Universal Design for Transport

Transport Australia Society Discussion Paper

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ENGINEERS
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Contents

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1. Introduction

1.1.   Purpose

As Australia continues to grow and with a forecast population of around 40 million by 2050, the challenge to provide universal accessible transport is one of our highest priorities for societal prosperity and equity. Around one in five Australians has a disability.[1] Added to this are people whose mobility is challenged due to ageing, injury, caring for others, moving heavy items as well as parents with prams. This discussion paper (the paper) aims to provide practical guidance on how universal design can be better considered in work carried out by transport professionals. It is a statement of goals and objectives and focusses on the concept of universal access and aims to be inclusive of a broad range of capabilities and needs. The aim in providing any universally accessible transport should be to achieve best practice, rather than comply with minimum standards.

This paper starts with the standards and guidelines available today and asks what more we can do. The Disability Discrimination Act 1992 Commonwealth (DDA) and the Disability Standards for Accessible Public Transport 2002 (Transport Standards) have influenced project outcomes and our thinking. Based on the United Nation's Sustainable Development Goal 11.2, we need to move to an understanding of universal design in terms of mobility. COVID19 has created an increased awareness and potential for mode shifts to walking and cycling in every state (Beck et al, 2020).[2] Governments and commuters have greater appetite for infrastructure which will improve safety for vulnerable users by separating walking and cycling activities from road traffic. The paper further considers how investment in walking and cycling infrastructure is an opportunity to integrate universal design specifications and guidelines (Baldwin & Stafford 2019). We then explore how digital technology is rapidly helping to transform our systems through greater engagement and service levels which improve our access to mobility.

The principles and concepts of universal access and global practices in design are delineated throughout the paper. Several best practice examples are provided, and the paper concludes with recommendations for future steps in policy, strategy, and implementation. The primary focus of this discussion paper is on accessibility of public transport and active transport modes. Questions of mode choice are addressed in the companion Transport Australia Society discussion paper *Urban Transport Systems.*[3]

This discussion paper has been prepared by a working group of the Transport Australia Society (TAs). TAs is an Engineers Australia technical society and represents engineering and professionals working in transport infrastructure planning, design, and operations in Australia. This discussion paper represents a consensus of the views of the working group and has been peer reviewed. The recommendations included are intended to inform discussion, the paper does not represent a formal policy position of Engineers Australia.

2. Context

More than four million Australians or around 18 per cent of the population are classified as having a disability. In 2018, one in six (17 per cent) of the population with a disability had difficulty using public transport. Transport is commonly reported as a limitation on activity by younger disabled people (93 per cent) who chose to stay in residential care facilities (ABS 2019).

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[1] Australian Bureau of Statistics, Disability, Ageing and Careers, Australia: Summary of Findings, 2012 ABS cat no 4430.0 (2013). http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/3A5561E876CDAC73CA257C210011AB9B?opendocument
[2] 'Physical distancing is here for a while – over 100 experts call for more safe walking and cycling space' *The Conversation* (29 April 2020) https://theconversation.com/physical-distancing-is-here-for-a-while-over-100-experts-call-for-more-safe-walking-and-cycling-space-137374
[3] 'Urban Transport Systems: A Transport Australia Society Discussion Paper' *Engineers Australia* December 2021 https://www.engineersaustralia.org.au/sites/default/files/2022-01/Urban-Transport-Systems-TAS-Discussion-Paper-December-2021-revised.pdf

Research shows the cost of living with a disability requires an additional adult-equivalent disposable income of 50 per cent (in the short-run) to achieve the same standard of living as those without a disability. [4] Government subsidies can only assist to a limited extent. The options for transport need to be more than exclusive modes which are more expensive, such as taxis. Universally accessible transport allows people with all levels of mobility to fulfil their access needs.

In 2007, Australia signed the United Nations Convention on the Rights of Persons with Disabilities. Under this, the nation accepts the responsibility to ensure that all people are provided with opportunities to reach their full potential, regardless of their situation or disability.

Within Australia, the *Disability Discrimination Act 1992* (Cth) (DDA) prevents discrimination against a person because of disability when providing goods, services, facilities, or access to public premises. The DDA states disability discrimination occurs when a person is treated less favourably, or not given the same opportunities as others in a similar situation, because of their disability. The disability could be temporary or permanent; a physical, intellectual, or psychosocial disability; a disease or illness; physical disfigurement; medical condition or injury. [5]

The Disability Standards for Accessible Public Transport (DSAPT) establish minimum accessibility requirements to be met by providers and operators of public transport. Rather than simply complying with such standards, world best practice is now moving towards the concept of Universal Access, based upon the concepts of Universal Design.

