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Bus Rapid Transit Accessibility Guidelines

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Photo on left courtesy of Bus Rapid Transit system of León, México; photos on right by the author, from TransMilenio in Bogotá, Colombia

BRT Accessibility Guidelines

By Tom Rickert*
Consultant to the World Bank
January 2007

Introduction

In recent years helpful guides have appeared in both English and Spanish to assist planners and officials to construct accessible buildings and pedestrian infrastructure which are usable by seniors, persons with disabilities, and all others who especially benefit from universal design. Less has been written about access to public transport systems. Very little guidance is available concerning specific issues which confront those planning Bus Rapid Transit (BRT) systems – mass transit systems which incorporate a spectrum of design and operational features on integrated trunk and feeder routes and which were initiated in Latin America and are now spreading throughout the region and beyond.

Construction of BRT line in Cali, Colombia

In Colombia, BRT systems are in different stages of planning, implementation, and expansion. Bogota's well-known *TransMilenio* is expanding and Pereira's *Megabús* BRT system recently opened. Planning and construction are moving forward for Cali's *El MIO*, the *Metroplús* system in Medellín, *Metrolínea* in Bucaramanga, *Transmetro* in Barranquilla, and *Transcaribe* in Cartagena, all scheduled to being operation in 2007 or 2008. Colombia will thus be the first country in the world to provide integrated systems of mass transport in most of its major cities.

External funding for these systems is provided by the World Bank, with the exception of Cali, where funding is provided by the Inter-American Development Bank. Conscious of their role in promoting "transport for all" around the world, institutions such as the World Bank are working with the national Ministry of Transport and municipal stakeholders to promote the accessible design and operation of BRT systems in Colombia and beyond. The Bank has learned much from the pioneering accessibility features of *TransMilenio* and from Medellín's *Metro* and *Metrocable* systems, as well as from existing and planned BRT systems throughout Latin America. This experience, combined with what has been learned from other regions, has resulted in the publication of these BRT Accessibility Guidelines.

The guidelines focus on the BRT environment and assume that interested parties can take advantage of existing guidelines to clarify general issues of access to public space, buildings, and pedestrian infrastructure. The guidelines generally follow the travel path of a passenger using a full-featured Bus Rapid Transit system. The accessible travel chain begins with sidewalks and pedestrian crossings and continues into a typical mid-island station served by buses with left-side doors (in countries where traffic drives on the right side). Buses pull up to an enclosed station with a ramped platform the height of the bus floor. The guidelines then focus on station features, crossing the gap into the bus, and bus features. Due to the integrated nature of BRT, the guidelines focus equally on both trunk line and feeder line issues while acknowledging that a long-term planning process may be needed to identify funding for improved feeder line infrastructure and vehicles. Costs and benefits are discussed in a separate document, but most of the features discussed in this guide are low cost or even without cost in new features. The accessibility features are usually examples of universal design that not only assist disabled passengers but also make BRT more attractive to other categories of passengers. *The guidelines put special emphasis on BRT features that have proven to be problematic according to findings by planners and passengers. Special* "alert" *notices are placed to further emphasize these sections*. References are provided with further information on the topics in the guide. Information on the references is found in the Resources section at the rear of this report. A Check List to assist task manages to apply the guidelines is added as an appendix. The CD version of this guide provides additional resource materials. Photos not credited are by the author.

BRT construction in Pereira

Appreciation is expressed to those who have commented on the draft version of these guidelines, including but not limited to the Ministry of Transport of the Republic of Colombia; representatives of agencies in all seven of the Colombian cities operating or phasing in BRT systems; and persons with disabilities and their NGOs in Bogotá, Cartagena, Cali, Bucaramanga, and Medellín. Special thanks to other individual reviewers, including Arq. Claudia Sánchez (Colombia), Dr. CGB (Kit) Mitchell (United Kingdom), Dr. Christoffel Venter (South Africa), Arq. Silvia Coriat (Argentina), Ing. Gerhard Menckhoff (World Bank), and Lic. María Eugenia Antúnez and Arq. Andrés Balcázar (México).

* Information about the author is found on Page 40.

Contents

1.0 PUBLIC PARTICIPATION

BRT planners should use focus groups of users and an advisory committee to review and assess plans for access to BRT systems during the entire planning and implementation process. (For more information, see AEI, *Making Access Happen*, pp. 3-15, listed under "Resources" at rear.)

1.1 Focus groups	Focus groups composed of 6-12 persons with *different types* of physical, sensory, and cognitive impairments, including frail seniors, can identify their travel barriers and help prioritize access features. For information, go to TRL, *Enhancing the mobility of disabled people: Guidelines for practitioners*, pp. 32-33 at www.globalride-sf.org
1.2 Advisory Committee	Transit planners should include individuals with different types of physical and sensory impairments on an advisory committee which meets periodically to (1) put inclusive transport on their agenda, (2) help officials to remain focused on access through periodic meetings, (3) prioritize actions, (4) avoid costly mistakes, and (5) monitor results by testing access features (or mockups of access features) and reporting back on compliance with design and operating standards. End users of accessible transport should also participate in any Accessible Transport Working Group bringing together government ministries and other stakeholders. **ALERT** (1) Make sure the committee is representative of *different* disabilities. For example, passengers with hidden disabilities, such as arthritis, need to be heard. Lack of such representation may be one cause of a lack of proper emphasis on the design of bus entrances. (2) Also assure that disabled persons from neighborhoods served by feeder routes are on the advisory committee, as well as persons from areas along trunk line corridors, due to the different issues faced by many users of feeder buses.  Advocates work together with transport officials. - **Photo courtesy AEI.**  Public meeting in Cali, Colombia For information, consult TRL or AEI, *Making Access Happen*.

2.0 PEDESTRIAN USE OF PUBLIC SPACE TO ACCESS BRT STATIONS AND FEEDER LINE BUS STOPS

For further detail, see TRL, *Enhancing the mobility of disabled people: Guidelines for practitioners*, pages 75-91; AEI, *Mobility for All*, pages 4-6; ADAAG (Ground & Floor Surfaces); IDB, *Guía Operativa de Accesibilidad para Proyectos de Desarrollo Urbano*; & UN, *Diseño de Lugares Accesibles*.

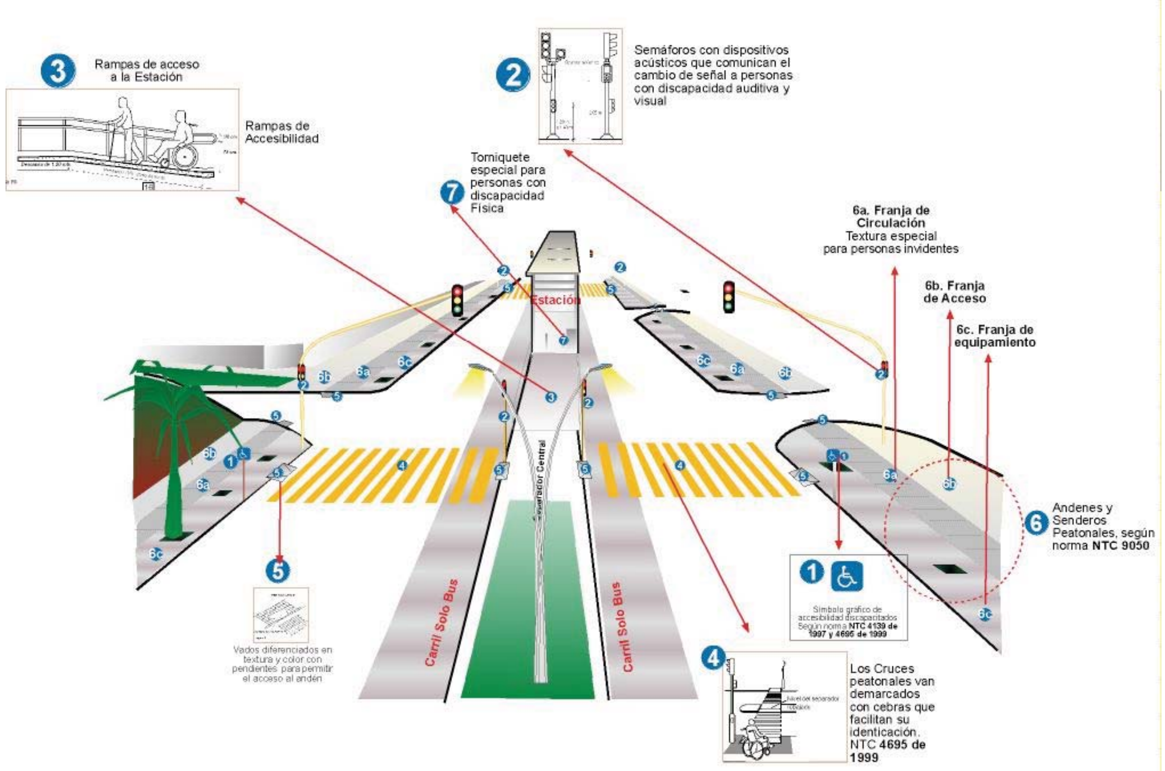


Diagram of accessibility features for Avenue Simón Bolívar, from presentation by city of Pereira, Colombia

The features shown include

1 Use of the universal symbol of accessibility
2 Traffic lights with acoustic signals to assist those with sensory impairments
3 Access ramps for passengers with mobility impairments
4 Well marked pedestrian crossings
5 Curb ramps with color and texture differentiation
6 Accessible pedestrian walkways
7 Wide fare gate for persons with disabilities

2.1	SIDEWALKS AND PATHS BRT corridors should provide accessible pedestrian ways along their length and should assure that major trip generators are connected to the BRT stations by accessible sidewalks. The minimum width for accessible pedestrian pathways is 1500 to 2000 mm, with 900 mm the minimum for passing an obstruction such as a signpost. The minimum overhead clearance above a pathway, especially to protect blind pedestrians, is specified as 2000 to 2200 mm in many countries.

2.1.1 Surface condition	- Persons with mobility and sight impediments especially benefit from even and smooth pedestrian pathways with non-skid surfaces. Sidewalks should be level, well paved, well drained, and well lit when possible, with a maximum side-slope ideally of 1 to 2% and not more than 2.5%. Surface textures used in public space should not confuse persons with disabilities nor inconvenience persons riding wheelchairs. Obstacles such as street furniture should contrast with their surroundings and be off to the side to permit a straight and clear pathway for all pedestrians. Ideally, a grass strip between sidewalk and curb can separate the sidewalk from a BRT corridor, providing further safety for all and especially for blind or visually impaired pedestrians. - Care should be taken that sidewalks are continuous and level where owners are required to build and maintain sidewalks. - Pedestrian paths should ideally be kept clear of gratings, which can catch the small front wheels of wheelchairs. If this is not possible, grate openings should be perpendicular to the pedestrian path and with openings not exceeding 13 mm. - Solutions are required so that vendors who have occupied public space are removed, typically by designating alternative locations. Enforcement by security personnel is needed.  **Photo: Street vendors crowd public space near pedestrian overpass on planned BRT corridor in Bucaramanga, Colombia**
2.1.2 Tactile guideways	- Tactile guideways approx. 300 mm wide benefit blind persons and those with reduced vision as well as helping others to find their way, especially (1) across large unmarked areas, (2) along complex paths to a known destination such as an information booth, or (3) on pedestrian ways without a well defined boundary with the road. Guideways should be used in a consistent manner and are most helpful when they are in a contrasting color and texture to their surroundings. Texture differences must be detectable under foot and by a long cane in comparison with the surrounding surface. (Research has shown that grooved concrete is not detectable under foot.) The use of tactile guideways varies from country to country. For example, tactile guideways are little used in Europe or the USA, but are often found in major cities in China and Japan. Much depends on the availability of mobility instruction for blind persons, which may eliminate the need for tactile guideways in some situations. In most countries, tactile guideways are marked by raised parallel bars pointing in the direction of travel. - In BRT environments, tactile guideways can be especially useful to mark a travel path from a sidewalk to a pedestrian crossing to a BRT station, then turning up the ramp into the station and proceeding to the ticket vending and information booth. A 300 mm wide tactile guideway could then proceed down the center line of the station, with guideways going off at right angles to station doors. Care should be taken that tactile guideways do not lead into obstacles or

safety hazards.

