Chapter 4—Engineering
4.6 Transit Facilities

Transit Facilities

Transit is an important component of Complete Streets. Transit refers to mass public transportation, usually with fixed routes. Common examples are subways and buses. In this document, the word "transit" refers to public transportation. Fixed-route transit provides service on a repetitive, fixed-schedule basis along a specific route. On the other hand, demand-responsive service is provided to passengers at any location, but is typically limited to persons with disabilities. This section details fixed-route transit, as opposed to demand-response services.

Using transit always involves a multi-modal trip: Besides walking to and from transit stops, a person can bike to a transit stop or drive their car to a Park & Ride facility and then take transit to their final destination. While this section will focus on transit, it will mention other modes of travel as appropriate.

Types of Transit

There is a wide range of transit types in the United States. Defining characteristics are based on speed and right-of-way, which are inter-related. Different types of passenger transit are outlined below.

Bus

Probably the most common form of transit is a bus. A bus is a rubber-tired, self-propelled, manually-steered vehicle. Standard-sized buses are from 35 - 41 feet in length (APTA Glossary). The fuel supply can vary from diesel gasoline to biodiesel to hybrid electric.

▲ COTA bus in Columbus, OH.
(Source: MORPC, 2010)

- Typically, transit buses have front and center doors, are used in frequent-stop service, and do not have luggage compartments or restroom facilities (APTA Glossary).
- The two primary types of bus service are feeder/local and express.
    - Local, or also called feeder, bus service picks up and delivers passengers to a rapid transit station or express bus stop or terminal (APTA Glossary).
    - Express bus service operates a portion of the route without stops or with a limited number of stops (APTA Glossary).
- Other special types of buses include: articulated buses (55 feet or more in length) that bend in the middle, small buses (28 feet or less in length), medium-sized buses (29-34 feet in length), trolley buses (powered by overhead wires from a central power source not on board the vehicle), and van bus (20 feet or less in length and used for demand-response service or vanpool) (APTA Glossary).
- A current existing example is COTA's fixed-route service buses.

Heavy Rail (Subway or Metro)

Heavy rail is an electric railway with a capacity for a "heavy volume" of traffic compared to light rail. It is characterized by exclusive rights-of-way, multi-car trains, high speed and rapid acceleration, sophisticated signaling and high platform loading (APTA Glossary).

- Heavy rail is also known as "rapid rail," "subway," "elevated railway," or "metropolitan railway/metro" (APTA Glossary).
- Current existing examples include Cleveland's RTA Red Line and Chicago's CTA "L" system (The Transport Politic website).

Cleveland RTA red line train ► in Cleveland, OH
(Source: Clifton, Weiss and Associates, Inc.)

Light Rail (Streetcar or Tramway)

Light rail is an electric railway with a capacity for a "light volume" of traffic compared to heavy rail. It is characterized by shared or exclusive rights-of-way, and high or low platform loading. It may use multi-car trains or single cars (APTA Glossary).

- Light rail is also known as "streetcar," "trolley car," and "tramway" (APTA Glossary).
- A current existing example is Cleveland's RTA Blue Line and Green Line (The Transport Politic website, Existing Light Rail Systems).

◄ Cleveland RTA blue line train in Cleveland, OH.
(Source: Flickr user "tracktwentynine")

Commuter Rail

Commuter rail refers to local and regional passenger rail. It is characterized by tickets that can be used on more than one trip, specific station-to-station fares, and one or two stations in the central business district. This is sometimes known as "suburban rail" (APTA Glossary).

- Commuter rail systems sometimes share tracks with freight trains.
- Trips tend to cover longer distances at higher speeds than on light rail, heavy rail, or buses.
- A current existing example in the Midwest is the Chicago area's METRA system (The Transport Politic website, Existing Commuter Rail Systems).

◄ METRA blue line train in Chicago, IL
(Source: Windy City Chicago)

High-Speed Rail

In the United States, high-speed rail is defined as a system with exclusive right-of-way which serves densely traveled corridors at speeds of 124 miles per hour or greater (APTA Glossary).

- Currently, high-speed rail is not as common in the U.S. as it is in Europe and Asia. This form of transit is used to connect different cities and regions over longer distances. A future example of possible high-speed rail in Ohio would be the eventual 3C Rail plan, with trains traveling at high speeds between the cities of Cleveland, Columbus, and Cincinnati.
- A current existing example in the U.S. is the Acela Express, with service in the Northeast Corridor from Boston to New York City and Washington, D.C.

Acela Express train ►
(Source: Environmental Law and Policy Center)

Other Types of Transit

There are other less common forms of transit, none of which can be found in central Ohio. Although these systems are typically found in niche markets, they may offer advantages over other forms of transit in one or more aspects, such as right-of-way costs, operating costs, geographic suitability, user appeal, or energy efficiency. They are described briefly below.

- Monorail is an electric railway in which rail cars are suspended from a guideway formed by a single beam or rail. Sometimes instead of being suspended the cars straddle the guideway. Most monorail systems are either heavy rail or automated guideway systems (APTA Glossary). An example of a monorail is the Disneyland Monorail.

