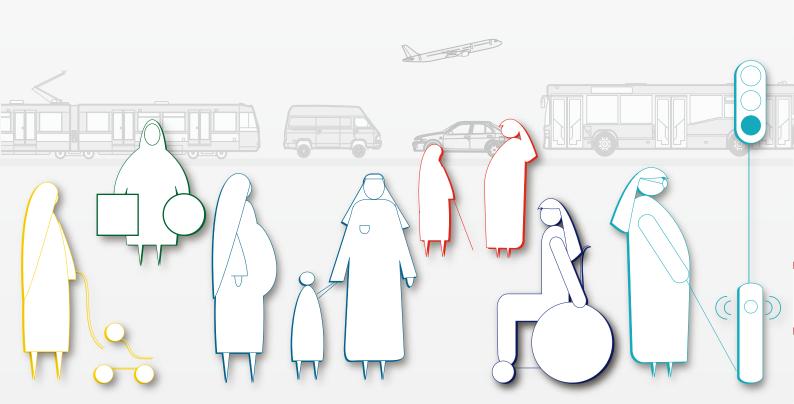




# **Universal Accessibility**

# **Land Transportation Guidelines**

for the Kingdom of Saudi Arabia 1431 H - 2010 G



# The Universal Design is **Essential for 10%, Supportive to 40%, and Comfortable to 100%**of the Population

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In 2007, the PSCDR embarked on a Universal Accessibility Program (UAP) culminating in the completion of a UAP Compendium in 2008. This comprehensive resource document evaluates and benchmarks the existing level of universal accessibility within KSA against acceptable standards and international best practices in four areas: built environment, land transportation, marine transportation and destination and accommodation. Based on the UAP compendium, four stand-alone, user-friendly working manuals are now available: one on Universally Accessible Land Transportation (UALT), Universally Accessible Building Environment (UABE), Universally Accessible Marine Transportation (UAMT), and Universally Accessible Destination and Accommodation (UADA).

The intended audiences of the Universal Accessibility Built Environment Guidelines Manual are planners, architects, engineers and interior designers, as well as other practitioners and decisions makers in the public and private sectors in KSA. The technical design guidelines will assist them in applying UABE principles and specifications to new building projects, and in the renovation of existing facilities to accommodate all members of Saudi society – including seniors and people with disabilities.

The UABE guidelines in this manual are prescriptive rather than performance-based. They are structured in a way to include considerations of the current conditions and unique cultural and administrative characteristics of the Kingdom of Saudi Arabia (KSA). The scope encompasses guidelines for Government/Administrative, Health Care, Education, Religion, Commercial, Recreation and Residential facilities. To facilitate practitioners in applying the UABE guidelines, two checklists have been compiled to facilitate on-site verification across KSA. In support of this validation process, users of the checklists are encouraged to provide comments and suggestions to the Prince Salman Centre for Disability Research using the Feedback Form.

The initial chapters of the UABE Guidelines Manual set the scene for the entire body of work, and explain the concept evolution and key terms that lay the foundations of a UABE. It is followed by the detailed technical design guidelines for all facilities. The appendices contain supporting documentation. Since the UABE guidelines were developed based on known best practices and expert opinions, and are subject to validation through accessibility audits, a feedback form is attached as an Appendix, to solicit users' comments for future enhancements.

"The issue of disability and its social and economic repercussions constitutes one of the most important challenges facing contemporary societies at present... (including) overcoming obstacles that constrain people with disabilities and limit their productivity and independence in society..."

His Royal Highness Prince Sultan Bin Salman Bin Abdul-Aziz Al Saud,
Chairman of the Board
Prince Salman Center for Disability Research

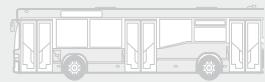


# Introduction











The Universal Accessibility Land Transportation Guidelines Manual is one of two manuals developed as part of a larger accessibility initiative within the Kingdom of Saudi Arabia to implement the universal accessibility program, which is championed by His Royal Highness Prince Salman Bin Abdul-Aziz, President of the Prince Salman Center for Disability Research.

In 2007, the PSCDR embarked on the Universal Accessibility Program (UAP) culminating in the completion of the UAP compendium in 2008. This comprehensive resource document evaluates and benchmarks the existing level of universal accessibility within KSA against acceptable standards and international best practices in three areas: built environment, transportation and tourism. Based on the UAP compendium, two stand-alone, user-friendly working manuals are now available: one on Universal Accessible Transportation (UALT) and the other on Universal Accessible Building Environment (UABE).

The intended audiences of the UALT Guidelines Manual are planners, architects, engineers, interior designers, decision-makers and other practitioners in the public and private sectors in KSA. The technical design guidelines will assist them in applying UALT principles and specifications to new public transportation projects, and in the renovation of existing facilities to accommodate all members of Saudi society – including seniors and persons with disabilities.

The UALT guidelines in this manual are prescriptive rather than performance-based. They are structured in a way to include considerations of the current conditions and unique cultural and administrative characteristics of the Kingdom of Saudi Arabia (KSA). The scope encompasses all vehicles and associated boarding equipment used in the family of local and intercity public transportation systems on land; ranging from intercity train, intercity coach, regional commuter train, to urban subway, light rail, bus rapid transit, transit bus, minibus, vans, taxi and limousine. Trip planning information systems, fare collection systems, and the interface between vehicle with stops and terminals are also discussed.

The initial chapters of the UALT Guidelines Manual set the scene for the entire body of work, and explain the concept evolution and key terms that lay the foundations of UALT. It is followed by the development of detailed technical design guidelines for all urban and intercity land transportation modes based on known best practices







and expert opinions. The appendices contain the supporting documentations. To facilitate practitioners in applying the UALT guidelines, checklists have been compiled to facilitate on-site verification across KSA. In support of this validation process, users of the checklists are encouraged to provide comments and suggestions to the Prince Salman Centre for Disability Research using the Feedback Form.

Readers are advised to refer to the companion UABE Guidelines Manual for the general building requirements of a transportation terminal and the environmental infrastructure: e.g. pedestrian pathway, parking, doors, entrances, washrooms, stairs, elevators, emergency warning systems, and other amenities.





# 1.1 Purpose of the UALT Manual

The Universal Accessibility Land Transportation (UALT) Guidelines Manual includes information on trips and transport vehicles. Trip information could benefit planners, interior designers, architects and information providers. Vehicle information is targeted towards engineers, manufacturers and vehicle modifiers. The guidelines will assist them in importing accessible vehicles, applying UALT principles and specifications to new public transportation projects, and renovating existing facilities to accommodate all members of society in Saudi Arabia – including seniors and persons with disabilities.

#### 1.2 Context

The Universal Accessibility Land Transportation Guidelines Manual is one of two manuals developed as part of a larger accessibility initiative within the Kingdom of Saudi Arabia to implement the universal accessibility program,

In 2007, the PSCDR engaged an international consortium of universal accessibility experts to undertake a review of the current status of accessibility for persons with disabilities within the Kingdom, related to three focus areas: the Built Environment; Transportation; and Tourism. More specifically, the international experts reviewed existing Saudi legislation, policies, codes and standards and prepared a strategy for implementing universal accessibility across the Kingdom. A comprehensive report entitled Universal Accessibility Framework and Guidelines (the 'compendium') was completed in September 2008.

A critical component of the universal accessibility implementation strategy is the provision of appropriate technical information to the legislators, ministries, architects, engineers and other designers that will be responsible for developing projects that address the needs of everyone in Saudi Arabia. The subject Universal Accessibility Land Transportation Guidelines Manual provides technical design guidelines and application criteria as a benchmark for the creation of universally accessible transportation systems.



A second manual is also available titled Universal Accessibility Built Environment Guidelines Manual. It provides technical design guidelines and application criteria as a benchmark for the creation of universally accessible buildings and other built-environments, such as transportation terminals and its environmental infrastructure.

## 1.3 Scope

The UALT guidelines in this manual covers all vehicles and associated boarding equipment used in the family of local and intercity public transportation systems on land; ranging from intercity train, intercity coach, regional commuter train, to urban subway, light rail, bus rapid transit, transit bus, minibus, vans, taxi and limousine. Trip planning information systems, fare collection systems, and the interface between vehicle with stops and terminals are also discussed. The following topics are outside of the scope of this manual:

- Air and marine transport;
- Private automobile modification and adaptation;
- Transportation service planning and operations;
- Pedestrian infrastructure (access paths, sidewalks, crosswalks, etc.) parking and general terminal building amenities are covered under the UABE Guidelines.

Note that the guidelines were developed based on known best practices and expert opinions. They would need to be validated through accessibility audits and feedback from KSA practitioners.

## 1.4 How to use the Manual

The UALT guidelines in this manual are prescriptive rather than performance-based. They are structured in a way to include considerations of the current conditions and unique cultural and administrative characteristics of the Kingdom of Saudi Arabia (KSA).

Practitioners are encouraged to familiarize themselves with the key concepts of UALT as outlined in Drction 2.0 as well as the overall structure and organization of the Manual. This will give the reader an overview of the principal concepts







and comprehensiveness of the technical design requirements for universally accessible transportation systems and facilities in general. The Manual can also be used as a reference throughout the design, development and implementation phases of a project. It is emphasized that practitioners should apply the UALT principles right from the start of the design process. Thereafter, for the detailed design of specific vehicle and boarding equipments elements, they should consult the subject index for guidance throughout the lifespan of the development and implementation stages. The checklists in Appendix G will facilitate this process.

Users are also advised to refer to the companion UABE Technical Design Guidelines for the general requirements of a transportation terminal building and infrastructure: e.g. pedestrian pathway, parking, doors, entrances, washrooms, stairs, elevators, emergency warning systems, and other amenities. The UALT Guidelines are organized as follows:

**SECTION 1.0** sets the scene for the entire body of work.

**SECTION 2.0** explains the concept evolution and key terms that lay the foundations of UALT. The anthropometric measurements for human reach and space requirements are specified and illustrated.

**SECTION 3.0** presents the detailed design guidelines for all land transportation modes under these five headings:

- 1. **Title** of the transport element in question (i.e. WHAT);
- 2. The design considerations for developing the guidelines (i.e. WHY);
- 3. The **application guidelines** (i.e. WHERE, WHEN and HOW MANY and exceptions)
- 4. The **technical guidelines** for accessible elements (i.e. HOW to make them accessible).
- 5. **Illustrations** of the technical guidelines (i.e. HOW the design can be implemented). Unless otherwise noted, all dimensions are in millimeters.
- 6. Other considerations contains cross-references information from each element with other relevant sections of the UALT guidelines.

**Appendix A:** Definitions: Lists the terms covered in this manual.

**Appendix B:** International Access Symbols: Provides examples of common International Access Symbols, as developed by

the ISO.







**Appendix C:** Abbreviations: Defines the abbreviations and acronyms

used throughout the manual.

**Appendix D:** References: Provides a list of the bibliographical sources

used in this manual.

**Appendix E:** Subject Index: Facilitates searching by topic.

**Appendix F:** UALT Guideline Checklists: Provides detailed checklists of

the proposed technical UALT design guidelines.

**Appendix G:** Feedback Form: Facilitates readers to make comments and

suggestions to the PSCDR for future efforts to validate and

refine the UALT Guidelines.







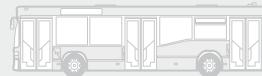


# **Basic Concepts in UALT**











## 2.1 **UALT Concept Evolution**

A transportation network is the circulatory system of a community. How we get to and from places is as vital as the arteries in our bodies – it connects us to school, work, services and friends. Hindrances or obstacles affecting a seamless flow are detrimental to the sustainability and livability of its citizens.

Transport planners define a "trip" as having an origin and a destination. The land use of the origins and destinations are typically homes, offices, school, hospitals, shops and parks. To be able to access these opportunities and facilities, we need to have a full range of mobility and transportation options available.

"Accessibility" means different things to different people. In order to ensure that disabled people can participate and have the same choices as non-disabled community members, community services should be rendered accessible to all. This includes: access to built environments, transportation, the electoral process, clean water, sanitation, technology, information and communication, etc. An ideal transportation system should provide all travelers with a pleasant and safe experience. Its attributes are: universality, reliability, convenience, affordability, safety and security. The UALT goal is "Seamless Transportation for All."

Western countries usually consider accessible transportation for Persons with Functional Limitations (PFL's) as a human right. This is reflected in basic human rights legislation that prohibits discrimination against PFL's in the provision of all goods and services, implicitly including transportation. In KSA, it is contained in Article 26 of the Basic Law of Governance. Other nations have additional specific legislation to require that all transportation services are universally accessible. A combination of both approaches is the most effective in promoting the goal of UALT.

The provision of accessible public transportation services began in the 1970s in North America and Europe in the form of specialized services exclusively for people with mobility impairments [Mitchell, Christopher (Kit) & Smith, Trevor, 1998]. Thirty years later, we have accessible subways, low-floor trams and buses, taxis, trains and aircraft, tactile guide ways, curb cuts, and electronic trip-planning and announcement systems in Europe, North America and parts of Asia and Latin America. A combination of local, national and international public-private sector initiatives, together with the application of technological innovations, have transformed ideas into action.



#### **Process to Make Transportation Accessible**

The process of making transportation systems more user-friendly has evolved through four distinct stages: awareness, understanding, development, and finally, implementation. Milestones include the International Year of the Disabled Person (1981), the United Nations Global Decade for Persons with Disabilities (1983-1992), and the International Conference on Mobility and Transport for Elderly and Disabled Persons (TRANSED) (1978 – present) series. These landmark turning points in the genesis of accessible transportation have contributed to the development of policy and projects in many parts of the world.

#### Demand Responsive Transit (Paratransit)

For many communities, the first venture into accessible transportation began

with demand-responsive transit services for areas ill-served by conventional transit (Figure 1), e.g. lowdensity suburbs with diverse trip origins and destinations. Demand-responsive transit provides door-to-door service by picking passengers up at their origins and dropping them off at their destinations, on flexible routes with no set schedules.



Figure-1. Conventional Transit – Fixed Route Bus Davenport, Iowa, USA. Source: www.firsttransit.com

It can operate on a many-to-one system, where many origins but only one destination are served; a many-to-few system, where many origins but limited destinations are served, or a many-to-many system, where multiple origins and multiple destinations are served.

It soon became apparent that demand-responsive service, with its door-to-door attribute, was best suited to transport passengers who have difficulties using conventional transit. Hence, "Paratransit" was born to cater to the unmet demand for mobility by persons with functional limitations. A centralized







dispatching system was set up to assign adapted vehicles (mainly vans), minibuses (Figures. 2 and 3) or taxis on a shared ride basis to transport eligible passengers certified medically unable to use regular public transit, all for a regular transit fare. Paratransit has since evolved to incorporate door-through-door service, where passengers are assisted from the home all the way to their destinations, including assistance with carrying parcels or way finding.



Figure-2. Minibus with ramp, rear access, Allied Mobility, UK. Source: www.alliedmobility.com



Figure-3. Accessible low floor community bus in Pennsylvania, USA.

Source: www.avmvans.com/comercial-vehicles.html

The aging of the baby boomer generation brought urgency to mobility issues for older adults who might not have disabilities – a group usually ineligible for specialized transport services. Solutions such as community buses (Figure 4) and flexible route services have been demonstrated and adopted by European and North American cities in order to accommodate the mobility needs of persons with functional limitations and particularly seniors.

Issues encountered with financing paratransit services are its low productivity in most systems (less than two passengers per vehicle hour) coupled with high unmet passenger demand despite eligibility criteria requirements. Pre-booking was necessary to maintain service on a first-come, first-served basis. Unplanned or spontaneous trips were seldom accommodated. Expansion of such systems was found to be economically unsustainable without extensive subsidies. These factors, combined with users' expressed preference for integrated transportation, has led to the current trend towards making mainline transportation fully accessible, while maintaining paratransit as a complementary service only for those unable to use regular accessible public transit.





Figure-4. Community Bus. Tokyo, Japan Source: www.tcvb.or.jp

#### Barrier-Free Design

There are four types of travel barriers in the trip chain: environmental (weather), attitudinal (being treated differently), inadvertent (lack of knowledge, education, understanding, or effort) and physical (heavy doors, level changes, lack of visual or auditory warnings, etc.) [Pivik, McComas, & LaFlamme, M. 2002]. The original focus of disability campaigners and architects was on barrierfree access to buildings and public environments – curb cuts, textured paving, ramped entry, wider doorways, corridors and accessible toilets – all denoted by a wheelchair symbol [Coleman, Roger, 2008]., i.e. design without any limitations to a sensory, cognitive or mobility-impaired individual.

Over the past 30 years, the barrier-free design approach has evolved to overcome these obstacles. With regard to the physical aspects, the results were reasonably good. Nevertheless, it was a reactive measure aimed primarily towards the removal of existing impediments to the use of public transport. Proponents of barrier-free design tend to focus on meeting needs of persons with mobility impairments, often overlooking the needs of persons with cognitive and sensory impairments [Suen, Ouellet & Blais, 2002]. A typical example of barrier free design in transportation is a lift equipped bus that caters to overcome the change of levels between the curb and the bus floor for passengers using mobility aids (Figures. 2 and 3).









#### **Universal Design (UD)**

As a way of overcoming the limitations of the barrier-free design approach, universal design (UD) emerged in the mid-1990s. The UD philosophy is based on designing products and environments to be usable by all people, to the greatest extent possible, without the needs of adaptation or specialized design, at little or no extra cost [Wilkes, J.A., 1989]. This approach aims to simplify life for everyone regardless of their functional abilities, including everyone, as shown in Figure 5: the Universal Design Pyramid. In the transportation context, the entire trip chain, including travel information, pedestrian facilities, vehicles, transfers, stops and terminals, must all be considered for universal accessibility [Suen, Ouellet & Blais, 2002]. A typical example of universal design in transportation is a low floor bus that is accessible to all passengers.

#### Legend

**Row-8** (the top of the pyramid) shows those users who require two or more assistants when they venture out..

**Row-7** shows people who drive electric scooters and wheelchair users who need the assistance and supervision of a companion.

Row-6 shows independent wheelchair users. (This group is generally catered for in areas where legislation has been enacted, however the accommodation of this group is usually very specific, i.e. lifting devices, elevators, etc.)

Row-5 introduces ambulant people with disabilities.

Row-4 includes people with strollers / pushchairs. (This group can be limited in access by lack of turning space in confined areas such as toilets, as well as the placement of stairwells, narrow doors, etc.)

Row-3 introduces children and women – this is the beginning of difficulties for users. (The architectural issues at this point may include limited numbers of toilet stalls, small stalls limiting movement for mothers with children, etc.)

Row-2 denotes those users to whom regular architectural fixtures (stairs etc...) pose no problem.

**Row-1** (from bottom up) denotes users who are completely able-bodied and have no trouble running, jumping and climbing ladders.

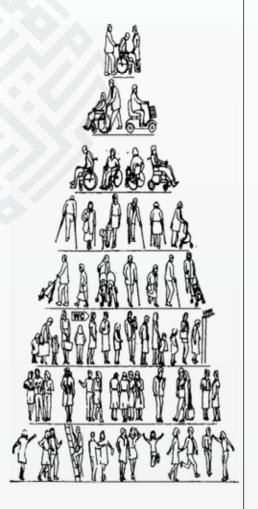


Figure 5. The Universal Design Pyramid, Source: Preiser and Ostroff, 2001





The European Union uses the term 'Design for All' which is equivalent to universal design, but with more emphasis on accessible information. Seven Principles that illustrate Design for All:

- Equitable Use
- Flexibility in Use
- Simple and Intuitive Use
- Perceptible Information
- Tolerance for Error
- Low Physical Effort
- Size and Space for Approach and Use [Coleman, Roger, 2008]

#### **Inclusive Design**

The term "inclusive design" is often used interchangeably with "universal design" but is less well-defined in literature. Inclusiveness means right to access, right to use and enjoy, without special status or burden [Ministry of Municipal Affairs and Housing (Ontario, Canada), 2005]. It is a process-driven approach by designers and industry to ensure that products and services address the needs



Figure 6. Partial Low Floor Bus - Chicago, Illinois, USA Source: www.chicagobus.org

of the widest possible consumer base, regardless of age or ability [Coleman, Roger, 2008]. It embodies the process of inclusion, i.e. bringing different user groups into the fold. It does not necessarily require uniform treatment and allows for viable options with choice, e.g. complementary paratransit provisions under the American with Disabilities Act (ADA) [Suen, Ling S., Varigonda, Meera Ashtakala, and Ouellet, Luc, 2001]. A typical example of inclusive design in transportation is a partial low floor bus (Figure 6) which can accommodate passengers using mobility aids in the front section only because the rear section houses the engine and cannot be lowered.







## 2.2 Key Concepts

The key concepts used in the UALT Technical and Design Guidelines are listed in alphabetical order.

#### **Accessible Information**

This is used to mean information presented in a comprehensible format that can be easily used by the intended audience [Stenberg, Lars, 2008]. For a blind user, it could be publications in Braille. For someone with learning difficulties, it could be publications using Rebus symbols [Merriam Webster Online]. It could also be information provided in one's native language, in print or on the web, which conforms to W3C Web Content and Accessibility Guidelines [Chisholm, Wendy; Vanderheiden, Gregg and Jacobs, Ian, 1999].

#### **Door-through-Door Service**

This is "a hands-on service for passengers with significant mobility limitations in which a driver not only escorts the passenger into the apartment, but assistance is also given for belongings (e.g., groceries). This service is for those who would otherwise not be able to use regular or even enhanced paratransit services." [National Centre on Seniors Transportation, 2008]

#### **Door-to-Door Service**

This is "a form of escorted paratransit service that includes passenger assistance between the vehicle and the door of his or her home or other destination but does not entail the driver going inside the destination." [National Center on Seniors Transportation, 2008]

#### Family of Transport Services

This means a comprehensive approach for service delivery of urban transit services including: accessible fixed-route rail and bus transit services for the larger communities and for links between communities; a provision for accessible bus route design to meet special needs, particularly during off-peak periods or in areas of low demand (e.g., community bus); a variety of door-to-door paratransit services to meet the needs of persons with disabilities, and accessible taxi services [Transportation Development Centre – Safety and Security – Transport Canada, 1998].



#### **Mobility**

Mobility is a quality of life goal. True mobility is reached when connectivity and accessibility are achieved throughout the trip chain. Within the neighborhood, for short trips, non-motorized options like walking and bicycling, minibuses, taxis, non-emergency medical transport, and private cars can be used. For persons with reduced mobility, canes, crutches, manual wheelchairs and motorized mobility aides are used to attain mobility [Suen, Ling S., D'Souza, Alana, and Blais, Daniel. 2007].

#### **Occupant Restraint Systems**

The purpose of the system is to ensure the safety of the passenger in the wheelchair during rapid acceleration or deceleration in transit vehicles. The passenger in the wheelchair/scooter is restrained by an occupant restraint system, typically a three-point belt system similar to those used in cars, with a lap and a shoulder belt. The belt system should be anchored to the vehicle, not to the wheelchair/scooter.

#### **Persons with Functional Limitations**

Persons with functional limitations refer to individuals with restricted or limited abilities to perform within the perceived normal range of activities. [World Health Organization, 1980].

#### Persons with Transportation Disabilities

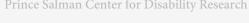
A subset of persons with functional limitations defined as, "individuals who, because of their health problems or condition, are unable to use transportation services, or use transportation services with more difficulty than those in the general population" [Health and Activity Limitation (HALS) Questionnaire, 1991]. The following describes various disability groups and their requirements while traveling [Meriläinen, A. and Helaakoski, R., 2001]:

#### Physical Disability

This group includes people who have locomotor disabilities, which affect agility and mobility. The two subgroups include:

1. ambulatory people able to walk with human assistance or mobility aids, such as crutches, sticks, braces or walkers, and













2. people who cannot move without the use of wheeled equipment for mobility such as wheelchairs, tricycles, push carts, etc. For either type, lack of agility impacts the ability to handle fares and to maintain stability while boarding and within moving vehicles. For individuals with mobility restrictions, the barrier to overcome is level change (as pedestrians and as passengers in vehicles).

#### Sensory Disability

This group includes people who, as a consequence of visual or hearing impairment, may be restricted or inconvenienced in their use of transportation modes. The two subgroups include: 1) visuallyimpaired/blind persons, who rely on their sense of hearing, touch and smell; hence, as a traveler, the issue is orientation and wayfinding. 2) hearing/speech-impaired persons, who rely on their sense of sight, touch and written information; hence, as a traveler, the issue is communication and information.

#### Cognitive Disability

This group includes people who have a mental illness, a developmental or a learning disability. Hence, as a traveler, the issue is safe, independent travel.

#### **Transportable Mobility Aids**

Transportable mobility aids refer to devices with the dimension, weight, degree of maneuverability, and turning radius of devices that can be accommodated and secured in a transit or moving vehicle.

## Transportation Disadvantaged

These are persons who do not own a vehicle or have difficulty accessing conventional public transportation. Included are: low income, youth, non-drivers, mothers with baby strollers, persons who do not speak the local language, and people unfamiliar with public transportation services [Suen, Ling S., D'Souza, Alana, and Blais, Daniel, 2007].

## **Transportation System**

A transportation system is composed of three elements: right-ofway (path), terminal (origin, destination), and vehicle [Suen, Ling S., D'Souza, Alana, and Blais, Daniel, 2007].









#### • Trip Chain

The links (path, vehicle) and nodes (stops, transfers) that a traveler experiences in a trip in order to travel from Point A to Point B; "home to curb, curb to vehicle, ride in vehicle, transfers, vehicle to curb, curb to entrance of building, entrance to destination" [Suen, Ling S. and Mitchell, Christopher (Kit), 1999].

#### • Wheelchair Securement Systems

When a wheelchair is used as a seat on public transportation, it should be fastened in some fashion to the transporting vehicle such as that the wheelchair is secure and safe as a permanent seat on the vehicle. Wheelchair securement systems are primarily mechanical devices designed to hold the wheelchair in place during rapid acceleration or deceleration. There are two type of securement systems used in vehicles: forward-facing and rear-facing [Hunter-Zaworski, K.M. and Zaworski, J.R, 2001].









#### 2.3.1 Design Considerations

The spatial requirements and movement profiles of persons using wheelchairs, mobility scooters and other mobility devices, as well as persons with luggage, prams or strollers are, as varied as the individuals themselves. Traditional approaches to accessibility have been conservative in nature, catering to the needs of physically strong individuals using manual wheelchairs – which is an exceptionally narrow characterisation. True universal accessibility should address the needs of all users, including those with limited strength, those using larger mobility devices, as well as others who other wheeled mobility devices such as prams, strollers and wheeled-luggage. This manual aims to more accurately reflect the vast array of equipment that is used by persons to access and use facilities, as well as, the diverse range of user ability. Emphasis is placed on appropriate space allowances that accommodate the dynamic movements of people using wheelchairs, mobility scooters, or other assistive devices.

## 2.3.2 Application Guidelines

Space and reach requirements for persons who use wheelchairs, mobility scooters, and other wheeled mobility devices, including strollers and luggage on wheels, should comply with this section.

#### 2.3.3 Technical Guidelines

- **a. General:** All pedestrian access routes and areas should provide sufficient space to accommodate all people.
- **b. Clear Floor Space:** Figure 7 outlines the minimum requirements for clear floor space or ground space.





Type of User	Clear Floor Space Requirements	Figure Reference
Person with a pram or stroller	Clear floor area at least 1650 mm long and 650 mm wide	Figure 8
Person with luggage	Clear floor area at least 1500 mm long and 700 mm wide	Figure 9
Person using crutches	Clear floor area 810-920 mm wide	Figure 10
Person using a walker	Clear floor area at least 710 mm wide	Figure 11
Person using a long cane	Clear floor area 900-1500 mm wide	Figure 12
Person using a manual wheelchair	Clear floor area at least 1300 mm long and 800 mm wide	Figure 13
Person using a power wheelchair	Clear floor area at least 1360 mm long and 800 mm wide	Figure 14
Person using a mobility scooter	Clear floor area at least 1400 mm long and 800 mm wide	Figure 15

Figure 7. Clear Floor Space Requirements

The minimum clear floor space or ground space for wheelchairs or mobility scooters should be designed for a forward or parallel approach to objects.