The concept of Universal Design developed by Ron Mace in the 1970s is the creation of systems for use by all people, to the greatest extent possible, without the need for specialised adaptation to meet gender, ethnicity, health, size, ability, disability, or other factors. [6] Providing a network which caters to the needs of all people, including the young, the elderly, those with shopping, prams or luggage and those with disabilities, will benefit all users of the network. However, there is no uniform definition of universal access or what constitutes best practice. In late 2020, the World Economic Forum announced a collaboration of expertise drawn from university researchers, the private sector, non-governmental organizations and thought leaders to develop core principles for universal access. The Universal Mobility Principles being developed will create a shared language on universal access which can lead to more equitable mobility policies. [7]

3. Current State of Play in Australia

There are several immediate challenges in the Australian context:

- There is no mandatory national compliance reporting for accessibility standards.

- DSAPT and DDA requirements state that by 2022, infrastructure must comply with the regulations and by 2032 all vehicles are to comply. [8] Australia has legacy heavy and light rail systems which are not compliant and will require significant investment to become compliant.

- A 2012 review of DSAPT concluded that whilst the standards had been effective in reducing discrimination, they are not optimal in their current form. [9]

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[4] 'The costs of disability in Australia: a hybrid panel-data examination' *Health Economics Review* (14 March 2020) https://healtheconomicsreview.biomedcentral.com/articles/10.1186/s13561-020-00264-1
[5] 'Access for all: Improving accessibility for consumers with disability' *Australian Human Rights Commission* (2016) https://humanrights.gov.au/our-work/disability-rights/publications/access-all-improving-accessibility-consumers-disability
[6] 'Transit Universal Design Guidelines: Principles and Best Practices for Implementing Universal Design in Transit' *APTA Standards Development Program* (28 July 2020) https://www.apta.com/wp-content/uploads/APTA-SUDS-UD-GL-010-20.pdf
[7] 'It's time for mobility to be innovative and accessible. Here's how' World Economic Forum (19 October 2020) https://www.weforum.org/agenda/2020/10/mobility-to-be-innovative-and-accessible-hyundai/
[8] 'Disability Standards for Accessible Public Transport 2002' *Disability Discrimination Act 1992* https://www.accessibletourism.org/resources/14_disability-standards-for-accessible-public_en-2.pdf
[9] 'Transport Standards review' *Australian Government Department of Infrastructure* (July 2015) p. 10 https://www.infrastructure.gov.au/transport/disabilities/have-your-say/files/dsapt-reform-consultation-ris.pdf

- A review and reform of standards is underway. [10]

Table 1 Compliance with Accessibility standards[11]

Jurisdiction	Mode	% Accessible	Year
New South Wales	Railway Stations	53.7%	2018
Victoria	Bus Stops	52%	2012
	Tram Stops	22%	2018
	Trams	24%	2018
Western Australia	Railway Stations	53%	2018
South Australia	Buses	80%	2018
Australian Capital Territory	Bus Stops	55%	2012
Tasmania	Buses	52%	2017
	Bus Stops	37.5%	2017

4. Challenges

- Australia has a variety of settings, from dense urban centres to sparsely populated regional areas. Providing a single one-size-fits all solution to accessibility is not possible.

- There is a need to design all transport infrastructure that allows all persons to access it with dignity, desirably in the same way.

- Many cities within Australia have extensive heavy and light rail networks older than 100 years, making retrofitting both technically challenging and expensive.

- Cities with newer rail systems and bus-based public transport are closer to compliance.

- Responsibility for accessibility rests with the States, leading to inconsistent application of technical standards and disparate investments in improving accessibility outcomes.