Other Types of Transit, cont'd

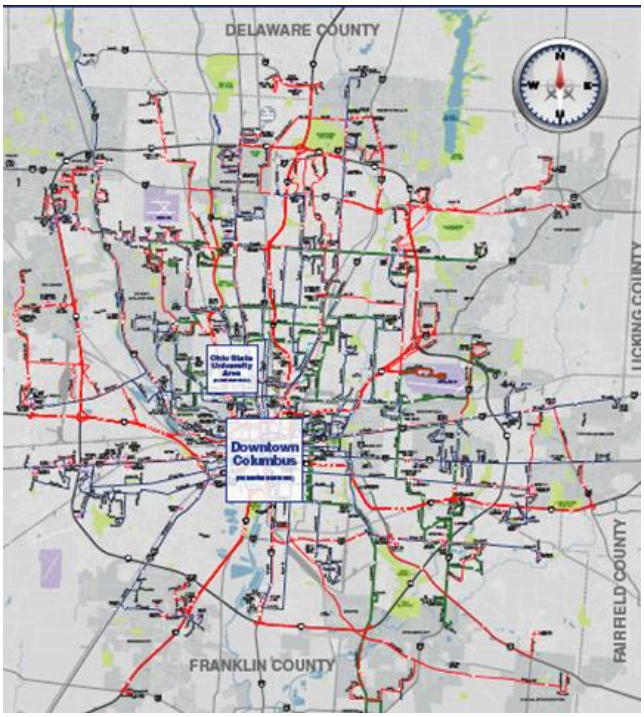
- Cable Car is an electric railway operating in mixed-street traffic. In other words, it does not have its own exclusive right-of-way. The vehicles are propelled by moving cables located below the street surface. The engines and motors are not on board the vehicle; instead they are at a central location (APTA Glossary). An example of a cable car system is the San Francisco cable car.
- The Downtown People Mover is a type of automated guideway transit vehicle. It operates on a loop or shuttle route in the Central Business District of a city. Detroit has a Downtown People Mover (APTA Glossary).
- Inclined Plane is a railway operating over exclusive right-of-way on steep grades. The vehicles are propelled by moving cables and powered by engines or motors at a central location. The engines and motors are not on board the vehicle (APTA Glossary). The Duquesne Incline in Pittsburgh is an example of an inclined plane. This system makes the most sense where there are very steep grades.
- Personal Rapid Transit (PRT) is an automated guideway system. However, the vehicles are smaller and are sometimes called pods. These carry no more than 3-6 people per vehicle. Intermediate stations can be bypassed (Wikipedia entry on PRT). An example of a PRT system can be found at West Virginia University in Morgantown, WV.

◄ Inclined Plane railway in Pittsburgh, PA
(Source: Duquesne Incline Website)

Local Transit Systems in Central Ohio

Central Ohio currently has 3 fixed-route systems through COTA (Central Ohio Transit Authority), CABS (Campus Area Bus Service by OSU), and DATA (Delaware Area Transit Authority). COTA service provides both local (feeder) and express service.

- Other on-demand/paratransit service is available in central Ohio.
- There have been discussions for non-bus systems, but none have moved beyond the planning stage at this time.
- The largest transit system locally is COTA. For this reason most of the following discussion centers on COTA's service.
- For information on transit agencies in central Ohio, excluding COTA, see the MORPC webpage: http://www.morpc.org/transportation/transit/OtherAgencies.asp.
- COTA has a *Long-Range Transit Plan* and *Planning and Development Guidelines* that can be useful reference materials. Both documents can be found online at: http://www.cota.com/assets/Publications/Long-Range_Plan_w_Appendices.pdf and http://www.morpc.org/trans/COTA_1999_Guidelines.pdf.



◄ COTA system-wide map
(Source: COTA map)

Bus Transit—Fixed Route vs. Demand Responsive

Fixed-route bus transit is the mainstay of the central Ohio transit system and most other cities in the United States. Demand-responsive transit is a federally-mandated extension of fixed-route service for individuals with disabilities.

- Fixed-route service provides service on a repetitive, fixed-schedule basis along a specific route. Each fixed-route trip serves the same origins and destinations. This is different from taxicabs and demand-responsive service (APTA Glossary).
- Demand-responsive service is provided to passengers at any location within the system's service area. Typically, this service is limited to persons with disabilities. This service is also known as Dial-A-Ride (APTA Glossary).
- The Americans with Disabilities Act (ADA) of 1990 requires comparable transportation services to be offered for individuals with disabilities who are unable to use fixed-route systems (APTA Glossary).
- In central Ohio demand-responsive service is provided by COTA (Project Mainstream), OSU (Handivan), and other more rural transit agencies (for example, DATA, Licking County Transit Board, Lancaster Public Transit).
- More information on demand-responsive service can be found online. COTA maintains a webpage with information on its Mainstream service: http://www.cota.com/Mainstream.aspx. DATA information can also be found online: http://www.ridedata.com/dr.htm.

◄ COTA Mainstream van, an example of a demand-responsive transit vehicle
(Source: COTA website)

Bus Design Features

The physical aspects of bus design impact their usability and have consequences for other users of the public right-of-way. Additionally, they may have implications for route planning. For example, the width of buses may preclude their usage on some narrow streets.

