take notice of the hazard • Barricades, hoarding and safety rails to be rigid, distinctively coloured, and in absence of toe rail to be provided at least 1 m from obstruction • Warning on the door to hazardous areas must be identifiable to the touch by a textured surface on the door handle, knob, pull or other door opening hardware. Not to be provided for emergency exit doors
19	Lighting	<ul style="list-style-type: none"> • Illumination levels to comply with AS 1680.2 <ul style="list-style-type: none"> – No less than 150 lx without glare is needed for lip-reading (for hearing impairments) – Recommended levels: 150 lx for entrances, walkways, stairs, ramps; 200 lx for telephones; 200–300 lx for general displays; for lifts see AS 1735.12 • Lighting switches to be in accordance with zones of common reaching in Clause 22
20	Sounds	<ul style="list-style-type: none"> • Refer and comply with AS 2107 for design for sounds.

Clause	Title	Description
21	Hearing augmentation – listening systems	<ul style="list-style-type: none"> • Sound amplification system to: <ul style="list-style-type: none"> – cover 10% of the total enclosed area – be indicated of presence at entrances to enclosed spaces • accepted types of listening systems: <ul style="list-style-type: none"> – Audio-frequency induction loop systems – Infrared light transmission system – Induction field radio system – The VHF frequency-modulated radio system • Consideration when choosing assistive listening systems <ul style="list-style-type: none"> – Usable by people who don't use listening aids – Suitability of frequency response and adjustable volume gain of hearing-impaired receivers – Essential equipment that is safe and easy to use – Suitability for the intended use and not to be subjected to interference of any kind – Must not potentially interfere with other listening enjoyment
22	Reach and ranges	<ul style="list-style-type: none"> • For forward reach only for wheelchair users, see Figure A.32 • Allowable parallel approach to an object for wheelchair users, see Figure A.33 • Reach of ambulant people with disabilities in Figure A.34 • Zone of common reach (suitable for wheelchair users and ambulant people), see Figure A.35
23	Controls	<ul style="list-style-type: none"> • To comply with AS 1428.1 • Must be operable with one hand
25	Viewing ranges	<ul style="list-style-type: none"> • Refer to Clause 27, see Figure A.36
27	Street furniture	<ul style="list-style-type: none"> • General street furniture <ul style="list-style-type: none"> – Cannot protrude into the accessible path of travel – Seats must be 500 mm away from the path of travel – Object should contrast background (luminance factor of 30%) • Seating in pedestrian areas <ul style="list-style-type: none"> – Cannot protrude into the accessible path of travel
28	Gateways and checkouts	<ul style="list-style-type: none"> • The international symbol for access (from AS 1428.1) used to designate where access is available • Width is no less than 820 mm • Ticket or coin feed height: 800 to 900 mm. any controls needed for the operation of the device must have tactile applications • Barriers must be no less than 1200 mm past ticket/coin feed point in direction of travel
30	Telephones	<ul style="list-style-type: none"> • One must be accessible at floor level • Clear floor space of 800 x 1300 mm (forward approach) • Operational height, see Figure A.37 • In a suite of payphones, the first must be equipped with a volume control and built-in coupler • Must have push button controls
31	Time delay for lights and pedestrian crossings	<ul style="list-style-type: none"> • Delay for light at crossings should allow for pedestrian travel rate of 0.4 m/s

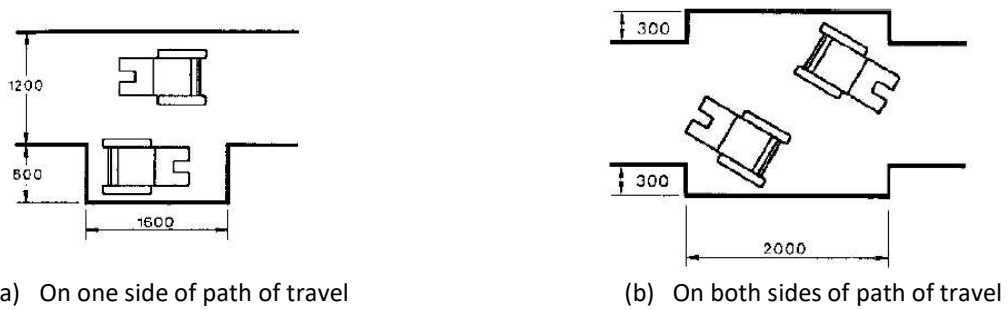
Source: AS1428.2-1992 (R2015).