- In cities with large backlogs of infrastructure not meeting accessibility standards, there is insufficient funding to upgrade this infrastructure to meet standards by the target timeframes of 2022 and 2032. [12]

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[10] 'Transport Standards review' *Australian Government Department of Infrastructure* (July 2015) p. 10
https://www.infrastructure.gov.au/transport/disabilities/have-your-say/files/dsapt-reform-consultation-ris.pdf
[11] 'An Assessment of Australia's Future Infrastructure Needs' *Australian Government, Infrastructure Australia* (June 2019)
https://www.infrastructureaustralia.gov.au/sites/default/files/2019-08/Australian%20Infrastructure%20Audit%202019.pdf
[12] 'An Assessment of Australia's Future Infrastructure Needs' *Australian Government, Infrastructure Australia* (June 2019)
https://www.infrastructureaustralia.gov.au/sites/default/files/2019-08/Australian%20Infrastructure%20Audit%202019.pdf

- Local government has a large role in providing accessible transport, varying by state. Accessible pedestrian infrastructure is often inconsistently applied across different local government areas.

- Multi-level government and stakeholder engagement means collaboration is complex and reaching agreement can be a lengthy process.

- Signage and information can be complex and not accessible in many cases.

- The "first mile" and "last mile" remains an impediment to universally accessible transport. Each element needs to be considered in a "whole of journey" context.

- There are challenges for accessibility in remote and indigenous communities.

5. Benefits of Universal Access

5.1. Accessibility benefits to Individual

Universal accessibility offers inclusion to all individuals. For those with disability, benefits arise from the opportunity to live a less dependent life and the enjoyment of enhanced respect, dignity, privacy, and rights. While universal design promotes access for individuals with disabilities, it also benefits all individuals in the broader community through good design, by easing the complexity and pressure in transport system use and by eliminating some of the barriers to mobility in our everyday life.

5.2. Employment and Participation

Universal accessibility promotes a safer and easier environment for everyone and helps to equalise the opportunity for employment. Forty-eight per cent of working-age people with a disability are employed.[13] 50 per cent of those employees (or 47,700) need special equipment or modified buildings/fittings, or to be provided such as special transport arrangements or parking.[14] Accessible transport and parking play important roles in keeping working-age people with a disability in the workforce.

5.3. Aging Society and Quality of Life

In 2017, 15 per cent of Australians (3.8 million) were aged 65 and over; this proportion is projected to grow steadily over the coming decades.[15] The number of formal and informal carers are increasing. Medical technology is extending our lifespans and the durations for people living with disability is expected to continue to increase.

All Australians need to maintain regular social engagement. Universal accessibility especially enhances access for older Australians, eases the pressure on aged care resources, whilst ensuring social participation and strengthening of social networks.[16]

5.4. Legal and Administrative Benefits

Standards and guidelines are already used to help guide how we plan and design transport infrastructure. Universal transport accessibility requires agencies to rethink their obligations and transform ways of working. Greater front-end effort to deliver universally accessible transport infrastructure will result in savings to society in other areas because of adopting well thought-out plans and best practice

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[13] 'People with disability in Australia: Employment rate and type' *Australian Government, Australian Institute of Health and Welfare* (02 October 2020) https://www.aihw.gov.au/reports/disability/people-with-disability-in-australia/contents/employment/employment-rate-and-type
[14] 'People with disability in Australia: Employment participation needs and challenges' *Australian Government, Australian Institute of Health and Welfare* (02 October 2020) https://www.aihw.gov.au/reports/dis/73-1/people-with-disability-in-australia/contents-1/employment/employment-participation-needs-and-challenges
[15] 'Older Australians at a glance' *Australian Government, Australian Institute of Health and Welfare (10 September 2018)* https://www.aihw.gov.au/getmedia/2cb104f4-c6d1-4728-9be3-a418840588de/Older-Australia-at-a-glance.pdf.aspx?inline=true
[16] 'People with disability in Australia: Employment participation needs and challenges' *Australian Government, Australian Institute of Health and Welfare* (02 October 2020) https://www.aihw.gov.au/reports/dis/73-1/people-with-disability-in-australia/contents-1/employment/employment-participation-needs-and-challenges

approaches. To help achieve this, new measures for success and effectiveness of transport access need to be established for policy frameworks and included in the business case stages.

5.5.   Boarding capacity and Patronage

Provision of fully accessible public transport stops and rolling stock has advantages for all service users and the service operator. Level (train style) boarding afforded by low floor light rail vehicles (LRVs) and stop platforms, gives faster and more convenient boarding for passengers, owing to the absence of an internal step. This leads to up to 50 per cent higher boarding capacity at stops, often critical at inner city stops, and better passenger acceptance (Harris 2007)[17]. Accessible vehicles and stops have been cited as success factors in French LRT systems since their introduction in Grenoble and Strasbourg (Boquet 2017).[18]

5.6.   Universal Access and economic activity

Transport designed to meet universal accessibility principles tends to result in a more walkable, easy to use urban environment in the vicinity of the infrastructure. This in turn leads to more economic activity. Therefore, in addition to social and transport benefits, building new transport infrastructure to meet universal design goals tends to encourage economic (re)development along the corridor the infrastructure is constructed in. Canberra and Gold Coast Light Rail are good examples of this benefit.