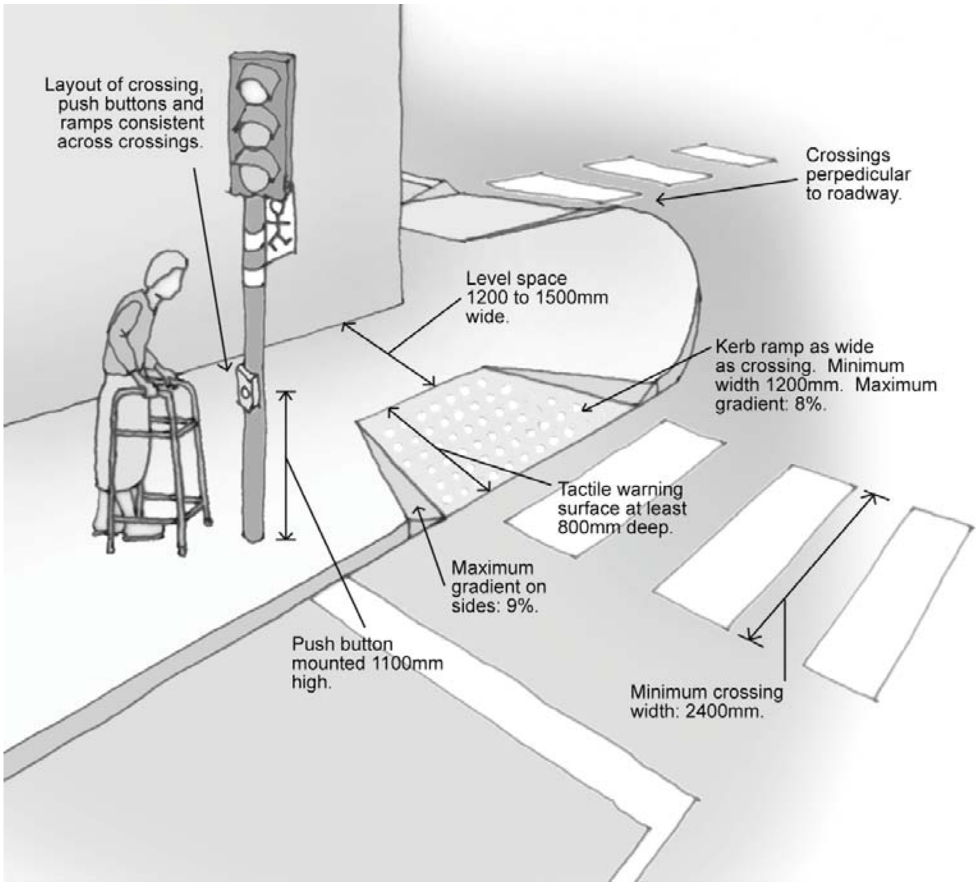
- The need for tactile guideways should be reviewed in focus groups and by advisory committees of users in cases where national norms do not already exist. (See IDB, pages 27-30; TRL; and also DfT's *Inclusive Mobility* for guidance from the United Kingdom)

2.1.3 Tactile warnings

- Most countries agree on the need for detectable tactile warning strips (also called "attention patterns") to mark hazardous areas such as platform edges or transitions from curb ramps to street pavements. (See photo at 4.6.2) Tactile warnings benefit everyone, especially blind persons or those with low vision. To assure that pedestrians do not step over a tactile warning strip without noticing it, an emerging international standard of 560-600 mm width is anticipated. Strips consist of a truncated dome pattern in many countries, which helps differentiate them from tactile guideways. Some authorities recommend that tactile warnings be placed immediately adjacent to a hazard (e.g., a platform edge) while others recommend that the warnings be 600-1,000 mm away from the hazard. Go to www.access-board.gov/research/DWSynthesis/DW-synthesis.pdf at ADAAG for detailed information from several countries. Also see Bentzen's web site (going to "detectable warnings") and COST 349, p. 31, in the Resources section.

2.2

INTERSECTIONS AND OTHER CROSSINGS



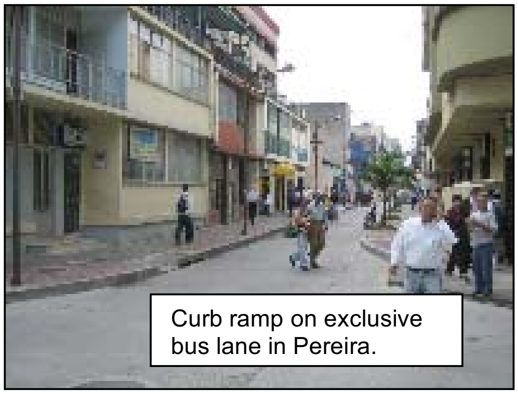
The diagram above (from TRL, p.86, copied with permission) presents good practice at street crossings as depicted in this publication sponsored by the

United Kingdom’s Dept. for International Development.

2.2.1
Curb ramps

Correctly designed curb ramps benefit most persons and especially those using wheelchairs, walkers, or strollers. ALERT The trip chain for wheelchair riders and many others with mobility impairments can be broken by a single excessively steep curb ramp. Steep curb ramps can lead to injuries.

Curb ramp features


Curb ramp on exclusive bus lane in Pereira.

Planners and designers are advised to consult norms addressing curb ramp construction. In Colombia, for example, guidance includes ICONTEC norm 4143; Decree Number 1538 (May 2005), Article 7; Alcaldía de Medellín *Manual de Diseño* (2003), pp. 38 & 232; and Law 361 (1997), Chapter Eleven.

One widely followed standard is found in the regulations of the Americans with Disabilities Act at www.access-board.gov or see IDB, pp. 24-27 (vados peatonales: rampas de acceso en las aceras).

- Curb ramps should not exceed a maximum gradient of 8%, that is, a 1:12 slope with one unit of vertical rise for every 12 units of horizontal distance. (Curb ramps built on sloped terrain will be shorter or longer depending on the degree to which the terrain helps or hinders obtaining a 1:12 grade.) Where possible, a gradient of 1:20 is preferred and a 1:20 gradient should be the maximum slope of adjoining gutters and road surfaces. The transitions between the curb ramp surface and the street or other adjoining surfaces should be smooth and without obstacles so that the foot braces on wheelchairs do not scrape against these surfaces.

- Curb ramps should have a tactile warning strip, aligned with the curb ramp on the opposite side of the intersection. (See 2.1.3) If a curb ramp is not properly aligned, at least the protective warning strip should be properly aligned. Curb ramps should not direct blind or visually impaired pedestrians out of the pedestrian crossing into traffic in the middle of the intersection.

- Curb ramps should lie within the marked pedestrian crossing. Whenever possible, it is best practice that curb ramps should be the same width as the pedestrian crossing, as illustrated in the photo at right from Rio de Janeiro, and in no case should a curb ramp be less than 1200 mm wide. (See TRL, IDB) Full width curb ramps are seldom more costly, could eliminate

<table>
<tr><td>Curb ramps</td><td>potential trip hazards, and are architecturally pleasing. However, consult with focus groups and advisory committees (see Section 1.0, above) to determine if this approach is satisfactory to blind persons who in some cases may prefer narrower curb ramps.
- To carry off heavy rainfall, some cities have many deep gutters with raised sidewalks (e.g., Barranquilla, Colombia, or San José, Costa Rica), creating an added challenge by requiring that curb ramps be designed to bridge the deep gutters. In some cases, a partial solution would be to channel rain water into a mid-street gutter and thus decrease the need for high curbs or deep gutters on each side of the street. Street furniture and utilities can also create design problems.
- As a priority, curb ramps should be installed on routes between BRT stations and stops and important trip origins and destinations based on observations of pedestrian traffic patterns.</td></tr>
<tr><td>2.2.2
Other ramps</td><td>Recommended gradients vary with ramp lengths. The following is adapted from a UK guideline (see TRL).
<table>
<tr><td>Gradient of ramp</td><td>Recommended use</td><td>Maximum horizontal length</td></tr>
<tr><td>10% (1 in 10)</td><td>Very short distances only</td><td>1 meter</td></tr>
<tr><td>8% (1 in 12)</td><td>Most curb ramps</td><td>2 meters</td></tr>
<tr><td>5% (1 in 20)</td><td>Ideal gradient</td><td>10 meters</td></tr>
</table>
Also see 4.2.2: Ramps to BRT stations</td></tr>
<tr><td>2.2.3
Raised pedestrian crossings</td><td>- Across lightly used side roads, or at full-stop intersections leading into larger corridors, raised crossings (also known as “continuous sidewalks”) can assist all pedestrians and especially help those who are frail or otherwise require more time to cross the street. This method of traffic calming is an important element in the creation of pedestrian-friendly streets and helps create a safer path for all pedestrians. (See also the discussion at 6.2.1 on “boarders.”)</td></tr>
<tr><td>2.3</td><td>SIGNALIZATION</td></tr>
<tr><td>2.3.1
Traffic signals</td><td>- Bus-activated traffic signals are an integral part of BRT systems, decreasing the travel time on trunk line routes. Traffic signals need to be set to allow frail seniors and other slow-moving pedestrians sufficient “green time” to cross. The width of pedestrian crossings can be adjusted to the flow of pedestrians, with wider widths able to handle more pedestrians. In some circumstances, available technical solutions can detect the presence of pedestrians in the crossing or waiting to cross, automatically extending the crossing time for slow walkers and canceling the pedestrian phase if no one is waiting to cross.
- Crossing times are often based on a pedestrian speed of 1.2 meters/second on level ground, but elderly or frail persons may need time to cross at .9 meters/second. “Count down” traffic lights, which indicate the seconds remaining to cross, assist pedestrians to know whether it is safe to cross and to avoid a need to rush when, in fact, adequate time is available.</td></tr>
</table>

2.3.2 Audible signals	- Audible signals at pedestrian intersections can especially assist passengers who are sight-impaired. They are especially needed when the “walk” signal is not synchronized with the onset of vehicular movements on the streets leading into the intersection. Audible sounds can be annoying to nearby residents and some types of signals can be sensitive to sound levels (e.g., becoming quieter at night and louder during the day). Alternatively, locations can be user-activated by uniformly located push buttons. When a push button is used, the source of the sound should be at the push button mechanism located approx. 1,100 mm above ground level. Push buttons should be uniformly located as close as possible to the pedestrian crossing. When buttons are used at two crosswalks at an intersection, they should be located at least 3 meters apart to avoid confusion. An alternative technical solution would provide wayfinding and orientation information through a small receiver carried by a blind pedestrian, using a system of fixed transmitters at key sites including intersections, which in turn would be keyed by traffic signal changes. For more information on accessible traffic signals, go to Bentzen in the Resources section.
2.4	PEDESTRIAN BRIDGES AND UNDERPASSES
2.4.1	 **Photo courtesy of Dirección General de Transporte Municipal, León, México** Pedestrian bridges or pedestrian underpasses are expensive, requiring long ramps or elevators if they are not to obstruct many passengers with mobility impairments. They should be avoided when possible due to their expense and also the pedestrian travel time and fatigue required to use them. However, pedestrian bridges are sometimes indispensable. Care should be taken to provide resting places for wheelchair users and others who will otherwise become fatigued. In some cases, it may be possible to keep pedestrian ways level by elevating or lowering vehicular traffic by means of overpasses or underpasses. See TransMilenio presentation on pedestrian bridges (Puente Peatonal).

2.5

PRIORITIZING ACCESSIBLE PEDESTRIAN ROUTES

Authorities have prioritized making public space accessible to all along the major trunk line corridors in Colombia's cities. Such access is necessary in order to make public transport available to seniors, persons with disabilities, and many other categories of persons who especially benefit from universal design. However, feeder routes connecting to trunk line corridors are often surrounded by inaccessible infrastructure, which may prevent up to half of those with disabilities from ever reaching the trunk lines because there is no accessible travel path to the feeder lines. The photos from Cartagena (above) and along a feeder route to TransMilenio in Bogotá (below) illustrate this concern. ALERT Even when funds are currently lacking to upgrade access along feeder routes, the design of a BRT system should require a comprehensive long-term planning process to prioritize the systematic construction of accessible paths to feeder route bus stops. (See AEI, *Making Access Happen*, pp. 16-25.)