Figure A.25 Minimum clear floor space for wheelchairs



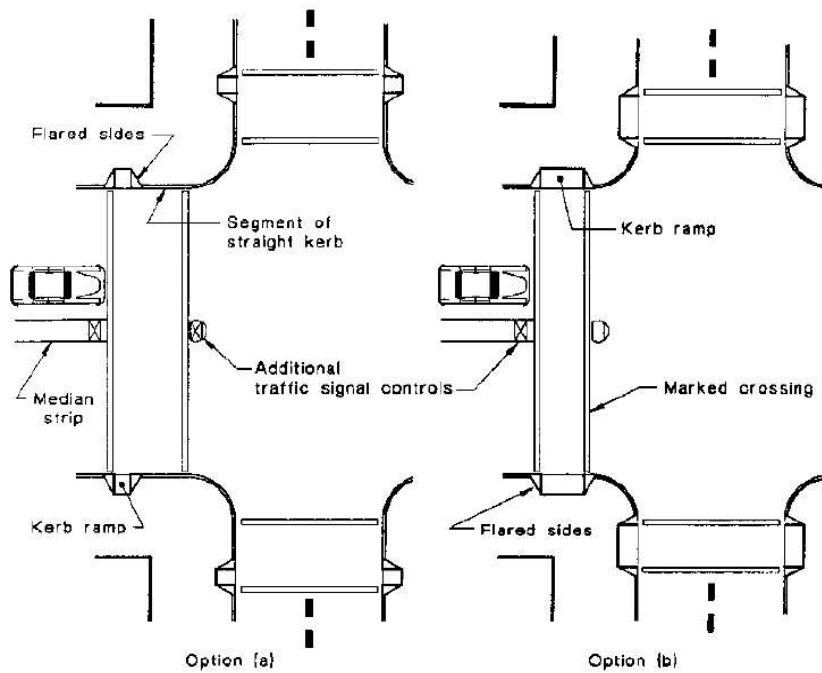
Source: AS1428.2-1992 (R2015).

Figure A.26 Passing space for wheelchairs



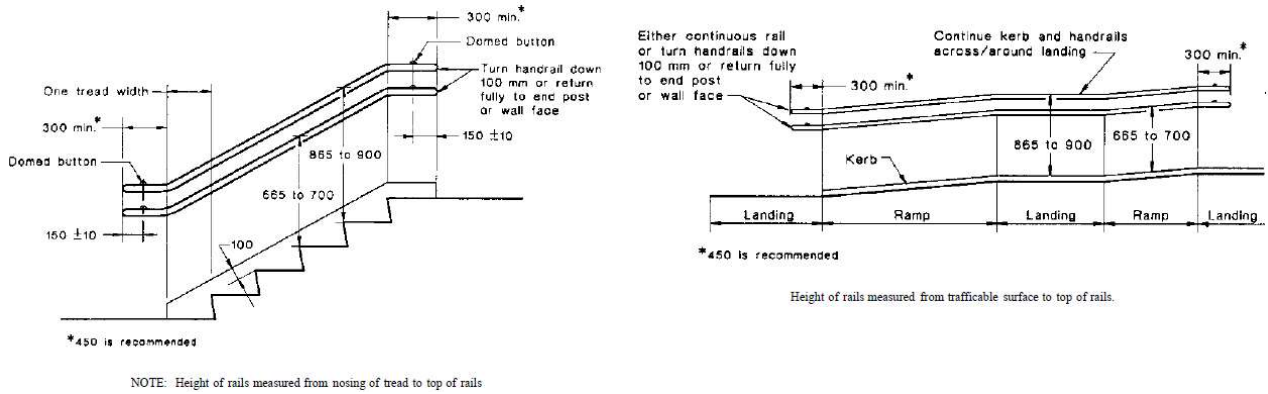
Source: AS1428.2-1992 (R2015).

Figure A.27 Kerb ramps at marked crossings



Source: AS1428.2-1992 (R2015).

Figure A.28 Handrails

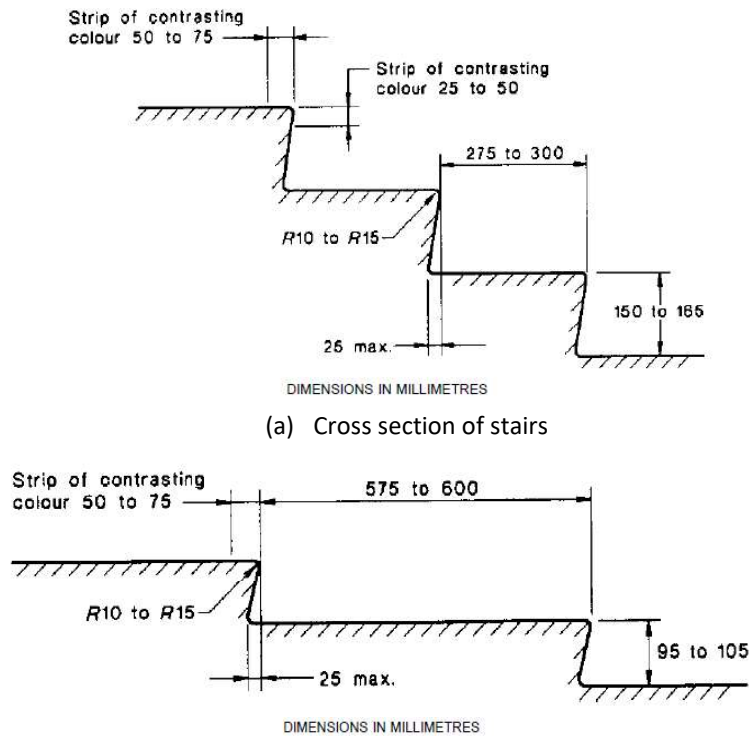


(a) Stairway handrails

(b) Ramp handrails

Source: AS1428.2-1992 (R2015).