6. Best Practice Examples
6.1.   Signage and wayfinding

- High quality wayfinding includes signage to help passengers find the next step in their journey, easy to comprehend guidance on schedules and directions towards key destinations that may not be within line of sight. Adelaide Trams, Brisbane City Trains, and Gold Coast Light Rail have highly legible examples of both. Wayfinding increases the confidence and likelihood of passengers walking to destinations from stops.

6.2.   Infrastructure

- The Sydney light rail connects the Sydney CBD to the University of Sydney, Kingsford and Randwick. The route through George Street in the city removed vehicle traffic and provided a major upgrade in the quality of urban realm. This increased the space available for pedestrians and its ability to function as a "place". By the end of 2020 the system carried 45,000 passengers per day with higher footpath activity.[19]

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[17] Harris, N 'Train boarding and alighting rates at high passenger loads' *Journal of Advanced* Transportation (20 January 2010) https://onlinelibrary.wiley.com/doi/abs/10.1002/atr.5670400302
[18] Boquet, Y 'The renaissance of tramways and urban redevelopment in France' *Miscellanea Geographica – Regional Studies on Development* (March 2017) https://www.researchgate.net/publication/316573692_The_renaissance_of_tramways_and_urban_redevelopment_in_France
[19] 'Light Rail Patronage - Monthly Comparison: A Comparison of Monthly Opal Trips' *NSW Government, Transport for NSW* (accessed 19 April 2022) https://www.transport.nsw.gov.au/data-and-research/passenger-travel/light-rail-patronage/light-rail-patronage-monthly-comparison

Sydney, George St - New Catenery free light rail system (photo: S.Elaurant)

- The benefits of universal access may be applied to bus and rail infrastructure. The Brisbane Busways were designed with accessibility features associated with Metro rail systems, including grade separation from conflicts, stop platforms allowing level boarding, and tactile guidance. These features were designed after liaison with advocates for persons with mobility impairments. Daily patronage on the South East Transit exceeded 150,000 by 2019, comparable to rail lines.[20]

Brisbane, South Brisbane Busway Station, South East Transit (photo: M Coghlan)[21]

- Retrofitting existing public transport services to a fully accessible standard is often challenging due to space limitations. Rebuilding of tracks, for maintenance purposes, presents an opportunity to introduce fully accessible platform standards to existing systems. Recent refurbishment work in Adelaide and Melbourne tram systems has included implementation of platforms to permit level boarding of low-floor trams. From both a safety and overall transport network capacity viewpoint, it is preferable to reduce the provision of adjacent traffic lanes in such circumstances to achieve a fully accessible design for the public transport facility.

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[20] 'Brisbane Busways - case study' *UGL* (accessed 19 April 2022) https://www.ugllimited.com/en/case-studies/current/brisbane-busways
[21] Photo credit: Michael Coghlan (4 February 2016) https://commons.wikimedia.org/w/index.php?curid=92754528

Upgraded Melbourne Tram stop (photo: S Elaurant)

6.3.   Active Transport and Micro-Mobility

- Walking and cycling are healthy forms of transport for all age-groups, provided infrastructure is adequate. Shared use paths that meet design standards for pedestrians and cyclists also provide high quality mobility for disabled persons.

- The need for programmed investment in pedestrian and cycle infrastructure emerged as an issue in many cities during Covid19.[22]

- As pedestrian activity increases the need to provide separate pedestrian and cyclist infrastructure rises.

- There is a growing class of personal mobility and micro-mobility devices such as gophers, scooters and E-bikes which creates a further need for allocated road space.

7. Other Opportunities
7.1.   Program Management

- Consultation and advisory bodies – Designing Public Transport (PT) facilities to meet universal access standards is a task that should be done with, rather than for, customers with disability (Co-design). This provides infrastructure designers with better information on the location and nature of highest mobility needs, allowing better prioritization of works that are tailored to passenger needs.

