

# Pedestrian Safety Guide for Transit Agencies

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# Table of Contents

<b>Introduction</b> .....	<b>1</b>
<b>About this Guide</b> .....	<b>2</b>
<b>Chapter 1: Tools for Identifying Pedestrian Safety and Access Issues</b> .....	<b>4</b>
A. Bus Stop Assessment Tools .....	4
1. Bus Stop Checklists .....	4
2. Prompt Lists and Road Safety Audits .....	5
Case Study: Bus Stop Inventory and Improvements .....	7
Case Study: Community Coordination to Plan a Bus Stop Inventory .....	8
3. Pedestrian Catchment Area Facility Inventories .....	8
B. Pedestrian Questionnaires .....	8
C. Observations of Pedestrian Behavior .....	9
D. Pedestrian Crash Data Analysis.....	10
Case Study: Pedestrian Safety Program.....	10
<b>Chapter 2: Approaches to Enhancing Pedestrian Safety and Access</b> .....	<b>11</b>
A. Take Internal Action.....	11
1. Make Organizational Improvements .....	11
2. Update Policies .....	13
3. Modify Services and Facilities.....	14
4. Identify Additional Resources.....	14
B. Develop Partnerships .....	15
1. Local, Regional and State Agencies .....	15
Case Study: Mariner Park-and-Ride Pedestrian Safety Improvements .....	16
Case Study: Interagency Partnerships .....	18
2. Residents and Community Groups.....	18
Case Study: Community Pedestrian Safety Committee.....	19
Case Study: Pilot Bus Stop Audit Program .....	20
Case Study: Regional Pedestrian & Bike Safety Workshop .....	22
3. Land Developers .....	23
Case Study: Agreements for Bus Stop Placement .....	23
<b>Chapter 3: Actions to Increase the Safety of Pedestrians Accessing Transit</b> .....	<b>24</b>
A. Engineering Actions .....	24
1. Sidewalk Design.....	25
2. Roadway Crossings .....	28
3. Pedestrian Crossings of Rail Systems.....	33
4. Bicycle Considerations .....	35
5. Transit Vehicle Design .....	36
6. Transit Stop Location and Design.....	36
Case Study: Community Involvement in Transit Stop Design.....	43
B. Education and Enforcement Actions.....	44
Case Study: StreetSmart Pedestrian Safety Campaign.....	45
<b>Chapter 4: Background Information on Pedestrian Safety and Access to Transit</b> .....	<b>47</b>
A. Typical Walking Distance to Transit.....	47
B. The Effect of Motor Vehicle Speed on Pedestrian Safety.....	48
C. Pedestrian Characteristics and Behavior .....	48
<b>Chapter 5: Legal Issues</b> .....	<b>50</b>
A. Example Laws Pertaining to Pedestrian Access to Transit .....	50
1. Uniform Vehicle Code .....	50
2. Americans with Disabilities Act.....	52
B. Legal Cases.....	53
1. Transit Agency’s Role in the Safety of Pedestrian Access Routes to Transit Stops.....	53
2. Transit Agency Liability for Pedestrian Safety During Transfers .....	54
3. Transit Agency Liability for Pedestrian Safety at Drop-off Locations.....	55
<b>References</b> .....	<b>56</b>





## Introduction

The primary goal of transit providers is to carry passengers between residences, employment and other destinations in a safe, convenient, efficient and reliable manner. The physical safety of passengers is vital to the success of any transit system—not only to retain existing riders but also to encourage new riders. This is true both while passengers are on board a transit vehicle as well as when they are accessing the system. To access a transit stop or station, all passengers travel at least a short distance by foot, wheelchair, bicycle, or other assistive device.

In recent years, courts in several states have ruled that transit agencies are obligated to address the safety of passengers accessing the system, leaving the system, and transferring between vehicles. Transit agencies should consider the effects of the surrounding environment on pedestrians when planning service and stops, and they should implement changes that will increase the safety of passengers accessing the transit system.

Transit agencies play a critical role in making conditions safe for pedestrians traveling to and from transit stops. Transit agencies can help ensure that their vehicles are operated safely near pedestrians and that their stops and stations provide safe pedestrian access. However, agencies are often limited in their ability to take unilateral actions to improve pedestrian safety. Transit agencies frequently lack the authority to address transit access on property not owned by the agency. In order to improve safety for their customers, transit agencies should build partnerships with other organizations and local government agencies, especially those that own and maintain public rights-of-way.