Figure A.29 Configuration of stairs

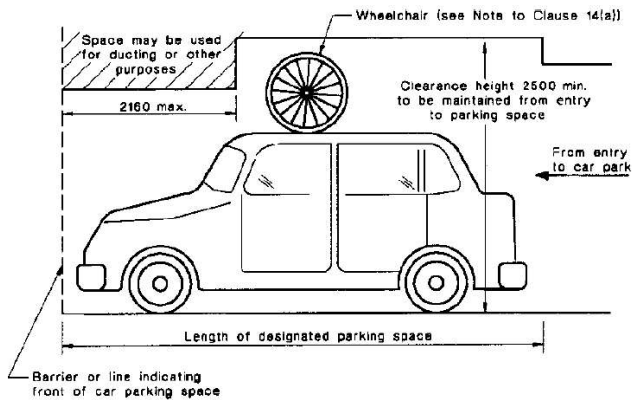


(a) Cross section of stairs

(b) Preferred configuration of steps for users with walking frames

Source: AS1428.2-1992 (R2015).

Figure A.30 Side view of vertical clearance in car parks (dimensions in millimetres)



Source: AS1428.2-1992 (R2015).

Figure A.31 Height of lettering for varying viewing distances

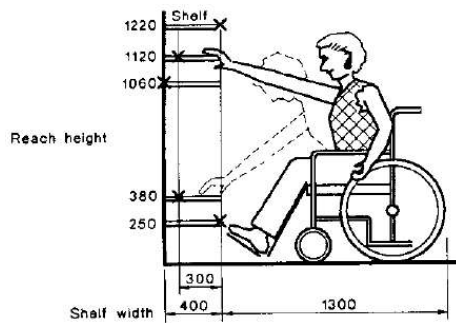
Required viewing distance m	Minimum height of letters* mm
2	6
4	12
6	20
8	25
12	40
15	50
25	80
35	100
40	130
50	150

* For further information on the heights of letters for different situations, reference should be made to AS 1744.

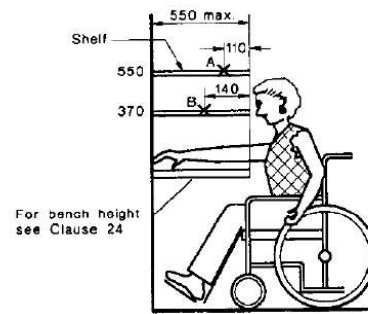
NOTE: Helvetica Medium typeface is preferred.

Source: AS1428.2-1992 (R2015).

Figure A.32 Forward reach – wheelchair users (dimension in millimetres) (X = points reached)



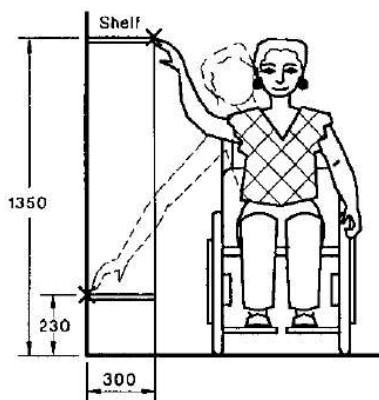
(a) Forward reach limit



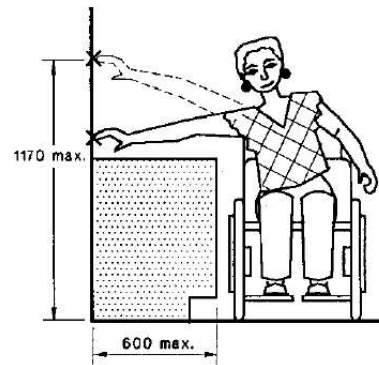
(b) Max forward reach limit

Source: AS1428.2-1992 (R2015).

Figure A.33 Side reach – wheelchair users (dimension in millimetres) (X = points reached)



(a) High and low side reach limits

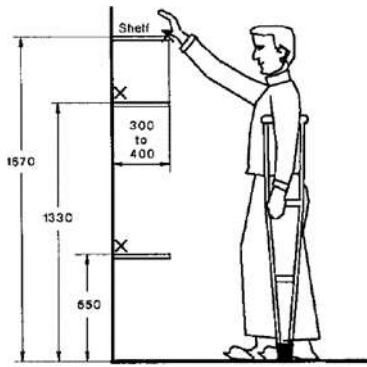


(b) Maximum side reach over obstruction

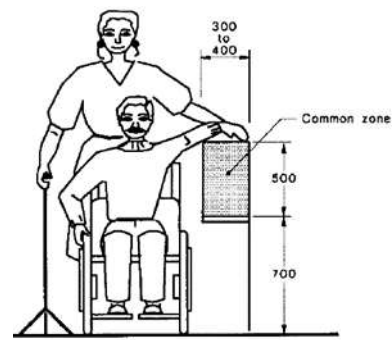
Source: AS1428.2-1992 (R2015).

Figure A.34 Reach of ambulant people with disabilities (dimensions in millimetres) (X = points reached)

Figure A.35 Zone of common reach for ambulant people with disabilities and wheelchair users (dimensions in millimetres) (X = points reached)

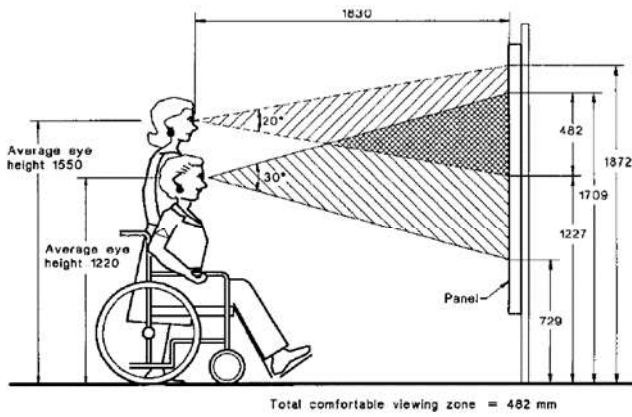


Source: AS1428.2-1992 (R2015).