- Developing long term program and commitment – some cities have performed better than others in meeting the challenge of upgrading transport systems to meet modern accessibility guidelines. If tasks such as station upgrades to achieve DDA compliance are defined as a single project, obtaining the required level of one-off funding may be impossible. Adelaide and Brisbane have adopted long-term programs of gradually upgrading several rail stations per year. With this gradual approach, a significant proportion of their stations have now been upgraded to DDA compliant standards.

- Prioritisation and coordination of complimentary modes - there are synergies between investment in walking, cycling and public transport infrastructure, with the first two providing the means of access to the latter. Construction efficiencies and higher patronage may be gained if projects are conceived and delivered as integrated packages of walking, cycling and public transport infrastructure (co-design).

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[22] 'How major cities are trying to keep people walking and cycling' *The Conversation* (12 May 2020) https://theconversation.com/how-major-cities-are-trying-to-keep-people-walking-and-cycling-137909

7.2.   Vehicle Design

- Zero Emission Buses (ZEB) design opportunities - The introduction of ZEB, creates the opportunity to revise bus designs. ZEBs require less space than internal combustion engines for power units. This creates potential for lower floor heights, and more passenger space.

- Flexible wheelchair spaces – A common feature of modern PT interior designs is to create a space for wheelchair passengers with folding seats near all doorways. This allows maximum utilisation for wheelchair users while remaining flexible for other passengers at other times. These spaces are also useful for passengers with bicycle, prams and strollers.

- Hand-holds – falls within PT vehicles during sudden stops are a significant cause of passenger injury. PT vehicle interiors should be generously fitted with interior handholds designed to suit standing passengers of a range of heights.

7.3.   Information Technology

- Universal access to mobility can be enhanced through information technology by integrating knowledge between users and operators. The obvious example of this is the growth of on-demand services such as Uber and the deployment of smart applications by mass transit operators. However, new technology requires knowledge of the physical, cognitive and behavioural aspect of both individuals and the environments in which they need to move.

- IT potentially offers low cost means to understand the needs of individual and societal access and mobility requirements. Information on how persons with mobility impairments can access PT systems can be included on App-based support already in use. Given the scale of disabled user numbers and those who require additional assistance, this also has potential to be used in machine learning and for universal access to alter with changes in user needs over time.

- Existing digital systems such as Google Maps could have accessibility data (e.g., Briometrics) included which will allow them to be used as wayfinding for differing mobility groups.

7.4.   Emerging technology

- The scale of development in transport systems in Australia lends itself to exploring a wide range of emerging technologies. The ability to evaluate and recommend effective technologies needs greater rigor. There is a Cooperative Research Centre (CRC) for freight transport (iMove) but not passenger or public transport. A CRC for passenger and public transport would improve Australia's capability to reliably deploy new technologies. A national transport CRC or hub could include a specialty unit focused on universal access.

- Developing consistent national standards should reduce costs through standardisation. Potential initiatives in modular off-site fabrication, lift in construction and "bolt-on" accessibility modules could accelerate the pace of retrofitting existing infrastructure.

7.5.   Leverage big programs

- The demand for large scale mass transit transportation programs is driven by Australia's population growth. Such programs require significant funding. They offer the obvious opportunity for expansion of universal access within the broader system in which these programs are delivered.

8. Recommendations

1. Recognise that compliance alone doesn't mean good accessibility - focus on universal access.

2. Support the DSAPT modernisation process.

3. Leverage existing programs (fleet purchasing, major projects) to get universal access outcomes.

4. Need for long term program and state commitment to retrofitting existing infrastructure to achieve DSAPT standards – including a funding commitment.

5. Make more use of state-based accessibility groups in understanding solutions and prioritisation of finite funding- i.e., maximise accessible benefits.

6. Need to make sure there is access to public transport for those who are reliant on public transport for mobility due to their disability, including in regional areas.

7. Leverage technological advances including internet of things (IOT) and artificial intelligence into wayfinding, access to services etc.

8. Engineers and designers (and regulators) need to have agile mindset to new technologies and ways of providing accessible transport options.

9. Opportunities for new vehicles to be designed for more accessibility- zero emission busses (ZEBs), new trams and trains.

10. Universal access needs to be a guiding principle through the design process not post-design check.

11. Harmonise public transport and active transport infrastructure design standards and best operating practices.

12. Subject matter experts should be engaged at project commencement to identify appropriate standards that lead to good accessibility outcomes.

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