The knee space required under some objects may be incorporated into the clear floor space or ground space requirements.

One full side of a clear floor space for a wheelchair or mobility scooter should adjoin, or may overlap an accessible route or may adjoin another wheelchair clear floor space.







Additional manoeuvring clearances should be provided as shown in Figures 18-21 for clear floor space that is located in an alcove or otherwise confined on all or part of three sides.

- **c. 360 and 180 Degree Turn:** 2100 mm in diameter of clear floor space is required for most wheelchairs and mobility scooters to make a 180 or 360-degree turn (Figure 16).
- **d. 3-Point Turn:** A T-shaped space as shown in Figure 17 is required for most wheelchairs and mobility scooters to make a 3-point turn.
- **e. Side Reach:** When a parallel approach to an object is used, the maximum high side reach should be 1350 mm, and the low side reach should be no lower than 250 mm above the floor (Figure 22). All reach and clearances should be as shown in Figures 23 and 26 if the side reach is over an obstruction.
- **f. Forward Reach:** When a forward approach to an object is used, the maximum high forward reach should be 1200 mm, and the low forward reach should be no lower than 450 mm above the floor (Figure 24). All reach and clearances should be as shown in Figures 25 and 27 if the forward reach is over an obstruction.
- g. Knee Space, Toe Clearance and Lap Space for Seated Persons: A clear knee space at least 685 mm high and 280 mm deep should be provided, as well as a further clear toe space at least 300 mm high and 250 mm deep (Figure 29). Lap clearance should be at least 700 mm high and 600 mm deep (Figure 30).



#### 2.3.4 Illustrations

Source: Fig. 8 – 12, 31 – 36 UDA & Associates / Fig. 13 – 30 City of London 2006

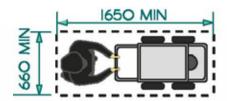


Figure 8. Clear Floor Space for a Person with a Typical Pram/Stroller (see also Figures 26-31)

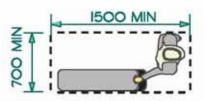


Figure 9. Clear Floor Space for a Person with Luggage



Figure 10. Clear Floor Space for a Person using Crutches



Figure 11. Clear Floor Space for a Person using a Walker



Figure 12. Clear Floor Space for a Person using a Long White Cane

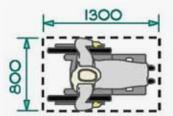
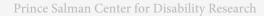


Figure 13. Clear Floor Space for a Person using a Manual Wheelchair













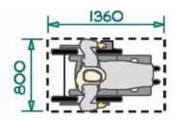


Figure 14. Clear Floor Space for a Person using a Power Wheelchair

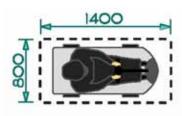


Figure 15. Clear Floor Space for a Person using a Mobility Scooter

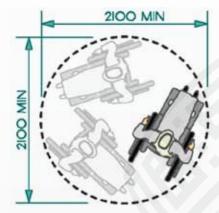


Figure 16. 360° Turning Space for Wheelchair

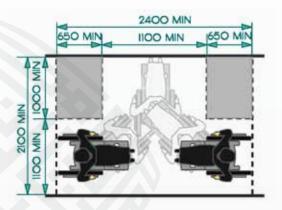


Figure 17. 180° Turning Space for Wheelchair or Mobility Scooter

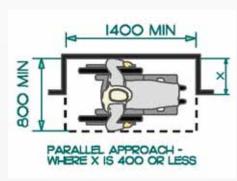


Figure 18. Clearances at Alcove

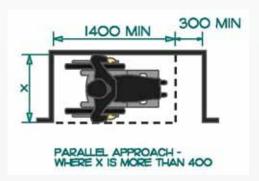


Figure 19. Clearances at Alcove



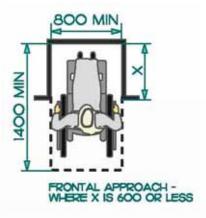


Figure 20. Clearances at Alcove

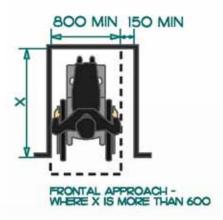


Figure 21. Clearances at Alcove



Figure 22. Side Reach

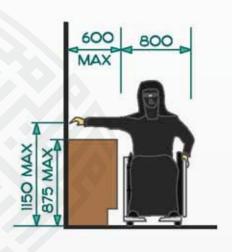


Figure 23. Side Reach over an Obstruction

#### Notes: In Figures 20 and 22

- $\bullet$   $\,$  X should be less than or equal to 625 mm; Z should be greater than or equal to X.
- When X is less than 500 mm, then Y should be 1200 mm maximum
- $\bullet$   $\;$  When X is 500 to 625 mm, then Y should be 1100 mm maximum













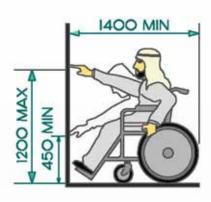


Figure 24. Forward Reach

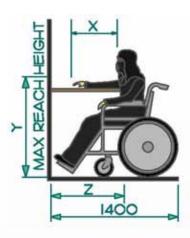


Figure 25. Forward Reach over an Obstruction

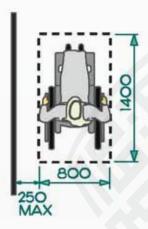


Figure 26. Side Reach - Maximum Distance to Wheelchair

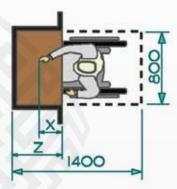


Figure 27. Forward Reach over an Obstruction

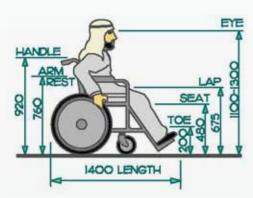


Figure 28. Typical Dimensions of an Adult Manual Wheelchair

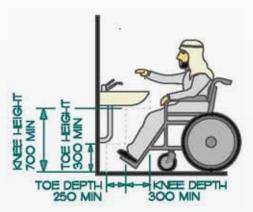


Figure 29. Knee and Toe Clearances





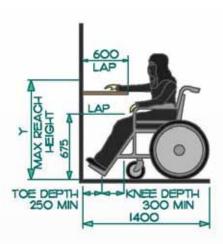


Figure 30. Lap Clearances

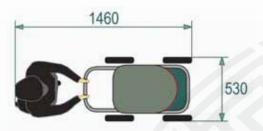


Figure 31. Clear Floor Space for a Single Regular Stroller

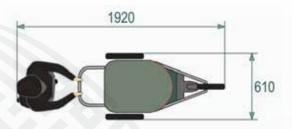


Figure 32. Clear Floor Space for a Single Jogger Stroller

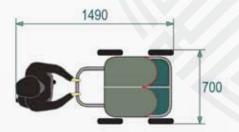


Figure 33. Clear Floor Space for a Twin Side-by-Side Stroller

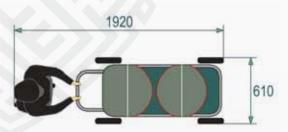


Figure 34. Clear Floor Space for a Twin Tandem Stroller

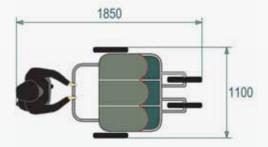


Figure 35. Clear Floor Space for a Triple Side-by-Side Stroller

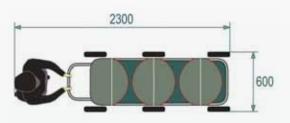


Figure 36. Clear Floor Space for a Triple Tandem Stroller









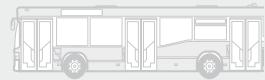


# **UALT Technical and Design Guidelines**











## 3.0 UALT Technical and Design Guidelines

Over the past 20 years, a significant number of guidelines and standards have been published in the ongoing effort to make transportation in developed countries accessible to persons with functional limitations. There are notable differences in the topics covered according to the time they were published and the frequency of updates.

The ADA Guidelines (USA) are the most comprehensive and address all transportation modes. However, they were established two decades ago and the updating process has been slow. The most recent standards will soon be adopted in 2008 by Ontario, Canada under the Accessibility for Ontarians with Disabilities Act, 2005. The standards set out under this Act are baseline requirements and organizations are encouraged to go above and beyond the minimum requirements. These standards are based on the most recent policies and developments in the industry worldwide. The Transportation Accessibility Improvement Law, enacted in 2000 in Japan, obligated new stations, signals, facilities, and vehicles to comply with comprehensive barrier-free standards. The Canadian Standards Association broke new ground in 2002 with standards relating to wheelchair securement systems, allowing for the first time a system that requires no tie-downs or involvement of the driver. The World Wide Web Consortium (W3C) provides and continually updates website accessibility requirements. Finally, the ECMT – which has since been renamed the International Transport Forum (ITF) – has continuously published on this topic in recent years, with discussions on accessible taxis and public transport.

The design guidelines developed in the following sections are based on:

- 1. Known international standards, best practices and expert opinion. Including using basic references as the International Access Symbols in Appendix B
- 2. Anthropometric dimensions of various mobility aids and devices (including strollers) in 2.3 Human Reach and Space Requirements.
- 3. Factors unique to KSA: religious, cultural, and gender considerations
- 4. The entire spectrum of travelers covered in Figure 5 The Universal Design Pyramid: including the following:







- Children
- Seniors & elderly persons
- People with disabilities
- People with temporary disabilities
- Pregnant women
- Obese persons
- Those requiring pram access
- Those requiring luggage access
- Foreigners and illiterate persons

# 3.1 Trip Information

Trip planning is the first step in the complete travel chain. Before embarking on a trip, a traveler needs to acquire all the necessary information from origin to destination in order to complete a timely and safe journey over three stages:

Before embarking on the journey: The information required includes the travel route and mode to take, the frequency and level of service, the number of transfers encountered, the costs and method of fare payment, baggage handling, security screening, and landmarks.

While traveling en route: The information required is time of day, identification of vehicles and arrival times at stops, on-board stop announcements, direction of travel, destination and emergency instructions in vehicles.

Upon exiting and arrival: These include time, location, instructions for transfer and exiting, information kiosks, directional signage, baggage retrieval, security screening, and landmarks.

Information and communication could be conveyed in print, electronic, audio, visual, haptic, touch and data conversion formats [.Canadian Transportation Agency (CTA). 2004. "Code of Practice – Removing Communication Barriers for Travelers with Disabilities"].













### 3.1.1 **Design Considerations**

Traveling can be a stressful experience, especially in an unfamiliar setting. Elderly travelers, persons with sensory or cognitive impairments, illiterate persons and foreigners, and all travelers require adequate and clear transportation information and good signage in legible form for directions. Having this knowledge enhances the sense of security experienced by travelers in a transportation system by reducing uncertainty, decreasing stress and eliminating redundancy in way finding. When designing trip information systems, service providers should be sensitive to the needs of persons who have difficulty reading or comprehending small print and using devices such as telephones, information kiosks, websites, Personal Digital Assistants (PDAs) and personal computers.

### 3.1.2 **Application Guidelines**

Providers of public travel information should conform to all proposed guidelines. Carriers, operators, travel agents, and website providers should ensure that at least two or more methods of information and communication are available.

### **Technical Guidelines** 3.1.3

### 3.1.3.1 **Pre-Journey**

- Alternative Information Formats: Information should be provided in accessible formats, e.g. Braille, cassette, large print and computer disk. Language should be plain, simple and clear with appropriate illustrations.
- **b. Booking Arrangements:** Travel agents, tour operators and airline staff should routinely inquire and take note of passengers who require assistance in traveling. The information should be transmitted to the carriers for action.
- c. Services Provided Upon Request: Assistance with registration at check-in should be made available upon request.









### 3.1.3.2 Pre-Arrival/Booking and Arrival

- a. Advertising materials/websites should contain information relating to accessible phone numbers, i.e. text direct or fax and email addresses in order to book accommodation. Advertising material/websites should mention the equipment and services available, such as: loop systems in bedrooms, public telephones and inductive couplers.
- **b. Reservation desks** at transport terminals should provide "pen and paper" for booking of accommodation or ground transportation either for individual establishments or through a central reservation system.
- **c.** A counter induction loop system or portable loop system should be available. Where glass barriers are in-situ they should be non-reflective.

# 3.1.3.3 Printed Schedules, Braille Maps, Tactile Communication & Signs

- a. Printed schedules should be available in stations, terminals, information kiosks, and travel agencies, as well as through carrier websites. Braille maps should be available in terminals and vehicles.
- **b.** Tactile Communication is best suited to relating qualitative and comparative information such as an object's shape and size relative to those of something familiar to everyone. The same concept should be applied to tactile maps and signs. Quantitative details and abstract ideas can only be communicated if the traveler can read Braille.
- c. Tactile Signs: High visibility and tactile signs should always be used on or adjacent to: washroom doors, elevator call buttons, the top and bottom of flights of stairs, and wherever else it is necessary to show the function of a room They should always be on the latch side of the door openings for safety considerations.







- d. Sign Position: A tactile sign must be positioned where it can be easily touched, that means at a height between 1.4m and 1.7m and at a forward distance of approximately a half a meter i.e. a maximum horizontal stretching distance of 500mm. Consistency in mounting height is critically important to persons with functional visual limitations. All tactile signs should be mounted so that the top line of tactile characters on the signs is at the same height from the finished floor. The reach of wheelchair users should be taken into consideration when mounting tactile signs.
- **e. Mounting Angle:** If the message on a tactile sign is too lengthy to fit within the recommended upper/lower limits, signs can be mounted at an angle, to provide additional message space.
- **f. Embossing Depth:** A tactile sign must be embossed, not engraved. The depth of embossing must be 1 mm to 1.5 mm and the stroke width 1.5 mm to 2 mm. The edges should be slightly rounded (a half-round section is not acceptable). The minimum character height should be 15mm, the maximum 60mm. Tactile signs should be accompanied by Level 2 Braille.
- **g. Special Characters:** For tactile lettering, use white upper- and lower-case letters on a black background. Special care must be taken with certain letters. Zero's for example, have slashes in the middle to distinguish them from the letter "O", and the number four is somewhat open at the top, so as not to be confused with the letter "A".
- h. Tactile Maps: Tactile maps need to be larger and simpler than visual maps to convey the same information. A minimum of 5mm shall be left between parallel lines and 3mm between adjacent symbols. Varying the height of symbols helps users to decipher them, but too many symbols create 'tactile noise'. Tactile maps must be carefully designed to give information without clutter and must be easily accessible. Different textures can be used



to signify different types of datum, although the number of readily recognizable different textures which may be distinguished is limited to four.

### 3.1.3.4 Access to Website and Interfaces

The following guidelines are adapted from the "W3C Web Content Accessibility Guidelines." (W3C, 1999).

- a. Text Tags: A text equivalent for every non-text element should be provided (e.g. via "alt", "longdesc" or in element content; the LONGDESC tag is implemented by placing a textual description of an image in a separate file. No one else can see a LONGDESC tag, except a user with a screen reader).
- Every image, Java applet, Flash file, video file, audio file, plug-in etc. that conveys content should have an equivalent "alt" description or text description, or is described in the adjacent text.
- Complex graphics (graphs, charts etc.) should be accompanied by detailed text descriptions, either through a description in the body of the page, a link to a description on a separate page, or the "longdesc" attribute.
- "Alt" descriptions for images should be used as links.
- Decorative graphics with no other function should be inserted as background images using CSS and should have an empty "alt" description (alt="").
- There should be equivalent alternatives for any multimedia presentation.
- Video files should have synchronized captions.
- Audio files should have captions and/or transcripts.
  - **b.** Color: Web pages should be designed so that all information conveyed with color is also available without color, for example from context or markup. Color should







not be used solely to convey important information. Sufficient contrast should be provided.

- **c. Readability:** Documents should be organized so they are readable without requiring an associated style sheet. Style sheets should be used for layout, but the document should still be understandable (even if less visually appealing) when the style sheet is turned off.
- **d.** Server-Side Image Maps: Redundant text links should be provided for each active region of a server-side image map. Separate text links should be provided outside of the server-side image map to access the same content that the image map hot spots access. Client-side image maps should not be used to provide the same hot spot areas.
- e. Client-Side Image Maps: Client-side image maps should be provided instead of server-side image maps except where the regions cannot be defined with an available geometric shape. Client-side image maps should be used and appropriate "alt" text provided for the image as well as each hot spot region.
- f. Table: Row and Column headers should be identified for data tables. Markup should be used to associate data cells and header cells for data tables that have two or more logical levels of rows or column headers. Data tables should have the column and row headers appropriately identified (using the "th" tag). Tables used strictly for layout purposes should not have rows or column headers. Data table cells should be associated with the appropriate headers (e.g. with the "id", "headers", "scope" and/or "axis" attributes).
- **g. Frames:** Frames should be titled with text that facilitates frame identification and navigation. Each frame should be given a "title" that describes the frame's purpose or content.



- h. Flicker Rate: Pages should be designed to avoid screen flicker of a frequency greater than 2Hz and lower than 55Hz. Page elements that flicker at a rate of 2 to 55 cycles per second should not be used, thus reducing the risk of optically-induced seizures.
- i. Text-Only Alternative: A text-only page, with equivalent information or functionality, should be provided to make a website comply with the provisions of these standards when compliance cannot be accomplished by any other means. The content of the text-only page should be updated whenever the primary page changes.
- A text-only version should be created only when there is no other way to make the content accessible or when it offers significant advantages over the "main" version for certain types of functional limitation.
- The text-only version should provide equivalent content and be up-to-date with the "main" version.
- The text-only version should provide the functionality equivalent to that of the "main" version.
- An alternative should be provided for components (e.g. plug-ins, scripts) that are not directly accessible.
  - **j. Scripts:** When pages utilize scripting languages to display content or to create interface elements, the information provided by the script should be identified with functional text that can be read by assistive technology. Information within the scripts should be text-based, or a text alternative be provided within the script itself. All scripts (e.g. JavaScript pop-up menus) should either be directly accessible to assistive technologies and the keyboard or an alternative method of accessing equivalent functionality should be provided (e.g. a standard link).
  - **k.** Applets and Plug-Ins: When a web page requires that an applet, plug-in or other application be present on a client system to interpret page content, the page should provide a link to a plug-in or applet. A link should be



provided to a page where the plug-in can be downloaded. All Java applets, scripts and plug-ins (including PDF files and PowerPoint files, etc.) and the content within them should be accessible to assistive technologies, or else an alternative means of accessing equivalent content should be provided.

- **1. Electronic Forms:** When electronic forms are designed to be completed online, the form should allow people using assistive technology to access the information, field elements, and items functionally required for completion and submission of the form, including all directions and cues. Additionally:
- All form elements should have text labels;
- Form elements should have labels associated with them in the markup (i.e. the "id" and "for" or "label" elements), and
- Dynamic HTML scripting of the form should not interfere with assistive technologies and should be keyboard accessible.
  - **m.** Navigation Links: A method should be provided that permits users to skip repetitive navigation links. A link should be provided to skip over lists of navigational menus or other lengthy lists of links.
  - **n. Time Delays:** When a timed response is required, the user should be alerted and given sufficient time to indicate that more time is required. The user should have control over the timing of content changes.
  - **o. Validation:** Web pages should be validated using both automatic tools and human review in order to identify any accessibility issues including clarity and ease of navigation



## 3.1.3.5 Access to Travel Agents

Travel agents should have equipment to communicate with people who are deaf or have severe hearing impairments that do not allow them to use regular phones. Travel agents should be trained to communicate with persons who have speech and cognitive impairments and should provide alternative media access, such as printed materials, or text-messaging equipment.

### 3.1.3.6 Telephone, PDA, and Cellular Phones

- a. All public pay phones should have volume controls and visual displays for instructions and use. There should be at least one lower mounted public phone for every phone bank accessible for a person in a wheelchair/scooter (Figure 45).
- b. Extremely small keys and small text/symbols create problems for person with low vision and those with agility problems (Figure 37). Cell phones are practical devices for orientation and way finding in places where street addresses and house numbers are not prevailing. The tendency today is to combine cell phone and PDA technologies to provide audio communication, text messaging and Internet access into one. Some devices are also incorporating GPS technology for way finding. The vibrating features of cell phones can also be useful for deaf or hard of hearing persons hearing to signal incoming messages or callers at the door.
- c. Due to the various telecommunication tools used by different travelers, alternatives to a voice telephone line such as a TTY line, e-mail or web-based reservation or information systems should be prerequisites for direct communication with some travelers with disabilities.
- d. TTY numbers need to be publicized wherever voice telephone numbers are printed so that travelers who have severe to moderate functional hearing limitations can also take advantage of promotions and specials available to other travelers.







e. An automated messaging system may be a quick and convenient way to book a trip or provide information, but can also create barriers to effective communication for travelers with functional hearing, speech or cognitive limitations as well as many of the elderly. Travelers with disabilities may also have questions or reservation requirements that cannot be addressed within the standard options provided. Communicating with a live operator will assure travelers that their questions are answered adequately and that their reservations have been completed successfully.



Figure 37. PDA Concept with Large Controls and Text Display Personal Digital Assistants (PDA) with large keys for persons with agility problems. Source: Rutenberg Design Inc., Canada



### 3.1.3.7 Information on Land Vehicle Access

Transport carriers should provide information in an accessible format on vehicle accessibility, including:

- a. Information for reservation policy, e.g. for intercity buses with lift, which should include the time required for making a reservation.
- b. Information on train travel, e.g. accessible washrooms.
- c. Information on special vehicles, e.g. seating capacity.

### 3.1.3.8 Fare Payment and Ticketing Information

Ticket and schedule information should be available in alternative formats from carriers, operators, travel agents and information centers by telephone, online, onboard vehicles and in stations and terminals.

- a. Fare payment methods should include payment over telephone, online, onboard vehicles, and in stations and terminals, and should address the requirements of persons who have agility problems, are blind or have low vision, are deaf/hard of hearing, or have cognitive impairments.
- b. Payment over telephone with carriers or travel agents should require the use of a compatible hearing aid for passengers who are hard of hearing.
- c. Online payments should require the use of personal computers, cellular phones, and Personal Digital Assistants (PDAs, such as Blackberry-type devices). For persons with agility problems, special features, such as large keys, should be used; for persons who cannot use their hands/fingers, special interfaces are required (Figure 37) for blind people, screen reader programs should be installed; and for elderly and those with low vision, font enlargements on websites are needed (Figure 38).













Figure 38. Accessible Website with Text Increase Option
Transport Canada web page, Canada,
Source: http://www.accesstotravel.gc.ca/lts/local\_main-e.asp

- d. In terminals, for ticket and schedule information, printed material, and alternative information at ticket counters for person who are deaf/hard of hearing should be provided via loop systems, or sign language.
- e. Automatic ticket vending machines (Figure 39) in terminals should address the requirements of travelers with disabilities with regard to information provided and legibility.
- f. Vending and ticketing machines should have a clear, level floor area at least 800mm wide x 1400mm should be provided at controls and operating mechanisms, such as dispensers and receptacles, for a forward approach. A clear, level floor area of 1400mm by 1400mm can accommodate both a forward and parallel side approach.
- g. The controls and operating mechanisms on vending and ticketing machines (including input and retrieval areas) should be at a maximum height from the floor of 1200 mm and at a minimum height from the floor of 450 mm to their centerlines. Controls and operating mechanisms



should be operable with one hand, without tight grasping, pinching, or twisting of the wrist, and with a force of less than 20N.

- h. Signage on vending (Figure 46) and ticketing machines should be in highly contrasting lettering and at least 13mm high. Signage on machines should be tactile, contain Braille explanations, and have pictograms available.
- i. The operating controls and mechanisms should be accessible and usable by a person seated in a vehicle.



Figure 39. Automatic Ticket
Vending Machine, available
throughout train terminals in France.
Source: Rutenberg Design Inc.
Canada.

## 3.1.3.9 Pre-Boarding Route or Destination Announcements

Ticket and schedule information should be available in alternative formats from carriers, operators, travel agents and information centers by telephone, online, onboard vehicles and in stations and terminals.

- a. For all services that do not require pre-booking, the transportation provider should ensure that the operator audibly announces the route, direction, destination or the next major stop of the vehicle, orally or through electronic means, at the boarding point and en-route.
- b. Pre-boarding and announcements in stations and terminals should be provided in audio and text mode simultaneously for passengers with hearing and cognitive impairments. Audio destination announcements in vehicles should be provided in text format also (Figure 40).







Figure 40. Digital Text Display on Subway, Télécité Visual Communication Network (VCN) system, Montreal, Quebec, Canada Source: UDA & Associates

### 3.1.3.10 Route or Destination Signage

a. The transportation provider should legibly display or ensure that the operator legibly displays the route or direction, destination or next stop of the vehicle such that it is visible at the boarding point and en route (Figure 41).

b. Where route or destination signs are displayed on the vehicle, the transportation provider should ensure that all new vehicles have signs that:

- Are illuminated;
- Have non-glare surfaces;
- Are positioned to minimize glare, and
- Use characters that provide high contrast with the background.

c. Where route or destination signs are used on the vehicle, the transportation provider should ensure that all new vehicles have signs that resemble solid characters.

Where destination or route information is displayed on the exterior of the vehicle (Figure 42), illuminated signs should be placed at the front and boarding side of the vehicle. Characters on signs should have:



- A width-to-height ratio of between 3:5 and 1:1;
- A stroke width-to-height ratio of between 1:5 and 1:10;
- A minimum character height of 25mm for boarding side signs (using an uppercase "X") and 50mm for front signs;
- Spacing of 1.5mm; and
- A contrast with the background (light-on-dark, or dark-on-light).

### 3.1.3.11 International Access Symbols

Refer to: Appendix B

### 3.1.3.12 Emergency and Evacuation Information

Emergency and evacuation systems should be of an accessible design. When using stroboscopic or pulsating light system to alert persons with moderate to severe functional hearing limitations in case of emergency, a net flash rate for a bank of strobe lights should not exceed 5 flashes per second, at which only 5 percent of photosensitive epileptics are at risk. Special (battery-operated) lighting may be needed for signs that must be visible during emergency conditions, e.g. power failures.

# a. Visual Alarms (Figure 43)

**Location:** Visual alarms should be located in conjunction with audio alarms and should be placed at 2100 mm above the floor level within the space or 150 mm below the ceiling, whichever is lower.

Visibility: In general, no place in any room or space, common corridor or hallway, required to have a visual alarm or a visual signal appliance, should be more than 15 meters from the signal (in the horizontal plane). In large rooms and spaces exceeding 30 meters across, without obstructions and at 2000 mm above the finished floor, such as auditoriums, devices may be placed around the perimeter, spaced a maximum of 30 meters apart, in lieu of suspending appliances from the ceiling.



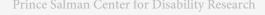












Figure 41. Onboard Destination Route Display on Intercity Bus Monitor, Canada



Figure 42. Destination or Route Information Displayed on Exterior of Vehicle, LED Sign with Large Fonts and Color Contrast, Las Vegas, USA

Source: Rutenberg Design Inc. Canada

**Lamp:** Visual alarms and signals should be a Xenon strobe type or equivalent.

**Colour:** The colour of the visual alarm output should be clear or a nominal white (i.e. unfiltered or clear filtered white light).

**Pulse Cycle:** The maximum pulse duration should be two-tenths of one second (0.2 sec) with a maximum duty cycle of 40 percent. The pulse duration is defined as the time interval between initial and final points of 10 percent of maximum signal.

**Intensity:** The intensity of the visual alarm signal should be a minimum of 75 candelas.

Flash and Flash Rate: The flash rate should be a minimum of 1 Hz and a maximum of 3 Hz. The visual alarms should be synchronized to flash in unison with flash rates set to minimize the risk of triggering an epileptic seizure.