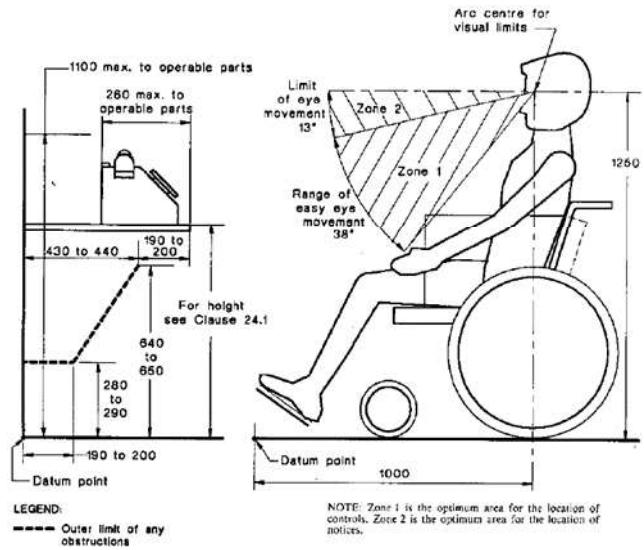
Source: AS1428.2-1992 (R2015).

Figure A.36 Zones for viewing and for common viewing



Source: AS1428.2-1992 (R2015).

Figure A.37 Payphones



Source: AS1428.2-1992 (R2015).

A.4.3 AS/NZS 1428.4.1: DESIGN FOR ACCESS AND MOBILITY: MEANS TO ASSIST THE ORIENTATION OF PEOPLE WITH VISION IMPAIRMENT – TACTILE GROUND SURFACE INDICATORS

This standard specifies the design requirements for the use of tactile ground surface indicators. The aim of the standard is to assist in providing safe implementation and use for those who may be blind or have vision impairments by addressing their needs and specifying the minimum requirements. Table A.28 identifies chapters of the AS/NZS 1428.4.1:2009 which are relevant to design for people with disability and provides a summary of the chapter’s content.

Table A.29: Summary of AS/NZS 1428.4.1

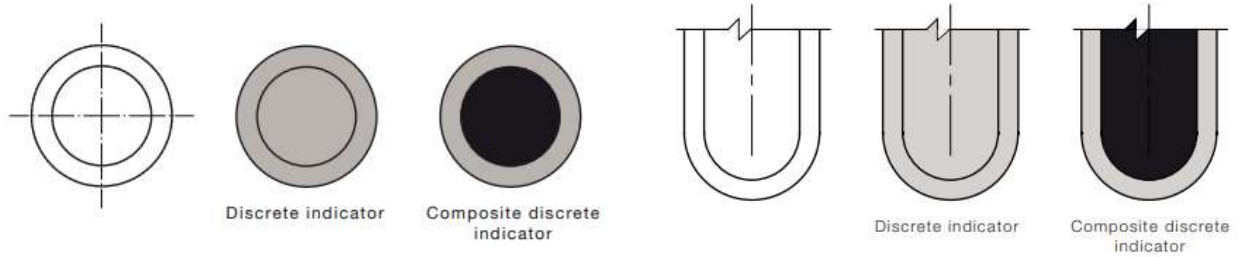
Clause	Title	Comments
Criteria and application for tactile indicators		
2.2	General requirements	<ul style="list-style-type: none"> • Detectable by tactile means • Luminance contrast for: <ul style="list-style-type: none"> – Same colour TGSI as underlying surface to be > 30% – Discrete TGSI to be > 45% – TGSIs constructed using two colours or materials, raised surface ($\varnothing 25 \pm 1$ mm) to be > 60%

Clause	Title	Comments
2.3	Warning TGSIs	<ul style="list-style-type: none"> • General <ul style="list-style-type: none"> – No likelihood of edges lifting – When placed in direction of travel, ensure they are detectable and comply with Figure A.38 – Slip-resistant – Top surface: 4–5 mm above base surface • Design requirements, see Figure A.38 • Placement <ul style="list-style-type: none"> – Cover full width of path of travel – Perpendicular to direction of travel when approaching hazard – 300 ± 10 mm set back from edge of hazard (excluding railway platforms and wharves, see Clause 3.4 and Clause 3.5) – Detectable at an angle to the continuous accessible path of travel, 600–800 mm from directional approach – Discrete warning TGSIs: depth = 300–400 mm; minimum number of cones = 6 in direction of travel – Discrete warning TGSIs to be detectable at an angle to the continuous accessible path of travel, minimum number of cones = 12 in direction of travel
2.4	Stairway, ramp, escalators and moving walks	<ul style="list-style-type: none"> • TGSIs at top and bottom of stairways, ramps, escalators and moving walks • Where TGSIs is not mandatory, a dome button (H = 4–5 mm, ϕ = 10–12 mm) must be provided on top of handrail, 150 ± 10 mm from end • Landings length (to nearest nose edge): <ul style="list-style-type: none"> – > 3000 mm, TGSIs to cover 600–800 mm – < 3000 mm, TGSIs to cover 300–400 mm. Unless handrails are continuous on both sides then TGSIs not required
2.5	Pedestrian and vehicle at the same grade	<ul style="list-style-type: none"> • Pedestrian area to join carriageways at grade or delineate pedestrian area from grade • TGSIs to comply with Figure A.39 and Figure A.40
2.6	Warning of hazards within the circulation space, or adjacent to a continuous accessible path of travel	<ul style="list-style-type: none"> • If hazard/impediment is < 2000 mm height clearance in an accessible open public space with no clearly defined continuous accessible path prevention includes: <ul style="list-style-type: none"> – Enclose the area – Provide handrails with kerbs or kerb rails (AS 1428.1) – TGSIs to be installed in absence of suitable barrier
Criteria and application of directional tactile ground surface indicators		
3.1	General	<ul style="list-style-type: none"> • TGSIs to give directional orientation in open spaces • TGSIs designate route to avoid hazards • TGSIs to give directional orientation where person must deviate from regular path to access <ul style="list-style-type: none"> – Mid-block kerb ramp or street crossing – Public transport access points – Point of entry to significant public facility. E.g. entertainment venue • Additional directional information can be provided using raised pavement markers