3.0 FARE COLLECTION

3.1 A single flat fare	- The "social fare," a feature of some Bus Rapid Transit systems in Latin America, helps poor people, often living on the far outskirts of large cities, to get to work and other destinations at lower cost. Since disability correlates closely with income levels, the social fare especially benefits persons with mobility, sensory, or cognitive impairments. A single fare for all trips may need to be phased in in some BRT systems due to the complex job of restructuring fares. Consideration may be given to lower fares (e.g., reduced fares for off-peak travel) for seniors and persons with disabilities. (Photo: A wide fare gate at a TransMilenio station.) 
3.2 Fare cards	- Prepaid proximity cards (contactless cards) require less hand dexterity and benefit persons with limited mobility. The option of purchasing multiple trips may also reduce stress for persons with disabilities. However, it is necessary to solve the problem of poor persons who cannot afford to prepay for multiple trips.
3.3 Fare card vending sites	- A low counter, to serve wheelchair users and short persons, should ideally be included at neighborhood fare card vending locations and should be a feature of formal BRT facilities. An accessible counter or ticket vending window is about 800 mm high, ideally with knee space for a wheelchair user, measuring approx. 500 mm deep and 900 mm wide, with 1200 mm clear space in front. (TRL) - Electronic ticket vending machines should have buttons and slots for cash and for dispensing fare cards, located not more than 1200 mm above the ground. - Assistance should be provided as needed to blind passengers, deaf passengers, and others who may have difficulty with card purchase procedures. - Consideration should be given to hiring disabled persons to work at fare vending sites.

4.0 ACCESS AT TRUNK LINE STATIONS

Photo: Station under construction in Cali, Colombia

4.1	STATION PERSONNEL
4.1.1 Station assistants	- While most disabled passengers will need no assistance, many disabled persons, tourists, visitors, and others will benefit from the assistance of properly trained staff who can assist with fare payment and transit information or help passengers navigate wide gates or turnstiles. It is helpful to train station assistants to communicate in basic sign language to enhance communication with those deaf passengers who use sign language. Station assistants should be helpful and knowledgeable and wear a uniform or badge for identification.
4.1.2 Security personnel	- The presence of security personnel makes the use of public transit more appealing to most passengers, including many women and persons with disabilities. This is especially true at night, when many women and seniors may otherwise be hesitant to travel on public transport.
4.2	MOBILITY FEATURES
4.2.1 Uniform design	Stations should have uniform design features where possible, assisting visitors and tourists to navigate the system. Uniform design especially assists those with sensory and cognitive disabilities. (Photo courtesy of TransMilenio) 
4.2.2 Ramps to BRT stations	Wide and gently sloped ramps assist most passengers and especially wheelchair users entering BRT stations. Ramp widths tend to be satisfactory in BRT applications, but ramp grades can be a concern due to constraints on total station-plus-ramp length. International standards are converging concerning norms for gradients of ramps of various lengths. Readers should refer to the resources section of this guide for information and especially see TRL, pages 145-146 and 2.2.2, above. ALERT Station ramps should not exceed a 1:12 (8%) grade from a horizontal plane and the preferred grade is 1:20 (5%). When a ramp section exceeds 9 meters a horizontal resting area the width of the ramp and at least 1200-1500 mm long will assist many passengers with mobility impairments to navigate the

ramp into the station. (See TRL, p. 146) BRT station ramps may or may not fall within the recommended 9 meter ramp length – if the ramp length only slightly exceeds this length one approach would be to designate station assistants to assist those wheelchair users who are fatigued by the long ramp to enable them to access the station. The norms in some countries specify a level resting area after a maximum run of 6 meters (e.g., Argentina's Ley Nacional 24314), others specify 9 meters, and others specify other lengths. Section 4.8 of the USA's ADAAG states, "The shortest possible grade for a ramp shall be used. The maximum angle for a ramp in new construction should be 1:12. The maximum rise should be 30 inches (760 mm)."

- Well-designed handrails assist wheelchair users as well as all others to use BRT station ramps and other ramps. See TRL pages 147-148. In Colombia, see the IDU PowerPoint presentation on "pasamanos," also ICONTEC norms 4143 and 4201.

- The pedestrian crossing leading to a BRT island station, as in the TransMilenio photo above, would normally be wide enough to readily provide the minimum landing needed by a wheelchair user making, typically, a 90-degree turn at the foot of a ramp. This landing should in all cases be at least 1200 mm wide.

4.2.3 Station entrances and exits

BRT station width is determined by passenger volumes as well as constraints on busway width. (Compare the photo below left from the Quito Trole, to the photo above from TransMilenio in Bogotá.)

Longer stations should have entrances at each end when possible to especially assist those who are unable to walk long distances. An exit should be considered at the "far end" of stations even if an entrance is not possible. Exit doors should provide a minimum of 900 mm of clear space. Manually operated doors should open easily, requiring no more than 15 newtons of operating force. – Photos courtesy of Margi Ness (left) and Angela Werneck (right)

4.2.4 Fare gates	A wide fare gate, with a clear width of at least 900 mm, is needed for passengers using wheelchairs, walkers, or crutches.
4.2.5 Seats and supports	Folding seats may be needed if non-peak or weekend waiting times exceed five minutes. Isquiatic supports (horizontal "perches"), about 700 mm high, especially assist passengers with hidden disabilities such as arthritis. As with folding seats, the need for supports will vary with the length of waiting time during periods of low usage during weekends and other off-peak hours. Folded seats and supports can usually be located so that they do not decrease the clear width of a station. Seats and supports should be painted a high contrast color.
4.2.6 Sliding doors	 Full-height transparent sliding doors should be used when possible. Doors provide safety and security for all passengers. Transparent doors are needed so that intending passengers can see route signs on approaching buses. ALERT Since the smallest platform-to-bus gap usually is found at the front entrance of the bus, this entrance should be designated for use by disabled persons, who also will benefit from being closer to the driver. A tactile warning strip may not be needed at the platform edge if sliding doors are in use, but is required if sliding doors are not in use and platform edges are not protected. Doors should have audible signals to assist blind persons to know when they are opening and closing. (Photo courtesy of TransMilenio)
4.3	**VISUAL ELEMENTS**
4.3.1 Lighting	Good lighting is needed especially for those with reduced vision. Good lighting also provides more safety and security for all passengers.
4.3.2 Color contrast	Color contrast can be provided at a negligible cost and should be used for signage (see below) and for station features such as railings, turnstiles, wide fare gates, tactile warnings at bus entry gates, folding seats, and ischiatic supports. A growing number of countries use "safety yellow" as the color of choice for such uses. The International Organization for Standardization (ISO) standard 3864 specifies "safety yellow." The standard in the USA is "Yellow-Federal Standard #33538."
4.3.3 Signage	Uniform signage is part of uniform station design. Many countries use icons and specific colors to supplement text for route and station names, thus assisting persons with cognitive impairments, visitors, tourists, and others who may not be able to read text.

Color contrast for signs

Background	Sign board color	Letter or symbol color
Red brick or dark stone	White	Black, dark green or dark blue
Light brick or light stone or white walls	Black or dark blue or dark green	White or yellow
Green vegetation	White	Black, dark green or dark blue
Back-lit sign	Black	White or yellow

Source: Merseyside Code of Practice (UK) in Oxley (2002) and TRL, page 162

Recommended letter sizes and applications

Adapted from TRL

Minimum letter height	Application
150 mm	Long distance reading (e.g., signs on station entrances)
50-100 mm	Signs in corridors and stations
50 mm	Information on bus stop flags and shelters
25 mm	Close reading. e.g., wall-mounted timetables
22 mm	Minimum for any text displayed

Left: Signage in TransMilenio Station

- Visible signage indicating the arrival time of the next bus especially helps deaf persons and those with hearing impairments.

4.4

AUDIBLE ELEMENTS assist all passengers and especially those with reduced vision

4.4.1 Warning sounds

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

4.4.2 Transit information

Depending on the system, announcements can be actuated by GPS technology or simply provided by station staff. All passengers benefit but, again, those with reduced vision are especially helped and also tourists and others who are new to the system or who have difficulty reading. Information on delays or other service changes is especially helpful.

4.5

TACTILE ELEMENTS assist many passengers and especially those with reduced vision.

4.5.1 Tactile information

Some blind persons may benefit from raised tactile route numbers (about 20 mm high and raised 1-2 mm) at stations. Other blind persons may prefer Braille signage at stations while others may have other useful advice. Consult with focus groups and disability advisory committee members concerning any need for tactile information in stations.

Tactile warning strips should be installed at station doors opening to trunk line buses if sliding doors are not used. See 2.1.3: Tactile warnings.

4.6	FEATURES AT TERMINALS AND INTERMODAL TRANSFER CENTERS  **Photo: TransMilenio terminal** Trunk line terminals and other intermodal transfer stations have added features, although some features described below may be found at other stations along BRT routes.
4.6.1 Elevators & lifts	Elevators or stair lifts are expensive and require ongoing maintenance, so ramps are preferred. Elevators and stair lifts should be used only if other alternatives are not available. They especially are required for wheelchair users and others with reduced mobility. Stair lifts have been observed out of service at various sites in Latin America, perhaps due to issues of maintenance or of training of station personnel. In Colombia, the Instituto de Desarrollo Urbano (IDU) has a helpful PowerPoint presentation in Spanish on accessible elevators.
4.6.2 Added information and services	 Transfer terminals can be confusing for many passengers and especially those new to the system. Passengers must understand different transit modes and different schedules: the photo at left, courtesy of TransMilenio, illustrates signage at a portal. Passengers also need direction to a range of public services and commerce. In Colombia, TransMilenio and IDU have presentations available concerning access to bathrooms and to public telephones. For information on access to bathrooms, public telephones, ticket counters, parking for private cars, and other elements often found at portals, see TRL, “bus and train stations,” pages 142-155; IDB, pages 34-38, and AEI, *Mobility for All*.
4.6.3 Intermodal transfers	Access to intermodal transfers especially assists tourists, visitors, and persons with disabilities. Travel paths and facilities between BRT vehicles and other transit modes should be accessible. In Colombia, for example, Bucaramanga is planning to integrate its BRT corridors with a major transfer terminal for intercity transport. In Cartagena and Barranquilla, long-term planning includes integration of BRT lines with waterway transport, while bikeways and BRT integration exists in Bogotá and is planned in Bucaramanga.

5.0 THE PLATFORM TO BUS FLOOR GAP

The space between the platform edge and the edge of the bus floor should be eliminated (see 5.1) or reduced as much as possible (see 5.2) to avoid accidents. Concerns about excessive gaps have been expressed by user groups in both Latin America and Asia.

Gaps between platforms and vehicle doors should be as small as possible with a maximum permissible gap of 10 centimeters and a preferred gap of 7.5 centimeters or less.

ALERT The platform-to-vehicle gap is a critical issue for Bus Rapid Transit systems using high floor buses boarding at high platforms and can also be a concern when low-floor buses are used at low platforms. The platform-to-vehicle gap can be *eliminated* by a bridging device and can be *minimized* by a combination of station and vehicle design, driver training, and ongoing vehicle and platform maintenance. In the future, gaps may be addressed by technology now being developed to enable “precision docking” of BRT vehicles at station platforms.

5.1 Eliminating the gap

The problem: Injuries or system delays may occur when an excessive gap causes accidents when children, frail seniors, or other passengers catch their foot in the space between the station edge and the bus floor. Also, the small front wheels of wheelchairs may fall into the gap. Gaps are usually smallest at the bus front entrance and often increase at rear doors due to the approach angle of buses. The smaller the gap, the better, consistent with avoiding contact between buses and platform edges.