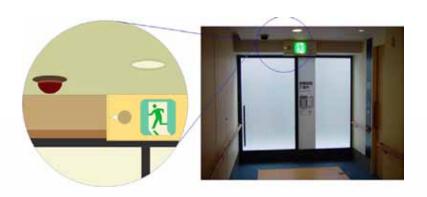


Figure 43. Visual Alarm Above Emergency Exit, ceiling strobe visual alarm, Japan Source: UDA & Associates

### b. Audible Alarms and Warnings

- Audible alarms should exceed the ambient noise of a setting by 15decibels, or exceed any maximum sound level with a duration of 30 seconds by 5 decibels, depending on which is louder.
- Audible alarms should not exceed 120 decibels, and should provide intermittent noise.
- Where possible, the alarm should be placed immediately above an emergency exit door.
- Audible warnings should be between 500 and 3000 Hz. Use frequencies below 500 Hz if the sound must bend around obstacles or pass through partitions. Use a modulating signal (1 to 8 beeps per second, or warbling that changes 1 to 3 times per second). Present the signal for at least 0.5 to 10 seconds.

### c. Evacuation from Platforms

• For emergencies and help required on the platform, "SOS" type communication (such as hotline telephones) should be provided, clearly marked and positioned on the platform in highly visible colors and signage. Two-way communication and a "Help" button should be provided











for persons who can speak and/or hear.

Emergency and evacuation procedures should avoid the use of elevators and escalators. Trained staff should carry or move persons who are unable to walk or in a wheelchair along evacuation routes in tunnels or on guide ways, down stairs or on ramps. It may be necessary to take persons out of their wheelchair/scooter and transport them on stretchers or similar equipment, such as Evacu-trac, to safety.

### d. Evacuation from Vehicles

- Signage for emergencies and evacuation instructions in vehicles should be provided in large print, minimum 18pt bold, title case, fonts without serif, and accompanied with symbols/illustrations. Text and symbols should be backor front-lit without glare. Operating components to initiate emergency calls, such as levers, pull/push handles and alike should be in high-contrast color and within reach of a standing person between 1200mm-1800mm from the floor. Real-time instructions should be provided in audio and text format.
- An emergency call button should be placed in the priority seating and wheelchair space area, about 750 mm - 1000 mm above the floor.

#### **Arrival Information** 3.1.3.13

At arrival, information should be provided in alternative formats for elderly and disabled passengers for transfers, ground transportation alternatives, medical, wheelchair repair/exchange and emergency contacts. This should be in the form of large print, tactile maps, access to websites via PDAs, or at accessible information kiosks (Figure 44). This information is particularly important when arriving at stops and stands in rural areas. Information should be provided with printed material, such as printed maps of the area, access to a public phone and help lines.













Figure 44. Self-Serve Information Kiosk, prototype model with multilingual touch screen, text and audio display, Pierre Elliot Trudeau Airport, Dorval, Quebec, Canada

Source: Rutenberg Design Inc.

### a. Accessibility of Electronic Information

**Information** should be left on the screen for at least twice the normal reading. A display time of 10 to 20 seconds should be used.

Navigation of electronic information should be clear and consistent.

**Icons:** Icons should be recognizable by all expected users. International symbols should be used where possible.

Display Time / Scroll Rate on Electronic Media: Scrolling information is very difficult for a person with a functional visual limitation; therefore text should be displayed in a fixed manner if possible. If scrolling is used, information should be left on the screen for at least twice the normal reading time. A fixed time of about 10 seconds is likely to avoid confusion [so a display time of 10 to 20 seconds should be used.

## **b. Accessibility of Audible Information**

**Sound Intensity** should be about 68dB(A). Very short exposures should not exceed 135dB(A), except for impulse noise whose instantaneous level should never exceed 150dB(A).







**Peak noise criteria** should be no more than 40PNC. Signal to noise ratio should be a minimum of +10dB (S/N).

The reverberation time should be as low as possible, preferably less than 1 second.

Noise level should not exceed 70dB(A) to avoid speech interference.

**Sound frequencies** should be between 500 and 3000Hz, as the ear is most sensitive in this range.

Sound systems with loudspeakers should be designed with professional advice, according to human factor principles.

Sound Intensity is the sound level or loudness: the pressure of the sound waves. The loudness is measured as the ratio of the sound pressure to that of the pressure for a just-audible sound. The ratio is logarithmic, to enable the enormous range of audibility to be expressed in convenient numbers. The unit of loudness (i.e. the human perception of intensity) is the decibel or dB(A). A quiet office might measure 55 dB(A) and a busy office would measure about 68 dB(A). Very short exposures should not exceed 135 dB(A), except for impulse noise whose instantaneous level should never exceed 150 dB(A). A change of 3dB means doubling the physical effect of the noise; small changes in level are thus important.

### c. Tactile Information

Tactile maps should be large and simple. A minimum of 5 mm shall be left between parallel lines and 3mm between adjacent symbols. Tactile maps should avoid clutter.

Refer to: 3.1.3.3 Printed Schedules, Braille Maps, Tactile Communication & Signs.







# **d. Accessibility of Telecommunication Systems** (Figure 45)

Communication with a live operator should be assured.

Refer to: 3.1.3.6 Telephone, PDA, & Cellular Phones

## 3.1.4 Illustrations



Figure 45. Accessible Phone Bank with One Lowermounted Public Phone to Accommodate a Person in a Wheelchair/Scooter

Source; Illustration adapted from Inclusive Mobility: A Guide to Best Practice on Access to Pedestrian and Transportation Infrastructure (Department for Transport, Traffic Advisory Unit, 2002, UK, P. 53)



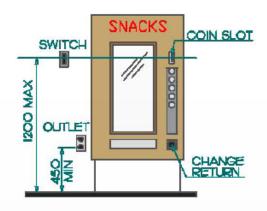


Figure 46. High Contrast Lettering on Vending Machines (example of proper signage on a vending machine)

Source: Figure B.4.4.3.1.

# 3.1.5 Other Considerations

- 3.1 Taxis and Limousines (Urban and Intercity)
- 3.3 Special Vehicles
- 3.4 Urban Buses
- 3.5 Light Rail Transit
- 3.6 Bus Rapid Transit
- 3.7 Metro/Subway
- 3.8 Commuter Rail
- 3.9 Intercity Buses
- 3.10 Intercity Rail



# 3.2 Taxis and Limousines (Urban and Intercity)

Urban or intercity city taxis and limousines are cars operated by a licensed driver whose job is to take passengers, with or without luggage, to their destinations, for a fare. A standard taxi vehicle is a four-door sedan or minivan with a license plate. It has an illuminated dome on the roof indicating its availability ("free" when lit, or "occupied" when unlit). There are several methods of determining fares: based on mileage and standing time as calculated by the taximeter, fare based on zones or by negotiation, especially for intercity trips. A limousine is typically a roomy sedan with four doors and is available in both standard and stretch versions. Limousines usually charge a set fare based on distance or zones, and are usually stationed at hotels and transport terminals. All taxis and limousines can be hired by phone, but only an urban taxi can be flagged from the street or hired from a stand.

Urban and Intercity taxis usually have a different color or other markings for easy identification. The intercity taxi is a unique in KSA for long distance travel and provides a convenient service to rural areas (Figure 47, 48). It requires a separate operating license than the urban taxi. It can be hired by phone or at the intercity terminus. Intercity taxis may not require a lighted dome. It may have off road capability to serve rural areas.





Figure 47. Standard Four-Door City Taxi used in KSA

Figure 48. Yellow Intercity Taxi used in KSA

Photo Source: UDA & Associates



### 3.2.1 Design Considerations

At the time of writing, taxis are the main public transportation in existing KSA cities due to the low level of public bus transit services available. Existing taxi vehicles and services are not accessible to passengers in wheelchairs without transfer. It is important to render this ubiquitous transportation services accessible. The main issues with taxis or limousines are the door width and height of entry in and out of the vehicle for persons who have mobility impairments, especially the boarding and placement of passengers in a wheelchair. Persons with sensory impairments may not be able to see, read, hear or understand the information provided by the driver, and require alternative methods of communication. Fare payment methods should account for persons with limited agility and vision.

When designing for taxi stands and intercity taxi terminus, consideration should be given to the vertical difference between the road/sidewalk/platform and the vehicle floor. For persons with sensory impairments, in vehicles, on stands, and within terminals, information should be conveyed in several mediums: audio, text and tactile formats.

## 3.2.2 Application Guidelines

All providers of urban/intercity taxis and limousine services should comply with the following guidelines. Vehicles should be identified for hire and be equipped with systems that allow passengers with mobility impairments and strollers to access the vehicle. Information and communication alternatives for sensoryimpaired passengers should be provided as well as fare payment options.

Due to the vehicle size and technical limitations for door openings and interior spaces, the taxi or limousine vehicle may be unable to accommodate several passengers using mobility aids, or a person using large mobility aid, or parents with oversize strollers.

### 3.2.3 Technical Guidelines

### 3.2.3.1 Identification

 The urban taxi or limousine should have a different color from the intercity taxi, and a dome light indicating free or occupied service.







The International Access Symbol should be shown on the front and rear of the vehicle, as well as on the side(s) where passengers board.

#### 3.2.3.2 **Accessible Taxi and Limousine**

Independent operators, brokerages or dispatch services providing taxi/limousine services should ensure that accessible vehicles conform to applicable legislation and regulations.

### 3.2.3.3 Taxi and Limousine Registration Numbers

Independent operators, brokerages or dispatch services providing taxi/limousine services should place registration numbers on the exterior of the vehicle adjacent to entrance doors. Exterior taxi registration numbers should be at least 150mm in height, and have high color contrast with their background.

### 3.2.3.4 Taxi and Limousine Registration Information

Independent operators, brokerages or dispatch services providing taxi/limousine services should make available taxi/limousine registration information in Braille and large print formats in easily accessible locations inside the vehicle (Figure 49).

### 3.2.3.5 **Boarding/Deboarding Points**

Where a passenger is unable to board/deboard at a designated accessible stop because of a temporary barrier, the transportation provider should ensure that the driver allows passengers to board/deboard at the next available safe location. This is especially important in unpaved areas.

#### 3.2.3.6 **Doors**

Doors should have a minimum width clearance of 800 mm. Persons with large strollers, for instance a triple side-by-side stroller measuring 1100 mm in width, may







be restricted in access by the width of the entrance door of 800 mm and the interior space available in the vehicle. In these cases, direct assistance or an alternative transportation service should be made available.



Figure 47. Taxi Registration Information in Braille and Large Print Source: UDA & Associates

## **3.2.3.7** Occupancy

Due to the size and technical constraints, the number of persons using a wheelchair may be limited in a taxi or limousine vehicle.

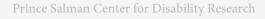
# 3.2.3.8 Family and Gender Seating

If the number of family and gender passengers exceeds the number of seats in the back of the taxi/limousine, another vehicle should be made available. The seat beside the driver can only be occupied by a male passenger.

# 3.2.3.9 Lifting Devices, Ramps, or Portable Bridge Plates

The transportation provider should ensure that boarding equipment such as lifts, ramps or bridge plates are available for use by seniors, persons with mobility aids or strollers and those who cannot negotiate steps or stairs (Figure 50).













- 54). The mobility aid should be secured in the taxi, in a forward-facing position with an occupant restraint. Low floor vehicles should provide a ramp, high floor vehicles a lift. Bridge plates should be used if there is a horizontal gap between the vehicle floor and a platform/curb but not a significant vertical difference of 50mm or less. Present payload guidelines for lifts and ramps specify 400kg for a mobility aid plus the occupant. This may not be sufficient for the present trend in the increase of obesity and heavier and larger scooters and power chairs.

The transportation provider should ensure that the operator does not deploy lifting devices, ramps, or portable bridge plates if he deems the location or stop to be unsafe.

The transportation provider should also ensure that each end of boarding/deboarding/lifting devices, ramps, or portable bridge plates be marked by a color strip with high-color contrast to its background that runs the full width of the device or plate (Figure 58).

### a. Low Floor Taxi and Limousine

Converted vans with a low floor and accessible doors on both sides with ramps should be used where possible to accommodate the full height of a large person in a wheelchair with clear headroom, and persons with strollers.

Low floor taxis with side doors facilitate easier boarding from curb level with less ramp gradients than rear door taxis that board from the road level and require a longer ramp (Figure 54).









Figure 50. Converted Van and Custom Designed Low floor Accessible Taxi with ramp used in several cities in Canada Source: Rutenberg Design Inc. Canada



Figure 51. Four door sedan taxi. New universal taxi design by Standard Taxi, New York City, New York, USA

Source: www.standardtaxi.com



Figure 52. Four door taxi with stroller boarding up ramp, New York City, New York, USA, Source: www.standardtaxi.com















Figure 54. Ramp for Back Entry of accessible taxi in San Francisco, California, USA Source: UDA & Associates



Figure 53. Figure 53: Taxi Boarding Ramp. UK taxi van with ramp on the side for wheelchair Source: www.portaramp.co.uk



### 3.2.3.10 Wheelchair Securement and Occupant Restraint Systems

Taxis and limousines should use forward-facing securement system combined with an occupant restraint. Forward-facing securement systems (Figure 57) should withstand decelerating forces of 8000N. They should confine rearward movement and tipping. Most forward facing securements use four belts anchored to the vehicle floor, two for the front, and two for the rear that are connected by hooks to the mobility aid. The forwardfacing securement requires the use of an occupant restraint typically comprised of three belts (similar to a passenger car's three point systems) to restrain the occupant. The occupant restraint system should be independent of the securement system. Each anchorage point of the occupant restraint should have the strength to resist at least a 4000N deceleration force and should be anchored to the vehicle, not to the mobility aid or the securement.

## 3.2.3.11 Boarding/Deboarding Assistance

- The transportation provider should ensure that the driver provide routine boarding/deboarding assistance to passengers with disabilities when required in accordance with Islamic custom without jeopardizing health and safety for both parties. This includes assisting the passenger in a wheelchair into the securement position or transferring the passenger from a wheelchair into a seat.
- The transportation provider should ensure that drivers do not request the assistance of other persons, other than personal care attendants, for routine boarding/deboarding assistance to a passenger with a disability except upon requests or consents from the said passenger (Figure 55).
- Where a passenger is unable to board/deboard at a designated accessible stop because of a temporary barrier, or in unpaved areas, the transportation provider should ensure that the driver allows passengers to board/deboard at the next available safe location. This is especially important in rural areas.











## 3.2.3.12 Navigation & Automatic Vehicle Location (AVL) Systems

Both, the navigation system in cars and the AVL system use the Global Positioning System (GPS). The operator inputs the destination and the system finds the most efficient way to destination. It is interactive. To facilitate way finding and to ensure driver's and passenger's safety, the urban, intercity taxi and limousine should be equipped with a GPS navigation system, as well as an AVL system (Figure 56).





Figure 56. In-Vehicle Navigation System. Screen showing text and audio display of route, arrival time and travel distance,

Garmin, USA

Source: Source: www.gpscentral.ca





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### 3.2.3.13 Fare and Notices

- Rates and communication or emergency information notices should be clearly posted for sensory impaired persons and foreigners.
- The same fare should be charged for a passenger in wheelchair as for other passengers.
- For sensory, cognitively-impaired, foreigners and illiterate persons, the transportation provider should provide alternative means of communicating fare information, such as talking meters, and onboard loop systems. Fare display should be in text and audio format. The vehicle should be equipped with a printer for the issuance of receipts.
- Prepaid proximity cards (contact-less cards) that require less hand dexterity and benefit persons with limited mobility should be considered within the taxi environment.

# 3.2.3.14 Emergency and Evacuation

Clearly posted evacuation and emergency warnings and instruction, in large print and in Braille, should be provided in the vehicle.

# 3.2.3.15 Vehicle Interfaces with Stops and Stands

Taxi stands and stops should have a minimum of a sign post with a telephone number, fare structure and street name. As a minimum, stops should have a paved, slip-resistant surface. The front edge of the paved surface should have a bright colored band. If not leveled with the road, a curb cut should provide access for disabled and elderly persons. Stops should include a bench for seating. Intercity taxis can be called by phone or hired at intercity taxi terminus.











### 3.2.4 Illustrations

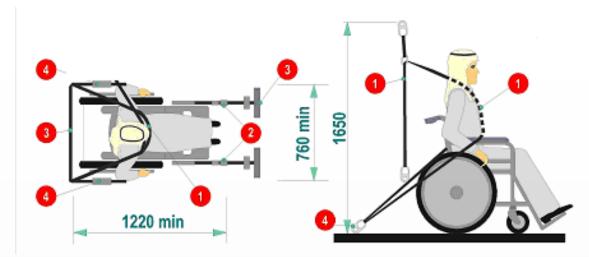


Figure 57. Forward-Facing Wheelchair Securement and Occupant Restraint System

- 1. Shoulder and lap belt of occupant restraint system
- 2. Front tie-down straps
- 3. Floor tracks, front and rear for anchoring tie-down straps
- 4. Rear tie-down straps

#### Specifications:

- 900kg min. shoulder and lap belt anchorage
- 1200kg min. tie-down straps anchorage
- Shoulder belt attachment point on bus wall min. 900kg anchorage

Source: Illustration adapted from ADA compliant system, produced by Transportation Seating Inc, (TSI), Montezuma, Georgia, USA

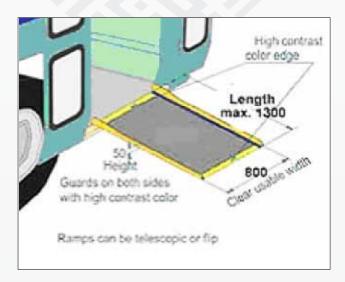


Figure 58. Vehicle Ramp Source: Rutenberg Design Inc.



## 3.2.5 Other Considerations

2.3 Human Space and Reach Requirements

3.1 Trip Information

3.4.3.6 Seat Surfaces















## 3.3 Special Vehicles

[The technical content and illustrations in this section have been adapted from ADA Guidelines: Part 1192 – Americans with Disability Act (ADA) Accessibility Guidelines for Transportation Vehicles, Subpart: 1192.21 – 1192.39]

Special vehicles are typically converted vans and minibuses for providing transport service to persons who are unable to use regular public transit (Figure 59). These vans and minibuses have a lift or ramp, several places for passengers in wheelchairs, and forward-facing securement systems. Trained drivers are responsible for the loading and unloading of persons who require boarding equipment, for the deployment of the wheelchair securement system and the occupant restraint. There are also regular seats available for companions. Most services are part of the general public transit operation but can also be private companies.



Figure 59. Special Vehicles Equipped With Lift or Ramp at Rear of Vehicle.

Lift at the rear of the vehicle used in San Diego, California USA

Source: www.surerideinc.com



## 3.3.1 Design Considerations

Due to the size and technical constraints of vans and minibuses, design consideration should be given to boarding equipment and mobility aid securement systems, and designated seating for family and gender seating if vehicle capacity permits. Audio and text information is important for all persons who have vision, hearing or cognitive problems. Consideration should be paid to persons with agility and sensory impairments for fare payment methods.

## 3.3.2 Application Guidelines

The service provider should comply with all the following guidelines. This service should apply in particular but not limited to persons who are incapable of using public transit. Due to technical constraints, family and gender seating and triple side-by-side strollers may not be possible and alternative service should be rendered.

#### 3.3.3 Technical Guidelines

## 3.3.3.1 Doors, Steps and Thresholds

- Door openings should have a clear width of 800mm.
- All passenger areas, including aisles, steps, floors, and securement locations, should have anti-slip floors.
- All step edges, thresholds, and the boarding edge of ramps or lift platforms should have a band of color(s) running the full width of the step or edge. Bright yellow color bands are mostly used in the industry as best practice. This color band should contrast from the step treads, risers, or lift surface.
- For vehicles of 6.7m in length or less, the overhead clearance should be a minimum of 1400mm.

#### 3.3.3.2 Handrails at Entrance

Handrails should be in place for easy boarding. Persons with functional limitations should be able to grasp them from











outside the vehicle and continue to use them throughout the boarding (and fare payment, if applicable) process. Handrails should be between 750mm to 1000mm above the surface of the ramp or floor, capable of withstanding a force of 45kg at any point, have a diameter of between 30mm and 40mm (or equivalent grasping surface) and have corner radii of 3mm or greater with eased edges. These handrails should not interfere with wheelchair or mobility aid maneuverability when entering or leaving the vehicle.

### 3.3.3.3 Mobility Aid and Stroller Accessibility

All vehicles should provide boarding equipment (e.g. lift, ramp or bridge plate) to permit a wheelchair or other mobility aid user to reach a securement location, as well as provide a designated position for persons with stroller (Figure 60).

#### 3.3.3.4 Vehicle Lift

Lifts should be designed to a payload minimum of 400kg. Moving parts (such as cables and pulleys) should have a safety factor of at least six, while non-moving parts (such as platform, frame) should have a safety factor of at least three.

# 3.3.3.5 Lift Control Systems

An interlock system between the lift controls and the vehicle brakes, transmission, and door must be in place to ensure that the vehicle cannot move when the lift is deployed. Lift controls should require continuous pressure by the operator to function. Reversal of operation sequences should be possible to raise or lower a lift that is part way up. Occupied platforms must never be allowed to retract into a stowed position.



### 3.3.3.6 Emergency Operation

The lift must incorporate an emergency operation mode in case of power failure. The lift must be capable of being deployed, raised, lowered, or stowed in this state. The emergency operation mode must not be hazardous to lift occupants or operators.

### 3.3.3.7 Power or Equipment Failure

Platforms stored vertically, or occupied, must not be deployed, fall, or fold at a speed greater than 300mm/s.

#### 3.3.3.8 Platform Guards

Lift platform guards should be at least 50mm high and should be in place to prevent the wheels of a wheelchair or mobility aid from rolling off the platform. The front guard may function as the loading ramp when at ground level. Fail safe systems should be in place to ensure that power wheelchairs or mobility aids do not ride over the front and rear guard and should ensure that the guards remain closed at all times once the platform is 75mm above the ground and is occupied.

#### 3.3.3.9 Platform Surface

Platforms should have an anti-slip surface and contain no protrusions over 6mm in height. The platform should have a minimum clear width of 750mm at the platform and from 50mm to 750mm above the platform, as well as a minimum clear length of 1200mm from 50mm to 750mm above the surface of the platform.

# 3.3.3.10 Platform Gaps

Any gaps between the platform surface and the raised guards should not exceed 15mm in width. When the platform is at vehicle floor height with the rearguard (if applicable) down or retracted, gaps between the forward lift platform edge and the vehicle floor should not exceed 13mm horizontally and 15mm vertically.













#### 3.3.3.11 Platform Entrance Guard

The entrance guard used as a ramp should not exceed a

slope of 1:8, measured on level ground, for a maximum rise of 75mm, and there may be up to a 6mm rise between the ground and the ramp. Thresholds between 6mm and 13mm high should be beveled with a slope no greater than 1:2.

- Platform Deflection: The lift platform (not including the entrance ramp of vehicle roll or pitch) in any direction between its unloaded position and its position (when loaded with 400kg applied through a 660mm by 660mm test pallet at the centroid of the platform) should not deflect more than 3 degrees.
- Platform Movement: The maximum speed of the lift platform while lowering or lifting a passenger should be 0.15m/s, and 0.30m/s while deploying or stowing the lift. Manually deployed and stowed lifts are exempt.

## 3.3.3.12 Wheelchair Boarding Direction

The lift should permit both inboard and outboard facing of wheelchair and mobility aid users.

- Standing Position: Lifts should accommodate anyone who has difficulty in using steps, including persons with walkers, crutches, canes or braces, and the lift may have markings indicating a preferred standing position.
- Handrails: Lift platforms should be outfitted with handrails on two sides in order to provide support for those standing. Handrails should be at least 200mm long, between 30mm and 40mm in diameter, between 750 and 1000mm above the platform, have corner radii of 3mm or greater, have a clearance for knuckles of at least 35mm from the nearest surface, and be capable of withstanding forces of up to 45kg at any point. Maneuverability of wheelchairs and mobility aids while boarding and alighting should not be compromised by the location of handrails.







### 3.3.3.13 Vehicle Ramp Design

- **Design Load:** Ramps of at least 750mm wide and 1200mm long should be capable of supporting a load of 400kg at the centre of the ramp distributed over an area of 660mm by 660mm, with a safety factor of at least three based on the ultimate strength of the material.
- Ramp Surface: Ramps should be continuous, have an anti-slip surface and contain no protrusions over 6mm in height. They should have a clear width of 750mm; and should accommodate four-wheel and three-wheel mobility aids and all strollers except triple side-by-side strollers.
- Ramp Threshold: Any vertical gap between the roadway or sidewalk and vehicle ramp, as well as between the vehicle floor and ramp should be 6mm or less. Level changes with an edge of between 6mm and 13mm require the edge of the ramp be beveled with a slope no greater than 1:2.
- Ramp Guards: Guards that are at least 50mm or higher and marked in high contrast color should be located on each long side of the ramp to prevent the wheels of mobility aids from slipping off.
- **Slope:** Ramps should have the least slope practicable and should not be steeper than 1:8 when deployed to curb or road level. Folding, flopping or telescoping ramps that conform to structural requirements can be used.
- Attachment: When passengers are using ramps to board vehicles, ramps must be secured and attached to the vehicle, and gaps between the vehicle and the ramps should not be greater than 15 mm.
- **Stowage:** Ramps should be stored securely in a place that will not intrude on wheelchairs or mobility aids in the passenger area in order to ensure that no hazards are posed to passengers in the event of a sudden stop or maneuver.







### 3.3.3.14 Mobility Aids Securement System

A securement system should be capable of securing common wheelchairs and mobility aids. It should either be automatic or easily deployed by a person with average dexterity and trained in the use of the system and the mobility aid.

- **Orientation:** In vehicles 6.7m in length or less, the required securement device should be forward-facing only and be used with an occupant restraint system (Figure 61).
- **Movement:** Under normal vehicle operating conditions the securement system should constrain the movement of an occupied wheelchair or mobility aid to 50mm or less in any direction.



Figure 60. Foldable ramp at rear of minibus, UK Source: www.portaramp.co.uk

• **Stowage:** The securement area can be used by standees, persons with strollers, or persons with luggage when not in use for mobility aids. This area should be readily accessed when needed, as well as protected from vandalism and from interfering with movement of passengers throughout the vehicle.



• **Seat Belt and Shoulder Harness:** Seat belts and shoulder harnesses, anchored to the vehicle, should be provided for each forward-facing securement position (Figure 61).

Refer to: 3.2.3.10 Wheelchair Securement and Occupant Restraint System

### **3.3.3.15 Stop Request**

- Stop request controls should be provided when passengers may alight at any stop. These controls should be within easy reach of the securement position, provide audio and visual indication, and alert the driver that a mobility aid user has requested a stop.
- Controls should be mounted from 400mm to 1200mm above the floor, be easily operable with one hand, and not require tight grasping, pinching, or twisting. No greater than 22N of force should be required to activate them.

### 3.3.3.16 Priority Seating and Signage

- Priority seating, including at least one set of forward facing seats near the entrance door should be made available and marked with signage indicating that they are designated for persons with functional limitations. Signage should indicate that other passengers should make these seats available to those who wish to use them. Priority seats should not be designated in the position for wheelchairs.
- The International Access Symbol should be used to denote wheelchair securement locations, as well as the direction in which the wheelchair should face (forwards or to the rear).
- Characters on signs should have:
  - A width-to-height ratio of between 3:5 and 1:1;
  - A stroke width-to-height ration of between 1:5 and 1:10;
  - A minimum character height of 25mm for boarding side signs (using an uppercase "X") and 50mm for front signs;











Figure 61. Wheelchair Securement Devices

Forward-facing wheelchair Securement with four tie-down straps and occupant restraint with lap and shoulder belt, Q-straint, USA

Source: www.qstraint.com

Forward-facing scooter securement with two rear tie-down straps and one strap across the front, BC Transit, Victoria, Canada

Source: Rutenberg Design Inc.