Clause	Title	Comments
3.2	Directional TGSIs	<ul style="list-style-type: none"> • Laid so that no likelihood of the edges lifting • Placed across direction of travel, extending over depth of 600–800 mm • Slip resistant • Top surface 4–5 mm above base surface, see Figure A.38. • Base surface no more than 3 mm above abutment surface of surrounding floor or ground surface and be exposed to external edges chamfered. • Installed parallel with and along centreline of required direction of travel • Integrated directional TGSIs that indicate continuous accessible path, depth is 300–400 mm. • If integrated directional TGSIs need to be detected at an angle, depth is 600–800 mm • Discrete directional TGSIs that indicate continuous accessible path, minimum number of directional TGSIs is 4 • If integrated directional TGSIs need to be detected at an angle, minimum number of directional TGSIs is 8 • (see Figure A.42)
3.3	Change in direction	<ul style="list-style-type: none"> • Where a continuous accessible path of directional TGSIs reaches point of change in direction, this point to be indicated by 600–800 mm x 600–800 mm. See Figure A.43
3.4	Railway platforms	<ul style="list-style-type: none"> • Edges of platforms must have warning TGSIs • Ramps and stairways must have directional indicators
3.5	Passenger wharves	<ul style="list-style-type: none"> • Warning indicators with depth of and commencing 600–900 mm from edge of wharf
3.6	Bus stops and tram/light rail stops	<ul style="list-style-type: none"> • Tactile indicators provided at stops, see Figure A.45

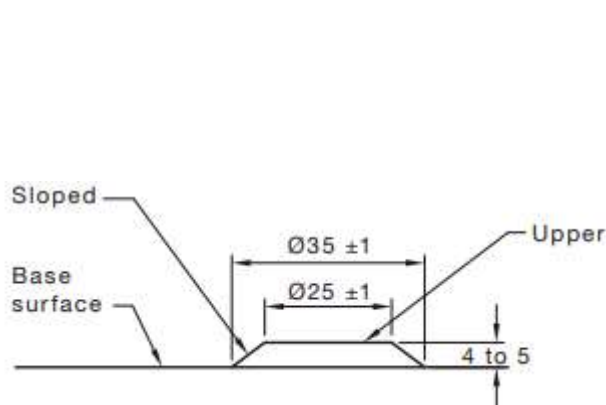
Source: AS/NZS 1428.4.1:2009.

Figure A.38 Design arrangement of warning and directional TGSIs

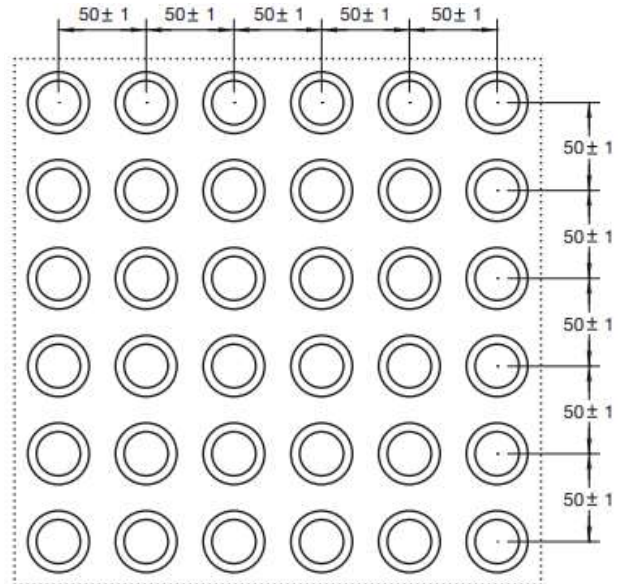


(a) Plans of individual truncated cones

(b) Plans of directional indicators



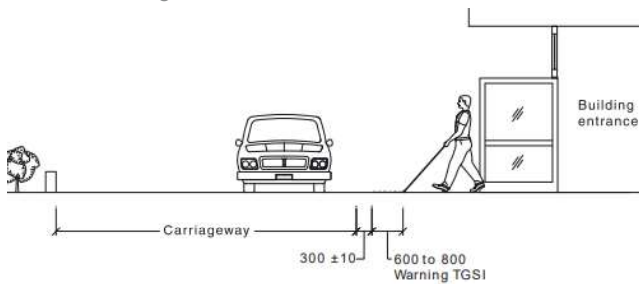
(c) Evaluation of individual truncated cones and directional TGSIs



(d) Plan arrangement of truncated cones for TGSIs

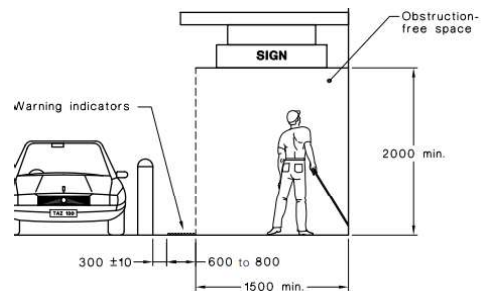
Source: AS/NZS 1428.4.1:2009.