- Transit facilities need to meet ADA requirements. Consult pedestrian/ADA resources, especially the AASHTO *Guide for the Planning, Design, and Operation of Pedestrian Facilities.*
- Fixed-route COTA buses are 40 feet in length, meeting the standard size designation (COTA Guide, p. III-4). Dimensions listed in this section for facilities are based on a standard 40-foot COTA bus. Different dimensions may be needed if a different sized vehicle is used. Contact COTA to ensure your communities' designs are appropriate.
- COTA buses are 8.5 feet in width and can seat 50 passengers. If standing capacity is considered, an additional 37 passengers can be accommodated. Front step height is 9.5 inches and the ground clearance is 11 inches. The wheelbase is 25 feet. Empty weight is 13.3 tons. If mirrors are included the buses have a width of 10 feet. Height is 10.5 feet (COTA Guide, p. III-4).
- All COTA buses have lifts to accommodate wheelchairs and other mobility devices. For more information see the COTA webpage: http://www.cota.com/Riders-with-Disabilities.aspx.
- Since September 2005 each COTA fixed-route bus has been equipped with a bike rack. This allows customers to take their bikes with them during their transit trips (COTA LRTP 2006, p. 4-47). Each bike rack has space for 2 bicycles. While both road and mountain bikes can be placed on the racks, some atypical bicycles cannot be accommodated. These include tandems, tricycles, very small bikes (children's bikes), and long-tail bikes (Xtracycle). For more information see the COTA webpage: http://www.cota.com/assets/Riding-Cota/COTAbikenbus.pdf.

COTA bus with two bikes ▶ on the front rack in Columbus, OH
(Source: MORPC)

Types of Bus Stops

When planning for a transit stop, three types of locations can be considered: near-side, far-side and mid-block. There are trade-offs with each type of stop location, and the exact location should be based on the adjacent land uses and likely paths of travel to and from the station. The following is a brief list of some of the advantages and disadvantages of each type of location. A number of factors affect the decision of bus stop location, including transfer situations, space availability, and traffic volumes. Consulting with COTA at the early design stages is very strongly recommended (COTA Guide, p. V-2).

Types of Bus Stops, cont'd

- **Near-side stops** refer to stops located immediately before an intersection. They minimize walking distances to connecting transit service. They also do not generate traffic backups into intersections. However, near-side stop locations have the disadvantage of slowing vehicles behind stopped buses at intersections (COTA Guide, p. V-4). Limited visibility of crossing pedestrians is another potential disadvantage associated with near-side stops. Pedestrians who cross in front of a bus are not able to see around the bus, and also are not seen by motorists in the adjacent lane.
- **Far-side stop**s refer to stops located immediately after an intersection. Far-side bus locations are recommended on routes after a bus has made a left turn. They can facilitate bus re-entry into traffic and also allow pedestrians to safely cross behind the bus, where visibility is better. However, far-side stop locations have the disadvantage of creating a backup of vehicles behind a stopped bus into an intersection (COTA Guide, p. V-4).
- **Mid-block stops** refer to stop located between intersections. The mid-block stop location has fewer vision problems for vehicles and pedestrians. If used in conjunction with a bus turnout there are no traffic flow problems caused by stationary buses in the roadway. However, mid-block stop locations have the disadvantage of increasing walking distances to intersections and encouraging pedestrians to cross mid-block without proper crosswalks (COTA Guide, p. V-4).
- COTA also performs on-site evaluations of proposed bus stop sites to identify appropriate locations. Consult with COTA during your initial development planning stages to identify potential bus stop locations (COTA Guide, p. V-4).

◄ COTA mid-block stop with standard sign in Columbus, OH
(Source: MORPC)

Winter Maintenance of Bus Stops

Winter maintenance of bus stops is an important element of a Complete Street.

- During winter, plowing may cause snow to build up on the buffer between the sidewalk and the street, in the space that is normally used for bus passengers to board. This is also known as the "furniture zone."
- This can make boarding the bus difficult or impossible for transit riders, especially those who are disabled.
- Access to the bus (both front boarding door and rear exit door) should be maintained during periods of accumulated snowfall.

Winter Maintenance of Bus Stops, cont'd

◄ Bus stop in winter. Columbus, OH (Source: MORPC)

- Boarding a bus from this sidewalk is difficult for most pedestrians.
- Boarding the bus is likely impossible for transit users in wheelchairs.

Bus stop in winter►
In Columbus, OH (Source: MORPC)

- Access has been properly cleared of snow and ice.
- Boarding the bus is relatively easy for transit users in wheelchairs.

Bus Stop and Bus Shelter Features

Transit facilities need to meet ADA requirements. Consult pedestrian/ADA resources, especially the AASHTO *Guide for the Planning, Design, and Operation of Pedestrian Facilities.* Additionally, COTA recommends that certain elements be included in bus stops/bus stop areas. Below is a brief summary of each. More detailed information can be found in the COTA *Planning and Development Guidelines*: http://www.morpc.org/trans/COTA_1999_Guidelines.pdf. Furthermore, COTA recently built an assessment area that demonstrates the various elements.

◄ COTA's Assessment Center inside the Mobility Services Facility in Columbus, OH
(Source: COTA press release)

- Note the fire hydrant and bus shelter.