- Spacing of 1.5mm; and
- A contrast with the background (light-on-dark, or dark-on-light).

### 3.3.3.17 Family and Gender Seating

Appropriate separate and designated seating (for family and gender separation) should be provided according to local customs if vehicle capacity permits. Clear signage should indicate the location(s).

## 3.3.3.18 Interior Circulation, Handrails and Stanchions

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- Interior handrails and stanchions should be located to permit sufficient turning and maneuvering space for mobility aids to reach a securement location from the lift or ramp. These handrails and stanchions should allow for safe boarding and alighting, provide seating and standing assistance, and allow for easy circulation throughout the vehicle for persons with functional limitations.
- Persons with functional limitations should be able to grasp handrails from outside the vehicle to assist them in boarding.







- Handrails should be between 30mm and 40mm in diameter, have corner radii of 3mm or greater, and have a clearance for knuckles of at least 35mm from the nearest surface (Figure 62).
- Where on-board fare collection is used, a horizontal passenger assist should be in place across the front of the vehicle in order to assist and protect passengers throughout the boarding and fare payment process, and prevent injuries in case of a quick deceleration.
- Where lifts or ramps are located at the front entrance, stanchions must be located in such a way as to not interfere or impede wheelchair footrests.
- Where driver seat platforms must be passed by a wheelchair or mobility aid user boarding the vehicle, the platform should not extend beyond the wheel housing if possible.
- The interior height from lift to securement position should be a minimum of 1500mm, for vehicles 6.7m in length or less.

## 3.3.3.19 Lighting

- When the door is open, 2 foot-candles of illumination as measured on the step tread or lift platform should be provided on step wells or doors adjacent to the driver.
- Other step wells and doorways should be illuminated to at least 2 foot candles at all times.

All vehicle doorways should have outside lights that illuminate when the door is open and provide at least 1 foot-candle of illumination on the street surface for a distance of 1000mm perpendicular to the bottom step tread or lift outer edge. These light(s) should be shielded to protect the eyes of entering and exiting passengers.







#### 3.3.3.20 Fare Payment

If fare boxes are used, they should be located as far forward as possible in order to not obstruct movement through the vehicle, especially for persons in wheelchairs or mobility aids. Fare payment methods for persons with agility, sensory, speech and cognitive impairments should include contact-less smart cards.

### 3.3.3.21 Public Information System

Public address systems should be provided in vehicles using fixed-route, multiple stop service, enabling the operator or an automated system to provide stop and other information to passengers. Information should be provided in text and audio format, using electronic displays or loop systems.

- Alternative audio and text display and/or loop systems for information should be used to address the needs of seniors, deaf/heard of hearing, blind/vision impaired and cognitively impaired for next stop announcements, transfers and connections.
- Real-time audio and text information should be used for emergency and evacuation instructions.



Figure 62. Handrail for Persons with Functional Limitations in a wheelchair position, BC Transit, Victoria, Canada Source: Rutenberg Design Inc., Canada



- For foreigners who do not speak the local language(s), either multi-language announcements or symbols and pictograms for information should be used.
- Advanced technologies should be considered that interface between driver announcements and personal communication devices (e.g. PDAs) via Bluetooth or similar systems for real time audio and text display.

### 3.3.3.22 Destination and Route Signs

Vehicles indicating destination or route information should display illuminated signs on the front and boarding side of the vehicle.

Characters on signs should have:

- A width-to-height ratio of between 3:5 and 1:1;
- A stroke width-to-height ration of between 1:5 and 1:10;
- A minimum character height of 150mm for boarding side signs (using an uppercase "X") and 200mm for front signs;
- Spacing of about 15mm; and
- A contrast with the background (light-on-dark, or dark-on-light).

## 3.3.3.23 Emergency and Evacuation Information in Vehicle

Refer to: 3.2.3.14 Emergency and Evacuation Information in Vehicle

# 3.3.3.24 Emergency and Evacuation from Platforms

Refer to: 3.5.3.21 Emergency and Evacuation from Platforms

# 3.3.3.25 Interface with Stops and Stands

Refer to: 3.2.3.15 Vehicle Interface with Stops, Stands and Termini











## 3.3.4 Other Considerations

- 2.3 Human Space and Reach Requirements
- 3.1 Trip Information
- 3.4.3.6 Seat Surfaces
- 3.9 Intercity Buses
- 3.10 Intercity Rail



















### 3.4 Urban Buses

[The technical content and illustrations in this section have been adapted from Canadian CSA-D435-02: Accessible Transit Buses, 2002]

Accessible urban buses are vehicles with a Gross Vehicle Weight Rating (GVWR) of at least 7000kg designed to provide transit service and that are intended to accommodate both ambulatory passengers and those using mobility aids. Urban buses can have a high floor or a low floor. There are standard buses measuring 10m-12m in length as well as articulated buses up to 16m long (Figure 63, 64, 65). Such buses may have a fare collection system and do not provide storage for under-floor luggage. Accessible vehicles may be equipped with a lift or a ramp and be capable of kneeling (Figure 38). Buses in Europe and Canada use rear-facing wheelchair securement system. Other countries use forward-facing systems with occupant restraints. Some countries use two wheelchair positions in a bus, others use one.



Figure 63. Urban Low Floor Transit Bus Used in Gloucester, England Source: Rutenberg Design Inc., Canada



Figure 64. Urban High Floor Bus Used in New Jersey, USA Source: www.njtransit.com



Figure 64. Articulated Low Floor Bus, Chapel Hill Transit, North Carolina, USA Source: www.townofchapelhill.org/transit/





## 3.4.1 Design Considerations

The issues with urban buses for children, seniors, parents with strollers, persons with baggage and persons with mobility impairments are the height of the steps/stairs and door width. Fare payment poses a challenge for those with agility and problems, foreigners, passengers with cognitive impairments or who are illiterate. The aisle width and seat size can restrict the movement of large persons and those using mobility aids. There is a need to provide for family and gender seating within the vehicle. Passengers in a wheelchair require boarding and securement systems. Persons with mobility, sensory and/or cognitive impairments as well as frail seniors require priority seating in close proximity to the driver near the front door for assistance and ease to disembark. Next-stop announcements, transfer information, and emergency evacuation instructions in multiple formats throughout the bus could make the trip more safe, secure and stress-free for all passengers.

## 3.4.2 Application Guidelines

All elements of an urban bus should comply with the following guidelines. Access for triple strollers is limited by the bus door opening of 800mm unless they are folded. Wheelchairs, scooters and oversized wheelchairs exceeding 400 kg of combined weight (wheelchair plus passenger), a length of 1300mm, a width of 750mm, and a turning radius of 1000mm are limited by the technical restrictions of the bus. Onboard information for deaf/hard of hearing persons and those who sit at the rear of the bus is essential. Application of advanced information technologies such as Bluetooth and text messaging should be considered.

## 3.4.3 Technical Guidelines

#### 3.4.3.1 Doors

Doors should have a minimum width of 800mm (clearing handrails on both sides) to accommodate persons with standard envelope mobility aids, persons with tandem prams, and persons with large luggage. Handrails should be provided on both sides inside the doors, be color-coded, and high-contrast without interfering with the clear width of 800mm of the door (Figure 66).











### 3.4.3.2 Vehicle Steps

For high floor buses the first step should not be higher than 250mm from road or curb level. The depth of step should be a minimum of 300mm; the width of the step a minimum of 400mm. Step nosing (overhang) should not exceed 10mm. For low floor buses not kneeled the step should not be higher than 220mm; kneeled, 120mm.



Figure 66. Scooter Access Over Ramp at Front Door to Kneeled Low Floor Bus from Road Level at BC Transit, Victoria, British Columbia, Canada

Source: Rutenberg Design Inc., Canada

## 3.4.3.3 Vehicle Ramps

- Ramps should have a maximum gradient of 1:8 measured from a level ground surface to the ramp's intersection with the floor of the bus. The ramp width should be a minimum of 750 mm wide with a non-slip surface and side guards of 50 mm high (Figure 76).
- The payload for ramps should be a minimum of 400kg due to obesity and the increased weight of mobility aids.
- Power operated ramps (sliding or swing-out) should have interlock devices (only operable when brakes are on), emergency override, and supervised operation by the driver (Figure 67, 68).





Figure 67. Attached Flip Ramp, Ricon Corp., USA/Canada

Rated Load Capacity 300 kg Maximum Usable Platform Length 1270 mm Maximum Usable Platform Width 810 mm

Source: www.riconcorp.com



Figure 68. Attached Extended Bi-Fold Ramp for Low Floor Bus, Corp., USA/Canada

Source: www.riconcorp.com











#### 3.4.3.4 Wheelchair Lifts

- Wheelchair lifts can be vehicle- or station/platform-based. They can be manually or power operated. The platform dimension should be a minimum of 750mm in clear width and a minimum of 1220mm in clear length. The lift should have an anti-slip surface and be well drained, with 50mm high guards on the sides, and guards at the front and rear with a minimum height of 75mm, withstanding a force of 135kg (Figures 69, 77). Front and rear end guards should be marked with bright color stripes.
- Lift platforms extending outside the vehicle should have handrails on each side that are 750mm to 950mm in height, and at least 200mm in length.
- The maximum speed of the lift platform while lowering or lifting a passenger should be 0.15m/s, and 0.30m/s while deploying or stowing the lift.

#### 3.4.3.5 Low Floor Buses

Low floor buses, including articulated buses, should be equipped with a manual or power operated service ramp. A maximum ramp gradient of 1:8 should not be exceeded even if the bus is equipped with a kneeling feature.

#### 3.4.3.6 Seat Surfaces

Sitting surfaces, especially those of aisle-facing seats, should be covered by materials with a coefficient of friction sufficient to prevent passengers from sliding back and forth during sudden starts and stops. The seat profile should be ergonomically contoured. Bench seats should be provided for large/obese persons without armrests between seats.

# 3.4.3.7 Special Needs Passenger Seating

• The place where a passenger in a wheelchair is positioned







should be either forward- or rear-facing. The minimum floor space should be 800mm x 1300mm at floor level, with the length of 1300mm along the vehicle's longitudinal centerline.

- A pathway between the mobility aid space and the access door should be a minimum of 800mm wide.
- Folding seats in the mobility aids space should be of the bench type for use by all passengers but in particular for obese persons, and be in the 'up' position when not in use. These seats should not be designated as priority seats (Figure 70).

When the wheelchair position is not occupied, it can be used by a person with a stroller (Figure 71), or for stowing oversized luggage.



Figure 70. Flip-up Seats in Wheelchair Location for Use by General Public and Obese Persons, BC Transit, Victoria, British Columbia, Canada



Figure 71. Wheelchair Position Used for Stroller When Not Occupied by a Wheelchair at Berlin Transit, Berlin, Germany

Source: Rutenberg Design Inc., Canada











### 3.4.3.8 Priority Seating and Signage

- At least one priority seat should be located close to the driver and entrance door. The seats should be reserved for male passengers who have mobility, sensory or cognitive disabilities, and seniors. Hip-to-knee room should be no less than 675mm in front of the seat in a forward-facing position.
- Pregnant women, mothers with child, seniors and female passengers who have mobility, sensory or cognitive disabilities are accommodated separately in the section reserved for family seating.

Refer to: 3.3.3.17 Family and Gender Seating

- Each priority seat or mobility aid position should be equipped with stanchions, handholds, or handrails
- Each bus should contain sign(s) which indicate that certain seats are priority seats for seniors and persons with functional limitations. Other passengers should make such seats available to those who wish to use them (Figure 78). Priority seats should not be located in the area of the wheelchair station.

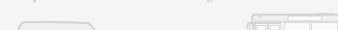
Characters on priority seating signs should have:

- A width-to-height ratio of between 3:5 and 1:1;
- A stroke width-to-height ration of between 1:5 and 1:10;
- A minimum character height of 200mm for signs
- Spacing of 15mm; and
- A contrast with the background (light-on-dark, or dark-on-light).

# 3.4.3.9 Family and Gender Seating

Appropriate separate and designated seating for family and gender separation should be provided according to local customs. Clear signage should indicate the location(s) (Figure 78).







### 3.4.3.10 Wheelchair Securement and Occupant Restraint

A Forward-facing wheelchair securement system should withstand decelerating forces of 8000N. It should confine rearward movement and tipping of the mobility aid. Commonly, 4 belts are anchored to the vehicle floor, two for the front, two for the rear, and are connected by hooks to the mobility aid. The forward-facing securement requires the use of an occupant restraint, typically using three belts (similar to a passenger car's three point systems) to restrain the occupant. This system should be independent of the securement system. Each anchorage point of the occupant restraint should have the strength to resist at least a 4000N deceleration force and should be anchored to the vehicle, not to the mobility aid or the securement (Figure 79).

In a rear-facing system the wheelchair and the occupant face the rear of the vehicle. The rear-facing system (Figures 72, 80) should be provided with a padded back panel with the following dimensions:

- Height from floor to bottom edge: 350–480mm
- Height from floor to top edge: 1300mm min
- Width: between 250mm and 400mm
- Back panel should withstand a decelerating force of 3g.
- The aisle side of the space should be fitted with a means of preventing tipping of the mobility into the aisle when the vehicle is turning (such as a stanchion, movable arm, or belt).
- The vehicle should be fitted with a horizontal handrail along the longitudinal side of 750 mm 1000 mm from the floor, not to exceed the mobility aid space by more than 90mm, and have a diameter of 30mm 40mm with a clear knuckle space of 35mm between any part of the vehicle and the handrail.











### 3.4.3.11 Interior Circulation, Handrails and Stanchions

Refer to: 3.3.3.18 Interior Circulation, Handrails and Stanchions.

### 3.4.3.12 Lighting

Refer to: 3.3.3.19 Lighting

#### 3.4.3.13 Visual Elements

**Lighting:** Good lighting should be provided for those with reduced vision, and for the safety and security of all passengers.

Figure 72. Wheelchair Securement Systems in Public Transportation



Front-facing securement system in low floor bus, BC Transit, Victoria, British Columbia, Canada



Tandem rear-facing systems in low floor bus, BC Transit, Victoria, British Columbia, Canada



Side-by-side rear-facing systems in low floor bus, OC Transpo, Ottawa, Ontario, Canada

Source: Rutenberg Design Inc. Canada

Color Contrast: High color contrast should be used for signage and for station features such as railings, turnstiles, wide fare gates, tactile warnings at bus entry gates, folding seats, and perch supports. Specific colors should be selected for persons who are color blind and can only see red and green as gray.

**Signage:** Uniform signage should be provided for persons with cognitive impairments, visitors, tourists, and others who may not be able to read text.





#### 3.4.3.14 Use of Color

- Using color can make information more attractive and easier to follow. However, for many, the wrong choice or combinations of colors can make reading or understanding difficult, if not impossible. There is a very narrow choice of colors which are easily distinguished by most of the population. Light shades should be avoided and reds and greens can be problematic if used together because a significant proportion of tourists may be color-blind.
- Color Blindness: The most common form of color blindness is red/green defect in which shades of gray are generally detected in place of the red and green. This needs to be taken into account when using color coding or colored text.
- Black print on white background should be used.
- There should always be a sharp contrast between print and background.
- Color Coding: Keep the number of colors down to 5 and the number of datum per color equal. Arrange the colors so that information arranged adjacently are always different colors.
- Avoid the use of green and red color coding.

#### 3.4.3.15 Audible Elements

Audible warnings should be provided to announce the opening and closing of vehicle doors, which will especially assist passengers who are blind or have reduced vision. All passengers benefit from this helpful assistance.

## **3.4.3.16 Stop Request**

The wheelchair position should be equipped with an easy to reach stop request button which alerts the driver that the person in this position wants to exit.











### 3.4.3.17 Next Stop Announcement

For persons in seats that face the rear of the bus, a Next Stop text display should be provided to be visible from their position.

### 3.4.3.18 Luggage Storage

If the space for the mobility aid is not occupied by person in a mobility aid, luggage can be stored there unless the vehicle has a designated space for luggage (Figure 73).

#### 3.4.3.19 In-Vehicle Communication & Information

- Alternative audio and text display and/or loop systems for information should be used to address the needs of seniors, deaf/heard of hearing, blind/vision impaired and cognitively impaired for next stop announcements, transfers and connections.
- Real-time audio and text information should be used for emergency and evacuation instructions.
- For foreigners who do not speak the local language(s), either multi-language announcements or symbols and pictograms for information should be used.
- Advanced technologies should be considered that interface between driver announcements and personal communication devices (e.g. PDAs) via Bluetooth or similar systems for real time audio and text display.

## 3.4.3.20 Fare Payment

Fare payment options should be provided to pre-purchase tickets, or provide contact card systems wherever possible for persons with agility and vision problems (Figure 74).

# 3.4.3.21 Emergency and Evacuation

Refer to: 3.2.3.14 Emergency and Evacuation Information





Universal Accessibility Land Transportation Guidelines for the Kingdom of Saudi Arabia



## 3.4.3.22 Emergency and Evacuation from Platform

Refer to: 3.5.3.21 Emergency and Evacuation from Platform

#### 3.4.3.23 Arrival Information

Refer to: 3.1.3.13 Arrival Information



Figure 73. Storage of Luggage in Wheelchair location when not occupied by wheelchair, Vienna Transit, Vienna, Austria



Figure 74. Fare payment box on bus at driver stations Calgary Transit, Alberta, Canada











#### **Vehicle Interfaces with Stands and Stations** 3.4.3.24

- Stands: Stands should have a minimum of a sign post with an indication of the vehicle type that will stop at the stand. Symbols used should represent the relevant transportation mode, e.g. intercity taxi, minibus, fixed or flex route buses, etc.
- **b. Stops:** As a minimum, stops should have a paved, slipresistant surface with a sign post indicating the vehicle route. The front edge of the paved surface should have a bright colored band. If not leveled with the road, a curb cut should provide access for disabled and elderly persons. Stops should include a bench for seating. A large print schedule and route map should be attached to the post (Figure 75).
- c. Sheltered Stops: Sheltered stops (Figure 75, 81) should have a minimum of a sheltered structure with a roof and protected sides. The platform surface should be flat, level, slip-resistant and solid.
- A bench should provide seating with provisions for obese persons and pregnant women without armrests in between seats, but armrests at the end of the bench. A space for a wheelchair/scooter should be 900mm x 1500mm.
- There should be a minimum depth of 2700 mm from the curb for a wheelchair/scooter to board a vehicle over a ramp.
- Along the front edge of the platform should be a high contrast color warning strip for persons who are blind or have low vision.
- A large print schedule and route map should be shown.
- Transparent sides should be provided for safety during day times, as well as for safety by night with interior and exterior lighting.









• A "Help" phone should be available for information and safety.



Rural stop with sign post, large route number, route map, and paved landing for wheelchair space, OC Transpo, Ottawa, Canada



Sheltered suburban stop, with ramp, concrete platform, space for wheelchair, seats and route map, OC Transpo, Ottawa, Canada

Figure 75. Rural Bus Stops and Sheltered Stops

Source: Rutenberg Design Inc.











#### 3.4.4 Illustrations

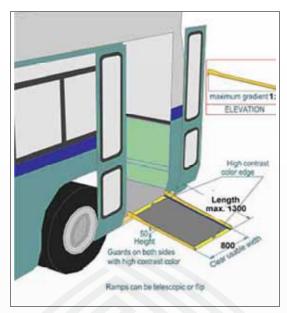


Figure 76. Attached Vehicle Ramp

Rated Load Capacity	300 kg
Maximum Usable Platform Length	1300 mm
Maximum Extended Platform	1500 mm
Maximum Usable Platform Width	800 mm
Maximum Gradient	1:8

Illustration created by Rutenberg Design Inc., Canada

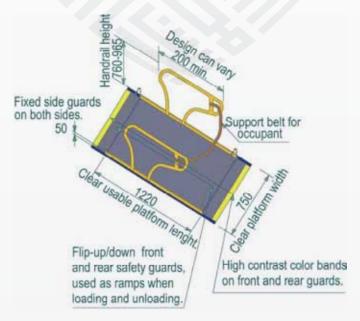


Figure 77. Diagram of Vehicle Based Lift Platform with Minimum Dimensions Source: UDA & Associates











Figure 78. Priority Seating Sign

Indicates reserved seats for male passengers with mobility or sensory disabilities, and seniors Priority seating for families sign indicates reserved seats for pregnant women, mother with child, seniors, and female passengers who have mobility, sensory or cognitive disabilities

Source: UDA & Associates

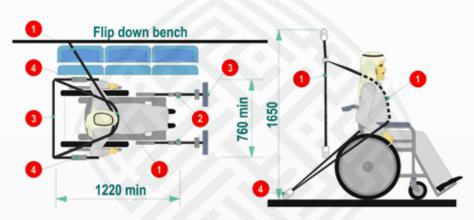


Figure 79. Forward-Facing Wheelchair Securement and Occupant Restraint System

- 1. Shoulder and lap belt of occupant restraint system
- 2. Front tie-down straps
- 3. Floor tracks, front and rear for anchoring tie-down straps
- 4. Rear tie-down straps

#### **Specs**

- 900kg min. shoulder and lap belt anchorage
- 1200kg min. tie-down straps anchorage
- Shoulder belt attachment point on bus wall min. 900kg anchorage

Source: Illustration adapted from ADA compliant system, produced by Transportation Seating Inc, (TSI), Montezuma, Georgia, USA







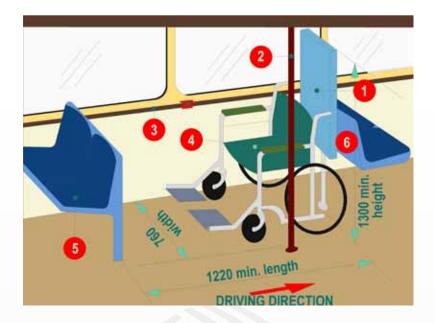


Figure 80. Rear-Facing Securement System

#### Rear-facing securement system for wheelchairs - Specs:

- 1. Padded back panel to withstand 3 g deceleration
  - Height from floor to bottom edge: 350-480 mm
  - Width 270-420 mm
  - Fore/aft angle not less than 4 degrees
  - Height from floor to top edge min. 1300 mm

#### Aisle stanchion

- Can be fixed stanchion, or
- Pivoting arm, or
- Belt attached to back panel structure and connected to bus wall

#### 3. Horizontal handrail

- 750-1000 mm from floor; 700-1000 mm long
- 30-40mm in diameter, and withstand a horizontal force of 450N
- 4. Wheelchair or scooter
- 5. Rear-facing bus seats, optional
- 6. Clearance between back of panel and next seat/wheel well/bulkhead
  - 250mm

Source: Rutenberg Design Inc., Canada







## 3.4.5 Other Considerations

- 2.3 Human Space and Reach Requirements
- 3.1 Trip Information
- 3.9 Intercity Buses















## 3.5 Light Rail Transit (Sky Trains, Streetcars and Trams)

[The technical content in this section has been adapted from ADA Guidelines: Part 1192 – Americans with Disability Act (ADA) Accessibility Guidelines for Transportation Vehicles, Subpart: 1192.71 – 1192.87]

Light rail refers to streetcar/tram transit systems as opposed to heavy rail, which refers to subway rapid transit systems, as well as heavier commuter rail/intercity rail. Light rail systems typically provide frequent service with multiple-unit trains or single cars in urban areas.

The terms "tram" and "streetcar" refer to rail public transit that run partially or entirely on streets, providing a local transport service. While the term "tram" or "tramway" is widely recognized, its use varies in English, with "streetcar" most common in North America, while tram predominates elsewhere. An elevated form of light rail is marketed as Sky Train, after the 1986 system in Vancouver, Canada (Figure 82).

Older light rail cars have high floors with steps. New low floor tram/street cars (Figure 82) are level with the stop platform. Each car has a designated place for wheelchairs, but do not require securement systems. Onboard information system for next stop and transfers is displayed in audio and text format.







Figure 82. Low Floor Streetcar, Tram and Sky Train LRT

Low floor tram in Prague, Czech Republic Low floor tram with leveled platform, Kassel Transit, Germany Sky Train, British Columbia, Vancouver, Canada

Source: Rutenberg Design Inc., Canada

Source: translink.bc.ca







### 3.5.1 Design Considerations

The issues with light rail vehicles for children, seniors, parents with strollers, persons with baggage and persons with mobility impairments are the height of the steps/stairs and door width for high floor car models. Fare payment poses a challenge for those with agility problems, foreigners, and illiterate travelers. The aisle width and seat size can restrict the movement of and use by large persons and those using mobility aids. There is a need to provide for family and gender seating within the vehicle. Persons with mobility, sensory, cognitive impairments and frail seniors require priority seating near the entrance door for ease to disembark. Next stop announcements, transfer information, and emergency evacuation instructions in multiple formats within the vehicle could make the trip more safe, secure and stress-free for all passengers.

For light rail vehicles that run on tracks with exclusive rights of way, especially on an elevated guide way, the boarding platform accessibility and emergency evacuation is an issue. For light rail vehicles (e.g. trams or streetcars) that share right of way with car and pedestrian traffic, crossing the tracks is both a safety and accessibility issue for passengers, especially those with mobility and sensory impairments.

## 3.5.2 Application Guidelines

The transportation provider should provide light rail cars that comply with the following guidelines. Cars should be required to provide boarding equipment for elderly persons and those using mobility aids and strollers.

#### 3.5.3 Technical Guidelines

#### 3.5.3.1 Doors

Doors should have a minimum width of 800mm (clearing handrails on both sides if applicable) to accommodate persons with standard envelope mobility aids, persons with tandem prams, and persons with large luggage.











#### 3.5.3.2 Steps

For high floor vehicles the first step should not be higher than 250mm from road or curb level. The depth of step should be a minimum of 300mm; the width of the step a minimum of 400mm. Step nosing (overhang) should not exceed 10mm. For low floor vehicles the step should not be higher than 120mm.

#### 3.5.3.3 Ramps

Refer to: 3.3.3.13 Vehicle Ramp Design.

#### 3.5.3.4 **Station based Wheelchair Lifts** (Figure 83)

Station-based lifts are independent mobile devices not connected to the vehicle. They should be used when the station platform and the vehicle floor are not at the same level and a bridge plate is not applicable. During the lifting operation the lift should be connected to the vehicle. Station-based lifts should comply with all platform dimensions, safety features and controls as car-based lifts.

#### 3.5.3.5 **Low Floor Trams, Streetcars**

Low floor trams and streetcars should interface with leveled platforms. Where horizontal gaps of 50mm and vertical gaps of 75mm are exceeded, a vehicle based bridge plate or similar device should be available at the service door...

#### 3.5.3.6 **Seat Surfaces**

Refer to: 3.4.3.6 Seat Surfaces.

#### 3.5.3.7 Special Needs Passenger Seating

Refer to: 3.4.3.7 Special Needs Passenger Seating.

#### 3.5.3.8 **Priority Seating and Signage**

Refer to: 3.3.3.16 Priority Seating and Signage.

#### 3.5.3.9 Family and Gender Seating

Refer to: 3.3.3.17 Family and Gender Seating.









## 3.5.3.10 Mobility Aid Securement/Occupant Restraint

Not required on light rail cars.

# 3.5.3.11 Interior Circulation, Handrails and Stanchions

Refer to: 3.3.3.18 Interior Circulation, Handrails and Stanchions.

## 3.5.3.12 Lighting

Refer to: 3.3.3.19 Lighting

#### 3.5.3.13 Visual Elements

Refer to: 3.4.3.13 Visual Elements

#### 3.5.3.14 Audible Elements

Refer to: 3.4.3.15 Audible Elements

# **3.5.3.15 Stop Request**

Refer to: 3.4.3.16 Stop Request

# 3.5.3.16 Next Stop Announcement

Refer to: 3.4.3.17 Next Stop Announcement



Figure 83. Station-based lift (used for boarding passenger in wheelchair from low platform to high vehicle floor, Baltimore, Maryland, USA)



Figure 84. In-Vehicle information Text Display for Next Stop in LRT, Kassel Transit, Kassel, Germany

Source. Rutenburg Design Inc., Canada













## 3.5.3.17 Luggage and Stroller Storage

Refer to: 3.4.3.18 Luggage Storage

#### **3.5.3.18 In-Vehicle Communication/Information** (Figure 84)

Refer to: 3.4.3.19 In-Vehicle Communication/Information.