Adequate sidewalks, pathways, and roadway crossings in the area around transit access points and amenities such as benches, shelters, and lighting at stops and stations are important for pedestrian comfort and safety. The most successful transit systems have safe and convenient pedestrian access and provide comfortable waiting areas, all of which encourage greater transit use.



Passengers carry packages on board this bus as a part of a shopping trip. The pedestrian facilities serving the bus stop make it comfortable and safe to walk to the bus.

## About this Guide



This guide is intended to provide transit agency staff with an easy-to-use resource for improving pedestrian safety. It should prove useful for transit staff who set agency policies, monitor transit performance, determine transit stop locations and schedules, train transit operators, and work with communities on development near transit stations. The guide is also a resource for agency staff who work with other transportation agencies to develop safe access and egress for transit passengers.

Secondary audiences for this guide include transit agency partners who are responsible for pedestrian safety issues—local and state transportation agency staff, developers, transit customers, and community groups interested in improving pedestrian safety near transit stops and stations.

### *The guide includes:*

- Common pedestrian safety issues which are likely to be found near transit stations, bus stops, and other places where transit (bus or rail) is operated.
- Descriptions of specific engineering, education and enforcement programs that have been effectively applied by transit agencies to foster greater pedestrian safety.
- Background information about pedestrian safety and access to transit.
- References to publications, guides and other tools that can be used to identify pedestrian safety problems.

The guide emphasizes the importance of solving pedestrian safety issues through partnerships between transit agencies and state and local transportation agencies, municipalities, and consumer interest groups, all of which can affect roadways and the pedestrian infrastructure.

The guide is divided into five chapters focusing on different elements of pedestrian safety that are most relevant to transit agencies.



**Chapter 1: Tools for Identifying Pedestrian Safety and Access Issues**

The first chapter provides tools to identify pedestrian safety and transit access issues. The chapter includes references for additional strategies to identify opportunities for improvement and case study examples of how these tools have been used successfully.

**Chapter 2: Policy and Organizational Approaches to Enhancing Pedestrian Safety and Access**

The second chapter highlights internal organizational changes and describes external partnerships that transit agencies can pursue to improve pedestrian safety. These solutions involve coordination with local and state agencies, transit operators, developers, citizens, and community groups. This chapter integrates case study examples of United States transit agencies that have undertaken successful initiatives to improve pedestrian safety and encourage transit use.

**Chapter 3: Actions to Increase the Safety of Pedestrians Accessing Transit**

The third chapter presents engineering (physical infrastructure), education, and incentive approaches that can be used to improve the safety of pedestrians walking along roadways, crossing roadways, and waiting at bus or rail stops and stations.

**Chapter 4: Background Information on Pedestrian Safety and Access to Transit**

The fourth chapter provides background information on pedestrian safety concepts, such as straightforward descriptions of issues relating to pedestrian access to transit. This chapter also provides a general overview of pedestrian characteristics and behavior.

**Chapter 5: Legal Issues**

The final chapter contains examples of laws and legal cases regarding pedestrian access to transit. It includes a summary of several key cases and rulings as they relate to the responsibility of the transit agency for pedestrian safety. Case law is different in each state, therefore transit agencies should understand the laws and precedents in their respective area.

**References**

Citations from the main body of the guide are provided in this section.

## Chapter 1: Tools for Identifying Pedestrian Safety and Access Issues



.....  
*Bus stop audit  
 checklists  
 can be used  
 to assess  
 pedestrian  
 safety issues,  
 such as difficult  
 roadway  
 crossings or  
 incomplete  
 sidewalks  
 near stops.*  
 .....

This chapter provides tools including bus stop audit checklists, pedestrian catchment area facility inventories, pedestrian questionnaires, pedestrian behavior observation surveys, and pedestrian crash analyses to help agencies identify specific pedestrian safety issues that affect their customers.

While the tools in this chapter are presented for use by transit agencies, they can also be beneficial for other transit agency partners, such as:

- Local, regional and state agencies.
- Citizens and community groups.
- University researchers.
- Non-profit organizations.