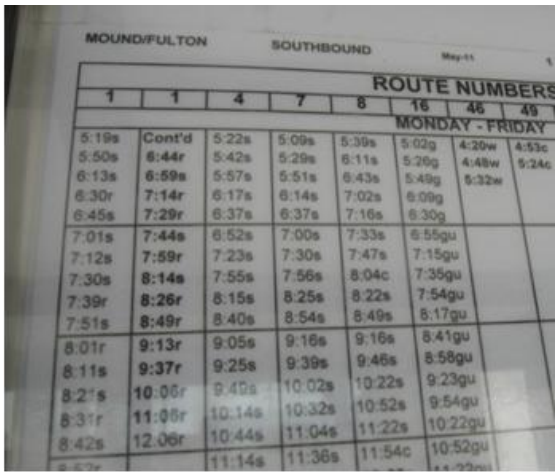
Bus Stop and Bus Shelter Features, cont'd

- A **sidewalk** is a key element for pedestrian access to a bus stop and is especially important for wheelchair users.
- A **paved passenger waiting area** will provide comfort and convenience, as well as access for the mobility-challenged. These areas should have a minimum 4-inch thick concrete pad extending 25 feet back from the corner tangent point (COTA Guide, p. V-7).
- **Access ramps** for people with disabilities and those using strollers, luggage, etc., should be provided at all corner curbs. These ramps should include special contrasting pavement textures to warn of grade changes (COTA Guide, p. V-7). Access ramps are both a requirement for federal ADA regulations, and a recommendation by COTA.
- **Passenger shelters** are recommended at high-volume boarding sites. Standard shelters are 13.5 feet by 6.5 feet and are setback 5 feet from the street (COTA Guide, p. V-7). Each shelter should include a **bench** (COTA Guide, p. V-11). In high use areas, heaters are also recommended.

◄ COTA passenger shelter in Columbus, OH (Source: MORPC)

- Note the paved passenger waiting area around the shelter, and the sidewalk behind it.
- Lighting is also near the passenger shelter.

- As an alternative, **building lobbies** can be designed as interior wait areas. Lobbies should be close to a bus stop and face the service area. Transit users should be able to view approaching buses for a 1,000-foot distance. Seating should also be provided (COTA Guide, p. V-9). An example of this alternative would be the lobby of the Nationwide Insurance building that faces West Spring Street near the intersection of North Wall Street in downtown Columbus.
- **Transit route information** can be displayed to help users navigate the system. This can include simple signs with routes, or it can include full schedule information (COTA Guide, p. V-9).



◄ COTA passenger shelter with transit route information in Columbus, OH (Source: MORPC)

Bus Stop and Bus Shelter Features, cont'd

- **Lighting** should be provided at bus stops and waiting areas. This helps transit drivers to see the bus stop area (COTA Guide, p. V-11) and helps riders to be more aware of their surroundings at stops, thereby increasing security and comfort. Lighting is also important to increase visibility of pedestrians who cross near bus stops at night.
- **Landscaping** can be included to increase passenger comfort. Landscaping can provide shade, a windbreak, and offer an aesthetically appealing environment. However, passenger security and corner sight-distance should be considered. (COTA Guide, p. V-11)
- **Convenience amenities** such as public phones, ATMs, newspaper stands, and trash receptacles can enhance passenger wait areas. However, care must be taken to minimize visual clutter and avoid disturbing the corner sight-line. (COTA Guide, p. V-11)

◄ COTA bus stop that lacks a paved passenger waiting area in Columbus, OH (Source: MORPC)

- There is no sidewalk and no convenience amenities.

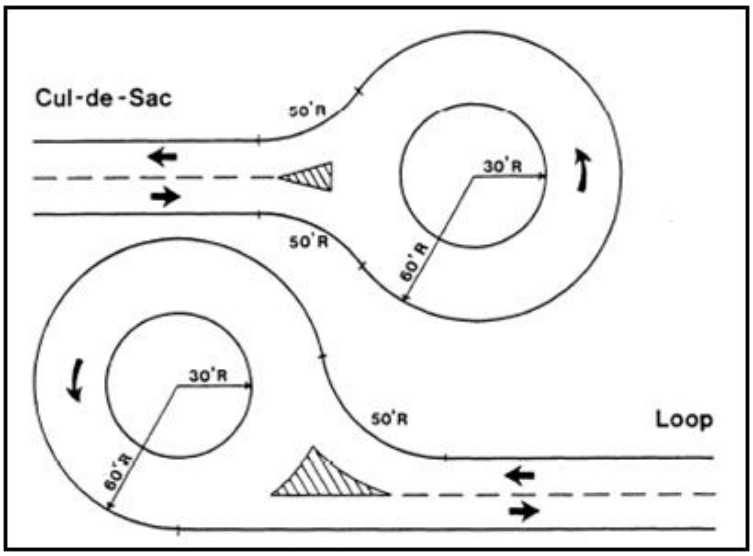
- **Various services** can also be coordinated with transportation facilities. Businesses such as dry cleaning, food service, or child care centers can be offered at park-and-ride lots or other such larger stops. (COTA Guide, p. V-11, V-12)
- **Bicycle storage facilities** are especially useful at park-and-ride lots. Facilities should be located in a well-lit area with high visibility. Security from theft and weather protection should be considered when selecting and locating bike storage facilities. (COTA Guide, p. V-12) For more information on bicycle storage facilities, see the section *Access to Transit Facilities* later in this document.
- The street furniture section of the toolkit has more details on the area between the building and the road. Common street furniture elements include trash receptacles, benches (for non-transit use), and sidewalk lighting. For more information see factsheet 4.10 on Street Furniture.