Experience to date: There is relatively little experience due to BRT being a new concept.

A relevant guideline

Americans with Disabilities Act Accessibility Guidelines (ADAAG): 49 CFR Part 37, App. A, 10.3.1(9). The quoted guidance by the US Dept. of Transportation is dated September 1, 2005, and followed up by Proposed Rulemaking dated February 27, 2006.	3 inch (approx. 7.5 cm) maximum horizontal gap & 5/8 inch (approx. 1.6 cm) maximum vertical gap for new rail vehicles in new stations. This norm appears relevant to the design of new BRT trunk line buses and stations. Recent guidance notes the difficulty of meeting this specification without using mechanical devices, of which, if feasible, “a high-level platform in conjunction with short bridge plates . . . . should be the option of choice.”

Suggested norm: A 10 cm. horizontal gap is the absolute maximum and smaller horizontal gaps are highly desirable. Vertical gaps should be minimized as much as possible to no more than 1-2 centimeters.

Eliminating the gap:

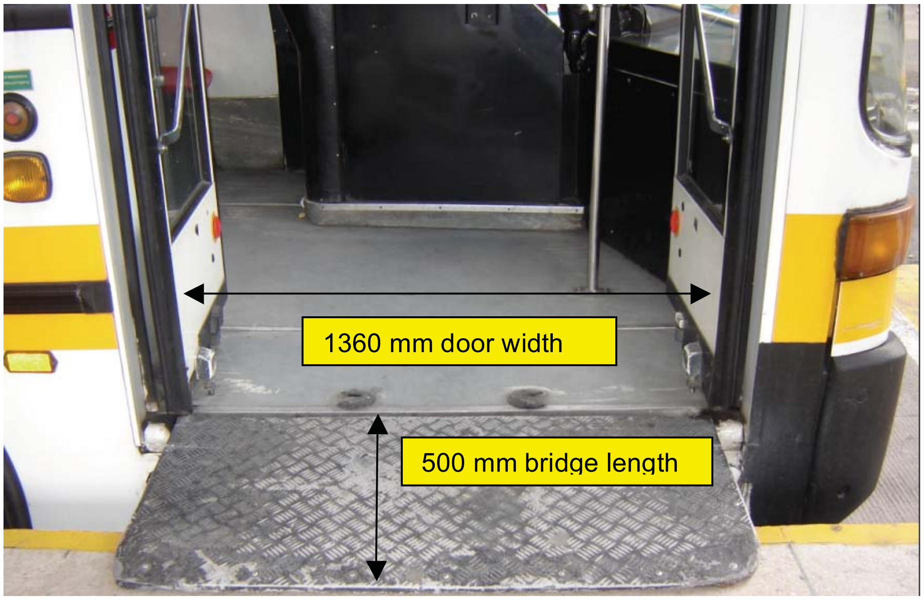
1. The gap can be eliminated through the use of a mechanical bridge to span the space between the bus and the platform. The BRT systems in Latin America with extensive experience in use of a bridge are those in Curitiba, Brazil; Quito, Ecuador (both bus and trolley); and Guayaquil, Ecuador. The

Eliminating the gap

system of bus-mounted bridge plates used in Ecuador, combined with the general features of TransMilenio's station design and use of sliding station doors at bus entrances, provides a helpful combination of passenger protection and convenience.

The agency operating Quito's trolleybus BRT system reports a cost of US$1,000 per bus-mounted bridge (ramp), or US$3,000 for an articulated trolley coach with three doors. Articulated buses in Quito average US$200,000 in cost, implying that the addition of bridge pieces to trunk line buses in BRT systems would add approximately 1.5% to the cost of the bus. Photos of a bus used in Quito are shown below, illustrating the bridge plates attached to the exterior of the doors:

A front view of the deployed bridge plate is shown below:



The photos above are courtesy of the Unidad Operadora del Sistema Trolebús de Quito. The system operator notes a deployment time of 3 seconds for the bridge plate, implying 6 additional seconds per stop. The actual additional time is stated to be 4-5 seconds due to (1) partially overlapping bus door and bridge operation cycles, and (2) passengers being able to cross the bridge plate with

Eliminating the gap	no need to position themselves to avoid the gap.  The photo at right illustrates the use of an on-board bridge plate, which is lowered at BRT stations to span the gap in Curitiba's Ligeirinho BRT corridors. (Photo courtesy of Charles Wright) 2. A less satisfactory alternative may be the use of a small portable bridge piece put in place by a station assistant at the bus front entrance to assist a wheelchair user in crossing the gap in cases where gap width and the passenger's situation require this approach. While this is a simple solution, (1) it requires that station staff are on hand and trained to reliably and consistently provide this assistance, and (2) it does not address the issue of gaps at other bus doors or problems created for passengers who are not easily identified.
5.2 Reducing the gap	Contact TransMilenio for technical information concerning their approaches to reducing the platform-to-bus gap. Some actions taken by TransMilenio or other BRT systems include 1) Take special care to design and build stations and buses so that the edges of platform and bus doors are precisely positioned to be as close as possible when buses dock at stations. 2) Train bus drivers to approach platforms with buses as parallel as possible to the platform edge in order to reduce the gap at rear doors. Note that an excessively long work shift may result in driver fatigue and less ability to dock vehicles within required limits. 3) Designate wheelchair securement areas in buses near the bus front entrance, where the gap is less, and designate the corresponding doors in stations for use by disabled passengers. 4) Train station assistants to be alert to assist wheelchair users and other persons with disabilities to cross the gap. Some wheelchair users may find it convenient to have a station assistant or friend assist by pushing their chair across the gap while pressing down on the back of the chair to reduce pressure on the smaller front wheels while they cross the gap. 5) Wheelchair users should be alerted to the option of backing on and off the bus, so that the large wheels (typically in back) can cross the gap first, thus decreasing the chance that the smaller front wheels will fall into the gap. 6) Another option might be to install a warning light, operated by passengers with disabilities at the forward bus boarding door in the station, to advise bus drivers to dock the bus with special care. This system is currently being tested by the Metrobús BRT system in Mexico City.

Reducing the gap	7) Periodically monitor horizontal and vertical gaps and perform required bus, station, or roadway maintenance. Gaps may change over time due to factors such as tire pressure, other bus maintenance, changes in bus dynamic envelope, possible wear or settling of busway or station platform, or inconsistent driver training and monitoring. 8) Other approaches for consideration include: a) The use of beveled curbs may be considered in the design of bus lanes adjacent to BRT stations. The curb at the base of the station must be precisely located and beveled at an approx. 65 degree angle. (See ECMT's *Improving Access to Public Transport, 2004,* for the European experience.) Bus drivers must then be trained to position buses at stations with the front tire in contact with the curb to minimize the gap. However, European experience has found that "the road surface tended to rut because of the continued use of the same part of the road surface (especially when braking or accelerating). Strengthening of this part of the road has reduced this problem. . . . Driver training in correctly approaching and stopping at the boarding area is important, as is involving drivers in the design and development of the stops." (ECMT, 2004, p.39) In Europe, a type of beveled curb called "Kassel curbs" is often used to reduce the gap between low floor bus entrances and platforms. See www.brett.co.uk/landscaping for information on Kassel curbs. This approach may have relevance to the design of bus lanes adjacent to BRT stations. See the photo at 6.2.2. b) There is current research and innovation focusing on concepts of precision docking of buses, based on electronic and mechanical sensors (e.g., a bus-mounted roller which touches the curb or other station structure surface) including applications in Essen, Germany, and demonstrations in San Diego and Cleveland in the USA. c) The use of different kinds of bus-mounted or platform-mounted gap fillers, which snap up or out in conjunction with the opening of bus and station doors, could also be adapted from current applications found in light rail service. Note that trends toward increased use of power wheelchairs may increase gap concerns during the lifetime of new buses and stations. More research is needed on how to best address excessive gaps at BRT trunk line stations. Noting the variety of approaches toward curb design and gap reduction at trunk line stations, there is clearly a need to share current best practices between BRT systems.

6.0 ACCESS AT FEEDER LINE STOPS

6.1 PRIORITIZING SELECTED BUS STOPS FOR ENHANCED ACCESSIBILITY

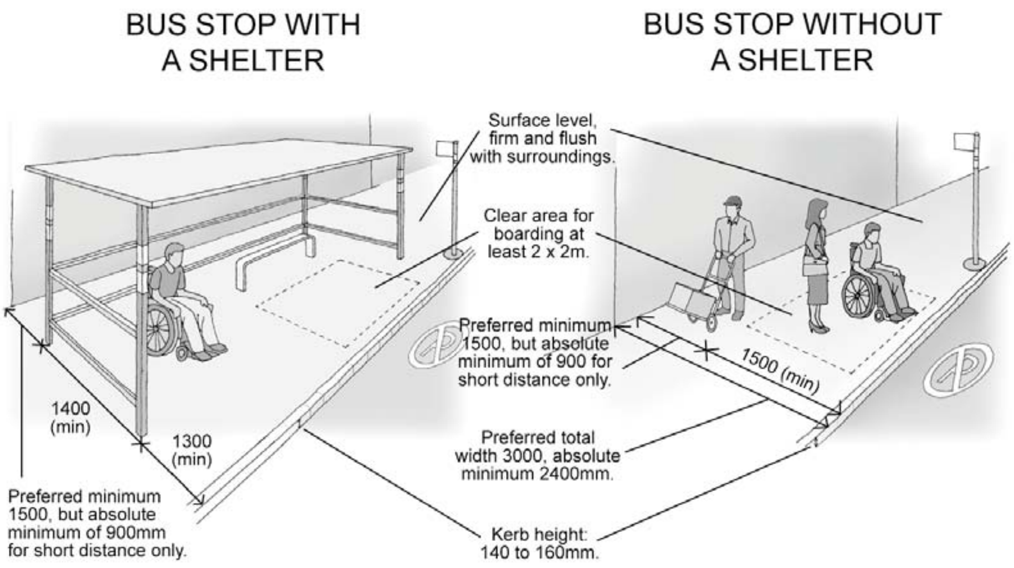
A discussion of deployment issues for wheelchair-accessible feeder line buses is found at 10.1, noting that the deployment of lift- or ramp-equipped buses on prioritized lines should be integrated with a planning process to systematically improve the pedestrian infrastructure and bus stops along those routes.

Access by most seniors and passengers with disabilities to feeder buses (even without inclusive design features) can still be enhanced by systematically upgrading feeder line bus stops, beginning with those stops which are most used by all passengers. Good bus stop design can enable passengers to more easily board even feeder buses with a high first step and poor entrance design. Good bus stop design also enables the stops to become accessible to wheelchair users when lift- or ramp-equipped buses are phased in.

Passengers, bus drivers, and bus companies all benefit from formally designated marked bus stops. Public education and law enforcement may be needed in some cities or neighborhoods in order to phase in designated stops to replace an informal custom of having buses stop anywhere. Traffic authorities will need to enforce laws prohibiting other vehicles from parking at bus stops. One approach would be to first upgrade the formal stops with concrete pads sized to serve both front and rear doors of buses, along with shelters against sun and rain, making them more attractive to passengers and creating an incentive to use them. Designated stops on feeder routes should be considered part of the larger spectrum of reforms introduced with an integrated Bus Rapid Transit system.

6.2 BUS STOP ACCESS FEATURES

6.2.1
Shelters, waiting areas



Shelters and waiting areas benefit all passengers, including seniors and those with disabilities. They provide protection from sun and rain, and also from wind-blown particles. Illuminated shelters may provide additional security for passengers, especially women, at night. The above diagram from TRL, page 93 (adapted from Oxley, 2002) illustrates some of these features, including a flat hard surface, proper minimum dimensions, a clear area for boarding, and a curb height which reduces the distance to the first step of a bus if bus drivers are trained and monitored to properly station the bus adjacent to the stop and steps are taken to assure that other vehicles do not park in the stop. If adequate space for a shelter is lacking, the shelter can be placed at the rear of the sidewalk, for example against the side of a building. If seats (approx. 500 mm high) are not affordable, the use of a pedestrian perch (ischiatic support) may be considered. See TRL, "bus stops," pp 92-102; AEI, *Mobility for All*, pages 7-8; PROJECT ACTION'S *Toolkit for the assessment of Bus Stop Accessibility and Safety*, and COST 349.