### **A. Bus Stop Assessment Tools**

#### 1. Bus Stop Checklists

Bus stop checklists are commonly used to inventory bus stops and roadway characteristics in the area immediately surrounding a stop. They can be used by transit agencies to evaluate their own facilities or by local residents to assess conditions at bus stops. These checklists typically document:

- Sidewalk presence and condition near the bus stop.
- Roadway crossing treatments near the bus stop (crosswalks, pedestrian signals, pedestrian push-buttons, pedestrian signal timing, audible warning signals).
- Path of access between the sidewalk and bus stop boarding area.
- Readability of bus stop signs.
- Obstructions at bus stop.
- Bus stop shelters and seating.

Example bus stop checklists are provided in the *Easter Seals Project ACTION Toolkit for the Assessment of Bus Stop Accessibility and Safety*<sup>1</sup> (excerpt included on the following page), *Queensland Transport’s Pedestrian Safety and Accessibility Audit Tools*,<sup>2</sup> and *Pedestrian and Transit Friendly Design: A Primer for Smart Growth*.<sup>3</sup>

<b>QUICK BUS STOP CHECKLIST</b>			
Route Name:	Location:	Weather Conditions:	Stop No.:
<b>PART B: Landing Area Assessment</b>			
<b>B1</b>	Is there a landing area at least 5 feet wide and 8 feet deep adjacent to the curb/street?		Yes No <input type="checkbox"/> <input type="checkbox"/>
<b>B2</b>	Where is the landing area positioned in relation to the curb/street?		
	Below street level (low ground or shoulder) <input type="checkbox"/>	Shoulder <input type="checkbox"/>	Other (specify): <input type="checkbox"/>
	Adjacent <input type="checkbox"/>	Adjacent <input type="checkbox"/>	
	Sidewalk <input type="checkbox"/>	Bus Bulb <input type="checkbox"/>	Off-Road/No sidewalk <input type="checkbox"/>
<b>B3</b>	What is the material of the landing area?		
	Asphalt <input type="checkbox"/>	Dirt <input type="checkbox"/>	Gravel <input type="checkbox"/>
	Concrete <input type="checkbox"/>	Grass <input type="checkbox"/>	Pavers <input type="checkbox"/>
	Other (specify):		<input type="checkbox"/>
<b>B4</b>	Are there problems with the landing area surface?		Yes No <input type="checkbox"/> <input type="checkbox"/>
	<i>If YES, rank resulting accessibility potential:</i>		
		Not Accessible	Minimally Accessible
		Accessible	
	Uneven	<input type="checkbox"/>	<input type="checkbox"/>
	Slopes up from the street	<input type="checkbox"/>	<input type="checkbox"/>
	Slopes down from the street	<input type="checkbox"/>	<input type="checkbox"/>
	Requires stepping over drain inlet	<input type="checkbox"/>	<input type="checkbox"/>
	Other (Specify)	<input type="checkbox"/>	<input type="checkbox"/>
<b>B5</b>	Are there any obstacles that would limit the mobility of a wheelchair (trash receptacle, newspaper boxes, landscaping, other)?		Yes No <input type="checkbox"/> <input type="checkbox"/>
	<i>If YES, describe obstruction:</i>		

A portion of the bus-stop checklist developed by *Easter Seals Project ACTION*.

## 2. Prompt Lists and Road Safety Audits

Prompt lists are listings of potential issues that should be considered when conducting a road safety audit (RSA). An RSA is a formal safety examination of an existing or future roadway that is conducted by an independent, multi-disciplinary team. “Independent” means that the RSA team should not include the roadway designer or current owner. The RSA team typically does not have authority to change a design that is being audited, however they can identify safety considerations and suggest measures (for the design team’s or responsible agency’s consideration) that can reasonably be implemented within the project schedule and available budget. There are several stages of a project where an RSA can be conducted, including: pre-construction (planning, preliminary design, final design); construction (work zone traffic control plan, pre-opening); and post-construction (including existing roads open to traffic).

The following table is an example prompt list for transit from the Federal Highway Administration's (FHWA) *Road Safety Audit Guidelines and Prompt Lists* (FHWA-SA-07-007). This particular FHWA publication also contains detailed descriptions of the prompts to clarify potential issues for pedestrians at transit stops.