Figure A.39 Application of warning TGSIs to define pedestrian way from carriageway at same grade



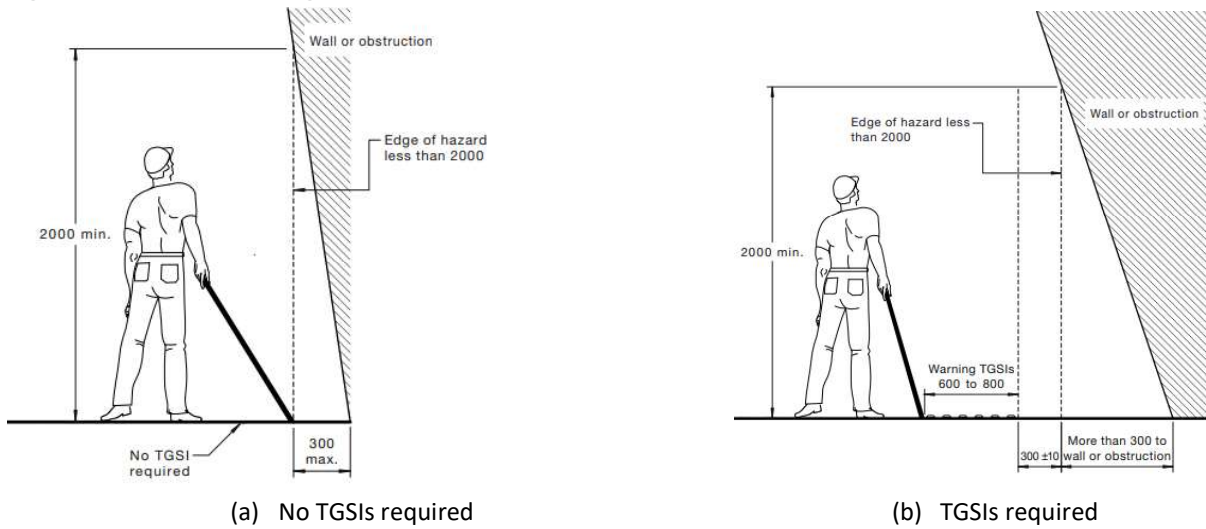
Source: AS/NZS 1428.4.1:2009.

Figure A.40 Application of warning TGSIs to define pedestrian obstruction free space



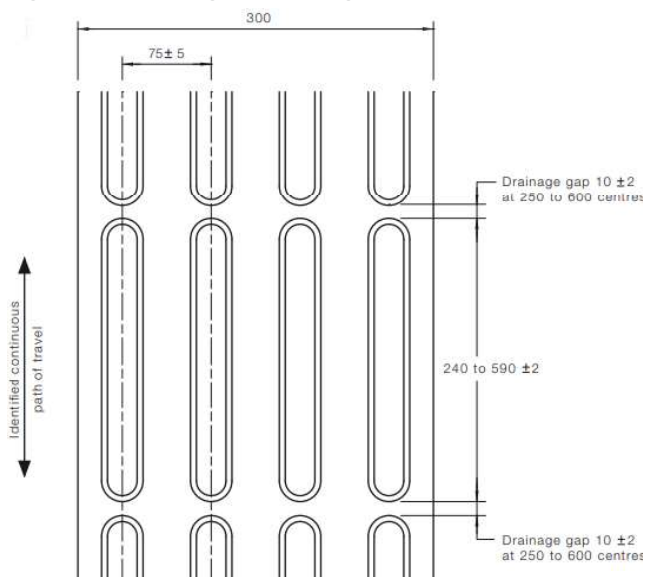
Source: AS/NZS 1428.4.1:2009.

Figure A.41 TGSIs warning of hazard in a circulation space



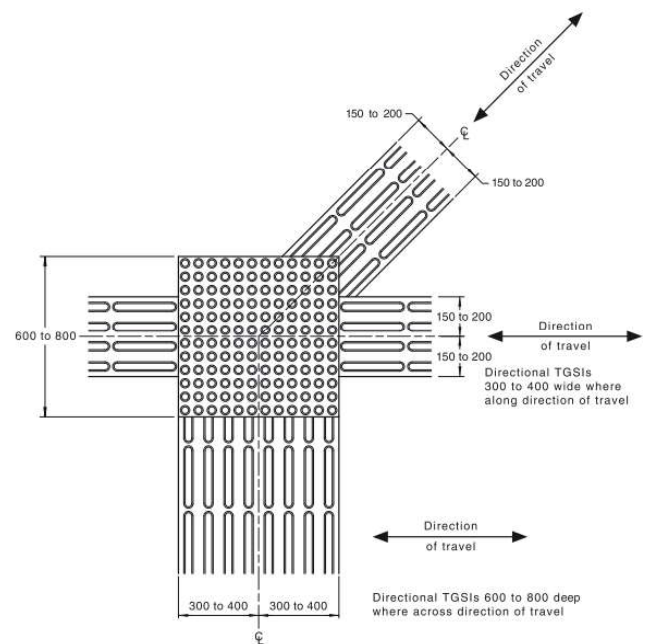
Source: AS/NZS 1428.4.1:2009.