- Bus stops can often extend across a parking lane to the edge of the traffic lane. These "bus bulbs" or "boarders" prevent parked vehicles from blocking the stop. A 2-meter buildout, for example, allows the bus driver to get the bus close to and parallel to the curb so that the bus does not need to overhang the sidewalk. This in turn permits the bus stop to be raised still further (e.g., to 200-250 mm) to give better access to the first step of the bus.

6.2.2
Bus stops in unpaved areas

The photo at left shows an improved bus stop on a TransMilenio feeder route on the outskirts of Bogotá, Colombia. The all-weather concrete pad, yellow curb, and route sign (with pictograph in contrasting colors) enhance the use of this stop.

Systematic upgrading of bus stops in unpaved areas helps all passengers and especially those with mobility impairments. Even the installation of brightly colored 2-3 meter long curb pieces, on otherwise unpaved streets *and* bus stops, may provide safety for passengers waiting outside the traffic area and (1) assist blind persons to locate the bus stop by tactile means or (2) those with low vision to note the color contrast, while (3) semi-ambulatory persons could use the curb piece to access the first step of the bus. However, drivers must be trained to consistently stop adjacent to the curb pieces, which in turn requires periodic maintenance of roadways to avoid rutting adjacent to the curbs due to frequent stops.

The use of a beveled curb at bus stops may enable drivers to position their buses closer to the curb by bringing the front tire into safe contact with the curb. This can greatly reduce the combined horizontal and vertical distances which passengers must overcome to reach the first step of the bus.

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7.0 SPECIFYING ACCESS FOR TRUNK LINE AND FEEDER LINE BUSES

7.1 Specification process

ALERT A focus on the planning and implementation of fixed infrastructure for a BRT system could result in insufficient attention to the access features and operational features of the buses themselves. This could especially be a concern in countries where one authority is in charge of building BRT corridors and stations and other improvements to public space, while another authority is in charge of concessioning the routes themselves to private bus operators. In Colombia, this issue is addressed by trained staff of the national Ministry of Transport working in turn with professional planners at the municipal level to assure proper coordination. Whatever the structures used to finance and implement a Bus Rapid Transit system, bus regulators and bus operators must also seek public participation by disabled persons, seniors, and other passengers. Regulators must monitor, and bus operators must implement, the inclusion of access features in vehicle specifications for both trunk line and new feeder line vehicles. For example, buses must be built to minimize the horizontal and vertical gaps between the station platform edge and the bus floor (see 5.0) and should include a full spectrum of inclusive design features, most of which are low cost when included in new vehicles. Many countries, such as Colombia, have a great deal of experience in concessioning BRT and other public transport routes. See “improving accessibility through concessioning” in TRL, pages 108-110 for general comments on this topic. For an overview of concessioning issues, see the article by Eduardo Vasconcellos noted in the Resources at rear.

8.0 TRUNK LINE AND FEEDER LINE BUSES: SIGNAGE AND ANNOUNCEMENTS

Good signage and announcements are required to assist passengers with reduced vision, those with reduced hearing, and other passengers who are not familiar with the system, such as first-time users, tourists, and visitors.

8.1 Exterior signage

All passengers benefit from large print bus route and destination signs on (1) the upper front of the bus, 2) high on the side near the entrance door, and (3) preferably at the rear as well.

Recommended letter sizes and applications for signage

Minimum letter height	Application
200 mm	Route number on buses (preferably 300 mm on front of bus)
125 mm	Route name/destination on buses (preferably 200 mm on front of bus)

Adapted from TRL, page 161.

Signs should be clearly visible with letters contrasting with their background: many transit agencies use white or yellow letters against a black background. Even those feeder bus systems which must use hand printed signs can incorporate proper contrast and placement of signs into their systems to assist low-vision passengers.

Newer feeder buses may be able to incorporate automatic stop announcements which permit waiting passengers to hear route information as the bus pulls into a stop or station.

8.2 Interior signage & announcements

- Route maps, showing transfer points to other trunk lines or to feeder lines, can be especially helpful within trunk line buses. Tactile maps with Braille text could be distributed to blind users, with the same information.

- Electronic visual displays and audible announcements of the next stop are preferred in new systems, including audible warnings when doors open or close at trunk line stations. These announcements can also be programmed to periodically remind passengers to yield priority seats to disabled persons and to vacate wheelchair securement areas when needed.

- Signs in raised letters may assist blind persons to identify priority seating for passengers with disabilities, or identify the bus number to provide them with the same option to complain or commend the service as exists for all other passengers.

- In feeder buses without pre-recorded or GPS-enabled announcements, drivers should be trained and monitored to call out key stops, thus assisting all passengers including blind persons, persons with reduced vision, visitors, tourists, and first-time users. In addition, blind passengers must request drivers to call out their intended stop as the bus approaches so that they can prepare to alight.

9.0 TRUNK, MIXED USE, AND FEEDER LINE BUSES: ENTRANCES AND INTERIOR DESIGN

BRT trunk line bus with high doors for platform boarding

BRT trunk line access is provided by (1) level boarding from high platforms or (2) level boarding from low platforms to low-floor buses. If proper design and operating guidelines are followed, trunk line buses are generally accessible to persons with disabilities including wheelchair users. However, entrance into mixed use (trunk/pre-trunk) and feeder buses is often less accessible and requires special attention. Yet even older and inaccessible feeder fleets can be upgraded at low cost by improvements in color contrast, installation of hand rails on both sides of stairways at entrance and exit doors, and improvements in visibility of route and destination signs. See TRL, “design and operation of buses,” pages 113-132; AEI, *Mobility for All*, pp 9-13.

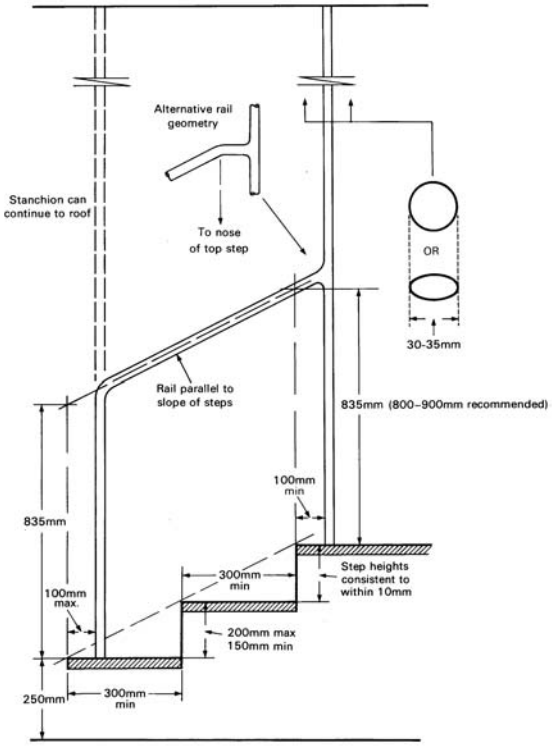
9.1 Use of ramped platforms	In its ideal form, BRT trunk line buses board from ramped platforms with level entry to high-floor vehicles. For example, all BRT systems in seven cities in Colombia use, or plan to use, high-level platforms to their BRT stations. (See sections 4.0 and 5.0 for comments on the use of ramped platforms for high-floor boarding of trunk line buses.) In some systems, planners may choose to also have some feeder buses enter into trunk routes, or even to dock at high ramped platforms along some or all of feeder routes. Such “mixed use” buses may have high doors on one side, to dock with high center-island platforms, and low doors with stairs on the other side to serve curb-side bus stops near ground level. If passengers may enter a bus from one side and depart from the other, special attention should be paid to the travel paths required for wheelchair users or other passengers with disabilities. (Note: The ramped platforms or stops on the feeder routes may not have controlled access and passengers may pay fares upon boarding the feeder bus. In some cases, passengers may be able to purchase a fare card upon entering the feeder bus so that they can continue into the trunk line in a seamless manner.)
9.2 Low-floor buses	 The photo at left, courtesy of Transantiago, illustrates the use of a simple manually operated ramp to provide access to a low-floor bus in Chile. See COST 322, under Resources, for more information on low-floor buses, or contact Transantiago. In low-floor bus systems: - The vertical distance between the bus stop surface and the vehicle floor should be minimized - The low-floor section of the bus floor should cover a high percentage of the floor and should avoid, insofar as possible, an irregular interior design.

Low-floor buses	- If wheelchair ramps are used in "semi low-floor" buses, they should preferably not be telescoping or should have a smooth transition between ramp sections (ECMT guidelines include a maximum 6 mm transition. See also DfT, *Significant Steps*). If ramps are installed in the bus, they should not exceed the angle for short ramps if passengers are to board or alight unassisted, noted at 10.2.3 - Stops and waiting areas should be at the level of the bus floor, or slightly below this level if ramps are used. In some cases ramps can be entirely eliminated by creating a stop at the same height as the bus, as seen in the photos below from New Delhi, by Gerhard Menckhoff.   - Methods should be considered to minimize the distance between the platform curb and the bus entrance. Beveled curbs are often used to channel buses close to curbs at bus stops serving low floor buses. (See 5.0, 6.2.2) Bus stops that jut into the roadway permit buses to stop parallel to a bus stop surface which has been raised to a height that permits virtually level boarding when the bus is kneeled. These "bus boarders" also discourage illegal parking. (See ECMT, 2004, p. 39 and COST 322, *Low Floor Buses*.)
9.3 Feeder bus entrances: general comments	ALERT No access feature benefits more seniors and disabled persons than reducing the vertical distance to the first step, combined with proper hand grasps in entrances and exits. The height to the bottom step clearly makes it difficult for the passenger in the photo at right to alight from the bus. (Photo courtesy of Angela Werneck, Rio de Janeiro) The closer entrances are to wheels, the less ground clearance is a problem.  (continued)

Feeder bus entrances

Raised bus stops can reduce the distance to the first step, provided that other vehicles do not block the stop and drivers are trained and monitored to stop adjacent to the stop. The photo at top shows a currently used feeder bus in a Colombian city with a first step that is especially high when boarded from ground level. The photo at bottom shows the impact of a lower first step and proper alignment with a raised bus stop, providing a far more accessible step. (Each mark on the rulers = 50 mm.)

(Bottom photo courtesy of AEI, from the Indios Verdes intermodal transfer center in Mexico City)



The handrail shown is for the center of a two-stream entrance. Handrails at the sides of entrances should have the sloping rail and the vertical rail near the outside of the bus. The vertical rail should extend to within 200 mm of the first step. Handrail centerlines should be 50 mm from bulkheads or doors. On a low-floor bus, there should be a vertical rail near the outside of the bus plus a horizontal rail 800-900 mm above floor level.

Source: DPTAC

Feeder bus entrances

The following table illustrates one approach toward guidelines for access by non-wheelchair users to bus entrances, recognizing that achieving the ideal specification may take time while newer feeder bus fleets are phased in.

Ideal and transitional specification for bus entrances (no wheelchair access)

Item	Ideal specification	Transitional specification
Maximum first step height	250 mm	325 mm
Max. height for subsequent steps	200 mm	225 mm
Max. total number steps	3	3
Max. ground to floor height	650 mm	775 mm
Minimum depth of steps	300 mm (280 mm on vehicles less than 2.5 meters wide)	
Step risers	Vertical, smooth, flat, color contrast on nose	
Minimum ceiling height	1.8 meters	
Entrance width between handrails	Min. 700 mm, max 850 mm for single stream of passengers Min. 530 mm, max 850 mm for wider doorways with a central handrail	

Adapted from TRL, page 116, from DPTAC

Recent British research on railroad access finds that the combined horizontal and vertical distance to the first step of a vehicle boarded by ambulatory passengers should preferably not exceed 200 mm and definitely should not exceed 300 mm (DfT, *Significant Steps*, summary). This research appears relevant to feeder buses serving BRT trunk lines.