#### **3.5.3.19** Fare Payment

- Fare purchase should be carried out in terminals or stations using automatic vending machines (Figure 85).
- Automatic ticket vending machines [Canadian Standard Association, CSAB651-04 3.2 Operating controls, 2004] should be accessible by persons who have agility problems, are blind-/vision-impaired, cognitively impaired, as well as children over 16 and foreigners (Figure 56). Instructions should be in audio, text, symbol and pictogram display with tactile information for location and identification of controls.
- Maps should be concise with large fonts of a minimum of 14-point typeface san serif. The height of all displays and controls, colors and contrast should be according to ergonomic principles and the 95th percentile of a female person.
- Fare payment should be in the form of prepaid ticket with validation, prepaid pass, or by contact less smart card, in terminus or on -board vehicle.

Refer to: 3.4.3.20 Fare Payment

# 3.5.3.20 Emergency and Evacuation from Vehicle

- Passengers should be provided with real-time audio and text instructions of how to proceed in case of emergency or evacuation.
- Rail staff should be trained to help disabled passengers, especially those with mobility and sensory impairments.







- Evacuation equipment should be available in trains and should include but not limited to: backboards, flexible stretchers, and evacuation chairs.
- Exterior equipment should include emergency carts on rails, portable ramps, and cable winch cabins.
- Above surface rail structures should provide a separate walkway on one side of the train tracks with handrails.
- In tunnels there should be a separate walkway on one side of the train tracks at the height of the vehicle floor if possible. The width of the walkway should accommodate a wheelchair, at a minimum of 800mm.
- The walkway should be lit, and be identified by signage and/or light reflective markers to lead to the nearest exit. Handrails should be provided along the walkway at a height of 850mm-1000mm from the floor (Hathaway, Markos & Balog, 1997).

Refer to: 3.2.3.19 Emergency & Evacuation Information

# 3.5.3.21 Emergency and Evacuation from Platforms and Tunnel/Guideway

[U.S. Department of Transportation" Emergency Preparedness Guidelines for People with Disabilities",2003, htm]

Emergency and evacuation from elevated tracks should avoid the use of elevators and escalators. Trained staff should carry or move, using mechanical devices (Figure 86), persons unable to walk or being in a wheelchair along evacuation routes, down stairs or on ramps. It may be necessary to take persons out of the wheelchair/scooter and transport them on stretchers or similar equipment to safety.











# 3.5.3.22 Platform Information Systems

Real-Time Public Announcements (PA) should be displayed in audio and text format. Other information should be available in large print, recorded audio or tactile formats. SOS and help posts should be available for one-way and two-way communication to assist passengers on platforms.



Figure 85. Automatic Ticket Vending Machine (with payment options for credit cards, coins and bills; large text display window, at Portland Transit, Oregon, USA)



Figure 86. Mechanical Evacuation Device for Stairs produced by Garaventa. (used by the US Department of Defense, St. Louis, Missouri, USA)

Source. www.portland.worldweb.com

Source. www.evacutrac.com

#### 3.5.3.23 Arrival Information

Refer to: 3.1.3.13 Arrival Information

#### 3.5.3.24 Priority Seating and Signage

Refer to: 3.3.3.16 Priority Seating and Signage











#### 3.5.3.25 Ticket and Information Counter

When a ticket and information counter or kiosk is provided, it should be accessible to persons in mobility aids, sensory-impaired persons, and foreigners. A low counter section should be available for persons using wheelchairs and scooters; seating should be provided for seniors and pregnant women. The kiosk should have a loop system or similar arrangement for hearing-impaired persons, printed material with large fonts, a text display system for persons who are deaf, and pre-printed basic "Answer and Question" forms in several common languages for foreigners.

## **3.5.3.26** Next Vehicle Departure & Arrival (Figure 87)

- Monitors and electronic signs should be placed at eye level for people using wheelchairs to see this information at a better viewing angle and also allow people with functional visual limitations to read the screen at a very close range.
- Some or all monitors and electronic signs should be installed at eye level (1.5 meters above the floor, +/- 25mm. Where monitors are placed above eye level, they should be placed at a height of 2.00 meters +/-25mm so that they can be easily seen by a person in a wheelchair. The information displayed on monitors should be in plain language that is easy to read, avoiding acronyms where possible.
- When monitors or other electronic signs are used, good color contrast should be provided, such as a light color on a dark background or a dark color on a light background, with light on dark being preferable. Monitors should be positioned to avoid glare. Red lettering on a black background should not be used. Scrolling, flashing or dot matrix text should also be avoided, where possible.











## 3.5.3.27 Information Systems

Where information is provided by video display terminals to the general public, information should be provided in an alternative format, such as audio, text, Braille, and large-font print. The minimum font size for large-text print should be 16-point.



Figure 87. Text Display on Station Platform for Next Train Departure, Railway Station, Japan Source: Rutenberg Design Inc., Canada

- Information systems designed for direct access by the public, such as touch-screen video display, keyboard or keypad access, should be mounted at a height suitable for use by a person using a wheelchair, scooter, or a person of short stature. Push buttons or other controls for accessing public information systems should be clearly identifiable by color and/or tone from the background color, and should include raised numbers, numerals or symbols for easy identification by persons with a visual impairment.
- Information should be available in audio and text format on PDAs or similar handheld devices.











# 3.5.3.28 Orientation and Way Finding

Bright colors and/or a highly contrasting tone should be used to assist orientation and with way finding. End walls or return walls in long corridors should be visually defined using highly contrasting colors or tone to enhance a change of direction or the end of the space. New technologies should be used to assist persons who are blind, such as RIAS.

## 3.5.3.29 Security Clearance

- Provide private screening areas, separated by gender for passengers when passing security screening. Alternative communication should be provided for passenger who are deaf/hard of hearing, speech and cognitively impaired foreigners and illiterate persons. Seats should be provided for passengers to rest while waiting in a long queue and for wearing or removing footwear.
- An alternative means to the queuing system should be available for people with disabilities.
- Both audible and visual means should be used to communicate with passengers during the screening process.
- Some passengers may not be able to undergo screening using either walk-through and/or hand-held metal detection equipment. In such cases, screening offices should offer a physical search in lieu of metal detection screening, with the option of it being performed in a search area which is not open to public viewing. Such a search area should be capable of accommodating a passenger in a large powered wheelchair and the security personnel.
- Some assistance with the screening process should be provided to the passenger upon request. Assistance includes, for example, ensuring a passenger is stable while his cane is processed through an X-ray machine, and picking up a boarding pass on the floor if a passenger drops it and has difficult picking it up.











- A means should be available to make accessibility services of security agencies or authorities known to travelers. This allows travelers to be aware of what accessibility services are available prior to travel.
- A process should be in place to deal with public concerns or complaints. Such concerns or complaints should be treated as expeditiously and effectively as possible. This process should include a designated person or group to deal with accessibility-related concerns or complaints. Web sites and written materials should also provide information about this service.

#### **Station Platforms (Figure 88)** 3.5.3.30

- Accessible Route: Where station platforms interface for boarding and deboarding of passengers to and from vehicles, they should have an accessible route from all levels of the station.
- Illumination: Station platforms should be illuminated to at least 100 lux at floor level at the darkest point.
- Platform Size: Station platforms should be sized to safely accommodate wheelchairs, strollers and boarding equipment.
- Detectable Warnings: Station platforms with open platform edges should have detectable warning surfaces. The placement of detectable warnings should be consistent throughout the setting. They should be positioned parallel to the open platform edge, extending the full length of the platform, and be a minimum depth of 600mm and a maximum of 900mm in depth from the open edge of the platform, and flush with the surface so as not to create a tripping hazard. They should be of high color contrast with truncated cones.







## 3.5.3.31 Vehicle Interface with Stations, Platforms

Where possible, the terminal platform level should be the same as the vehicle floor level. Otherwise bridge plates, ramps or station based lifts should be used.

Refer to: 3.5.3.4 Wheelchair lifts.

Refer to: 3.2.3.9 Lifting devices, Ramps, Bridge Plates

# 3.5.3.32 Emergency and Evacuation Information from Vehicle

Refer to: 3.2.3.14 Emergency and Evacuation Information

## 3.5.3.33 Emergency and Evacuation Information from Platform

Refer to: 3.5.3.21 Emergency and Evacuation Information from Platform

#### 3.5.3.34 Arrival Information

Refer to: 3.1.3.13 Arrival Information

#### 3.5.5 Other Considerations

- 2.3 Human Space and Reach Requirements
- 3.1 Trip Information
- 3.8 Commuter Rail
- 3.10 Intercity Rail











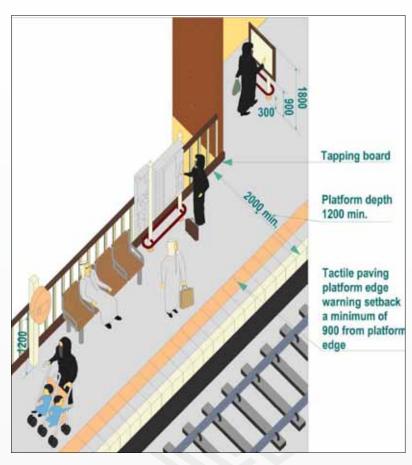


Figure 88. Train Platform. Accessible platform for train terminal, according to UK guidelines. Illustration adapted from Traffic Advisory Leaflet – Inclusive Mobility: A Guide to Best Practice on Access to Pedestrian and Transport Infrastructure, p. 3 (Department for Transport, Traffic Advisory Unit, 2002, UK)







# 3.6 Bus Rapid Transit

[The technical content in this section has been adapted from: "Bus Rapid Transit Accessibility Guidelines", Tom Rickert/World Bank, 2007]

Bus Rapid Transit (BRT) is a rubber-tire light-rail transit (LRT) system combining the dedicated right-of-way of rail service with the flexibility of bus transit. It operates mostly in exclusive bus lanes, and its characteristics include expedient passenger boarding/alighting and fare collection, and optimal mobility and accessibility for elderly passengers and persons with functional limitations. It can also utilize High Occupancy Vehicle (HOV) lanes, expressways, and ordinary streets (Figure 90). The system typically consists of two to four interconnected or articulated bus vehicles (Figure 89.) that can be high floor or low floor. High floor and low floor vehicles require a leveled platform interface. Accessible features include level entry from platform to bus via bridge plates (Figure 89), wider doors, and self-operated wheelchair securement systems.







Figure 89. Examples of BRT Systems and Bridge Plate System

BRT with accessible stations in Curitiba, Brazil

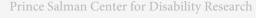
Source: www.bcsea.org

Double articulated bus system in Hamburg, Germany Source: www.wikipedia.org

Bridge plate from trolley bus to platform with extra wide door of 1360mm in Quito, Ecuador

Source: "Bus Rapid Transit Accessibility Guidelines", Tom Rickert/World Bank, 2007













## 3.6.1 Design Considerations

When planning for the design of BRT systems, attention should be paid to all elements of the trip chain, from the access to BRT vehicles, stations, and access paths to trunk line and feeder lines for persons who have walking, mobility and vision problems. Special consideration should be given to persons using wheelchairs and scooters who need boarding interfaces for accessing vehicles. Since BRT systems are integrated systems, pedestrian paths to platforms/stations, line-haul vehicles, and feeder buses must be accessible. Alternative onboard information is required for persons with vision and hearing impairments.

# 3.6.2 Application Guidelines

Providers of all elements of the BRT system should comply with the following guidelines. The use of public space to access BRT stations and feeder line bus stops should be accessible for all pedestrians and those using mobility aids, strollers and large luggage (Figure 91).



Figure 90. Complete BRT System Concept, Bogota, Columbia

Figure 91. Passenger with Stroller Boarding BRT Vehicle in Delhi, India

Source: www.streetsblog.org

Source: Samarthyam, India







#### 3.6.3 Technical Guidelines

## **3.6.3.1** Tactile Warnings and Tactile Guideways (Figure. 92)

Where possible, the terminal platform level should be the same as the vehicle floor level. Otherwise bridge plates, ramps or station based lifts should be used.



Figure 92. Tactile Guideway Consisting of Truncated Domes along Complex Path to a Known Destination (e.g. stairway) - Source: UDA & Associates, Canada

#### 3.6.3.2 Access at Trunk Line Stations

**Station Assistants:** Disabled persons, tourists, and visitors should be provided with assistance from station personnel if required. Station staff should be knowledgeable and easily identifiable.











Security Personnel: Security personnel should be available to ensure the safety of passengers, especially for women and persons with functional limitations and at night.

**Uniform Design:** To facilitate navigation within the station, especially for visitors, tourists, and persons with sensory and cognitive disabilities, stations should have uniform design features.

#### 3.6.3.3 Station Doors

- Station width is determined by bus way constraints and passenger volumes. For elongated stations, entrances should be located at each end for easier access of passengers unable to walk long distances. Exit-only doors should be considered at ends of stations where entrances are not possible.
- Automatic sliding doors should be used whenever possible and have a minimum of 900mm clear space. Manually operated doors should require no more than 15N of operating force. Sliding doors should be full height of at least 2100mm and transparent (Figure 93). Colored signs should be placed at eye height on clear doors to warn persons.

#### 3.6.3.4 **Vehicle Doors**

The front entrance of the bus should be designed for use by persons with disabilities, where the platform-to-bus gap is the smallest, and passenger assistance is more readily available. A tactile warning strip should be applied if the platform edges are not protected. Doors should have audible signals to alert passengers with reduced vision and children that they are opening and closing.

#### **Turnstiles** 3.6.3.5

Turnstiles (Figure 94) should be eliminated for use by mobility impaired persons and persons with strollers wherever possible. If turnstiles are required in a system







for any reason, they should be at least 950mm wide for persons in wheelchairs, scooters and strollers to pass. There should also be a button to deactivate the barriers.

## 3.6.3.6 Fare Payment, Collection and Fare Gates

A wide fare gate with a clear width of at least 900mm should be provided for passengers using mobility aids. Refer to: 3.5.3.25 Ticketing Information



Figure 93. A BRT Stop in Curitiba, Brazil with Sliding Doors



Figure 94. Access Gate Designed to Accommodate Mobility Aid

Source:
www.heureka.clara.net/gaia/curitiba.htm

Source: http://www.ukstudentlife.com/travel/ transport/london/underground/

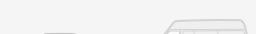
# 3.6.3.7 Station Seats and Supports

Horizontal perches approximately 700mm high should be provided for passengers with hidden disabilities such as arthritis. Seats should be provided which fold to maximize the clear width of a station. These seats should have no armrests to accommodate large persons and be painted in high-contrast colors.

#### 3.6.3.8 Transit Information In-Station

Bus status information should be provided via GPS and AVL technologies or by station staff.







#### 3.6.3.9 Visual Elements

Refer to: 3.4.3.13 Visual Elements

#### 3.6.3.10 Tactile Elements

Raised and tactile route numbers (about 20mm high and raised 1-2mm) at stations should be provided for passengers who are blind or have low vision. Tactile warning strips should be installed at station doors leading to bus gates.

#### 3.6.3.11 Elevators and Stair Lifts

Elevators and stair lifts should take Into consideration persons with large luggage, oversized wheelchairs and persons with strollers.

#### 3.6.3.12 Intermodal Transfers

Accessible intermodal transfer points should be provided to assist persons with functional limitations, and anyone unfamiliar with the area or transit system.

# **3.6.3.13 Platform to Bus Floor Gap** (Figure 95).

Horizontal gaps should be no bigger than 75mm. Bridge plates should be used to eliminate gaps. Vehicles and stations should be specifically designed, and drivers trained to reduce the platform to bus floor gap.

# 3.6.3.14 Ramp and Bridge Plates

If high-floor buses are used, ramped platforms should be used to provide level entry. Ramps or bridge plates should be used when the horizontal gap between the vehicle and the platform exceeds 75mm, and the vertical gap exceeds 50 mm. The width of the ramp/bridge plate should be according to the width of the service door.

#### 3.6.3.15 Vehicle Interfaces with stations

Refer to: 3.3.3.23 Vehicle Interfaces with Stops, Stands, Stations, Termini









## 3.6.3.16 Route or Destination Signage

Refer to: 3.5.3.30 Station Platforms and 3.5.3.31 Vehicle Interface with Stations, Platforms

#### 3.6.3.17 Interconnected and Articulated Buses

- High floor and low floor interconnected and articulated buses should provide leveled platform interfaces, and should use bridge plates or ramps for horizontal and vertical gaps.
- Low floor buses should deploy kneeling features to serve disabled and elderly passengers.

#### 3.6.3.18 Low Floor Buses

Refer to: 3.4 Urban buses

#### 3.6.3.19 Seat Surfaces

Refer to: 3.4.3.6 Seat Surface

## 3.6.3.20 Special Needs Passenger Seating

Refer to: 3.4.3.7 Special Needs Passenger Seating.

# 3.6.3.21 Priority Seating and Signage

Refer to: 3.3.3.16 Priority Seating and Signage.

# 3.6.3.22 Family and Gender Seating

Refer to: 3.3.3.17 Family and Gender Seating

# 3.6.3.23 Emergency and Evacuation Information from Platform

Refer to: 3.5.3.21 Emergency and Evacuation Information from Platform

# **3.6.3.24 Interior Circulation, Handrails and Stanchions** (Figure 96)

Refer to: 3.3.3.18 Interior Circulation, Handrails and Stanchions











#### 3.6.3.25 Lighting

Refer to: 3.3.3.19 Lighting

## 3.6.3.26 Public Information System

Refer to: 3.3.3.21 Public Information System.

#### 3.6.3.27 Wheelchair Securement Systems

Refer to: Figure 79 Forward facing securement and occupant system

Figure 80 Rear facing securement system

#### **3.6.3.28 Stop Request**

Refer to: 3.3.3.15 Stop Request.



Figure 95. Vehicle to Platform Gaps. Person with Crutches Accessing BRT Vehicle in Delhi, India. (No bridge plate required) - Source: Samarthyam, India



Figure 96. Colored Stanchions in Bus with High Color Contrast, OC Transpo, Ottawa, Canada - Source: Rutenberg Design Inc

# **3.6.3.29 Emergency and Evacuation Information from Vehicle**

Refer to: 3.2.3.19 Emergency & Evacuation Information from Vehicle

#### 3.6.3.30 Arrival Information

Refer to: 3.1.3.13 Arrival Information.







# 3.6.5 Other Considerations

- 2.3 Human Space and Reach Requirements
- 3.1 Trip Information
- 3.4.3.6 Seat Surfaces
- 3.5 Light Rail Transit
- 3.7 Metro/Subway















# 3.7 Metro / Subway

[The technical content in this section has been adapted from Americans with Disability Act (ADA) Accessibility Guidelines for Transportation Vehicles, Subpart: 1192.71 – 1192.87]

"Subway," "Underground,"
"Metro" and "Tube" are all terms
describing an underground mass
transit system consisting of cars
in a train consist. It runs on
fixed rail, has its own dedicated
rights-of-way, and carries a large
volume of passengers daily at
high speed. Some systems, e.g.
S-Bahn in Berlin, Germany,
provide a complete section of
the car for persons with strollers,



Figure 97. Metro Station in Brussels with Tactile warning strip on platform and color warning on cars.

Source: Retenberg Design Inc.

persons transporting bicycles and persons with large luggage. Many Subway/ Metro stations built several decades ago are not accessible to persons with mobility aids due to lack of elevators or ramps to reach the platform which are typically serviced only by stairs and escalators.

# 3.7.1 Design Considerations

The alignment of the subway/metro car's floor with the station platform may result in horizontal and vertical gaps which can be hazardous to persons using mobility aids, seniors, pregnant women and persons with strollers or luggage. For persons with reduced vision, detecting the edge of the platform is a challenge (Figure 97). Since metro systems carry a high volume of passengers especially during peak hours, priority seating is required for those who have less stamina and cannot stand for prolonged periods. Family and gender seating are required because of local customs. Due to crowding, on-board next stop announcement and other safety related information must be conveyed to all in a timely manner and in easily comprehensible formats. Emergency evacuation with subway tunnels or elevated guideway is of particular concern.





# 3.7.2 Application Guidelines

The transportation provider should provide subway cars that conform to all applicable guidelines.

#### 3.7.3 Technical Guidelines

#### 3.7.3.1 Doors

Doors on subway and Metro cars should have a minimum width of 800mm, and a maximum of 1200mm, which allows for access of oversized wheelchairs and scooters, as well as triple side-by-side strollers (Figure 98).

Refer to: 3.5.3.1 Doors

# **3.7.3.2 Ramps/Bridge Plates** (Figure 99)

Ramps or bridge plates should be used when the horizontal gap between the vehicle and the platform exceeds 75mm, and the vertical gap exceeds 50 mm. The width of the ramp/bridge plate should be according to the width of the service door.

#### 3.7.3.3 Seat Surfaces

Refer to: 3.4.3.6 Seat Surfaces

# **3.7.3.4 Special Needs Passenger Seating** (Figure 100)

Refer to: 3.4.3.7 Special Needs Passenger Seating

# 3.7.3.5 Wheelchair Securement/Occupant Restraint

Wheelchair securement/occupant restraint systems are not required on subway cars.

# **3.7.3.6** Priority Seating and Signage (Figure 101, 102)

Refer to: 3.3.3.16 Priority Seating and Signage.

# 3.7.3.7 Family and Gender Seating

In subways/metros, a section of a car or a complete car should be dedicated to gender and/or family seating. Refer to: 3.3.3.17 Family and Gender Seating



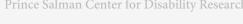














Figure 100. Designated Space on Subway for Wheelchair, Mobility Aid Users and Persons with Strollers

Wheelchair station in subway car with instructions posted on wall. Montreal, Quebec, Canada

Wheelchair priority seating sign above wheelchair station in subway car. Montreal, Quebec

Source: UDA & Associates



Complete section of car reserved for persons with stroller, wheelchairs and persons transporting bikes, Berlin S-Bahn, Germany

Source: Rutenberg Design Inc., Canada



Priority seating sign on subway (in French), Montreal, Quebec, Canada

Source: UDA & Associates

Figure 101. Priority Seating on Subway











Tokyo, Japan

Text and video route information in subway car in Priority seating in Tokyo train. Symbols indicate preference for pregnant women, women with child, person with a cane, and person with crutches

Figure 102. Symbols and Text Information Source: Rutenberg Design Inc. Canada

3.7.3.8 **Luggage Storage** 

Refer to: 3.4.3.18 Luggage Storage

3.7.3.9 **Communication/Information** 

Refer to: 3.4.3.19 Communication/Information

3.7.3.10 **Interior Circulation, Handrails and Stanchions** 

Refer to:3.3.3.18 Interior Circulation, Handrails and

Stanchions

3.7.3.11 Lighting

Refer to: 3.3.3.19 Lighting

3.7.3.12 **Visual Elements** 

Refer to: 3.4.3.13 Visual Elements

3.7.3.13 **Audible Elements** 

Refer to: 3.4.3.15 Audible Elements

3.7.3.14 **Fare Payment** 

Refer to: 3.3.3.20 Fare Payment

3.7.3.15 **Access to Platform** 

All new systems should provide elevators or other means











of level-change equipment (e.g. stair lifts) to platforms, as well as retrofitting older ones to make them accessible.

Elevators to platforms should be clearly marked for their accessibility and designated priority for persons with special needs. Elevators and stair lifts should consider persons with large luggage, those with oversized mobility aids, and person with strollers (Figure 103, 104). [American Society of Mechanical Engineers, 2005]

## 3.7.3.16 Warning Platform Edge

Warning edges on platforms should be 600mm wide with a distance of 600mm from the platform edge, with truncated high color contrast shapes (Figure 105).



Figure 103. Accessible Stair Lift to Subway Platform, Rio de Janeiro, Brazil Source: UDA & Associates

Universal Accessibility Land Transportation Guidelines for the Kingdom of Saudi Arabia





Elevator from ground level to metro platform level with priority signs for persons in wheelchairs and persons with strollers, Warsaw, Poland

Designated accessible elevator in subway, Rio de Janeiro, Brazil

Source: UDA & Associates

Source: Rutenberg Design Inc. Canada

Figure 104. Signage for Station and Elevator Source: UDA & Associates

# 3.7.3.17 Emergency and Evacuation from Platform and Tunnel/Guideway

For emergencies and help required on the platform, "SOS" type communication (such as hotline telephones) should be provided, clearly marked and positioned on the platform in highly visible colors and signage. Two-way communication and a "Help" button should be provided for persons who can speak and/or hear.

[Hathaway, William T.; Markos, Stephanie H. and Balog, John N., 1989-1997]

Emergency and evacuation procedures should avoid the use of elevators and escalators. Trained staff should carry or move persons who are unable to walk or in a wheelchair along evacuation routes in tunnels or on guideways, down stairs or on ramps. It may be necessary to take persons out of their wheelchair/scooter and transport them on stretchers or similar equipment to safety. Refer to: 3.5.3.21 Emergency and Evacuation from Platforms.













#### 3.7.3.18 In-Vehicle Communication/Information

Refer to: 3.4.3.19 Communication/Information

#### 3.7.3.19 Platform Information/Communication

Refer to: 3.5.3.22 Platform Information Systems

#### **3.7.3.20 Next Vehicle Departure and Arrival (Figure 106)**

Refer to: 3.5.3.26

# 3.7.3.21 Emergency and Evacuation Information from Vehicle

Signage for emergencies and evacuation instructions in vehicles should be provided in large print, minimum 18pt bold, title case, fonts without serif, and accompanied with symbols/illustrations. Text and symbols should be back- or front-lit without glare. Operating components, such as levers, pull/push handles and alike should be in high-contrast color and within reach of a standing person between 1200mm–1800mm from the floor. An emergency call button should be placed in the priority seating and wheelchair space area, at 750mm–1000mm above the floor. For emergency evacuation instructions, see examples in Figures 107.

Refer to: 3.2.3.14 Emergency and Evacuation from Vehicle

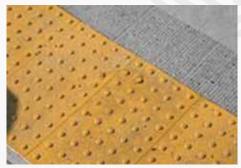


Figure 105. Tactile Warning Platform Strip Consisting of a Truncated Domes



Figure 106. Large Font Electronic Real-time Display of Next Train and Clock, U-Bahn (Underground) Berlin, Germany

Source: Rutenberg Design Inc., Canada







#### 3.7.3.22 Arrival Information

Refer to: 3.1.3.13 Arrival Information

#### 3.7.3.23 Washrooms on Platforms

If applicable, accessible washrooms should be made available on platforms.

#### 3.7.3.24 Ticket Counter

Accessible ticket counters in stations or on platforms should be designed according to Figure 108.



Emergency instructions (French and English) in case of fire, Montreal, Quebec, Canada



Emergency stop lever and instructions (French and English), Montreal, Quebec, Canada



Instructions (white sticker below lever, French and English) for manual opening of door and emergency evacuation of vehicle, Montreal, Quebec, Canada



Back-lit sign indicating the availability and location of emergency assistance, Montreal, Quebec, Canada

Figure 107. In-Vehicle Emergency and Evacuation Signage Source: UDA & Associates













#### 3.7.3.25 **Vehicle Interface with Stations**

The station platform and the vehicle floor should be leveled. The horizontal gap should be less than 75 mm, the vertical gap less than 50 mm, otherwise a ramp or bridge plate should be used.

Tactile and high contrast/color warning strips along the edge of the station platform should be available.