Figure A.42 Design and arrangement of directional TGSIs



Source: AS/NZS 1428.4.1:2009.

Figure A.43 Installation of TGSIs denoting change in direction



Source: AS/NZS 1428.4.1:2009.

A.4.5 AS 1735.12: LIFTS, ESCALATORS AND MOVING WALKS: FACILITIES FOR PERSONS WITH DISABILITIES

This standard contains the minimum requirements and recommendations for the design and layout of lifts, escalators and moving walks to assist people with disabilities. These three items under some circumstances can be used as elements of transportation infrastructure. An example of such use is lifts and escalators, which are commonly used at subway stations which allow for people with disabilities to access the platforms. Although this standard does specify some requirements that would limit the ability of a person with a disability to move around such as inner lift dimensions, it primarily focuses on the internal lift controls and fixtures.

A.4.6 AS/NZS 2890.1: PARKING FACILITIES: OFF-STREET CAR PARKING

This standard contains the minimum requirements and recommendations for the design and layout of off-street parking facilities. Table A.30 outlines specific regulations and guidance relevant to universal accessibility from AS/NZS 2890.1.

Table A.30: Summary of AS/NZS 2890.1

Clause	Title	
Section 1: Scope and general		
1.4	Classification of off-street parking facilities	<ul style="list-style-type: none"> • For people with disabilities: <ul style="list-style-type: none"> – User class: 4 – Required door opening: size requirements are specified in AS 2890.6
Section 2: Design of parking modules, circulation roadways and ramps		
2.3	Preliminary design considerations	<ul style="list-style-type: none"> • Design co-ordination <ul style="list-style-type: none"> – Need for traffic to move with minimal disruption to and from the frontage road with maximum pedestrian safety – Safe treatments of points of conflict with pedestrian and other road users – Provision of parking spaces and accessible pedestrian paths for people with disabilities (AS 2890.6) • Parking angles <ul style="list-style-type: none"> – 90° for one-way or two-way movements – 30°, 45° or 60° for one-ways • Parallel, see Clause 2.4: Parallel parking in parking aisles • Assignment of user class to parking modules <ul style="list-style-type: none"> – Anyone parking module (excluding private) must be for one user class only with an exception for disability reserved spaces
2.4	Design of parking modules	<ul style="list-style-type: none"> • Angle parking spaces (for people with disabilities) <ul style="list-style-type: none"> – Widths – see AS 2890.6 for parking spaces for people with disabilities – Nominal length is 5.4 m – Aisle width is a minimum of 5.8 m • Angle parking module layout – no provision of people with disabilities mentioned • Parallel parking in parking isles – no provision of people with disabilities mentioned • Physical controls <ul style="list-style-type: none"> – Kerbs – for protection of pedestrian walkways and others. – Barriers – prevention of encroachment onto pedestrian facilities and others. – Wheel stops – limit the travel of vehicles – Must not obstruct accessible travel paths for people with disabilities – Controls that are potential tripping hazards to be surfaced in colour contrasting from surroundings • Gradients within parking modules • Maximum gradients for people with disabilities see AS 2890.6 • Minimum gradients, indoor is 1%, outdoor in 0.5%

Clause	Title	
2.5	Design of circulation roadways and ramps	Does not contain information about people with disabilities
2.6	Design of domestic driveways	Does not contain information about people with disabilities
Section 3: Access facilities to off-street parking areas and queuing areas		
3.1	General	<ul style="list-style-type: none"> • Categories of access facilities, see Clause 1.4
3.2	Access driveways – width and location	<p>Procedure here to determine the following does not include user class 4.</p> <ul style="list-style-type: none"> • Access driveway widths, see Figure A.46 • Access driveway location • Sight distance at access driveway exits
3.3	Gradients of access driveways	<p>Access driveways graded to minimise problems associated with footpaths and entering/exiting traffic.</p> <p>Maximum gradients on or near access driveways are as follows:</p> <ul style="list-style-type: none"> • Property lines/building alignment/pedestrian paths – maximum 5% grade between the edge of frontage road and the property line, building alignment or pedestrian path and for at least the first 6m into the car park. Grade can be increased in certain circumstances as described in the standards. • Vehicular control points – maximum 5% grade for at least 6m before the control point • Queuing area – maximum 10% grade for not less than 0.8 of the queue length • Across footpaths – maximum 2.5% grade over a 1 m lateral distance where the driveway crosses a footpath
3.4	Queuing areas	<ul style="list-style-type: none"> • At entry points must not adversely affect pedestrian flows
3.5	Access to mechanical parking installations	Does not contain information about people with disabilities
Section 4: Other considerations		
4.1	Pedestrian service	<ul style="list-style-type: none"> • General <ul style="list-style-type: none"> – In parking areas, through traffic is excluded, and pedestrian entrances and exits are separate from vehicular entrances and exits – Where pedestrians must cross busy circulation roadways, they shall be guided to a safe crossing point with adequate sight distance to be provided through the use of signs and pavement markings (AS 1742.10) • Parking structures • Split level car parks must have a stairway or pedestrian ramp • Requirements for pedestrian access are given in relevant building codes and standards (none named) • Surface car parks provisions <ul style="list-style-type: none"> – Pedestrians to be directed and encouraged to cross circulating aisles and roadways at right angles with acceptable sight distance
4.3	Signposting	<ul style="list-style-type: none"> • General <ul style="list-style-type: none"> – Can be used to identify sections or rows of parking spaces so that pedestrians can easily find their parked vehicles – Can be used to direct pedestrians to lift, stairs etc. See Figure A.47. • Signs for people with disabilities are specified to AS 2890.6 • Sign location may not obstruct sightlines to traffic or pedestrians
4.4	Pavement markings	<ul style="list-style-type: none"> • Marking for parking spaces for people with disabilities is specified in AS 2890.6 • Raised pavement > 3 mm are potential tripping hazards for pedestrians • Pedestrian crossing markings <ul style="list-style-type: none"> – Zebra crossing – are a series of white or yellow bars 300 to 450 mm wide up to 3.5 m long. With gaps up to 3.5 m wide and up to 750 mm