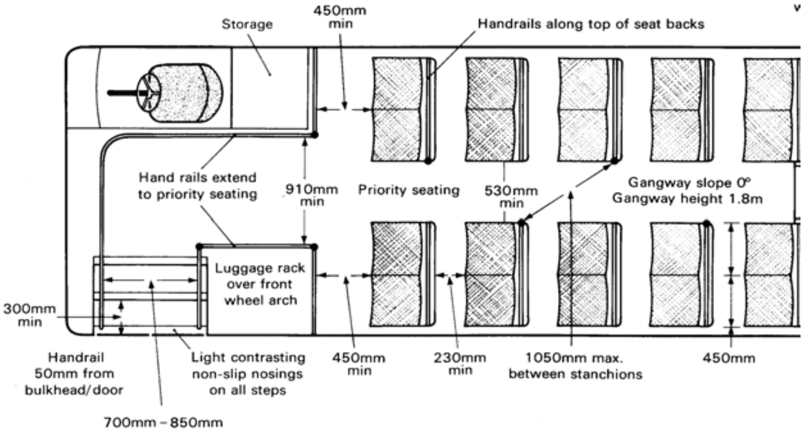
In addition, other steps can be taken to improve the entrances of older feeder buses:

- Install vertical handrails, and hand rails parallel to the angle of the stairs, on both sides of bus entrances and exits. This especially assists passengers who lack strength on one side of their bodies or who are carrying children or packages. Ideally, handrails should provide a continuous path up the steps and toward a priority seat in order to assist passengers with reduced vision. Improved handrails can mitigate the problem of a high first step, even on older buses, by enabling frail or semi-ambulatory passengers to better use their upper body strength.
- Paint all handrails, and the edges of steps, in a high contrast color. Many countries use a bright yellow color for maximum contrast with dark backgrounds. Yellow if often the color of choice for safety.

9.3.1 Elimination of turnstiles

As illustrated in the photo at left, even this non-disabled passenger finds it difficult to board this bus in Colombia due to a turnstile blocking his path. Turnstiles prevent the use of public transport by many seniors, persons with disabilities, mothers with children, and persons with packages. Their elimination would enhance accessibility for all. (See the Costa Rican norms, for example, which forbid turnstiles on buses.)

9.3.2 Feeder bus entrance option: retractable 1st step	 While not wheelchair accessible, this bus provides enhanced access to most persons with mobility impairments. Note the retractable steps and plentiful hand rails with excellent color contrast. - Photo above from Sweden courtesy of CGB Mitchell. The photo at right illustrates the use of a retractable first step on a bus in Mexico City. This option effectively reduces the distance to the first step at fairly low cost. Retractable steps can be activated manually by a lever near the driver or could be automatically activated when the door is opened. Note that retractable steps should provide room for the shoe or foot of alighting passengers, which requires greater projection from the plane of the bus side than an entrance step. (Photo courtesy of AEI) 
9.3.3 Feeder bus entrance option; Kneeler feature	A kneeler feature can lower the bus suspension by approx. 10 cm at stops serving disabled persons or seniors. This feature permits more rapid boarding by all passengers if the design permits this feature to be installed. Kneeler features are popular with bus drivers in the USA because they speed the boarding process.
9.4 Flooring	Non-skid flooring is required to prevent accidents, benefitting all passengers and especially those with mobility impairments.
9.5 Vertical stanchions	All buses should have vertical stanchions and horizontal grab bars which are within reach of all passengers. The use of stanchions and grab bars by TransMilenio is generally a best practice that may be copied by other BRT systems. Although this is not an international norm, the consultant recommends a vertical stanchion by every seat on each side of the aisle, where possible. This practice has given good results over many years in San Francisco, USA. In all events, a distance not exceeding 1200 mm (1050 mm if possible) is needed between adjoining stanchions to permit a passenger to navigate from one stanchion to another. Stanchions and hand holds should be painted in a contrasting color, typically a bright yellow.

9.6 Hand holds	 The photo, courtesy of TransMilenio, illustrates the abundant use of vertical stanchions and grab bars. Horizontal hand holds above each seat assist passengers to use the seats and also help short persons who cannot reach other hand holds. See also Costa Rica, section 4.1.5: "Stanchions, hand rails, and hand holds." Note that the stanchions should exhibit better color contrast.
9.7 Seating (general)	 Seat surfaces – especially those of aisle facing seats – need to be surfaced with materials with a coefficient of friction sufficient to prevent passengers from sliding back and forth during sudden starts and stops. The ideal dimensions of seats in the United Kingdom are noted in the diagram above, courtesy of DPTAC. Also see COST 349, pp. 17-18. Seat surfaces should be ergonomically contoured.
9.8 Prioritized seats	- Prioritized seats should be available for persons with disabilities, seniors, and pregnant women. These seats should face the front or rear of the bus, not toward the side. Priority seats require clear signage, adequate space, and should be located near the driver. The area around the seat should provide room to store a mobility aid such as a folded wheelchair, a walker, crutches, or a "seeing eye" dog guide. Note that it is good practice to permit disabled passengers to enter and exit the bus from the front entrance, even if other passengers use different doors to enter and exit. - The use of contrasting colors for priority seats helps to identify the seat, but also calls attention to the disability. A national norm, as in Colombia, is advisable to clarify which option is used.
9.9 Stop request signals	Visual and audible station and stop signals help all passengers and especially those with sensory disabilities. Stop cords or stop buttons should be located near seats to enable passengers to signal their stop. A lower cord, or lower stop button, can readily be placed by any wheelchair securement position. Stop buttons are generally preferred because they are more easily used by persons

with less strength in their hands. Stop announcements typically activate a sign in front of the bus, providing feedback to passengers that their message has been received.

9.10 Wheelchair securement

All trunk line buses are wheelchair accessible in a well designed Bus Rapid Transit system. In addition, increasing numbers of feeder line buses will typically become wheelchair accessible during the normal replacement of feeder bus fleets. Bus doorways must be at least 850 mm wide to allow space for wheelchair riders to enter. This width is readily achieved on the large vehicles used in BRT systems. Often, wheelchair users can then proceed to a securement area conveniently located opposite the front entrance of the bus. On feeder buses, a clear width of 750 mm from the entrance to the securement position will be needed. (Photo above is courtesy of TransMilenio.)

The international ISO standard for a reference wheelchair is 700 mm wide by 1200 mm long. An occupied wheelchair may require greater length and width due to feet and hand placement. For example, COST 349 recommends a minimum 1300 mm length and 750 mm width for securement areas. When not in use, wheelchair securement areas can be occupied by standing passengers or by folding seats which can be added in some configurations.

At a minimum, a cutout of a plan view of a reference wheelchair, to scale with a plan of the bus interior and adjacent stop, should be used to assure an accessible travel path into the bus and then into the securement area. Note that securement areas must be longer than the reference wheelchair to allow for turning motions as the wheelchair is positioned in the securement area. Better still, users of reference size wheelchairs should test a full-size mockup of a bus door, aisle, and securement area taped to the floor. Even better, a three dimensional mockup could be used, with the bus floor, sides, seats, stanchions, fare box, and other elements mocked up using plywood or other inexpensive materials.

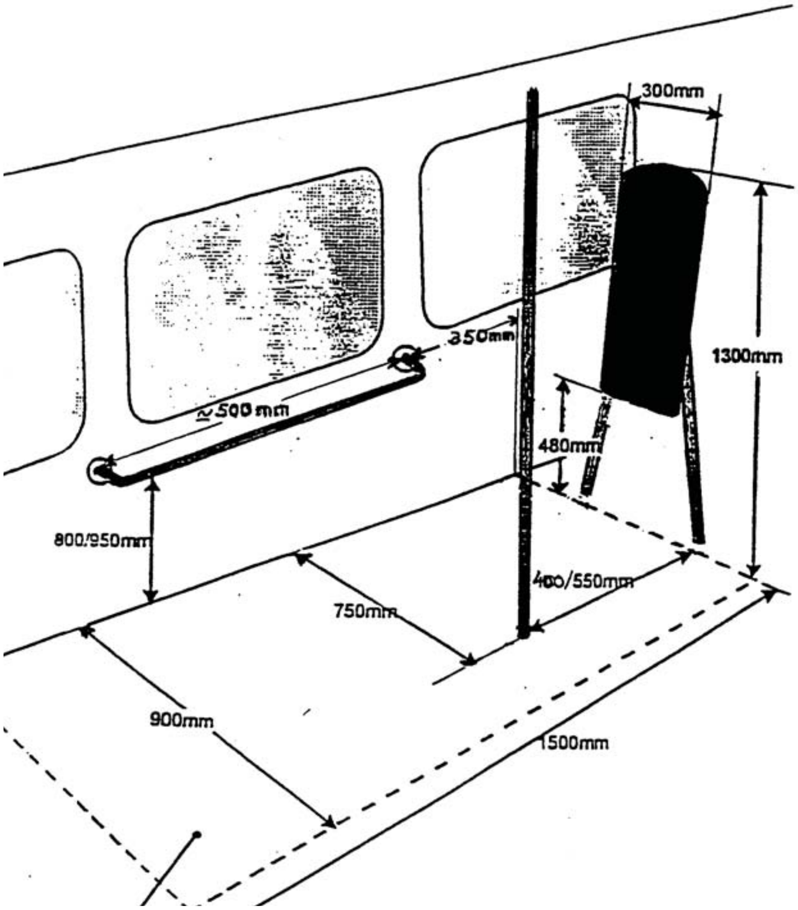
Note that wheelchair users vary in upper body strength and this effects how individuals choose to position themselves to ride on public transport vehicles.

9.10.1 Use of tiedowns

Tiedowns are used throughout North America. One or more designated and clearly identified spaces are reserved for wheelchair users. The spaces should have appropriate dimensions, are located near the door used to board the bus, provide a three point safety belt, with the passenger seated facing toward the front or the rear of the vehicle (never toward the side), and with a stop call mechanism. Typically, a wheelchair wheel clamp is also provided.

ALERT Additional methods may be needed to tie down wheelchairs and secure their occupants when the route includes severe inclines. In Colombia, for example, the trunk line planned for Medellín or feeder lines ascending the steep mountain sides near Bogotá, face the challenge of steep inclines.

9.10.2 “European method” without tiedowns: an option for trunk line buses?



This approach, common on lines served by large buses in Europe, does not use securement belts or wheel clamps. (Diagram from Sweden courtesy of CGB Mitchell.) This system is often used on large vehicles on fairly level routes without hills and without severe curves. The system requires that wheelchair riders face toward the rear of the bus. Note that the back rest is only 300-320 mm wide in order to go between the handles of a wheelchair and is 480 mm high to leave space for power chair motors. While not shown, 300 mm of clear space is provided behind the back rest to allow the passenger to maneuver the wheelchair so that his/her back actually rests against the backrest. (Slightly different measurements are given in COST 349, page 20.) This method would appear to be applicable to BRT trunk line buses in some situations. However, this option assumes drivers are well trained and monitored to avoid sudden stops and starts. In other cases, the “standard method” should be used and in all cases the norms of a specific country should apply or be exceeded. User groups should be consulted for guidance.

NOTE: It is commonly recognized that the brakes on wheelchairs cannot be trusted.

10.0 FEEDER LINE BUSES: DEPLOYMENT ISSUES AND ACCESS BY WHEELCHAIR USERS

This section deals with specific issues which confront planners of feeder bus services in an integrated Bus Rapid Transit system.

10.1 Deployment issues

Consideration should be given to deploying accessible feeder buses on one route at a time, with all buses accessible on that route. This is considered best practice in Europe and North America and is usually preferred to the practice of dividing up newly received accessible buses among many different routes with only a small percentage (often, initially, only 1-2 buses) accessible on each route. (See ECMT, 2004)

1) If wheelchair users must wait a long time (or if an accessible bus is out of service), the service may not be reliable and the use of the service by wheelchair users will be reduced.