#### 3.7.3.26 **Station Platforms**

Refer to: 3.5.3.30 Station Platforms

#### 3.7.4 Illustrations

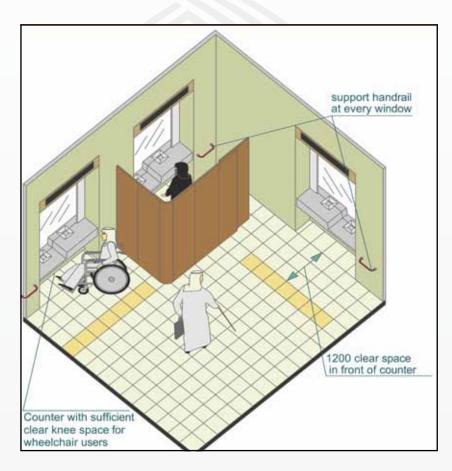


Figure 108. Accessible Ticket Counter Fare Payment Concept.

Illustration adapted from Traffic Advisory Leaflet – Inclusive Mobility: A Guide to Best Practice on Access to Pedestrian and Transportation Infrastructure (Department for Transport, Traffic Advisory Unit, 2002, UK)









# 3.7.5 Other Considerations

- 2.3 Human Space and Reach Requirements
- 3.1 Trip Information
- 3.5 Light Rail Transit
- 3.6 Bus Rapid Transit















[The technical content and illustrations in this section have been adapted from ADA Guidelines: Part 1192 – Americans with Disability Act (ADA) Accessibility Guidelines for Transportation Vehicles, Subpart: 1192.91 – 1192.109]

Commuter rail generally provides rail services between suburban towns and cities, unlike intercity rail that only links major population hubs. In North America, the term "Regional Rail" is synonymous with commuter rail. Most amenities for intercity trains are available on commuter trains, except for buffet, dining and sleeper cars. Commuter rail equipment can be made up of several self-propelled cars or a single locomotive pulling a line of cars. By using locomotives, commuter trains can handle the high volume of passenger traffic at peak periods.

Commuter trains can be one level or bi-level. The height difference from platform to lower level vehicle floor of the bi-level car is less than that of the single level car and allows for access by ramps or bridge plates. Bi-level cars (Figure 109) feature greater passenger capacity and easier access for passengers with mobility aids. Onboard information is typically in audio and text display formats. Washrooms are available on some cars and seats and luggage space are provided for passengers. Standees are discouraged.

# 3.8.1 Design Considerations

Level change between the platform and the train floor on commuter railcars for children, seniors, parents with strollers, persons with baggage and persons with mobility impairments is an issue. The aisle width and seat size can restrict the movement of and use by large persons and those using mobility aids. Fare payment poses a challenge for those with agility problems, foreigners, and illiterate travelers. There is a need to provide for family and gender seating within the vehicle. Persons with mobility, sensory, and cognitive impairments as well as frail seniors need priority seating near the entrance door for ease to disembark. Next stop announcements, transfer information, and emergency evacuation instructions in multiple formats within the vehicle could make the trip more safe, secure and stress-free for all passengers.





For commuter rail vehicles that run on tracks with exclusive right-of-way, platform accessibility and emergency evacuation are of concern. For commuter rail vehicles that share the right-of-way with car and pedestrian traffic, crossing the tracks is both a safety and accessibility issue for passengers, especially those with mobility and sensory impairments.

# 3.8.2 Application Guidelines

The transportation provider should provide commuter railcars that conform to all applicable guidelines. Technical constraints of maximum door-width limit the boarding of triple side-by-side strollers, except in folded position. Method of overcoming vertical and horizontal gaps between platforms to car required. Pedestrian safety and accessibility crossing tracks requires accommodation.

#### 3.8.3 Technical Guidelines



Figure 109. Accessible Ticket Counter Fare Payment Concept.

# 3.8.3.1 Fare Payment

If fare payment is required at terminals or in stations, automatic ticket vending machines should be accessible for elderly persons, those using mobility aids and persons with sensory impairments. Ticket counters should be low at a height of 700mm–750mm with a minimum knee clearance of 650mm for wheelchair and children, with handrails, and loop or other communication systems for persons with hearing or speech impairments. For onboard self-service payment systems, contact less cards should be used to accommodate persons with agility and sensory impairments







## **3.8.3.2** Railroad Crossings – Flangeway (Figure 118)

Tracks for trains, light rail vehicles, or trolleys cross the streets of many urban communities as well as in rural areas. Railroad crossings [Kirschbaum, Julie B. et al, 1999] have flangeway gaps that allow passage of the wheels of the train. But flangeway gaps are often large, and exceed the 13mm (0.5 inches) limit for openings.

- Flangeway fillers should be uses to cover flangeway gaps thereby preventing wheelchair and scooter casters from dropping into the gaps (Figure 118). They typically consist of rubber like materials that deflects when low speed trains are passing. Fillers are not available for high speed or freight trains.
- Approaches to the track and the area between the tracks and the top of the rail should be raised thereby creating flat level areas for crossing.
- Pedestrian paths of travel should intersect the railroad track at a 90 degree angle.

# 3.8.3.3 Doorways

At least one door on each side of the car or at least one adjacent doorway into the passenger compartment should have a minimum clear opening of 800mm.

# 3.8.3.4 Passageways

An accessible route of at least 800mm wide should be provided between the doors and the securement position. Doorway vestibules should be a minimum of 1300mm wide.

# 3.8.3.5 Door Signals

Audible and visual warning signals should be provided to alert passengers of opening and closing of automatic doors.







#### 3.8.3.6 Coordination with Boarding Platform

In stations with high-level platforms, the horizontal gap between rail cars and the platform should be a maximum of 75mm, and a maximum of 50mm in height between the platform and the floor of the car (Figures 110, 116).

## 3.8.3.7 **Signage**

The International Symbol of Access (Refer to: Appendix B) should be displayed on the exterior of all accessible doors. If all cars are accessible, the symbol is not required.



Figure 110. Elevated and Ramped Station Platform, GO Transit, Toronto, Ontario, Canada This is intended for level entry to bi-level train car Source: www.gotransit.ca

# 3.8.3.8 Mobility Aid Accessibility

Commuter rail cars should be equipped with level change or boarding devices, such as a lift, ramp, or bridge plate, to permit mobility aid users to reach a securement position.

#### 3.8.3.9 Onboard Car Lift

Refer to: 3.3.3.4 – 3.3.3.12 Vehicle lift

#### 3.8.3.10 Station-Based Lifts

Refer to: 3.5.3.4

#### 3.8.3.11 Station-Based Mobile Ramps

Station-based ramps should have handrails on both sides











at 750mm–1000mm high, with a non-slip floor surface and a gradient not exceeding 1:8. During the loading and unloading the ramp end should be connected to the car. Both ends should have a high contrast color strips and a threshold not exceeding 6mm (Figure 117).

## **3.8.3.12** Ramp or Bridge Plate (Figures 111, 119)

Ramps and bridge plates can be detachable or permanently connected to the vehicle. They must be available for boarding and alighting on both sides of the car.

Refer to: 3.6.3.14 Ramps and Bridge Plates

#### **3.8.3.13** Handrails

Refer to: 3.3.3.2 Handrails at Vehicle Entrance.

# 3.8.3.14 Seating of Passengers Using Mobility Aids

Spaces for persons in mobility aids should have a clear floor space of at least 1300mm by 800mm and should adjoin and may overlap an accessible path, if necessary. Fold-down seats may be located in this area as long as they do not occupy the necessary clear floor space when



Figure 111. Bridge Plate in Rail Cars

- Manual bridge plate used in rail cars, Ricon Corp., USA/Canada:
- Rated load capacity: 300kg
- Maximum usable bridge plate length: 400mm
- Maximum usable bridge plate width: 900mm

Source: www.riconcorp.com/







folded up. Not more than 150mm of the required clear floor space may be allocated for footrests under another seat provided there is a minimum of 250mm from the floor to the lowest part of the seat overhanging the space (Figure 112).

## 3.8.3.15 Wheelchair Securement System

If a securement system for wheelchairs onboard commuter rail cars is required it should comply with 3.2.3.10.

# 3.8.3.16 Priority Seating and Signage

Refer to: 3.3.3.16 Priority Seating and Signage

## 3.8.3.17 Family and Gender Seating

Refer to: 3.3.3.17 Family and Gender Seating



Figure 112. Wheelchair Space with Fold-Down Seat

Wheelchair position on commuter bi-level train (lower level), GO Transit, Toronto, Canada



Figure 113. Emergency Communication on Platform

SOS call column for emergencies and help, S-Bahn regional commuter rail, Berlin, Germany

Source: Rutenberg Design Inc. Canada













# 3.8.3.18 Interior Circulation, Handrails and Stanchions

Refer to: 3.3.3.18 Interior Circulation, Handrails and Stanchions

# 3.8.3.19 Warning Platform, Edge

Refer to: 3.7.3.16 Warning Platform Edge

#### 3.8.3.20 In-Vehicle Information Systems

Public address systems should be provided in each car, enabling transport personnel or an automated system to provide stop and other information to passengers. Information should be provided in audio and text display and/or by means of an onboard loop system.

#### 3.8.3.21 Station and Platform Information/Communication

For Persons with hearing impairments, and those with hearing aids and T-coils, induction counter loop system, with loop imbedded in writing pad should be used at counters and kiosk (Figure 115).

Refer to: 3.5.3.22 Platform Communication/Information Systems

# 3.8.3.22 Emergency and Evacuation from Platforms

Refer to: 3.5.3.21 Emergency and Evacuation from Platforms and Tunnel (Guideway)

# 3.8.3.23 Emergency Information on Platform

One way communication should be available on platforms for person who are deaf, and a two way SOS calling systems for the general public (Figure 113).

#### 3.8.3.24 Onboard Washroom

If an accessible washroom is provided on a commuter train, it should comply with Intercity Rail 3.10.3.15 onboard washroom. If space is an issue, a high tech bidet-cumtoilet (washlet) with heated seat and built-in ablution water jet in the toilet bowl with wall or seat-mounted electronic







controls, offers a compact solution for female washrooms instead of a separate toilet and a bidet, or a toilet with an ablution hose (Figure 114).

#### 3.8.3.25 Between-Car Barriers

Systems should be put into place to ensure that passengers cannot inadvertently step off the train platform between cars when high-level platforms are used. Possible devices include pantograph gates, chains, motion detectors or other suitable devices.

# 3.8.3.26 Emergency and Evacuation

Refer to: 3.2.3.14 Emergency and Evacuation from Vehicle

#### 3.8.3.27 Arrival Information

Refer to: 3.1.3.13 Arrival Information



Figure 114. Japanese High-Tech Toilet with Built-In Bidet (Washlet)
Two pictures featuring built-in ablution water jet in the toilet bowl with seat-mounted electronic controls

Source: www.whitesplumbing.com

Source: www.southwestmedical.com











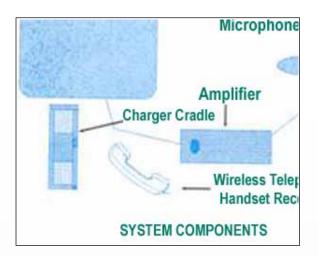


Figure 115. Communication System for Persons with Hearing Impairment Induction counter loop system, with loop imbedded in writing pad. System can be used for persons with hearing aids and T-coils

Source: Rutenberg Design Inc. Canada

#### Illustrations 3.8.4

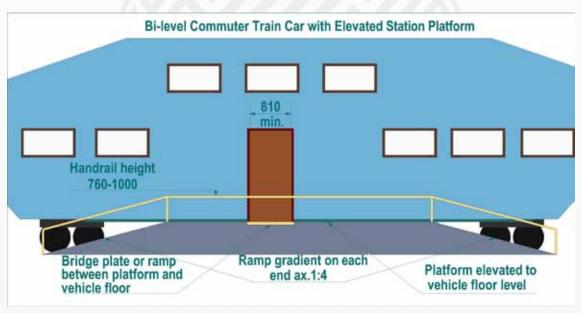


Figure 116. Elevated Boarding Platform

Source: Rutenberg Design Inc. Canada







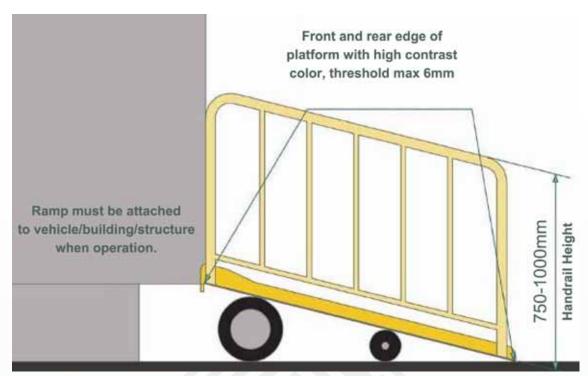


Figure 117. Diagram of Station-based Movable Ramp

Maximum usable platform length 1300mm Maximum usable platform width 800mm Maximum ramp slope 1:8

Source: Rutenberg Design Inc. Canada

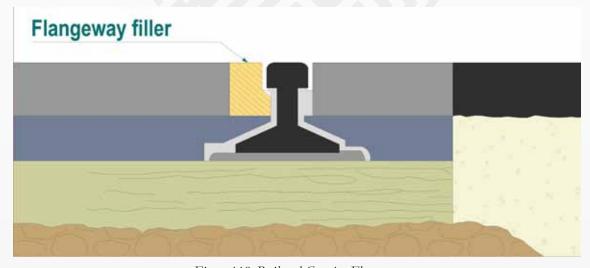


Figure 118. Railroad Crossing Flangeway
Flangeway filler prevents wheelchair and scooter casters from dropping into the gaps

Illustration Adapted from FHWA (USA), Designing Sidewalks and Trails for Access, Part 2, Figure 16-14

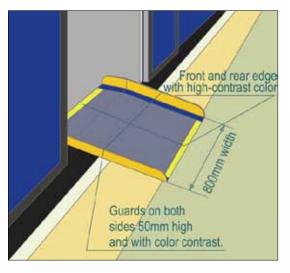












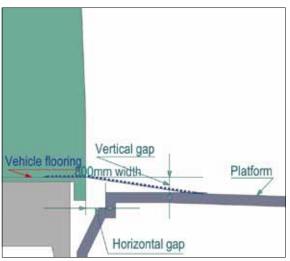


Figure 119. Bridge Plate Diagram

Source: Rutenberg Design Inc., Canada

#### 3.8.5 **Other Considerations**

- Human Space and Reach Requirements 2.3
- Trip Information 3.1
- Light Rail Transit
- 3.10 Intercity Rail

























Figure 120. 14m Intercity coach with mid section access door, New Jersey Transit, USA
Source: www.njtransit.com

[The technical content in this section has been adapted from the Americans with Disability Act (ADA) Accessibility Guidelines for Transportation Vehicles, Subpart: 1192.151 – 1192.161]

Intercity coach or Over-The-Road Buses (OTRBs) are vehicles characterized by an elevated passenger deck located over a baggage compartment (Figure 120). Accessible coaches are equipped with a level-change mechanism or boarding device to permit wheelchairs or other mobility aid users to reach a securement location. The bus length varies from 12m–14m with a GVWR of over 13,600kg. Most are single-deck buses, but there are double-deck low floor buses available as well, though not widely used. Intercity buses transport between 45–60 passengers over long distances, usually from city to city on fixed routes and a fixed schedules. They have a narrow front door with steps which cannot be used for passengers in wheelchairs. Access for them is through the door at mid or rear section on the curb side of the vehicle. In the KSA a small onboard washroom is typically used only for emergencies by male passengers. Passengers and disabled persons prefer an accessible washroom provided at rest stops, to avoid the discomfort and lack of balance caused by the moving vehicle.



# 3.9.1 Design Considerations

The high vehicle floor of intercity buses poses problems in boarding and deboarding for children, seniors, and parents with strollers, persons with baggage and persons with mobility impairments. The narrow aisle width and seat size can restrict internal circulation of large persons and those using mobility aids. Passengers in wheelchairs require boarding and securement systems. Persons with mobility, sensory, cognitive impairments and frail seniors needs priority seating in close proximity to the driver near the front door for assistance and ease to disembark. There is a need for family and female seating at the front of the coach close to the driver. Passengers with sensory impairments require information on next stop, transfers, and emergency and evacuation instructions in more than one format: visual (text or symbol), audio (speech or recorded), haptic and tactile (Braille, raised letters). The small onboard washroom is also an accessibility concern. A preferred solution by female passengers and passengers with disabilities is an accessible washroom at rest stops.

# 3.9.2 Application Guidelines

The transportation provider should ensure that intercity coach services conform to all applicable guidelines. In the absence of an onboard accessible washroom, stops with an accessible washroom should be provided. Access for persons with a stroller may be limited by the size of the lift/ramp platform and service door of 800mm in width and 1300mm in length, unless the stroller is folded and stored.

#### 3.9.3 Technical Guidelines

#### 3.9.3.1 Bus Number and Destination

The bus number and destination should be displayed in large fonts with high contrast in front and on the side of the vehicle. For persons who are blind an infrared transmitting/receiving system (RIAS) should be considered (Figure 121), [American National Standards Institute. 2004].

# 3.9.3.2 Helpful Travel Tips

Travel tips on intercity bus travel should be provided in at least two formats to enable all travelers, especially those with sensory impairments, to increase the level of certainty and security of the journey (Figure 122).















Figure 121. Infrared Transmitter at bus door and hand-held receiver for deaf/hard of hearing passenger to access information for bus number and destination.

Source: Rutenberg Design Inc., Canada

#### 3.9.3.3 Communication with Driver

Travel tips on intercity bus travel should be provided in at least two formats to enable all travelers, especially those with sensory impairments, to increase the level of certainty and security of the journey (Figure 122).

#### 3.9.3.4 Doors, Steps and Thresholds

• Anti-slip floors should be incorporated throughout the vehicle where wheelchair, mobility-aid users and elderly persons will be accommodated.



Figure 122. Travel Information Booklet

Concept for travel tips for passengers with special needs traveling on an Intercity bus, Transport Canada, Canada



Figure 123. Written Communication

Paper and pencil for communication between driver and speech impaired person.

Source: Rutenberg Design Inc., Canada









- All step edges should have a band of color(s) running the full width of the step. Bright yellow color bands are mostly used in the industry as best practice. This color band should contrast from the step treads, risers, or lift surface (Figure 124).
- When open, doors should have a minimum clear width of 800mm between the lowest step and a height of 1300mm. Above this point they may taper to at least 450mm. Protrusions, such as hinges, may reduce this clear width by no more than 100mm.
- The overhead clearance between the top of the lift door opening and the sill should be no less than 1700mm, and greater if possible.

#### 3.9.3.5 On-Board Fare Collection

Some intercity buses have onboard personnel for fare collection and/or validation. When onboard fare collection or validation is not available, fare payment should be carried out in terminals or stations using automatic vending machines.

Refer to: 3.3.3.20 Fare Payment

# 3.9.3.6 **Lighting**

- When the door is open, 2 foot-candles of illumination as measured on the step tread or lift platform should be provided on step wells or doors adjacent to the driver.
- All vehicle doorways should have outside lights that illuminate when the door is open and provide at least 1 foot-candle of illumination on the street surface for a distance of 920mm perpendicular to the bottom step tread or lift outer edge. These light(s) should be shielded to protect the eyes of entering and exiting passengers.













Figure 124. Colored Step Edge and Handrail

High-contrast colored handrail and step edge at entrance door of intercity bus, Trentway Wagar, Toronto, Canada

Source: Rutenberg Design Inc., Canada

# 3.9.3.7 Lift and Ramps

- To ensure accessibility for wheelchair and mobility aid users, passengers with strollers, and those who are otherwise unable to use steps, vehicles should be designed with a level-change or boarding device, such as a lift or ramp (Figure 125).
- At least one position for wheelchair or mobility aid users should be provided
- Boarding equipment should include one of the following: vehicle-based devices, portable or station-based levelchange devices, ramps, or bridge plates.

#### Bus Lift (Figures 125, 126) 3.9.3.8

Refer to: 3.3.3.4 – 3.3.3.12 Vehicle Lifts

#### 3.9.3.9 **Vehicle Ramps**

Vehicle ramps for low floor intercity buses should comply with 3.4.3.3









# 3.9.3.10 Boarding Direction

The lift should permit both inboard and outboard facing of wheelchairs, mobility aids, strollers and other passengers who require a lift or ramp.



Figure 125. Vehicle-Attached Level Change Mechanism



Figure 126. Storable Lift Mechanism

Built-in lift with access door for persons with mobility aids located before rear axle. The lift is equipped with safety guards (front and rear), handrails and safety belt. USA

Source: Rutenberg Design Inc

Swing-out lift at mid section of bus used at New Jersey Transit in USA. When not in use, the lift is stowed in the baggage section under the bus floor

Source: www.njtransit.com

# 3.9.3.11 Lift Use by Standees

Anyone who has difficulty in using steps, including persons with walkers, crutches, canes or braces, should be permitted to use the lift which should have markings indicating a preferred standing position.

# 3.9.3.12 Seating of Special Needs Passengers

A clear floor space of at least 800mm by 1300mm should be provided for persons in mobility aids. It should connect and may even overlap an accessible path, if necessary. Fold-down seats may be located in this area as long as











they do not occupy the necessary clear floor space when folded up. Not more than 150mm of the required clear floor space may be allocated for footrests under another seat provided there is a minimum of 250mm from the floor to the lowest part of the seat overhanging the space. If not occupied by a wheelchair or mobility aid, persons using strollers, obese persons or those with large luggage can use their space.

#### 3.9.3.13 Interior Circulation, Handrails and Stanchions

Refer to: 3.3.3.18 Interior Circulation, Handrails and Stanchions

# 3.9.3.14 In Vehicle Information Systems

In vehicle public address systems should be provided in the bus, enabling transport personnel or an automated system to provide stop and other information to passengers. Information should be provided in audio, text display tactile and/or by means of an onboard loop system (Figure 127).

Refer to: 3.3.3.21 Public Information Systems



Open captioning of text message onboard intercity bus, Trentway Wagar, Canada











Signing on bus monitor for persons who are deaf, prototype Transport Canada, Canada



Tactile seat number concept for visually impaired passengers on Greybound Canada buses (Canada)



Raised letters/symbols and Braille on washroom door, Trentway Wagar, Toronto, Canada

Figure 127. Interior Public Address Systems and Tactile Signage Source: Rutenberg Design Inc., Canada



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# 3.9.3.15 Priority Seating and Signage

Priority seating should indicate that certain seats are priority seats for persons with functional limitations and those other passengers should make such seats available to those who wish to use them. Priority seats should not be located in the area of the wheelchair location.

# 3.9.3.16 Family and Gender Seating

Family and gender seating should be provided at the front of the bus with signage indicating the designated area. Signage should indicate that these seats are priority seats for females and families. These seats should not be located in the area of the wheelchair location.

#### 3.9.3.17 Washroom

Female and disabled passengers should be able to access an accessible washroom at scheduled rest stops, or at time of need.

# 3.9.3.18 Wheelchair Securement Systems

- Securement devices and occupant restraint systems should be available to secure forward facing wheelchairs. Rearfacing wheelchairs do not require securement devices or occupant restraints.
- Location and Size. Refer to: 3.2.3.10.
- Mobility Aids Deployment: The securement system should be automatic or easy to use, and secure common wheelchairs (800mm by 1300mm) and mobility aids.
- Stowage: When not being used for securement, the securement system should not interfere with passenger movement, should not present any hazardous condition, should be reasonably protected from vandalism, and should be readily accessed when needed for use.







- Movement: Under normal vehicle operating conditions the securement system should constrain the movement of an occupied wheelchair or mobility aid to 50mm or less in any direction.
- Seat Belt and Shoulder Harness: Seat belts and shoulder harnesses should be provided for each forward-facing securement position and anchored to the vehicle. [International Standards Organization (ISO), 2004, Wheelchair tie-downs and occupant systems]

#### 3.9.3.19 Movable Aisle Armrest

At least 50% of aisle seats, including all moveable or removable seats at wheelchair or mobility aide securement locations, should have aisle armrests which can be raised, removed, or retracted to permit easy entry or exit.

# 3.9.3.20 Orientation and Way finding in Stations & Terminals

Refer to: 3.5.3.28 Orientation and Way finding

# 3.9.3.21 Emergency and Evacuation Information from Vehicle

Refer to: 3.2.3.14 Emergency and Evacuation Information

#### 3.9.3.22 Station Platform

Refer to: 3.5.3.30 Station Platform

#### 3.9.3.23 Platform Information Systems

Refer to: 3.5.3.22

#### 3.9.3.24 Emergency and Evacuation from Platform

Refer to: 3.5.3.21 Emergency and Evacuation from

Platform

#### 3.9.3.25 Arrival Information

Refer to: 3.1.3.13 Arrival Information







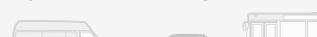




# 3.9.5 Other Considerations

- 2.3 Human Space and Reach Requirements
- 3.1 Trip Information
- 3.4 Urban Buses























# 3.10 Intercity Rail

[The technical content in this section has been adapted from the Americans with Disability Act (ADA) Accessibility Guidelines for Transportation Vehicles, Subpart: 1192.111 – 1192.127]

Intercity rail are train passenger services which cover longer distances than commuter trains. Trains can operate at regular or high speed, and be powered by diesel engines, electric or Maglev power systems. Intercity trains consist typically of coaches (first and second class), lounge cars, dining cars and sleeper cars. Seating layouts in coaches vary from 2+2, 2+1, or compartments with facing seats. All cars have public washrooms, some may have wireless Internet access, and all have onboard service personnel. There are specific locations for large luggage, and overhead racks for lighter luggage. There are public information systems onboard and connecting pathways between cars. Legislation in many countries requires intercity rail cars to be accessible for persons with functional limitations, which includes: boarding devices from platform to car level, access to onboard wheelchair locations, wheelchair securements, accessible washrooms, accessible sleeper suites and access to information in alternative formats. In Europe, intercity trains operate under the InterCity (IC) brand; in Japan, Shinkansens; in the USA, Amtrak, and in Canada, VIA Rail.

# 3.10.1 Design Considerations

The issues with intercity rail cars for children, seniors, parents with strollers, persons with baggage and persons with mobility impairments are the height of the steps/stairs and door width for boarding and deboarding. Fare payment poses a challenge for those with agility problems, foreigners, and illiterate travelers. The aisle width and seat size can restrict the movement of and use by large persons and those using mobility aids. There is a need to provide for family and gender seating and compartments. For long distance rail travel, passengers need to have access to washrooms, dining facilities and sleeping accommodations. Onboard announcements, transfer information, and emergency evacuation instructions in print, audio, visual and tactile formats are required for travelers who cannot see, hear, speak or comprehend. Intercity rail vehicles run on tracks with exclusive rights of way. Boarding platform accessibility and emergency evacuation are of concern. Crossing the tracks after disembarkation is both a safety and accessibility issue for passengers, especially those with mobility and sensory impairments.







# 3.10.2 Application Guidelines

The transportation provider should provide intercity rail cars that conform to all applicable guidelines.

#### 3.10.3 Technical Guidelines

#### 3.10.3.1 Vehicle Steps and Stairs

- All step edges should have a band of color(s) running the full width of the step. Bright yellow color bands are mostly used in the industry as best practice. This color band should contrast from the step treads, risers, or lift surface.
- To accommodate wheelchairs, mobility aids, and strollers, at least one door on each side of the car should have a minimum clear width of 800mm, as well as at least one accessible adjacent door to the passenger compartment.
- Dining and lounge cars should be connected to at least one accessible car.

# 3.10.3.2 **Lighting**

Two foot-candles of illumination as measured on the step tread, lift platform, ramp, or bridge plate should be provided on step wells when the door is open.

When operating at non-lighted station platforms, cars should be equipped with outside lights which provide at least 1 foot-candle of illumination on the station platform surface for a distance of 3 feet perpendicular to all points on the bottom step tread edge. These lights should be shielded to protect the eyes of boarding and alighting passengers.