Clause	Title	
		– Markings must be slip-resistant no worse than class W (wet pendulum test) for accessible paths for people with disabilities, in other cases use Class X
4.5	Parcel pick-up	<ul style="list-style-type: none"> • Pedestrians should be able to freely and safely move around vehicles in the pick-up zone
4.6	Shopping trolley requirements	<ul style="list-style-type: none"> • Provided in major pedestrian paths
4.7	Lighting requirements	<ul style="list-style-type: none"> • Parking, circulation and pedestrian paths including those used by persons with disabilities are to be adequately lit
4.8	Landscaping	<ul style="list-style-type: none"> • Sight distances for pedestrians and vehicles should not be compromised
4.9	Humps	<ul style="list-style-type: none"> • Cannot obstruct pedestrians or wheelchair traffic • Accessible paths of travel are minimum of 1 m • Hump design, see Figure A.48
4.10	Special loading/unloading parking spaces	<ul style="list-style-type: none"> • For prams, strollers, bulky parcels etc. – added minimums of 0.5 m to width (can be shared with footpath, 2.0 m to length) • For ambulance spaces at medical centres should be specified for people with disabilities
Section 5: Additional requirements for car parking structures		
5.2	Column location and spacing	Does not contain information about people with disabilities
5.3	Headroom	<ul style="list-style-type: none"> • General requirements <ul style="list-style-type: none"> – Allowable clearance of 2200 mm to permit cars and light vans – Note: Parking space for people with disabilities has required clearance of 2300 mm, see AS 2890.6 for further details on parking space and vehicular access for people with disabilities

Source: AS/NZS2890.1:2004.

Figure A.46 Recommended driveway widths

TABLE 3.2
ACCESS DRIVEWAY WIDTHS

metres			
Category	Entry width	Exit width	Separation of driveways
1	3.0 to 5.5	(Combined) (see Note)	N/A
2	6.0 to 9.0	(Combined) (see Note)	N/A
3	6.0	4.0 to 6.0	1 to 3
4	6.0 to 8.0	6.0 to 8.0	1 to 3
5	To be provided as an intersection, not an access driveway, see Clause 3.1.1.		

NOTE: Driveways are normally combined, but if separate, both entry and exit widths should be 3.0 m min.

Source: AS/NZS2890.1:2004.

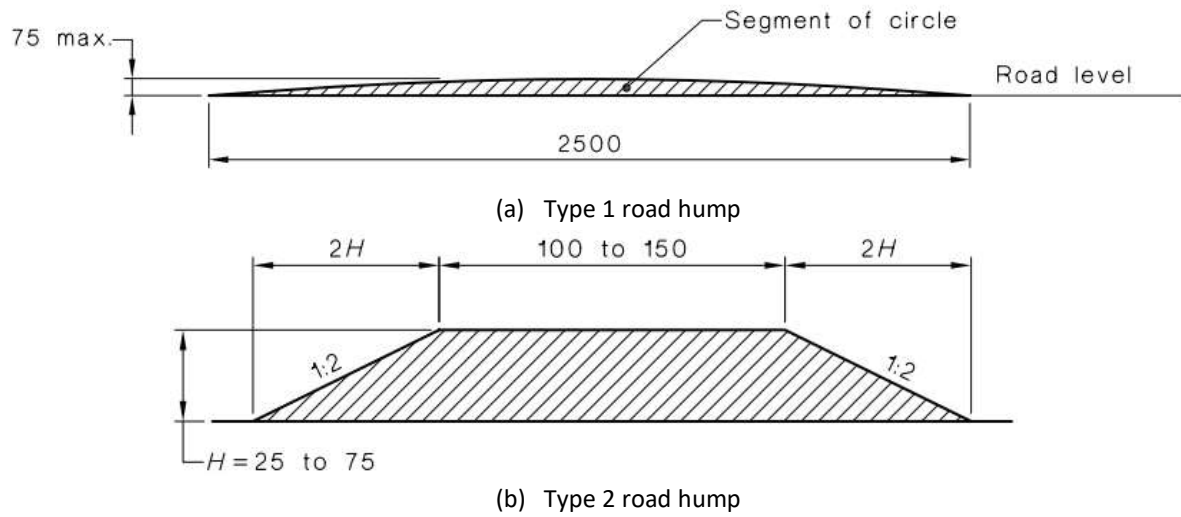
Figure A.47 General direction sign



G5-8 (white on blue) (Aust. only)

Source: AS/NZS2890.1:2004.

Figure A.48 Cross-sections of road humps for use in car parks



Source: AS/NZS2890.1:2004.