2) It may be more difficult to maintain the schedule of a single accessible bus. Traffic congestion during the day, the need to add buses during peak hours (and remove buses during off-peak hours), and mechanical problems are more difficult to solve using a mixed fleet with only one or two accessible vehicles.

3) In many situations a bus can be in service during the work shifts of two or three full-time or part-time drivers. Drivers can lose their training in the use of accessible features if they have not driven an accessible bus for a long time.

4) Accessible buses parked at night in the corporation yard may be impossible to reach by a driver trained in the use of a ramp or lift, if other vehicles block the bus. This problem typically does not occur when buses are parked in a herring-bone pattern.

5) Maintenance may be more complicated. The parts inventory of only 1-2 buses may be difficult to maintain and maintenance of lifts or ramps may suffer.

6) Levels of use by disabled passengers may decrease due to lack of confidence in the service. It is more difficult to remember the schedule of a single bus.

7) Of special importance, it may be easier to systematically improve the pedestrian infrastructure around prioritized feeder lines served by entirely accessible bus fleets, than to prioritize curb ramps and level sidewalks for all the routes at one time.

In summary, a “subsystem” of a small percentage of accessible buses presents challenges that require attention due to potential problems concerning the use, dispatching, operation, monitoring, maintenance, and promotion of a mixed fleet with a small minority of accessible vehicles. Without attention to these challenges, it is possible that low use of feeder buses by disabled persons can also lower the use of access features on BRT trunk lines.

NOTE: The concerns noted above [especially 1) through 6)] may be somewhat mitigated by contracting with a single bus operator to operate a large number of feeder buses with a relatively larger number of accessible buses, even if they are only a small minority of the total fleet.

10.2

ACCESS BY WHEELCHAIR RIDERS TO FEEDER LINE BUSES
This section examines alternative approaches to providing wheelchair access to a fleet of feeder line buses.

10.2.1
Wayside platforms

Feeder line buses may not be completely replaced at the time they are integrated into a Bus Rapid Transit system. Accessible features may be phased in as the fleet is replaced over a period of years. One approach to feeder line access is to use a network of wayside platforms built adjacent to key bus stops such as those that serve a major shopping area or school or neighborhood. The photos above by Christo Venter are provided by TRL Ltd. of the United Kingdom and illustrate a successful pilot project in Pretoria, South Africa, to demonstrate the feasibility of using such platforms. The bridge plate in this case is attached under the platform and is pulled out by the driver. Such platforms may be less expensive than wheelchair lifts on buses and may also require less maintenance. Issues which effect the use of such special-purpose platforms include (1) the width of bus doors using the route, (2) the availability of public space to lower or eliminate the cost of land acquisition, (3) issues of vandalism if bridges must be stored or locked in place on the platforms, (4) the need to train bus drivers to use the platforms, and (5) the need to have a sufficient number of platforms to attract steady and growing usage by wheelchair users and others needing a level-change device.

10.2.2
Wheelchair lifts

Wheelchair lifts provide an alternative approach for wheelchair access. The photo at left shows a wheelchair lift on a TransMilenio feeder bus. Specifications for wheelchair lifts may vary from country to country. A typical specification would require wheelchair lifts to handle 300 kg weight, with the lift platform having a 750 mm width and 1200 mm length. In many countries standards for lifts specify railings, security edges, or other features to address safety issues. In all cases, the norms of a given country should be followed or exceeded to assure safety. Operators or other trained staff must be present to physically assist as needed. Lifts should have a non-skid surface and should dock with the bus floor with no more than a 1-2 cm gap. (For the USA's norms for elevators and ramps, go to ADAAG: ADA Accessibility Guidelines for Transportation

	Vehicles, Subpart B [Buses, Vans and Systems], 1192.23 [Mobility aid accessibility].) In order not to interfere with the flow of passengers, wheelchair lifts should be designed so that they do not block the door when not in use. This is usually done by having the lift stow beneath or to the side of the stairs, or by having the stairs themselves re-align to form the lift platform.
10.2.3 Ramps	In some cases, a combination of bus floor height and bus stop height may permit ramps to be used for access by passengers using wheelchairs. The key issue in such cases is the gradient of the ramp. The following is the official norm for the USA, from the standards required by the Americans with Disabilities Act. Height to vehicle floor above 6-inch curb: Maximum ramp slope (modified from ADAAG) 1:4 75 mm or less 1:6 150 mm or less 1:8 225 mm or less 1:12 more than 225 mm A minimum ramp width of 750 mm should be achieved and 800 mm is better. Ramps are not a practical solution if the floor of the vehicle is more than 300 mm above the surface of the bus stop or if the ramp must extend more than 1200 mm from the side of the vehicle. Ramp sections (e.g., in a telescoping ramp) should not present more than a 6 mm change in surface level and the ramp bottom should not be more than 15 mm from the surface of the stop. (See COST 349, p. 14)
10.2.4 Low-floor buses	See 9.2, above, discussing the option of low floor buses for trunk line, mixed use, or feeder line bus fleets.
10.2.5 Personal assistance	The role of "hands on" assistance by others in providing access for wheelchair users to public transport may differ from country to country. Much may depend on the culture of the country, and even more on the training of station personnel or bus drivers to assist. For example, if drivers were trained and monitored to physically assist wheelchair users to board feeder buses using ramps, then such an approach might be desirable to address issues of ramp gradients or to increase safety while boarding, <u>if</u> such assistance could be consistently provided so that wheelchair riders could count on the system to get them to work or other activities with the same reliability as that enjoyed by all other passengers. Where personal assistance is not reliable – for example, from passengers lifting wheelchair users on board a bus – it is clearly not adequate, denying the rights of wheelchair users to get to their destinations like everyone else.

11.0 PUBLIC INFORMATION

This section lists types of public information required to market accessible services to BRT trunk line and feeder line users.

11.1 Alternative formats	The bus company needs to provide system information (route map for the entire system) to show passengers how to get about town, plus specific route information (a strip map and timetables for routes through a given stop). (On BRT routes with very high service frequency, a timetable may not be required.) Such formats include large print brochures and schedules for those with vision impairments, Braille materials or electronic means for passengers with reduced vision, tactile route maps for blind persons, and text phones and e-mail contact for deaf persons. It is important to consult with persons with sensory disabilities in focus groups or advisory committees, in order to learn which formats are appropriate. (See 1.0)
11.2 Phone	A contact telephone number for complaints and compliments is needed by any large public transport system. Phone numbers need to be displayed on board buses and in stations, as well as included in brochures or other public information. Persons who are deaf, deafened, or hard of hearing need to be able to reach the transit agency via text phone. Complaint and compliment data needs to be channeled to the different stakeholders in the system, including persons with disabilities serving on advisory committees.
11.3 Service center	A centrally-located office should be provided for passenger services, accessible to wheelchair users.
11.4 Web site	An accessible web site should be provided, with large high-contrast text and permitting the use of software by persons with different types of disabilities. Photos and animations that interfere with navigating the site should be replaced by text explanations. Readers are referred to the World Wide Web Consortium (W3C) Web Accessibility Initiative (WAI) for current norms for web accessibility. Go to http://www.w3.org/WAI/.
11.5 Public education	A public education program is often helpful, to orient the public to the principles of independent living. The public needs to learn that disabled persons are usually not accompanied by an attendant. The public also needs to be educated to yield priority seats and wheelchair securement areas. Public education campaigns can include elements such as well-publicized events involving disabled persons and public officials, signs in stations and buses, TV and radio announcements, and flyers distributed to passengers. See CREA-PE under Resources for an example of a well-structured public education program.

12.0 TRAINING OF DRIVERS, STAFF, AND NEW USERS WHO NOW BENEFIT FROM UNIVERSAL DESIGN

12.1 Driver training	Accessible design of vehicles must be supplemented by the accessible operation of these vehicles for the integrated system to be truly inclusive. Periodic training and retraining is needed for bus drivers. During the course of this training, drivers can learn how to operate access features and also receive sensitivity training concerning their treatment of passengers with disabilities. BRT station personnel and other employees also need training. In many countries, such training includes boarding a bus in a wheelchair or learning to navigate a station with a blindfold to experience what it is like for wheelchair riders or blind passengers to use the system. Ideally, top management should become involved, setting an example for others by also participating in sensitivity training. System personnel should avoid the extremes of “protecting” disabled persons on the one hand, or not assisting when help is really needed on the other. Station personnel should be trained to ask if help is needed before offering assistance, while drivers should monitor movements by wheelchair users and others to see if help in securing passengers is wanted. ALERT The training and monitoring of drivers in safe and courteous operation of their vehicles is one of the most important single steps toward creating an inclusive transport system. Without safety and courtesy, all passengers suffer and whole categories of passengers may be denied transport. Basic safety instruction includes - avoiding sudden starts and stops or speeding around curves - pulling up close to station platforms or feeder line bus stops - bringing the bus to a complete stop when passengers are boarding or alighting - waiting at least until disabled passengers are seated and other passengers have reached hand grasps before putting the bus in motion - if stops are not automatically announced using electronic means, drivers need to call out key stops (and all BRT station stops) to assist blind persons and all passengers not familiar with the system Without safe and courteous driving, access for all passengers suffers. It is especially important that drivers bring their vehicles to a full stop and wait while persons with disabilities and frail elders reach a seat.
12.2 User training	“Travel training” may be needed for persons newly able to use public transport due to universal design features. Disability NGOs or social service agencies provide such training in many countries.
12.3 Training for emergencies	Transport providers need emergency plans in place to deal with earthquakes, floods, storms, fires, and other emergencies. Elements of such plans should address training requirements for supervisors, drivers, and passengers so that they will know their roles in an emergency. The evacuation of passengers, including persons with disabilities, *from* a bus in an emergency, or *by* a bus from a disaster area, should be a part of such planning.

BRT Accessibility Guidelines: PRIMARY RESOURCES

For links to 100+ web sites with information on accessible transport, go to www.globalride-sf.org.

TITLE IN TEXT	DESCRIPTION
ADAAG	*Americans with Disabilities Act Accessibility Guidelines*. The official USA norms for accessible transport and infrastructure: go to www.access-board.gov.
AEI	Publications of Access Exchange International, authored by Tom Rickert. Complimentary hard copies are available from AEI, 112 San Pablo Ave., San Francisco, CA 94127, USA, e-mail to tom@globalride-sf.org, or telephone in English or Spanish to 1 (415) 661-6355. - *Mobility for All: Accessible Transportation Around the World*, 1998, 26 page introduction describing the design of accessible transport infrastructure and vehicles. Go to www.independentliving.org to download. A Spanish version of this document is available at the same site. - *Making Access Happen: Promoting and Planning Transport for All*, 2003, 30 page introduction to the promotion and planning of accessible bus, rail, and other land transport modes. Download at www.independentliving.org. -*Transport for All: What Should We Measure?: Comments on the use of indicators and performance measures for inclusive public transport in developing regions*, 2003, 20 pages. Download at www.globalride-sf.org.
BENTZEN	Accessible Design for the Blind: This site at www.accessforblind.org is maintained by Billie Louise Bentzen and Janet M. Barlow. Go here for detailed information about accessible pedestrian signals and detectable warnings.
CANADA HRC	*International Best Practices in Universal Design: A Global Review*, 2006, 236 pages. “A compilation of existing technical specifications” from 14 countries in the Americas, Europe, Africa, and the Asia-Pacific region, published by the Canadian Human Rights Commission. Focuses on buildings and pedestrian infrastructure. Order complimentary CD or hard copy at www.chrc-ccdp.ca.
COLOMBIA	*Decreto 1660 de 2003* (access to transport modes) *Decreto 1538 de 2005* (access to buildings and public space) *Ley 361 de 1997* Planning documents and presentations in Spanish from the following cities: Barranquilla, Bogotá, Bucaramanga, Cali, Cartagena, Medellín, and Pereira
COST	Go to www.bestgroup.cc/cost349/download.htm to access key publications of the European Commission: • COST 322, *Low Floor Buses*, 1995, 100 pages. • COST 349, *Accessibility of Coaches and Long Distance Buses for People with Reduced Mobility*, 2005, 137 pages. This publication does not directly address issues unique to BRT systems, but does reflect the latest European thinking