◄ COTA park-and-ride location with bike lockers in Hilliard, OH.
(Source: MORPC)

Roadway and Facility Design

Transit facilities, such as bus turnouts, berths and turnarounds, can be incorporated into roadway designs to provide safe, off-street service points that do not interfere with traffic movement and to promote a vehicle's safe re-entry into traffic flow (COTA Guide, p. IV-1). When designing road facilities, the following should be considered to be truly accommodating to transit. However, the flexibility of standards to fit with the built environment is encouraged.

- Good **pedestrian facilities**, including sidewalks and ADA-compliant curb ramps, work hand-in-hand with transit facilities. When transit passengers leave transit they are pedestrians, if only for a short walk to their destination or to their private vehicle.
- Roadways with transit service need at least an 11-foot **lane width.** On higher speed roads such as freeways, a 12-foot lane width is more appropriate.
- COTA recommends **grades** of 6% or less for roadways serviced by COTA vehicles. Also, changes in grade should be gradual so that buses can easily negotiate changes with adequate ground clearance for passenger safety and comfort (COTA Guide, p. IV-1 and IV-2).
- General street **pavement design** standards for local/collector roads are appropriate for COTA vehicles/service. COTA recommends that pavement be constructed to handle vehicles with loads of 20,000 lbs. per axle.
- Special care should be given to **pavement near bus stops**, with concrete recommended. This is due to the loads and sheer forces applied to the pavement surfaces during bus starting and stopping movements. The "bus pad" should be designed with a minimum 10" portland cement concrete jointed reinforced pavement on a 4" subbase of stabilized granular material. Developers can contact COTA at 614-308-4373 for assistance (COTA Guide, p. IV-2). Note that if bus pads are not well maintained they can pose a hazard for bicyclists. In particular, a poorly maintained edge or seam can cause a bike tire to become wedged, resulting in a crash.
- To guarantee clearance by COTA vehicles, **curb heights** of 6 inches are recommended. This curb height allows transit users to easily board and alight vehicles (COTA Guide, IV-2).
- **Turning radii** – COTA recommends a minimum of 50 feet outside turning clearance to ensure proper maneuverability of all COTA vehicles. This meets COTA's vehicle turning needs under ideal operating conditions, with speeds of less than 10 miles per hour (COTA Guide, p. III-3).
- **Intersection Radii** - COTA recommends a 60-foot parking setback on the bus's approach to the bus stop and a 40-foot parking setback on the entry road (COTA Guide, p. IV-2).



◄ Portion of a bus turnaround diagram from the COTA Guide. (Source: COTA Guide, p. IV-10)

- A good example of the details that can be found in the guide.

Roadway and Facility Design, cont'd

- **Bus Turnouts** are bus stops that provide an off-street service point and provide a safe waiting area for transit users. The turnouts do not interfere with other traffic movement. The recommended width is 15-20 feet, depending upon the travel speeds of the road. Concrete pavement is necessary due to frequent bus stops and starts. Acceleration and deceleration lanes need to be provided as well. Bus turnouts are needed in areas where passenger volumes are high, and the flow of traffic could be significantly impeded by stopped transit vehicles. COTA recommends following AASHTO guidelines for bus turnout dimensions at highway locations (COTA Guide, p. IV-6).
- Bus berths are areas away from the road where buses can stop for extended periods. Transit users may board at bus berths as well. Bus berths provide off-street service points and bus staging areas that do not interfere with traffic movement. They are designed to accommodate more than one transit vehicle. Due to the various factors involved, developers should contact COTA at 614-308-4373 for assistance during the site plan development stage (COTA Guide, p. IV-6).
- **Bus turnarounds** are facilities typically used at the termini of routes to turn transit vehicles around. Sometimes they are used in a development to allow transit service into the site. To improve the drivers' visual capabilities, bus turnarounds should use a counter-clockwise direction (COTA Guide, p. IV-9).
- It is difficult and costly to **retrofit transit into suburban locations**. These areas were predominantly rural in the past, and initial development was made without transit in mind. A good resource to consult in these cases is the report "Rethinking the Suburban Bus Stop."

Types of Right-of-Way

The operating characteristics of transit are in large part determined by the type of right-of-way it enjoys. In general, exclusive right-of-way is more conducive to higher speeds and fewer stops and delays, while mixed right-of-way tends to be slower with more frequent stops and delays. The appropriate type of right-of-way for a given route is influenced by transit technology, cost, feasibility, and land use characteristics, among other factors.

A. In most cases, buses operate within traffic and are therefore affected by traffic volume and traffic speed. This is mixed-use right-of-way. ***Mixed-use right-of-way*** *refers to an alignment where buses operate in mixed traffic with all types of road users. This includes streets, transit malls, and pedestrian malls where the right-of-way is shared* (MUTCD, section 8A.01 Introduction). This form of right-of-way is the most common for local bus facilities.