Master Prompt	Detailed Prompt		RSA Stages			
			planning	design	construction	post-construction
<b>D.1 Presence, Design, and Placement</b>	<b>D.1.1</b>	Are bus stops sited properly?	✓	✓	✓	✓
	<b>D.1.2</b>	Are safe pedestrian crossings convenient for transit and school bus users?	✓	✓	✓	✓
	<b>D.1.3</b>	Is sight distance to bus stops adequate?	✓	✓	✓	✓
	<b>D.1.4</b>	Are shelters appropriately designed and placed for pedestrian safety and convenience?		✓	✓	✓
<b>D.2 Quality, Condition, and Obstructions</b>	<b>D.2.1</b>	Is the seating area at a safe and comfortable distance from vehicle and bicycle lanes?		✓	✓	✓
	<b>D.2.2</b>	Do seats (or persons sitting on them) obstruct the sidewalk or reduce its usable width?		✓	✓	✓
	<b>D.2.3</b>	Is a sufficient landing area provided to accommodate waiting passengers, boarding/alighting passengers, and through/bypassing pedestrian traffic at peak times?		✓	✓	✓
	<b>D.2.4</b>	Is the landing area paved and free of problems such as uneven surfaces, standing water, or steep slopes?		✓	✓	✓
	<b>D.2.5</b>	Is the sidewalk free of temporary/permanent obstructions that constrict its width or block access to the bus stop?	✓	✓	✓	✓
<b>D.3 Continuity and Connectivity</b>	<b>D.3.1</b>	Is the nearest crossing opportunity free of potential hazards for pedestrians?	✓	✓	✓	✓
	<b>D.3.2</b>	Are transit stops part of a continuous network of pedestrian facilities?	✓	✓	✓	✓
	<b>D.3.3</b>	Are transit stops maintained during periods of inclement weather?		✓	✓	✓
<b>D.4 Lighting</b>	<b>D.4.1</b>	Are access ways to transit facilities well-lit to accommodate early-morning, late-afternoon, and evening	✓	✓	✓	✓
<b>D.5 Visibility</b>	<b>D.5.1</b>	Are open sight lines maintained between approaching buses and passenger waiting and loading areas?		✓	✓	✓
<b>D.7 Traffic Characteristics</b>	<b>D.7.1</b>	Do pedestrians entering and leaving buses conflict with cars, bicycles, or other pedestrians?		✓	✓	✓
<b>D.8 Signs and Pavement Markings</b>	<b>D.8.1</b>	Are appropriate signs and pavement markings provided for school bus and transit stops?		✓	✓	✓

Excerpt from FHWA Road Safety Audit Guidelines and Prompt Lists (Publication FHWA-SA-07-007).

### **Case Study: Bus Stop Inventory and Improvements<sup>4</sup> Montgomery County, Maryland**

In 2002, the Montgomery County Council established a Bus Stop Task Force and granted \$11 million to improve bus stops over a six year period. The Bus Stop Improvement Program has three phases:

1. Collect GPS locations for all Montgomery County bus stops.
2. Complete a needs assessment and an improvement plan.
3. Develop a manageable database with up to date information.

The first phase, collecting GPS locations for the transit stops, is complete. The needs assessment and improvement plan phase began in December 2004. A database was developed to manage assets, track improvements, and identify needs. Over one hundred pieces of data were gathered for each bus stop, including the quality of the landing pad, obstructions, speed and traffic characteristics of the road, bus site data, and pedestrian access and connection information. The database of bus stop characteristics/needs is tied to a photo inventory, which provides detailed images of each stop from several perspectives.



Originally, this bus stop was a pole in dirt and grass (left photo). To improve pedestrian access, Montgomery County added a sidewalk, a level landing pad, and an 18" high knee wall (right photo). The knee wall can act like a bench and the rough stone surface deters graffiti. Photos provided by Montgomery County, MD.



Before pedestrian access improvements were made, this bus stop was not accessible for people with disabilities (left photo). Montgomery County constructed a level landing pad, an accessible connection to the pedestrian system and informal seating (right photo). Photos provided by Montgomery County, MD.

Montgomery County plans to improve over 2,000 of the 5,400 stops in the County. By the fall of 2007, 300 stops had been assessed in detail and 88 had been improved, with 39 percent of the improved stops receiving some type of physical engineering improvement. County traffic engineers are working with local transit providers to develop innovative approaches to improve rider safety at each bus stop. Improvements include providing amenities such as bus shelters, benches, advertising, trash cans, bus maps, and other amenities. The cost of the improvements is shared between the County and the State.