# 3.10.3.3 Door Signals

Refer to: 3.8.3.5 Door Signals











# 3.10.3.4 Coordination with Boarding Platform

In stations with high-level platforms, the horizontal gap between rail cars and the platform should not exceed 75mm, and not exceed 15mm in height between the platform and the floor of the car. Boarding equipment should be provided if this is not possible.

# 3.10.3.5 Signage

The International Symbol of Accessibility should be displayed on the exterior of all accessible doors. If all cars are accessible, the symbol is not required. Signage should also indicate which accessible doors are adjacent to an accessible restroom.

# 3.10.3.6 Mobility Aid and Stroller Accessibility

Rail cars should be equipped with level change or boarding devices, such as a lift, ramp, or bridge plate, to permit mobility aid users and persons with strollers (except strollers exceeding 800mm in width) to reach a securement position.

# 3.10.3.7 Onboard Train Lift (Figure 128)

Refer to: 3.3.3.4 – 3.3.3.12 Vehicle Lift

# 3.10.3.8 Station-Based Lift (Figure 129)

Station-based lifts are independent mobile devices not connected to the rail car. During the lifting operation the lift should be connected to the vehicle. Station-based lifts should comply with all platform dimensions, safety features and controls as car-based lifts.

Refer to: 3.5.3.4 Station Based Lifts

# 3.10.3.9 Ramp or Bridge Plates (Figure 130)

Refer to: 3.6.3.14 Ramp and Bridge Plates

Universal Accessibility Land Transportation Guidelines for the Kingdom of Saudi Arabia



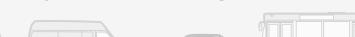








Figure 128. Onboard Operator-controlled onboard train lift in Sweden Source: www.railway-technology.com/contractors/passenger/u\_lift/



Figure 129. Station-Based Lift, VIA Rail in Ottawa, Canada Source: Rutenberg Design Inc.



Figure 130. Ramp on UK intercity train

Source: www.nationalrail.co.uk/stations/agt/

details.html













# 3.10.3.10 Securement Systems

Refer to: 3.4.3.10 Wheelchair Securement and Occupant Restraint

# 3.10.3.11 Stroller and Luggage Storage

Refer to: 3.4.3.18 Luggage and Stroller Storage

# 3.10.3.12 Seat Identification for Blind and Vision Impaired Persons

Seat numbers in cars should be identified with raised numbers, large fonts with high contrast, and in Braille on aisle armrest or on top of aisle seatbacks for persons who are blind or have low vision (Figure 131).

# 3.10.3.13 Priority Seating and Signage (Figures 132, 139)

Refer to: 3.3.3.16 Priority Seating and Signage

# 3.10.3.14 Family and Gender Seating

Refer to: 3.3.3.17 Family and Gender Seating



Figure 131. Train Seat Identification for Blind Persons, with raised number and in Braille on armrest, VIA Rail, Canada Source: Rutenberg Design Inc









Figure 132. Priority Seating Concept in Terminals

Designated location for person in wheelchair, VIA Rail, Montreal, Canada Special armrests to facilitate getting in and out of seats, VIA Rail, Montreal, Canada

Source: Rutenberg Design Inc., Canada

# 3.10.3.15 Onboard Washroom (Figure 133, 138)

Onboard accessible washrooms should be designed for a passenger using a wheelchair or mobility aid to use the washroom according to the following technical guidelines:

The accessible path to reach the washroom should be clear of obstacles with a minimum clear width of 800mm. A minimum of 900mm by 1500mm clear space in front and to the side of the toilet inside the washroom must be provided for assisted or independent transfers. Washroom fixtures may overlap this area (provided they do not interfere with toilet access) by a maximum of 150mm if the lowest portion of the fixture is a minimum of 230mm above the floor, or by a maximum of 480mm if the lowest

portion of the fixture is a minimum of 750mm. If any

fold-out or retractable seats or shelves are located in the washroom overlapping the clear floor space they must be able to be easily folded or moved out of the way. The height of the toilet should be between 450mm to 500mm measured to the top of the toilet seat, with seats that do not spring back to an upright position.

A grab bar should be located along at least one side wall, mounted horizontally, at least 100mm long, between







800mm-900mm from the floor, with a horizontal distance of 460mm - 480mm from the centerline of the toilet to the side wall. A horizontal grab bar at least 600mm long should also be located behind the toilet at a height of 800mm.

- Movable armrests/supports must be positioned on both sides of the toilet for transfers and for elderly persons at a height of 750mm – 850mm from the floor.
- Doors into the washroom should have a minimum clearance of 800mm. Door handles and latches should be easily operable with one hand and should not require tight grasping, pinching, or twisting of the wrist, and preferably be power operated for persons who do not have the strength to open/close doors.
- All controls, including faucets and flush controls, should be mounted between 900mm - 1200mm above the floor and should be easily operable with one hand with a force of less than 22N, without tight grasping, pinching, or twisting of the wrist.
- Accessible washrooms should be in close proximity to and connected to mobility aid seating locations by a path at least 800mm wide.
- Washrooms should also be equipped with a bidet-type device for use by women, as well as garment hooks to hang clothing at a height to be easily reachable yet high enough for long clothing not to touch the wet floor. A compact high tech toilet similar to 3.8.3.24 should be considered.
- An ablution hose should be located in the washroom within easy reach of (maximum 500mm) from the toilet/ bidet edge, at a height of 700mm–800mm, and be operable with one hand, preferably the right.
- An emergency call buttons or cord should be installed in the washroom within an easy reach of the user when sitting on the toilet (i.e. at a distance of 460-480mm from







the toilet edge to the wall, at a height of 750-1000mm from the floor, and at a position of 0-200mm from the front of the toilet).

#### 3.10.3.16 Interior Circulation, Handrails and Stanchions

Refer to: 3.3.3.18 Interior Circulation, Handrails and Stanchions

# 3.10.3.17 Public Information and Systems

Public address systems should be provided in each car, enabling transport personnel or an automated system to provide stop and other information to passengers. Information should be provided in audio and text display and/or by means of an onboard loop system. An onboard loop system should facilitate access to information by persons who are hard of hearing. Onboard entertainment systems can also be provided (Figure 134).

Refer to: 3.3.3.21 Communication/Information



Figure 133. Accessible washroom on high speed ICE train in Germany

Source: Rutenberg Design Inc.











#### 3.10.3.18 Between-Car Barriers

Refer to: 3.8.3.25 Between-Car Barriers

# 3.10.3.19 Sleeping Compartments

- Accessible sleeping compartments should allow wheelchair and mobility aid users to easily enter, maneuver within, and use every element of the compartment.
- A directly accessible washroom should be included in each accessible compartment (Figure 137).
- Controls for mechanisms such as heating and air conditioning, lighting, as well as call buttons, electrical outlets, and other mechanisms should be mounted no more than 1200mm and no less than 400mm above the floor and should have a minimum clear floor area of 800mm by 1300mm directly in front. They should be easily operable with one hand without requiring tight grasping, pinching, or twisting of the wrist.
- A call button should be provided in the washroom as well as in the sleeping compartment at a horizontal distance of 400mm 450mm from the side of a chair and the front of the seat, and at a height of 750mm 1000mm from the floor, or on a flexible cable.
- The height of the bed/chair should be the same as the height of the wheelchair seat of 450mm 480mm to allow for easy transfer.
- The accessible washroom should comply with Figure 138.

# 3.10.3.20 Dining and Lounge Cars

Dining, lounge and service cars should be accessible by persons using mobility aids from their wheelchair station or seat, including passageways and connections between cars. All elements in these cars should be accessible, such as counters and tables. Clearance under tables should be a minimum of 700mm in height and at least 600mm deep.







#### 3.10.3.21 Wireless Onboard Access

Wireless onboard access should be available for passengers with hearing and cognitive problems (Figure 135).

#### 3.10.3.22 Fare Collection

Some intercity trains have onboard personnel for fare collection and/or validation. When onboard fare collection or validation is not available, fare payment should be carried out in terminals or stations using automatic vending machines.

Refer to: 3.3.3.20 Fare Payment

#### 3.10.3.23 Station Platform

Refer to:

3.5.3.30 Station Platforms, 3.5.3.31 Vehicle Interface with Stations, Platforms

# 3.10.3.24 Tactile Warning Edge

Refer to: 3.7.3.16 Warning Platform Edge

# 3.10.3.25 Terminal Information Systems (Figure 136)

All travel information should be made available in text and audio on PDAs, such as departures and arrivals. Gate announcements, safety information, security waiting lines, and carrier websites.



Figure 134. Information & Entertainment System display in back of seat on European train

Figure 135. Wireless Access Onboard Trains. Amtrak Alcea trains, USA

Source: www.amtrak.com

Source: www.alstom.com

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Refer to: 3.5.3.22 Platform Information Systems

# 3.10.3.26 Emergency & Evacuation Information from Vehicle

Refer to:

3.2.3.14 Emergency and Evacuation Information from Vehicle

# 3.10.3.27 Emergency and Evacuation from Platform

Refer to:

3.5.3.21 Emergency and Evacuation from Platform

# 3.10.3.28 Next Vehicle Departure and Arrival

Refer to: 3.5.3.26 Next Vehicle Departure and Arrival

#### 3.10.3.29 Arrival Information

Refer to: 3.1.3.13 Arrival Information

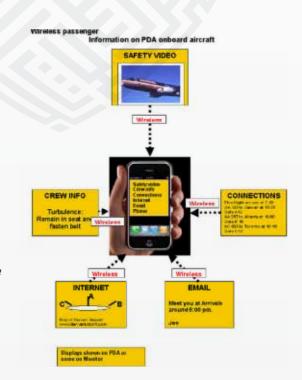


Figure 136. PDA Information System Concepts for wireless information access on handheld communication devices.

Source: Rutenberg Design Inc., Canada





#### 3.10.4 Illustrations

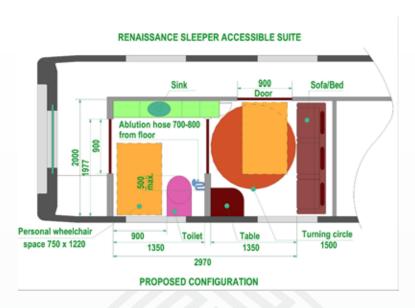


Figure 137. Concept for an Accessible Sleeper Suite with Accessible Washroom and Sleeping Compartment

Compartment designed to allow a person using a wheelchair or mobility aid to enter, maneuver within and approach and use each element within such compartment.

Source: VIA Rail Canada



Figure 138. Accessible Washroom on intercity Rail Car

Concept drawing with location for wheelchair and attendant for assisted transfer Source: VIA Rail Canada, Canada



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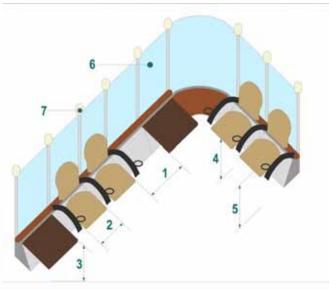


Figure 139. Diagram of Designated Location for Accessible Seating in Rail Terminal

- 1. Space for wheelchair min. 900mm wide x 1500mm deep
- 2. Seat width for large persons: 550mm
- 3. Table height: 700mm
- 4. Seat height: 480mm
- 5. Hand support height: 750mm
- 6. Privacy panel
- 7. Ambient lighting

Source: Rutenberg Design Inc., Canada

#### **Other Considerations** 3.10.5

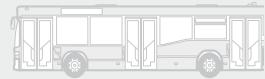
- Human Space and Reach Requirements 2.3
- Trip Information 3.1
- Light Rail Transit 3.5
- Commuter Rail 3.8

# **Appendix**



























#### **APPENDICIES**

# **Appendix A**

# **Definitions**

The terms used in the UALT Technical Design Guidelines are listed in alphabetical order.

#### **Ablution Hose**

Ablution is the washing of ones body or part of it (as in a religious rite) [Merriam Webster Online]. An ablution hose is typically a simple rubber hose wall-mounted next to the toilet. It is approximately 1.5 M. long installed on the toilet wall either by the right hand side of the toilet bowl or by the left hand side of the urinal stall. The main purpose is for Muslims to perform part of the Wudu i.e. cleaning the dirty part of the body after going to the toilet.

#### Access

Enter, board, embark.

#### Alt Text

An attribute used in web pages which allows for in-line text descriptions of images for visually-impaired persons.

# **Baby Carriage**

A four-wheeled carriage, often having a hood that folds back and a handle for pushing, used for wheeling an infant about. Synonyms: baby buggy, perambulator, pram, stroller, go-cart, pushchair, pusher. A stroller (North American English) or pushchair (British English) has the child (generally up to three years old) in a sitting position, usually facing forwards, instead of facing the pusher. The stroller can all be used for lying down and sitting by changing the angle of the back support.

#### **Best Practices**

Best Practices represent the most effective way to achieve a specific objective that meets the needs of the target population [David Skyrme Associates, 2008. www.skyrme.com/updates/u54\_f1.htm].







#### **Braille**

A reading system for persons with moderate to severe functional visual limitations using patterns of raised dots to form letters.

#### **Codes or Codes of Practice**

These are voluntary standards that set out the minimum measures that carriers and terminal operators should adhere to in making services and equipment accessible to persons with disabilities. They can be implemented more expediently than regulations, and are developed through consultation with key stakeholders Examples of voluntary Codes of Practice:

- Canadian Transportation Agency (CTA). 2007. Code of Practice
- Passenger Rail Car Accessibility and Terms and Conditions of Carriage by Rail of Persons with Disabilities.

www.cta-otc.gc.ca/access/codes/rail/index\_e.html. Accessed 31-01-08.

 Canadian Transportation Agency (CTA). 2007. Intercity Bus Code of Practice. www.tc.gc.ca/pol/en/acc/accf/accessCode.htm. Accessed 31-01-08.

# **Egress**

Exit, deboarding, disembark.

#### Feeder Line

A branch line or route that serves to deliver passengers to a more frequent, higher capacity trunk line.

# Flashing/Strobe Lights

Stroboscopic or pulsating light system to alert persons with moderate to severe functional hearing limitations in case of emergency. Strobe lighting can trigger seizures in photosensitive epilepsy. The British Health and Safety Executive recommend that a net flash rate for a bank of strobe lights does not exceed 5 flashes per second, at which only 5% of photosensitive epileptics are at risk. It also recommends that no strobe effects continue for more than 30 seconds due to the potential for discomfort and disorientation.











• [www.epilepsyontario.org/client/EO/EOWeb.nsf/web/ Epilepsy+and+Strobe+Lights]. Accessed 31-01-08.

#### Foot Candle

A unit of luminance on a surface that is everywhere one foot from a uniform point source of light of one candle and equal to one lumen per square foot [Merriam Webster Online: http://mw4.m-w.com/dictionary/foot%20candle]. Accessed 31-01-08.

#### Framework

A framework is an extensible structure for describing a set of concepts, methods, technologies, and cultural changes necessary for a complete product design and manufacturing process – a system of rules, ideas or principles that is used to plan or make decisions. It provides a unified view of the needs and functionality of a particular service or application thus allowing a coherent approach to the specification of protocols and protocol elements as needed to realize the implementation of the service or application. A framework is a broad overview, outline or skeleton, within which details can be added, e.g. a strategic framework for national environmental policy setting the context for individual programs and projects [CERN Engineering Data Management Service, 2001]

[Polish Government – Ministry of the Environment, 1997 – 2008].

#### **G**-force

A measurement of an object's acceleration due to gravity at sea level. 9.81 m/s<sup>2</sup>.

#### Guidelines

Guidelines are official statements that define the parameters of practice. A guideline aims to streamline particular processes according to a set routine. Guidelines are not mandatory requirements [Clinical Governance Support Team, 2008]. Examples of guidelines are:

 United States Access Board. ADA Accessibility Guidelines for Transportation Vehicles. URL: www.access-board.gov/transit/html/vguide.htm. Accessed 25-01-08.







• Snell, Mary Ann. 1999. Guidelines for Safely Transporting Wheelchair Users, American Occupational Therapy Association. OT Practice 4 (5), pp. 35–38. URL: www.wheelchairnet.org/WCN\_WCU/Departments/Docs/Snell.html. Accessed 25-01-08.

## Haptic

Relating to or based on the sense of touch. [Merriam Webster Online. http://mw4.m-w.com/dictionary/haptic]. Accessed 31-01-08.

### **ICE Train**

Inter City Express Train. A system of high speed trains running in Germany.

## **Induction Loop**

An induction loop is a cable that encloses a sound catchment area. It connects to a loop amplifier that gets its signal from a sound source and is transmitted to someone using a hearing aid. Its typical transport application is a counter loop at ticket counters and in vehicles.

## Legislation

This is an exercise of the power and function of making rules (as laws, or statutes) that have the force of authority by virtue of their promulgation by a legislature or other governing body [Merriam-Webster Online]. The term may refer to a single law, or the collective body of enacted law, while "statute" is also used to refer to a single law. Before legislation becomes law, it is called a bill. In some jurisdictions, legislation must be confirmed by the executive branch of government before it becomes law. Examples of international disability laws:

- Office of Public Sector Information (UK). 1995. Disability Discrimination Act. URL: www.opsi.gov.uk/acts/acts1995/ukpga\_19950050\_en\_1). Accessed 31-01-08.
- Department of Justice and Constitutional Development (SA). 2000. The Promotion of Equality and the Prevention of Unfair Discrimination Act. URL: www.doj.gov.za/legislation/acts/act\_docs/2001\_training\_eqc%20 act.html Accessed 31-01-08.











## Longdesc

An attribute used in web pages which allows for links to a separate file which contains long descriptions of images for visually impaired persons.

#### LUX

The SI (International) unit of luminance, or luminous flux incident on a unit area. Frequently defined as one lumen per square meter (lm/m2).

## Maglev Power System

When a train is powered by magnetic force and is suspended above a magnetized track, thereby traveling without friction [Princeton WordNet: http://wordnet. princeton.edu/perl/webwn?s=maglev]. Accessed 31-01-08.

#### N

A Newton is the unit of force in the SI system; it is equal to the amount of force required to give a mass of one kilogram an acceleration of one meter per second squared.

## **Policy**

A plan or course of action adopted by governments, political parties, or a business as an instrument to influence and determining decisions and actions Merriam Webster Online. URL: www.m-w.com/dictionary/policy. Accessed 30-01-08.]

## Regulations

A regulation is a delegated or subordinate form of legislation [Treasury Board of Canada Secretariat, 2000] that deals with details or procedure. It is a rule or order issued by an executive authority or government regulatory agency of and having the force of law [Encyclopedia Britannica Online]. Authority to make regulations must be expressly delegated by enabling acts

#### **Standards**

Standards are defined by the International Organization of Standardization (ISO) as "documented agreements containing technical specifications or other









precise criteria to be used consistently as rules, guidelines or definitions of characteristics, to ensure that materials, products, processes and services are fit for their purpose." In the context of technologies and industries, standardization is the process of establishing a technical specification, called a standard, among competing entities in a market, and brings benefits without hurting competition. In general, each country or economy has a single recognized National Standards Body (NSB), e.g. ANSI [Government of Canada – BioPortal, 2007]. Examples of Disability Standards:

Attorney General's Department, Australian Government. 2006. Disability Standards for Accessible Public Transport. URL:

www.ag.gov.au/www/agd/agd.nsf/Page/Humanrightsandantidiscrimination\_ DisabilityStandardsforAccessiblePublicTransport. Accessed 25-01-08

#### Trunk Line

A line that is the main route or corridor on a railway, light rail, or bus rapid transit system.

### **TTY or Text Phones**

TTY stands for Tele TYpewriter. A TTY is a compact device that uses computer technology, a typewriter keyboard and a letter display and/or printer to allow deaf or speech impaired persons to converse over telephone lines without the need of an interpreter by displaying the information as a text message on a small screen [York University, 2002. Access for People with Disabilities]. http://www.yorku.ca/computng/students/access/index.html. Accessed 06-02-08.

#### Washlet

A high tech bidet-cum-toilet with heated seat, built-in ablution water jet in the toilet bowl and wall or seat-mounted electronic controls offers a compact solution for female washrooms instead of a separate toilet and a bidet, or a toilet with an ablution hose.

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# **Appendix B**

## **International Access Symbols**

The Following is a list of ISO Symbols for accessibile signage.



Accessible toilet unisex (modified UK)



Accessible Parking (UK)



Accessible facility or entrance (UK)



Accessible Lift (UK)



Accessible Toilet for Men (UK)



Accessible Toilet for Women (UK)



Facilities for Vision Impaired (UK)



Guide Dogs Allowed (UK)



Mobility ImpairedUK)





Blind person (World Blind Union)



Facilities for hearing impaired (World Federation of the Deaf Symbol)



Induction loop System (World Federation of the Deaf Symbol)



Infra-red System (World Federation of the Deaf Symbol)



Telephone Amplification(ETSI)



Text Telephone (UK)



Video Telephone Suitable for lip reading (ETSI)



Assistance Available (International Sysmbol of Assistance)













#### **Appendix C List of Abbreviations**

Universal Accessible Transportation (UALT) Acronyms (in alphabetical order)

**ADA** Americans with Disabilities Act (USA)

**AODA** Accessibility for Ontarians with Disabilities Act (Canada)

**APTA** American Public Transportation Association (USA)

**ANSI** American National Standards Institute (USA)

**AVL** Automatic Vehicle Location BCBritish Columbia (Canada)

**BC** Transit British Columbia Transit Service (Canada)

**BRT** Bus Rapid Transit

**CSA** Canadian Standards Association **CTA** Canadian Transportation Agency

**ECMT** European Conference of Ministers of Transport

**GIS** Geographic Information System

**GO** Transit Government of Ontario Regional commuter rail and bus

public transit system, for the Greater Toronto Area

**GPS** Global Positioning System Gross Vehicle Weight Rating **GVWR HOV** High Occupancy Vehicle

**ICC** International Code Council (USA)

**ICE** Train Inter City Express Train

**ICT** Pedestrian Information Communication Technology

**ISBN** International Standard Book Number

**ISO** International Standards Organization (Switzerland)

ITF International Transport Forum ITS Intelligent Transport System **KSA** Kingdom of Saudi Arabia

LRT Light Rail Transit

**LUX** The SI (International) unit of luminance, or luminous flux

incident

N A Newton

NTS National Transportation Strategy, Kingdom of Saudi

Arabia

**OC** Transpo Ottawa Carleton Transport, Ontario, Canada

**OTRB** Over the Road Bus









PA Public AnnouncementPDA Personal Digital Assistant

**PFL** Persons with Functional Limitations

**R&D** Research and Development

**RIAS** Remote Infrared Audible Signage

STM Société de transport de Montréal (Canada)

**TRANSED** International Conference on Mobility and Transportation

for Elderly and Disabled People

UABE Universal Accessible Built Environment
 UAP Universal Accessibility Program (KSA)
 UALT Universal Accessible Transportation (KSA)

UK United KingdomUN United Nations

**UNDP** United Nations Development Program

**USA** United States of America

**W3C** World Wide Web Consortium (USA)













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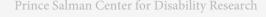
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## Appendix F UALT Guideline Checklists

This checklist has been compiled based on the technical requirements of the current draft guidelines, as listed in the Table of Contents. It should be noted that these are draft guidelines, subject to validation through on-site verification across KSA. In support of this validation process, users of the checklist are encouraged to provide comments and suggestions to the Prince Salman Centre for Disability Research using the Feedback Form in Appendix F.









		UALT GUIDELINE CHECKLISTS	KLISTS				
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3.1.3.1	41	Pre-Journey					
ष	14	Alternative Information Formats					
Ω	41	Booking Arrangements					
O	41	Services Provided Upon Request					
3.1.3.2	42	Pre-Arrival / Booking					
ल	42	Advertising Materials / Website					
Ω	42	Reservation Desk					
O	42	Counter Induction Loop					
3.1.3.3	42	Printed Schedules, Braille Maps, Tactile Communication & Signs					
Ø	42	Printed Schedules					
۵	42	Tactile Communication					
O	42	Tactile Signs					
σ	43	Sign Position					
Φ	43	Mounting Angle					
Ļ	43	Embossed Depth					
ರಾ	43	Tactile Maps					









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Guideline Reference	Š.	Element	Yes	8 N	Partial	N/A	Comments
3.1 TRIP INFORMATION	NOIL						
3.1.3.4	44	Access to Website and Interfaces					
ष	44	Text Tags					
Ω	45	Colors					
O	45	Readability					
ъ	45	Server-Side Image Maps					
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4	46	Tables					
ರಾ	46	Frames					
ב	46	Flicker Rate					
	46	Text-Only Alternative					
	47	Scripts					
¥	47	Applets and Plug-Ins					
-	47	Electronic Forms					
Ε	48	Navigation Links					
C	48	Time Delays					
0	48	Validation					

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		UALT GUIDELINE CHECKLISTS	KLISTS				
	Page	ī		Comp	Compliance Status	atus	Ċ
Guideline Reference	No No	Element	Yes	8	Partial	N/A	Comments
3.1 TRIP INFORMATION	NOIL						
3.1.3.5	48	Access to Travel Agents					
3.1.3.6	48	Telephone, PDA, and Cellular Phones					
Ø	48	Public Phones					
Ω	49	Small Keys					
O	49	TTY, e-mail or Website					
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Φ	49	Messaging System					
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3.1.3.8	20	Fare Payment and Ticketing Information					
Ø	51	Fare Payment Methods					
Ω	51	Payment Over Phone					
O	51	Online Payment					
σ	52	Payment in Terminals					









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	Š.		Yes	% 0	Partial	N/A	COLLEGE
3.1 TRIP INFORMATION	NOIT						
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<b>-</b>	52	Clear Floor Area for Vending Machines					
ರಾ	52	Controls and Operating Mechanism					
٩	52	Signage on Vending Machines					
-	52	Operating Controls					
3.1.3.9	53	Pre-Boarding or Destination Announcements					
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3.1 TRIP INFORMATION	NOIL						
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Ø	55	Visual Alarms					
	55	<ul> <li>Location</li> </ul>					
	55	<ul> <li>Visibility</li> </ul>					
	56	• Lamp					
	56	• Color					
	56	Pulse Cycle					
	56	<ul><li>Intensity</li></ul>					
	56	<ul> <li>Flash and Flash Rate</li> </ul>					
Ω	22	Audible Alarms and Warnings					
O	22	Evacuation from Platforms					
σ	28	Evacuation from Vehicles					











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Guideline Reference	No.	Element	Yes		No Partial N/A	N/A	Comments
3.1 TRIP INFORMATION	NOIL						
3.1.3.13	28	Arrival Information					
ત	28	Accessibility of Electronic Information					
Q	29	Accessibility of Audible Information					
O	09	Tactile Information					
σ	09	Accessibility of Telecommunication System					







Guideline	Page	UALT GUIDELINE CHECKLISTS Element	KLISTS		Compliance Status	atus	Comments
Reference 3.2 TAXIS AN	NO.	ence NO.  TAXIS AND LIMOUSINES (URBAN AND INTERCITY)	Yes	<u>8</u>	Partial N/A	¥ N	
3.2.3.1	65	Indentification					
•	65	Urban Taxi and Limousine					
•	65	International Access Symbol					
3.2.3.2	65	Accessible Taxi and Limousine					
3.2.3.3	65	Taxi and Limousine Registration Numbers					
3.2.3.4	65	Taxi and Limousine Information					
3.2.3.5	99	Boarding / Deboarding Points					
3.2.3.6	99	Doors					
3.2.3.7	99	Occupancy					
3.2.3.8	29	Family and Gender Seating					