B. In some cases, buses operate within bus-only lanes or dedicated bus lanes. ***Semi-exclusive right-of-way****: An alignment that is in a separate right-of-way or along a street or railroad right-of-way where motor vehicles, pedestrians, and bicycles have limited access and cross at designated locations only* (MUTCD, section 8A.01 Introduction). This form of right-of-way is not seen for local bus facilities.

C. In less common instances, buses or light-rail transit utilize ***Exclusive right-of-way****, such as a light-rail transit right-of-way that is grade-separated or protected by a fence or traffic barrier. In these circumstances, motor vehicles, pedestrians, and bicycles are prohibited within the right-of-way. Subways and aerial structures are included within this group (*MUTCD, section 8A.01 Introduction). This form of right-of-way is not seen for local bus facilities.

Types of Right-of-Way, cont'd

- **Bus-only lanes** are for the strict use of buses. They are most appropriate in areas with very frequent service. A few examples can be found in downtown Columbus. However, taxis are also allowed to use these lanes. The Columbus bus-only lanes are also time restricted, as they are utilized as regular lanes outside of peak rush hour times. Note that bus-only lanes do not prevent buses from having to slow down due to other buses or vehicles crossing at intersections. If used in combination with features such as priority signalization for transit, bus-only lanes can be quite effective in increasing bus travel speeds.

◄ Signage noting bus-and-taxi-only lane in downtown Columbus, OH
(Source: MORPC)

- Note the time restrictions.

- **Bus-bike lanes** are a variation on bus-only lanes that allow for the use of bicycles and buses in the same lane. Buses typically travel at slower speeds than motor vehicles in urban areas, due to their need to stop and pick-up or drop-off passengers. These slower speeds may more closely match bicycle speeds than other motorist traffic. Bus-bike lanes usually allow "bicyclists and buses to pass one another in "leapfrog" fashion," which requires careful attention to safety among both user groups (StreetsWiki entry on Bike Bus Lanes). Currently, there are no bus-bike lanes in central Ohio.

Baltimore shared bus-bike lanes ►
(Source: A. Godwin, 2010)

Types of Right-of-Way, cont'd

- In areas where freeways become congested during peak hours, the freeway shoulder can be dedicated as a peak-hour bus lane. COTA has successfully piloted **bus-on-shoulders** on local freeway I-70. Buses are allowed on the shoulders when freeway speeds fall below 35 mph. Buses may only travel 15 mph faster than the average speed for regular lanes, and the maximum allowable speed on the shoulder is 35 mph (COTA LRTP 2006, p. 4-20).

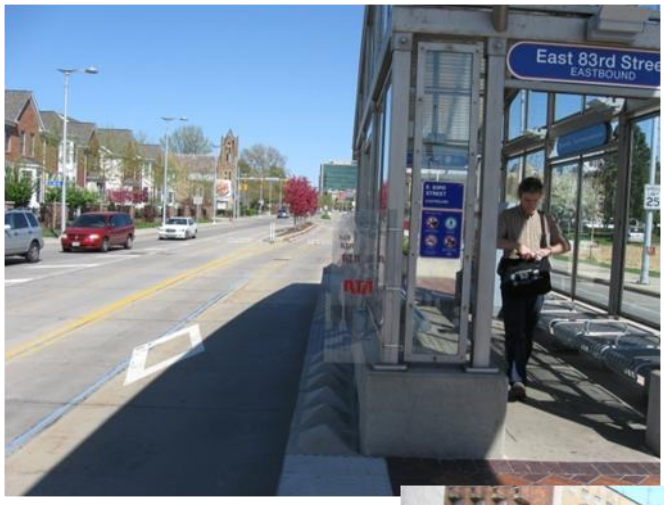
◄ Minnesota bus on the freeway shoulder in Minneapolis, MN (Source: University of Minnesota)

- **Bus Rapid Transit (BRT)** uses a semi-exclusive right-of-way. "BRT… pairs modern buses with … infrastructure to move people faster and in higher volumes than a traditional bus line. BRT can operate in physically separated busways or in designated express lanes with very few stops. Because of lower construction costs, BRT is often seen as a more practical alternative to rail-based systems such as a subway or light rail." **Besides right-of-way privileges**, there are other key features of BRT. These include: bus priority, off-bus fare collection, level boarding, and enclosed stations (Wikipedia entry on Bus Rapid Transit).

▲ Left Photo: Cleveland Health Line BRT bus in Cleveland, OH (Source: MORPC)
Right Photo: TransMilenio BRT bus in Bogota, Colombia (Source: J. Sandoval, 2009)

- Latin American cities of Mexico City, Mexico, Bogota, Colombia, and Curitiba, Brazil have extensive BRT systems. Several cities in the United States have installed limited versions of BRT, including New York, Pittsburgh, and Cleveland. There are not currently any BRT systems in central Ohio.
- More information can be found in the Institute for Transportation and Development Policy's BRT Planning Guide: http://www.itdp.org/documents/Bus%20Rapid%20Transit%20Guide%20-%20complete%20guide.pdf.

Types of Right-of-Way, cont'd



◄ Photo:
Cleveland Health Line route bus station in Cleveland, OH
(Source: MORPC)

- Note the diamond marking on the pavement, which indicates the bus-only lane.