	regarding standards that apply to all public transport infrastructure.
COSTA RICA	*Norma Nacional, Vehículos de Transporte . . . Accesibles*. Go to La Gaceta Diario Oficial de Costa Rica: 17 de diciembre de 2004.
CREA-PE	Go to www.creape.org.br clicking "Facil acceso para todos" for an example of a well-structured public education campaign (in English and Portuguese).
DfT	Mobility Unit of the Department for Transport of the United Kingdom with official UK guidelines to all modes of land and air transport. Especially see *Inclusive Mobility: A guide to best practice on access to pedestrian and transport infrastructure*, 2002, by Philip R. Oxley, 164 pages, to be downloaded by typing "Inclusive Mobility" in the search box at www.dft.gov.uk. Also see *Significant Steps: Summary*, 32 pages at the same site.
DPTAC	Disabled Persons Transport Advisory Committee. Download *Accessibility Specifications for Small Buses designed to carry 9-22 passengers* at www.dptac.gov.uk/pubs/smallbus.
ECMT	European Conference of Ministers of Transport, *Improving Access to Public Transport*, Paris, 2004, 82 pages; also *Improving Transport for People with Mobility Handicaps: A Guide to Good Practice*, Paris, 1999, 94 pages. Download at www.cemt.org.
EMBARQ	World Resources Institute (in English and Spanish). News and events in the field of Bus Rapid Transit at www.embarq.wri.org.
ICONTEC	Guidelines of the Instituto Colombiano de Normas Técnicas y Certificación. These must be purchased from ICONTEC. Go to www.icontec.org.co for purchase information. ICONTEC norms address access to buildings, public space and pedestrian infrastructure including station access.
IDB	Inter-American Development Bank, Washington DC, USA. - *Guía Operativa de Accesibilidad para Proyectos de Desarrollo Urbano, con Criterios de Diseño Universal*, by Eduardo Alvarez and Verônica Camisão, 2005, 47 pages. Covers the theory and practice of universal design with a special emphasis on buildings and pedestrian infrastructure. Download in Spanish or Portuguese at http://www.iadb.org/sds/SOC/publication/gen_6191_4180_e.htm. - *Facilitando el Transporte para Todos* (Spanish), edited by Charles Wright, 2001, 61 pages. Go to www.iadb.org for information on ordering this document. - *Facilitando o Transporte para Todos* (Portuguese version of Spanish publication, including *Mobility for All* (AEI) in Portuguese), 2001, 92 pages.
IDU	Instituto de Desarrollo Urbano, Bogotá, Colombia, at www.idu.gov.co. Contact IDU for information on obtaining PowerPoint presentations in Spanish, including Accesibilidad en el Espacio Público (Access to Public Space), Ascensor Accesible (Accessible Elevators), Conectividad de Rampas (Ramps), Pasamanos (Handrails), and Tableta Táctil (Tactile Guideways).
ITDP	Institute for Transportation Development and Policy. For information on BRT systems in developing countries as well as accessible pedestrian and bicycle

	paths to connect with them, go to www.itdp.org.
PROJECT ACTION	*Toolkit for the assessment of Bus Stop Accessibility and Safety*, Washington DC, (79 pages, 2006) and *Bus Rapid Transit and Accessibility in the U.S.* (10 pages, 2005) Information at http://projectaction.easterseals.com.
SANCHEZ	*Diseño para todos: Movilidad y Transporte*, PowerPoint presentation in Spanish prepared by Arq. Claudia Sánchez, Bogotá, Colombia, 2004. Contact claudiasanchez@etb.net.co in English or Spanish.
TRAN-SANTIAGO	PowerPoint presentation in Spanish: *Medidas para Favorecer a las Personas con Discapacidad en el Plan de Transporte Urbano de Santiago* (Transantiago BRT system in Santiago, Chile), 2004. Contact Transantiago in Spanish at info@transantiago.cl.
TRANS-MILENIO	For general information, go to www.TransMilenio.gov.co. Specific queries (in English or Spanish) should go to Alexandra Correa, Commercial Director of TransMilenio, Avenida Eldorado No. 66-63, Bogotá, Colombia; tel. (57-1) 220-3000, ext 1300, cell (57) 311-236-0242; e-mail alexandra-correa@transmilenio.gov.co.
TRL	*Enhancing the mobility of disabled people: Guidelines for practitioners*, by C.J. Venter, J. Sentinella, T. Rickert, D. Maunder, and A. Venkatesh. 2004, 190 pages. Comprehensive coverage of good practice for access to pedestrian infrastructure and all modes of public bus, rail, and land transport. Published as Overseas Road Note 21 by TRL, Ltd., of the United Kingdom, as a project of the UK's Dept. for International Development. Download at www.globalride-sf.org.
UN	*A Design Manual for a Barrier Free Environment*, published by United Nations Enable at www.un.org/esa/socdev/enable/designm.
VASCON-CELLOS	Vasconcellos, E A (2004) "Urban Transport and tensions in developing countries" in Beneria L and Bisnath S (eds), *Global Tensions – challenges and opportunities in the world economy*, Routledge, NY, pp. 291-308.
WERNECK	*Desenho Universal, Acessibilidade e Integração Modal, Estudo Exploratório no Transporte Coletivo no Rio de Janeiro* (Portuguese), by Angela Werneck, 2005, 240 pages (Universidade Federal do Rio de Janeiro, COPPE).
WORLD BANK	Several World Bank publications relate to access for persons with disabilities. Go to the Bank's web site at www.worldbank.org and type "Bus Rapid Transit Accessibility Guidelines" in the search box to download this guide.

About the author of this guide

Tom Rickert developed accessible transport for San Francisco, California's, public transport agency for a ten year period. He stepped down in 1990 to found Access Exchange International, an NGO promoting inclusive transport around the world. He has provided workshops on accessible transport for the World Bank, the Inter-American Development Bank, and agencies in more than 20 countries. His work preparing these guidelines was as a consultant to the World Bank's Integrated Mass Transit Systems Project for the Republic of Colombia.

Bus Rapid Transit Accessibility Guidelines
CHECK LIST FOR TASK MANAGERS

Note: In given situations, some guidelines may not apply or may have higher priority than others.

1.0 PUBLIC PARTICIPATION ELEMENTS IN PLACE	YES	NO
Focus groups of disabled persons have been utilized		
Advisory committee of disabled persons and seniors in place		

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2.0 ACCESSIBLE STANDARDS MET FOR PUBLIC SPACE ELEMENTS	YES	NO
Sidewalks along length of trunk line corridors are at least 1500-2000 mm wide (with at least 900 mm clearance at obstructions), with proper overhead clearance		
Sidewalks on key side roads providing neighborhood access to BRT corridors are at least 1500-2000 mm wide (with at least 900 mm clearance at obstructions), with proper overhead clearance		
Surface condition of sidewalks OK (level, paved, side slope not greater than 1-2%, drainage OK, non-skid, lighting OK)		
Tactile guideway design and use OK (guideways may not be required)		
Tactile warnings where required (e.g., at curb ramps, unguarded platform edges)		
Full-width curb ramps at all pedestrian crossings with gradient from horizontal not more than 1:12 (8%) and with smooth transition to street AND/OR continuous sidewalks (raised crossings) planned		
Other ramps with gradients appropriate to length		
Traffic signals pedestrian-friendly		
Audible signals where appropriate at crossings		
Pedestrian bridges include access features to assist disabled persons		
Long-term planning process in place for phasing in accessible footways to feeder route bus stops (NOTE: This is an especially critical issue.)		

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3.0 FARE COLLECTION	YES	NO
Have the advantages of a flat fare for many disabled passengers been taken into consideration in weighing the relative merits of different fare structures?		
Fare cards user-friendly		
Fare card vending sites accessible to disabled persons		

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4.0 ACCESS AT TRUNK LINE STATIONS	YES	NO
All stations served by trained station assistants and/or security personnel		
Stations display uniform design understandable by new users		
Ramps to stations not greater than 1:12 (8%) gradient		
Long stations have exits at both ends where possible		
One fare gate at least 900 mm wide		
Folding seats and isquiatic supports if off-peak waiting times exceed 5		

minutes		
Stations have sliding doors which automatically open with bus doors		
Adequate lighting		
Adequate color contrast		
Uniform signage, with icons and color coding to assist disabled or new users		
Audible warning at sliding doors		
Transit information in audible and visual formats, tactile format if desired by blind advisors		
Elevators planned where needed		
Transfer terminals have clear information		
Accessible routes planned to connect stations and terminals with other transport modes (pedestrian paths, bicycle paths, inter-city buses, etc.)		

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5.0 PLATFORM TO BUS FLOOR GAP: 10 cm. maximum gap at front entrance, 7.5 cm. gap preferred; gap eliminated if possible	YES	NO
Station door designated for disabled users at front entrance of bus		
Station assistants trained to assist wheelchair users, others with disabilities		
Drivers trained to approach platforms with bus parallel to platform edge		
Bus design and platform design coordinated to eliminate vertical gaps and minimize horizontal gaps		
Gap eliminated by bridges lowered from buses		
Gap mitigated by use of beveled curbs, precision docking, and/or gap fillers		

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6.0 ACCESS AT FEEDER LINE STOPS	YES	NO
High use bus stops prioritized for accessibility features		
Enforcement planned to keep bus stops free of other vehicles		
Shelters and waiting areas meet accessibility criteria		
All-weather concrete pads where no pavement exists		

.

7.0 SPECIFYING ACCESS FOR TRUNK LINE AND FEEDER LINE BUSES	YES	NO
Seamless integration of accessible station and bus design and operational features		
Full spectrum of access features included in specifications for trunk line and new feeder line buses		

.

8.0 SIGNAGE AND ANNOUNCEMENTS	YES	NO
Exterior signage meets or exceeds size and color specifications		
Interior signage and announcements meet needs of visually impaired and hearing impaired passengers		

.

9.0 BUS ENTRANCES AND INTERIOR DESIGN	YES	NO
Accessible travel paths checked on any buses with doors on both sides		
If low floor buses used, meet access standards		

First step of new feeder buses not more than 25 cm above ground level		
Hand grasps on both sides of entrances and exits and meet specifications		
All turnstiles removed from feeder buses		
Consideration given to including a retractable 1st step or kneeler feature on those feeder line buses with a design where this can be done inexpensively		
Flooring is nonskid		
Adequate (plentiful) use of vertical stanchions and hand holds painted in bright yellow or other contrasting color		
Seating meets standards to keep passengers from sliding		
Prioritized seats for seniors, persons with disabilities		
Visual and audible stop request signals		
If wheelchair access, securements meet stated norms		
Have special circumstances (e.g., steep hills) been taken into consideration in specifying wheelchair securement methods and equipment?		

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10.0 FEEDER LINE BUS DEPLOYMENT AND WHEELCHAIR ACCESS	YES	NO
Deployment of accessible buses on prioritized lines with integrated phasein of pedestrian access to prioritized bus stops		
Wheelchair user access provided or to be phased in by some combination of raised bus stops, low-floor buses, wheelchair lifts, ramps, and/or wayside platforms (See photos at 10.2.1)		
If personal assistance required to board/debark wheelchair users, service is reliably available using trained personnel		

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11.0 PUBLIC INFORMATION	YES	NO
Public information will be available in alternative formats		
Phone and text phone number for complaints and commendations		
Accessible service center		
Accessible web site		
Public education campaign		

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12.0 TRAINING	YES	NO
Driver training to include courteous and appropriate treatment of seniors and disabled passengers as well as smooth operation (avoiding abrupt starts and stops, driving slowly at curbs)		
Consideration given to provision of orientation to new disabled users		
Training for emergencies includes policies regarding disabled passengers		

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The complete *Bus Rapid Transit Accessibility Guidelines* are available at the web site of the World Bank. Go to www.worldbank.org, typing the document title in the search box. The guidelines have been developed by Tom Rickert for the World Bank thanks to funding provided by the Norwegian and Finnish governments through the TFESSD – Disability Window.