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	Compliance Status	No Partial N/A													
LISTS	Ŏ	Yes													
UALT GUIDELINE CHECKLISTS	i i i i i i i i i i i i i i i i i i i	петел	TAXIS AND LIMOUSINES (URBAN AND INTERCITY)	Lifting Devices, Ramps, or Portable Bridge Plates	Use by Seniors	Unsafe Stop	Color Strips	Low Floor Taxi and Limousine	Convertied Low Floor Vans	Side Entrance to Taxi	Wheelchair Securement & Occupant Rstraint System	Boarding / Deboarding Assistance	Boarding / Deboarding Assistance	Driver Request for Assistance	Inaccessible Stop
	Page	No.	ID LIMOUS	67	29	29	29	89	89	69	70	70	70	70	7
	Guideline	Reference	3.2 TAXIS AN	3.2.3.9	•	•	•	Ø	•	•	3.2.3.10	3.2.3.11	•	•	•







		N/A Comments									
	Compliance Status										
	mpliano	No Partial									
IS	ပိ										
CKLIS		Yes									
UALT GUIDELINE CHECKLISTS	i L	Lemen	TAXIS AND LIMOUSINES (URBAN AND INTERCITY)	Navigation and Automatic Vehicle Location Systems (AVL)	Fares and Notices	Rates and Communication	Same Fare	Sensory	Prepaid Smartcards	Emergency and Evacuation	Vehicle Interfaces with Stops and Stands
	Page	Š.	ID LIMOUS	72	72	72	72	72	72	72	72
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UALT GUIDELINE CHECKLISTS	Compliance Status	Reference Page No. Element Yes No Partial N/A Comments	SPECIAL VEHICLES	3.1 76 Doors, Steps and Thresholds	76 Door Opening	76 All Passenger Areas with Anti Slip Floors	76 Color Band on Edges	76 Overhead Clearance	3.2 Handrails at Entrance	3.3 Mobility Aid and Stroller Accessibility	3.4 Vehicle Lift	3.5 Lift Control Systems	3.6 T8 Emergency Operation	3.7 78 Power or Equipment Failure	3.8 Platform Guards	3.9 78 Platform Surface	
	: :- :	Guldeline Reference	3.3 SPECIAL VEH	3.3.3.1	•	•	•	•	3.3.3.2	3.3.3.3	3.3.3.4	3.3.3.5	3.3.3.6	3.3.3.7	3.3.3.8	3.3.3.9	







		UALT GUIDELINE CHECKLISTS	STS		
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•	79	Platform Deflaction			
•	79	Platform Movement			
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•	80	Design Load			
•	80	Ramp Surface			
•	80	Ramp Threshold			
•	80	Ramp Guard			
•	81	Ramp Slope			
•	81	Ramp Attachment			
•	81	Ramp Stowage			









		UALT GUIDELINE CHECKLISTS	STS				
	4	Ī		Comp	Compliance Status	atus	Č
auldeline Reference	Page No.	Element	Yes	No	Partial	N/A	Comments
3.3 SPECIAL VEHICLES	HICLES						
3.3.3.14	82	Mobility Aids Securement Systems					
•	82	Orientation					
•	82	Movement					
•	82	Stowage					
•	82	Seat Belt and Shoulder Harness					
3.3.3.15	83	Stop Request					
	83	Control Location					
•	83	Operation with one hand					
3.3.3.16	83	Priority Seating and Signage					
•	83	Forward Facing Seats Near Entrance					
•	84	International Access Symbol					
•	84	Characters on Signs					
3.3.3.17	84	Family and Gender Seating					







		UALT GUIDELINE CHECKLISTS	STS				
	2	Ī		Comp	Compliance Status	atus	
auldeline Reference	Page No.	Element	Yes	No No	Partial	N/A	Comments
3.3 SPECIAL VEHICLES	HICLES						
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•	84	Location of Handrails and Stanchions					
•	85	Handrails to Assist Boarding					
•	82	Handrail Dimensions and Clearance					
•	85	Horizontal Assist at Fare PAyment Box					
•	85	Interference with Wheelchair Footrest at Front Entrance					
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•	85	Driver Seat Platform Clearance					
•	85	Interior Height Dimension					
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•	86	Illumination at Door					
•	86	Illumination in Step Wells					
3.3.3.20	86	Fare Payment					









		UALT GUIDELINE CHECKLISTS	STS				
: : : :	:	Ī		Comp	Compliance Status		
Guideline Kererence	Page No.	Element	Yes	N <sub>o</sub>	Partial	N/A Comments	
3.3 SPECIAL VEHICLES	HICLES						
3.3.3.21	86	Public Information System					
•	98	Alternative Audio and Text Display					
•	87	Real Time Audio and Text for Emergencies					
•	87	Information for Foreigners					
•	87	Advanced Technologies for Communication					
3.3.3.22	87	Destination and Route Signs					
3.3.3.23	87	Emergency and Evacuation Information in Vehicle					
3.3.3.24	88	<b>Emergency and Evacuation from Platforms</b>					
3.3.3.25	88	Vehicle Interfaces with Stops and Stands					







UALT GUIDELINE CHECKLISTS	Compliance Status	e Keterence Page No. Element Yes No Partial N/A Comments	URBAN BUSES	.4.3.1 90 Doors	.4.3.2 9 Vehicle Steps	.4.3.3 91 Vehicle Ramps	Ramp Gradient	• Payload	Power Operated Ramps	.4.3.4 93 Wheelchair Lifts	93 Platform Dimensions	93 Handrails on Platforms	93 Platform Speed	.4.3.5 93 Low Floor Buses	
	: : :	Guideline Reference	3.4 URBAN BUS	3.4.3.1	3.4.3.2	3.4.3.3	•	•	•	3.4.3.4				3.4.3.5	









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duideline Reference Page No.	rage No.	Element	Yes	No	No Partial	N/A	Comments
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3.4.3.7	94	Special Needs Passanger Seating					
•	94	Floor Space for Wheelchair					
•	94	Pathway Dimensions					
•	94	Folding Seat Type					
•	94	Space for Stroller and Luggage					
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•	95	Priority Seat Next to Driver					
•	95	Reserved Seating Sections					
•	95	Seat Equipment					
•	92	Priority Seating Not in Wheelchair Position					
•	95	Signage Characteristics					







		UALT GUIDELINE CHECKLISTS	TS			
		† · · · · · · · · · · · · · · · · · · ·		Compl	Compliance Status	
Guideline Reference	rage No.	Element	Yes	8	Partial	N/A Comments
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3.4.3.10	96	Wheelchair Securement & Occupant Restraint				
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•	97	Rear Facing				
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•	86	Signage				
3.4.3.14	86	Use of Color				
•	86	Use of Color				
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		UALT GUIDELINE CHECKLISTS	STS				
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duidellne Reference	rage No.		Yes	8	Partial	N/A	Corninerits
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•	86	Color Coding					
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•	66	Alternative Audio & Text Disaplay					
•	66	Real-Time Audio & Text for Emergencies					
•	66	Information for Foreigners					
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3.4.3.20	100	Fare Payments					







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Guldeline Reference	Page No.	Element	Yes	N <sub>o</sub>	Partial	N/A Cor	Comments
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3.4.3.22	101	Emergency & Evacuation Platform					
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Q	101	Stops					
O	101	Sheltered Stops					
•	101	Bench					
•	102	Minimum Depth for Wheelchair					
•	102	Edge Warning for Blind					
•	102	Large Print Schedule and Route Map					
•	102	"Help" Phone					

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T (SKY TRAIN Doors Steps Station Station Low Flc Low Flc Mobility Restrain B4 Interior B6 Lighting B7 Visual E 99 Audibile	UALT GUIDELINE CHECKLISTS	Compliance Status	ge No. Element Yes No Partial N/A	LIGHT RAIL TRANSIT (SKY TRAINS, STREETCARS & TRAMS)				109 Station Based Wheelchair Lisfts	109 Low Floor Tramps, Streetcars	9 / 78 Seat Surfaces	9 / 94 Special Needs Passenger Seating	9 / 83 Priority Seating and Signage	0 / 84 Family and Gender Seating	Mobility Aid Securement / Occupant Restraint	0 / 84 Interior Circulation, Handrails & Stanchions	0 / 86 Lighting	0 / 97 Visual Elements	0 / 99 Audibile Elements
			Page N	TRANSIT	108	109	109 / 80	109	109	109 / 78	109 / 94	109 / 83	110 / 84	110	110 / 84	110 / 86	110 / 97	110 / 99
TRANSIT (6 109 / 80 109 / 78 109 / 94 109 / 83 110 / 84 110 / 84 110 / 97			Guideline Reference	3.5 LIGHT RAIL	3.5.3.1	3.5.3.2	3.5.3.3 / 3.5.3.13	3.5.3.4	3.5.3.5	3.5.3.6 / 3.3.3.6	3.5.3.7 / 3.4.3.7	3.5.3.8 / 3.3.3.16	3.5.3.9 / 3.9.3.17	3.5.3.10	3.5.3.11 / 3.3.3.18	3.5.3.12 / 3.3.3.19	3.5.3.13 / 3.4.3.13	3.5.3.14 / 3.4.3.15







		UALT GUIDELINE CHECKLISTS	STS			
		Ţ,		Comp	Compliance Status	
Guideline Kererence	rage No.	Element	Yes	8	Partial	N/A Comments
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3.5.3.16 / 3.4.3.17	110 / 99	Next Stop Announcements				
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		Comments															
	atus	N/A															
	Compliance Status	Partial															
	Comp	S S															
Z2		Yes															
UALT GUIDELINE CHECKLISTS	† · · · · · · · · · · · · · · · · · · ·		LIGHT RAIL TRANSIT (SKY TRAINS, STREETCARS & TRAMS)	mergency & Evacuation from Platforms & Tunnel / Guideway	Platform Information Systems	Arrival Information	Priority Seating and Signage	Ticket and Information Counter	Next Vehicle Departure & Arrival	Monitors and Electronic Signs	Monitors and Sign Placement	Color Contrast, Background, Glare	Information Systems	Alternative Formats	Access for Wheelchair Passengers, Accessible Control	Audio and Text on PDAs	Orientation and Wayfinding
		Page No.	RANSIT (S	112	113	113 / 58	114 / 83	114	114	114	114	114	115	115	115	115	116
		guideline Reference	3.5 LIGHT RAIL T	3.5.3.21	3.5.3.22	3.5.3.23 / 3.1.3.13	3.5.3.24 / 3.3.3.16	3.5.3.25	3.5.3.26	•	•	•	3.5.3.27	•	•	•	3.5.3.28









		Comments							
	Status	al N/A							
	Compliance Status	No Partial							
	Cor								
LISTS		Yes							
UALT GUIDELINE CHECKLISTS	† · · · · · · · · · · · · · · · · · · ·		LIGHT RAIL TRANSIT (SKY TRAINS, STREETCARS & TRAMS)	Security Clearance	Station Platforms	Vehicle Interface with Stations, Platforms	Emergency and Evacuation Information from Vehicle	Emergency and Evacuation Information from Platforms	Arrival Information
		rage No.	SANSIT (S	116	117	118	118 / 72	118 / 112	118 / 58
		Guideline Reference	3.5 LIGHT RAIL TE	3.5.3.29	3.5.3.30	3.5.3.31	3.5.3.32 3.2.3.14	3.5.3.33 3.5.3.21	3.5.3.34 3.1.3.13

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		UALT GUIDELINE CHECKLISTS	STS				
		†*** C CAC		Comp	Compliance Status	ıtus	4
	rage No.		Yes	8	Partial	N/A	COLLINGINS
3.6 BUS RAPID TRANSIT	TRANSIT						
3.6.3.1	122	Tactile Warnings and Tactile Guideways					
3.6.3.2	122	Access at Trunk Line Stations					
•	122	Station Assistants					
•	123	Security Personnel					
•	124	Uniform Design Elements					
3.6.3.3	124	Station Doors					
3.6.3.4	124	Vehicle Doors					
3.6.3.5	124	Turnstiles					
3.6.3.6	125	Fare Payment, Collection and Fare Gate					
3.6.3.7	125	Station Seats and Supports					
3.6.3.8	125	Transit Information in Station					
3.6.3.9 / 3.4.3.13	125 / 97	Visual Elements					
3.6.3.10	125	Tactile Elements					
3.6.3.11	125	Elevators and Stair Lifts					
3.6.3.12	125	Intermodal Transfers					







UALT GUIDELINE CHECKLISTS	Compliance Status	Yes No Partial N/A Comments	D TRANSIT	125 Platform to Bus Floor Gap	125 Ramp and Bridge Plates	126 / 87 Vehicle Interface with Stations	126 / 87 Route or Destination Signange	126 Interconnected and Articulated Buses	126 Interconnected High & Low Floor Buses	126 Low Floor Buses Kneeling	126 / 89 Low Floor Buses	126 / 93 Seat Surfaces	126 / 94 Special Needs Passenger Seating	126 / 83 Priority Seating and Signage	126 / 84 Family and Gender Seating	126 / 112 Emergency and Evacuation Information from Platform	
		rage No.	RANSIT	125	125	126 / 87	126 / 87	126	126	126	126 / 89	126 / 93	126 / 94	126 / 83	126 / 84	126 / 112	126 / 84
		Guideline Reference	3.6 BUS RAPID TRANSIT	3.6.3.13	3.6.3.14	3.6.3.15 / 3.3.3.23	3.6.3.16 / 3.3.3.22	3.6.3.17	•	•	3.6.3.18 / 3.4	3.6.3.19 / 3.4.3.6	3.6.3.20 / 3.4.3.7	3.6.3.21 / 3.3.3.16	3.6.3.22 / 3.3.3.17	3.6.3.23 / 3.5.3.21	36324 / 33318







Prince Salman Center for Disability Research





		UALT GUIDELINE CHECKLISTS	STS				
::- ::- ::- ::- ::- ::- ::- ::- ::- ::-		\$ 000 C C C C C C C C C C C C C C C C C		Comp	Compliance Status	atus	4
Guidellie Relerence	rage No.		Yes	8 8	No Partial	N/A	COLLINELLS
3.6 BUS RAPID TRANSIT	RANSIT						
3.6.3.25 / 3.3.3.19	122 / 86	Lighting					
3.6.3.26 / 3.3.3.21	122 / 86	Public Information Systems					
3.6.3.27 / Fig 79, 80	122 / 104	Wheelchair Securement Systems					
3.6.3.28 / 3.3.3.15	123 / 83	Stop Request					
3.6.3.29 / 3.2.3.19	124 /	Emergency and Evacuation Information from Vehicle					
3.6.3.30 / 3.1.3.13	124 / 58	Arrival Information					







Guideline Reference         Page No.         Element         Compliance Status           3.7.3.1         METRO / SUBMAY         Seat Surfaces         NA         Partial         N/A           3.7.3.2         130         Bamp / Bridge Plates         3.7.3.4         3.4.3.6         130 / 93         Seat Surfaces           3.7.3.4 / 3.4.3.7         130 / 93         Seat Surfaces         3.7.3.6         3.3.3.16         130 / 93         Seat Surfaces           3.7.3.5 / 3.3.3.16         130 / 94         Special Needs Passenger Seating         3.7.3.6         3.8.3.16         3.7.3.7         3.3.3.17         3.3.3.16         3.7.3.9         3.7.3.9         3.7.3.1         3.7.3.1         3.3.3.18         132 / 99         Priority Seating and Signage         3.7.3.1         3.7.3.1         3.3.3.18         132 / 99         Communication Information         3.7.3.1         3.3.3.18         132 / 99         Communication Information         3.7.3.11         3.3.3.18         132 / 99         Lighting           3.7.3.11 / 3.3.3.19         132 / 97         Visual Elements         3.7.3.13         3.4.3.15         3.4.3.15         3.2.9         3.4.3.15         3.2.9         3.7.3.14         3.3.3.3.14         3.3.3.3.14         3.3.3.3.14         3.3.3.3.14         3.3.3.3.3         3.4.3.15         3.4.3.15			UALT GUIDELINE CHECKLISTS	TS			
Tage No.         Tentient         Yes         No         Partial           130         Bamp / Bridge Plates         130 / 94         Seat Surfaces         130 / 94         Special Needs Passenger Seating         130 / 94         Special Needs Passenger Seating         130 / 94         Priority Seating and Signage         130 / 94         Family and Gender Seating         132 / 94         Priority Seating and Signage         132 / 94         Interior Circulation Information         132 / 94         Interior Circulation, Handrails & Stanchions         132 / 94         Interior Circulation, Handrails & Stanchions         132 / 94         Audible Elements         132 / 95         Audible Elements         132 / 97         Fare Payment         132 / 78         Fare Payment           133 / 78         Fare Payment         133 / 78         Fare Payment         133 / 78         133			\$ 000 000 L		Comp	liance Sta	
130 / 93   130 / 93   130 / 94   130 / 83   130 / 84   132 / 99   132 / 86   132 / 99   132 / 99   132 / 99   132 / 99   132 / 99   132 / 99   132 / 78   132 / 78   132 / 78   133 / 78	Guideline Reference	rage No.	Element	Yes	2	Partial	Comments
130   130   130   130   93   130   94   130   84   132   99   132   99   132   99   132   99   132   99   132   99   132   78   132   78   132   78   132   78   133   1		BWAY					
130 / 93 130 / 94 130 / 84 132 / 99 132 / 99 132 / 97 132 / 99 132 / 97 132 / 99 132 / 97	3.7.3.1	130	Doors				
130 / 93 130 / 94 130 / 83 132 / 99 132 / 99 132 / 97 132 / 99 132 / 97 132 / 99 132 / 97	3.7.3.2	130	Ramp / Bridge Plates				
130 / 94 130 / 83 130 / 84 132 / 99 132 / 97 132 / 97 132 / 99 132 / 97	3.7.3.3 / 3.4.3.6	130 / 93	Seat Surfaces				
130 / 83 130 / 84 132 / 99 132 / 84 132 / 97 132 / 99 132 / 78	3.7.3.4 / 3.4.3.7	130 / 94	Special Needs Passenger Seating				
130 / 83 130 / 84 132 / 99 132 / 86 132 / 97 132 / 99 132 / 78	3.7.3.5	130	Wheelchair Securement/Occupant Retraint				
132 / 99 132 / 99 132 / 84 132 / 97 132 / 99 132 / 78	3.7.3.6 / 3.3.3.16	130 / 83	Priority Seating and Signage				
132 / 99 132 / 84 132 / 86 132 / 97 132 / 99 132 / 78	3.7.3.7 / 3.3.3.17	130 / 84	Family and Gender Seating				
132 / 99 132 / 84 132 / 97 132 / 99 132 / 78	3.7.3.8 / 3.4.3.18	132 / 99	Luggage Storage				
132 / 84 132 / 86 132 / 97 132 / 78 132 / 78	3.7.3.9 / 3.4.3.19	132 / 99	Communication Information				
132 / 86 132 / 97 132 / 99 132 / 78	3.7.3.10 / 3.3.3.18	132 / 84	Interior Circulation, Handrails & Stanchions				
132 / 97 132 / 99 132 / 78 133	3.7.3.11 / 3.3.3.19	132 / 86	Lighting				
132 / 99	3.7.3.12 / 3.4.3.13	132 / 97	Visual Elements				
132 / 78	3.7.3.13 / 3.4.3.15	132 / 99	Audible Elements				
133	3.7.3.14 / 3.3.3.20	132 / 78	Fare Payment				
	3.7.3.15	133	Access to Platform Edge				







		UALT GUIDELINE CHECKLISTS	<u>S</u>				
		1		Comp.	Compliance Status	atus	4
duideline Reference	rage No.		Yes	9	Partial	N/A	Comments
3.7 METRO / SUBWAY	BWAY						
3.7.3.16	134	Warning Platform Edge					
3.7.3.17	<del>2</del> 5	Emergency and Evacuation from Platform and Tunnel Guideway					
3.7.3.18 / 3.4.3.19	135 / 99	In-Vehicle Communication / Information					
3.7.3.19 / 3.5.3.22	135 / 113	Platform Information / Communication					
3.7.3.20 / 3.5.3.26	135 / 114	Next Vehicle Department and Arrival					
3.7.3.21	135	Emergency and Evacuation Information from Vehicle					
3.7.3.22 / 3.1.3.13	137 / 58	Arrival Information					
3.7.3.23	137	Washrooms on Platforms					
3.7.3.24	137	Ticket Counters					
3.7.3.25	137	Vehicle Interface with Stations					
3.7.3.26 / 3.5.3.30	137 / 117	Station Platforms					







		UALT GUIDELINE CHECKLISTS	STS				
		Ī		Com	Compliance Status	ıtus	
auldeline Kererence	rage No.	Element	Yes	8	Partial	N/A	Comments
3.8 COMMUTER REAIL	REAIL						
3.8.3.1	140	Fare Payment					
3.8.3.2	141	Railroad Crossings-Flangeway					
•	141	Flangeway Fillers					
•	141	Track Approaches					
3.8.3.3	141	Doorways					
3.8.3.4	141	Passageways					
3.8.3.5	142	Door Signals					
3.8.3.6	142	Coordination with Boarding Platform					
3.8.3.7	142	Signage					
3.8.3.8	142	Mobility Aid Accessibility					
3.8.3.9 / 3.3.3.4	143 / 77	Onboard Car Lift					
3.8.3.10 / 3.5.3.4	143 / 109	Station Based Lift					
3.8.3.11	143	Station Based Mobile Ramps					
3.8.3.12	143	Ramp or Bridge Plates					
3.8.3.13 / 3.3.3.2	144 / 77	Handrails					



		UALT GUIDELINE CHECKLISTS	TS				
	2	Ī		Comp	Compliance Status	atus	Č
Guideline Reference	Fage No.	Element	Yes	8 8	Partial	N/A	Comments
3.8 COMMUTER REAIL	REAIL						
3.8.3.14	145	Seating of Passengers Using Mobility Aids					
3.8.3.2	145 / 78	Wheelchair Securement System					
•	145 / 84	Priority Seating and Signage					
•	145 / 84	Family and Gender Seating					
3.8.3.18 / 3.3.3.18	145 / 84	Interior Circulation, Handrails & Stanchions					
3.8.3.19 / 3.7.3.16	145 / 134	Warning Platform Edge					
3.8.3.20	145	In-Vehicle Information System					
3.8.3.21	145	Station & Platform Information / Communication					
3.8.3.22 / 3.5.3.21	145 / 112	Emergency & Evacuation from Platforms					
3.8.3.23	146	Emergency Information on Platform					
3.8.3.24	146	Onboard Washroom					
3.8.3.25	147	Between Car Barriers					
3.8.3.26 / 3.2.3.14	147 / 72	Emergency and Evacuation					
3.8.3.27 / 3.2.3.13	147 / 58	Arrival Information					







3.9.3.6 Auideline Reference Page 3.9.3.1 15 3.9.3.2 15 3.9.3.2 15 3.9.3.5 15 3.9.3.5 15 3.9.3.6 15 3.9.3.7 15	Page No.  152 154 154 154 155 155 155	Bus Number and Destination Helpful Travel Tips Communication with Driver Doors, Steps and Thresholds Anti-Slip Floors Step Edges Clear Door Width Overhead Clearance On-Board Fare Collection Lighting Illumination on Step Tread Illumination Outside Door Lifts and Ramps Use of Lifts and Ramps	ν <sub>α</sub>	Complia No P	Compliance Status No Partial N/	N/A N/A	Comments
• •	155	Number of Wheelchair Position Boarding Equipment Alternatives					
3.9.3.8 / 3.3.3.4	156 / 77	Bus Lift					











	Compliance Status	ial N/A Comments																	
	ompliano	No Partial																	
10	ŏ	Yes																	
UALT GUIDELINE CHECKLISTS		. Element		Vehicle Ramps	Boarding Direction	Lift Use by Standees	Seating of Special Needs Passengers	Interior Circulation, Handrails & Stanchions	In Vehicle Information Systems	Priority Seating and Signage	Family and Gender Seating	Washroom	Wheelchair Securement System	Forward and Rear Facing Systems	Location and Size	Stowage	Movement	Mobility Aids Deployment	Seat Belt and Shoulder Harness
	2	Page No.	USES	156 / 91	156	156	157	157 / 84	157	159	159	159	159	159	159	159	160	160	160
		Guideline Reference	3.9 INTERCITY BUSES	3.9.3.9 / 3.4.3.3	3.9.3.10	3.9.3.11	3.9.3.12	3.9.3.13 / 3.3.3.18	3.9.3.14	3.9.3.15	3.9.3.16	3.9.3.17	3.9.3.18	•	•	•	•	•	•







UALT GUIDELINE CHECKLISTS	Compliance Status	Page No. Partial N/A Confinents	SUSES	160 Movable Aisle Armrest	160 / 116 Orientation and Way finding in Station & Terminals	160 / 72 Emergency and Evacuation Information from Vehicle	160 / 117 Station Platform	160 / 113 Platform Information Systems	161 / 112 Emergency and Evacuation from Vehicle
		rage No.	USES	160	160 / 116	160 / 72	160 / 117	160 / 113	161 / 112
			3.9 INTERCITY BUSES	3.9.3.19	3.9.3.20 / 3.5.3.28	3.9.3.21 / 3.2.3.14	3.9.3.22 / 3.5.3.30	3.9.3.23 / 3.5.3.22	3.9.3.24 / 3.5.3.21

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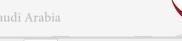








		UALT GUIDELINE CHECKLISTS	TS				
	-	Ē		Comp	Compliance Status		1
Guideline Keterence	Page No.	Element	Yes	S S	Partial	N/A Comments	TIS
3.10 INTERCITY RAIL	<b>AIL</b>						
3.10.3.1	164	Vehicle Steps and Stairs					
•	164	Steps Edges					
•	164	Minimum Door Width					
•	164	Dining and Lounge Cars					
3.10.3.2	164	Lighting					
3.10.3.4	165 / 143	Coordination with Boarding Platform					
3.10.3.5	165	Signage					
3.10.3.6	165	Mobility Aid and Stroller Accessibility					
3.10.3.7 / 3.3.3.4	165 / 77	Onboard Train Lift					
3.10.3.8	165	Station Based Lift					
3.10.3.9 / 3.6.3.14	166 / 125	Ramp or Bridge Plate					
3.10.3.10 / 3.4.3.10	167 / 96	Securement Systems					
3.10.3.11 / 3.4.3.18	167 / 99	Stroller and Luggage Storage					
3.10.3.12	167	Seat Identification for Blind					
3.10.3.13 / 3.3.3.16	168 / 83	Priority Seating and Signage					
3.10.3.14 / 3.3.3.17	168 / 84	Family and Gender Seating					









		UALT GUIDELINE CHECKLISTS	TS				
	4	Ē		Com	Compliance Status	ıtus	
Guldeline Kererence	rage No.	Element	Yes	2	Partial	N/A	Comments
3.10 INTERCITY RAIL	<b>AIL</b>						
3.10.3.15	168	Onboard Washroom					
•	169	Movable Armrest / Supports					
•	169	Washroom Doors					
•	169	Controls, Faucets, etc.					
•	169	Washroom Proximity to Mobility Aid					
•	170	Bidet Type Device & Garment Hooks					
•	170	Ablution Hose					
•	170	Emergency Call Button					
3.10.3.16	171	Interior Circulation, Handrails & Stanchions					
3.10.3.17	171	Public Information System					
3.10.3.18 / 3.8.3.25	171 / 147	Between-Car Barriers					
3.10.3.19	171	Sleeping Compartments					
•	171	Wheelchair User Space & Mobility Within					
•	171	Accessibile Washroom in Compartment					
•	171	Controls					
•	172	Call Button					
•	172	Height of Bed / Chair					



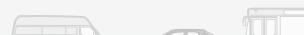












## Appendix H **Feedback Form**

## Suggested changes to the Universal Accessibility Land Transportation **Guidelines Manual**

Please mail your comments/changes to:



مركز الأهير سلمان لأبحاث الإعاقة Prince Salman Center For Disability Research علىم ينفع الناس Science Benefiting People

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Name	
Address	
Organization	
Telephone	
e-mail	
Proposed Change	Please identify the Section Number and Page Number related to the proposed change(s). Also include proposed new or revised wording, or identification of wording to be deleted.
Reason for Change	(attach additional sheets if required)

(attach additional sheets if required)

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