TransMilenio bus station ►
in Bogota, Colombia. Route J, Eje Ambiental.
(Source: J. Sandoval, 2009)

- Note the fencing on both sides

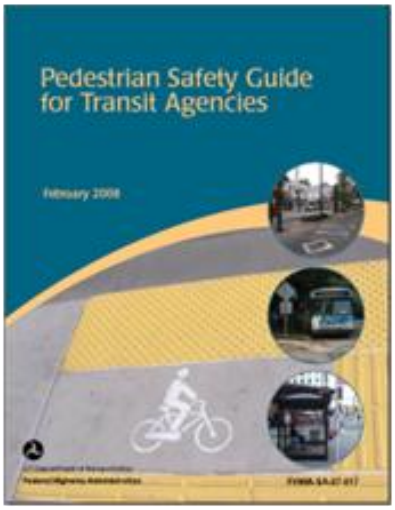
▲ Left Photo:
BRT has its own signal in Cleveland, OH.
(Source: MORPC)

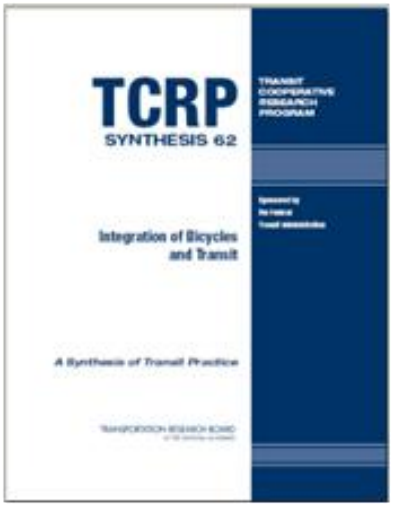
Right Photo: ►
Inside a BRT station in Cleveland, OH.
(Source: MORPC)

Access to Transit Facilities

Providing access to a transit facility is a critical element in ensuring safe and high transit ridership. Access can be provided via walking, biking, or driving to a Park & Ride facility. Walking is the most environmentally friendly and low-cost way to get people to and from public transportation (FHWA Course, Lesson 18, section 18.1).

- Good **pedestrian facilities**, including sidewalks and ADA-compliant curb ramps, work hand-in-hand with transit facilities. When transit passengers leave transit they are pedestrians, if only for a short walk to their destination or to their private vehicle. See the FHWA report: Pedestrian Safety Guide for Transit Agencies.
- **Integrating bicycles into transit services** enhances the travel potential for both modes (FHWA Course, Lesson 18, section 18.3). Some of the benefits include: enabling transit users to travel further distances, enabling transit users to overcome topographical barriers, increased overall transit ridership, increased transit efficiency, enlarging transit's catchment area, significant emission reductions, and reducing the cost of constructing automobile park-n-ride lots (FHWA Course, Lesson 18, section 18.3). The bike racks on COTA's buses also help with this mode choice. A detailed resource for programs that integrate bikes with transit can be found in TCRP's report: Integration of Bicycles and Transit.
- In November 2009 the Federal Transit Administration (FTA) proposed a new policy for bicycle and pedestrian accommodations near transit stops. This policy sets the **catchment area for pedestrians and bicyclists** in relationship to public transportation stops. "Safe walking and bicycling conditions are important inducements to using public transportation. The success of public transportation can be limited by the problem of the "first and last mile"(FTA catchment area policy, p. 2).
- The proposed FTA policy calls for a 0.5-mile catchment area for pedestrians, and a 3-mile catchment area for bicyclists. This catchment area is centered on each transit stop (FTA catchment area policy, p. 4).
- **Bike-n-Bus** programs can help passengers reach suburban destinations where transit coverage is sparse or non-existent (FHWA Course, Lesson 18, section 18.4). There are three ways to accommodate bicycles on buses: rear-mounted racks, front -mounted racks, and allowing bikes inside the bus. When agencies allow bikes inside the bus the priority is always given to wheelchair users over bicycle users (FHWA Course, Lesson 18, section 18.4). COTA and DATA buses use a front-mounted rack.





◄ Far Left Image: Cover of the FHWA report "Pedestrian Safety Guide for Transit Agencies." (Source: FHWA)

◄ Left Image: Cover of the TCRP report "Integration of Bicycles and Transit." (Source: TCRP)

Access to Transit Facilities, cont'd

◄ A bus rider loads their bicycle on the front-mounted COTA rack in Columbus, OH. (Source: MORPC)

- **Park & Ride** locations refer to transit stops where parking is providing for transit users. This allows users to travel to the transit stop using one mode before beginning their transit trip. A transit shelter at the transit stop is preferred.
- For cars, well-marked parking spaces should be provided in the Park & Ride lot. Good lighting and landscaping features are also desirable.
- For bikes there are two options for parking at the Park & Ride lot: **bike lockers and bike racks. Bike lockers** provide security for customers who would like to ride their bike to their bus boarding location, without taking it with them on their transit trip (COTA LRTP 2006, p. 4-47). If bike lockers cannot be installed, consider providing **bicycle racks**. Full guidelines for bike racks can be found in APBP's Bicycle Parking Guidelines: http://www.apbp.org/?page=Publications.

COTA park-and-ride ► location with bike lockers and transit shelter in Columbus, OH (Source: MORPC)

- Note the parked cars and lighting in the background.

◄ Good bike racks are placed outside of the sidewalk pedestrian zone in Greeley, CO. (Source: http://www.pedbikeimages.org/ Dan Burden)

Access to Transit Facilities, cont'd

- Bike stations provide short- and long-term secure bicycle storage and parking. They also provide bicyclists with amenities and services (Innovative Bicycle Treatments, p. 73). The amenities and services may be available for non-bicyclists. Some of the services provided include: bike rentals, repair, retail sale of accessories, changing rooms, food sales, tourist information, transit information, bike information, showers, and lockers for clothing (Innovative Bicycle Treatments, p. 73). Many of these are located at transit hubs.

There are additional considerations to keep in mind when designing access to transit facilities.

- It is important to consider potential ADA (Americans with Disabilities Act) conflicts with transit vehicles, as well as people boarding and exiting transit vehicles.
- While there are currently no streetcar lines in central Ohio, there is a known **issue with streetcar (rail) lines** in non-exclusive rights-of-way. These can be hazardous for bicyclists and wheelchair users if care is not taken in the design. The sign below has been installed in Portland to warn bicyclists of the hazard of streetcar tracks. The bicycle wheel can be stuck in the track, similar to a poorly-designed drainage grate. This happens when the bicyclist is traveling parallel to the streetcar track. See the ALTA planning report for more information: http://www.altaplanning.com/App_Content/files/pres_stud_docs/Bicycle_Streetcar_Memo.pdf. Another solution to this problem is to fill the track with rubber flange fillers.

▲ Sign warning of streetcar track hazard for bicyclists in Portland, OR.
(Source: Flickr user "major_clanger")

COTA-Specific Considerations

- COTA's Guide identifies design options that promote a more pedestrian- and transit-oriented environment. It also discusses management strategies that encourage employees to use public transportation or participate in shared-ride programs (COTA Guide, p. VII-1).
- COTA staff works with others to integrate transit design features in development plans and to identify viable transit service options for suburban firms and agencies (COTA Guide, p. VII-1).
- COTA is prevented from providing service to areas outside of its taxing area. Its taxing area is all of Franklin County and parts of Delaware, Licking and Fairfield counties (COTA LRTP, p. 1-8). This means that communities outside of the service area need to discuss joining COTA's taxing area with COTA. In the short-term they should contact their local transit agency, if available.

COTA-Specific Considerations, cont'd

- Another option is to work with MORPC's RideSolutions program to develop carpool and vanpool options for residents and employees. (See the fact sheet on Transportation Demand Management for more on MORPC's RideSolutions program.)
- COTA offers complimentary in-house development plan and transit service reviews to the development community. This includes both municipalities and developers. Site plans are analyzed and design options are suggested. Contact COTA at 614-308-4373 for more details on this complimentary service. If a plan cannot be submitted for review, COTA suggests that the transit checklist be used. This checklist can be found on page VIII-2 of the *Planning and Development Guidelines*.

Connection to Land Use and Other Topics

- "Population and employment densities are important to transit service… [the] densities determine route layout and service frequency" (COTA Guide, p. VI-1). The higher the densities the higher the ridership levels.
- Both higher-density land use and a mix of land uses will make transit service more efficient. Transit-Oriented Development (TOD) can also help raise transit ridership. The supply of personal car parking should also be considered when designing for transit. See Chapter 9 Land Use, Chapter 10 TOD and Chapter 11 Parking Supply of this Toolkit for more information on those topics.

Key Resources

- The Entire COTA Guide is a useful resource. http://www.morpc.org/trans/COTA_1999_Guidelines.pdf
- Suburban bus guide. http://www.acta-pgh.org/nu_upload/BusStopBook2LOW_copy1.pdf
- Ped Safety Guide for Transit Agencies. http://safety.fhwa.dot.gov/ped_bike/ped_transit/ped_transguide/transit_guide.pdf
- Bike and Bus lanes: http://www.bikexprt.com/bikepol/facil/lanes/bikebus.htm
- Bikes and Streetcars: http://www.altaplanning.com/App_Content/files/pres_stud_docs/Bicycle_Streetcar_Memo.pdf
- http://safety.fhwa.dot.gov/ped_bike/ped_transit/ped_transguide/transit_guide.pdf http://safety.fhwa.dot.gov/ped_bike/docs/case9.pdf
- Innovative Bicycle Treatments (link to pay site only) http://www.ite.org/emodules/scriptcontent/Orders/ProductDetail.cfm?pc=IR-114

Sources and Resources

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Rosales, Jennifer (2009). *Road Diet Handbook: Setting Trends for Livable Streets.* New York, NY: William Barclay Parsons Fellowship Monograph 20, Parsons Brinckerhoff. This is a comprehensive guide for road diet implementation, including guidelines for identifying and evaluating potential road diet sites, design concepts, and case studies. This 180+ page Handbook is not available online but can be viewed in person at the MORPC library. It can also be purchased from the ITE Bookstore: http://www.ite.org/emodules/scriptcontent/Orders/ProductDetail.cfm?pc=LP-670.

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Walk San Diego. "Taming Neighborhood Traffic." San Diego, California. Targeted to residents, the WalkSanDiego "Taming Neighborhood Traffic" guide (30+ pages) can be viewed in person at the MORPC library. It can also be purchased from WalkSanDiego: http://www.walksandiego.org/pdf/orderform_SlowDown.pdf