Contact: Jeff Dunckel, Manager - Passenger Facilities Unit at (240) 777-5826,  
Jeff.Dunckel@montgomerycountymd.gov.

### **Case Study: Community Coordination to Plan a Bus Stop Inventory<sup>5</sup> Flint, Michigan**

A team from Genesee County, Michigan, consisting of representatives from the Mass Transportation Authority, the Genesee County Metropolitan Planning Commission, the Leaders for Action Transportation Coalition, and The Disability Network won an opportunity to attend the Easter Seals Project ACTION's (ESPA) annual Mobility Planning Services Institute (MPS) in the spring of 2006. The different representatives brought a wide range of perspectives and experiences to the team that allowed them to work towards their common goal of improving transit service in and around the City of Flint.

The three-day MPS Institute enabled the group to develop a plan for improving accessible transit service in Genesee County that included increased fixed-route service, improved aesthetics at bus stops and compliance with all ADA requirements. In the months immediately following MPS Institute, team members continue to work together with local government and planning officials to implement their ideas. The first project is to inventory bus stop aesthetics, accessibility, and ADA compliance at over 100 stops using the Easter Seals Project ACTION Bus Stop Checklist. The database of information gathered during this process will be used to identify deficiencies and support applications for project funding. The team will continue using public meetings and email correspondence to foster community support for initiatives that improve accessibility for the working population, the elderly and passengers with disabilities in Genesee County.

Contact: Mae Golden, Housing/Transportation Advocate, The Disability Network,  
(810) 742-1800 X321, maeg@disnetwork.org.

### **3. Pedestrian Catchment Area Facility Inventories**

Transit agencies can partner with local and state transportation agencies to inventory sidewalk and roadway crossing facilities in the entire catchment area surrounding a transit stop, not just in the immediate vicinity of the stop location. These inventories often take advantage of existing GIS and aerial photography data to reduce field labor time. For example, the Maryland Department of Transportation conducted a statewide inventory of sidewalks within ½-mile of all rail stations as a part of a program to comply with the 9990177

Total Access 2000 statute passed in 1995. As a result, many key gaps in the sidewalk network were identified and filled.

#### ***B. Pedestrian Questionnaires***

Those who regularly walk to and from bus stops or transit stations are often familiar with pedestrian safety issues along their routes and will typically share this information. To take advantage of this first-hand knowledge, transit agencies can distribute questionnaires to transit riders to gather feedback about pedestrian safety and access conditions at and around transit stops and stations. A variety of questionnaire formats can be used, including providing printed forms on buses; conducting in-person interviews at transit stops; and posting online

surveys. Pedestrian questionnaires can also gather useful information about rider characteristics, such as transit use frequency, and walking distances to transit stops. Other information that can be collected by questionnaire includes:

- Trip purpose.
- Basic demographics.
- Perception of safety at roadway crossings.
- Convenience of crosswalks.
- Perception of sidewalk facilities (width and condition).
- Perception of walking environment (comfort and convenience).
- Origin and destination of trip.
- Comfort and convenience of transit locations.

As part of a pilot program in 2003 to learn more about pedestrian attitudes towards the walking environment, Queensland Transport in Australia developed and administered a pedestrian questionnaire and created a standard pedestrian behavior observation form. *Pedestrian Safety and Accessibility Audit Tools*. Queensland Transport, Queensland, Australia. 2006.

### C. Observations of Pedestrian Behavior

Transit agencies can gather useful information about pedestrian access to transit by observing pedestrian behavior near stops and stations. Observers can note activity, such as:

- Pedestrians using informal pathways where sidewalks do not exist.
- Pedestrians competing for seating or shelter space at a bus stop.
- Pedestrians crossing roadways at midblock locations.
- Pedestrians running across roadways to catch the bus.
- Motorist behaviors near the stop or station (e.g., speeding or not yielding to pedestrians in crosswalks).

Transit agencies can use the results of these observations to improve transit stop locations, bus stop design, or service schedules. They can also provide information to schools and other organizations to develop targeted education messages, confer with local police on ideas for targeted enforcement of driver and pedestrian behaviors, and coordinate with local transportation engineers on improvements to crosswalks, sidewalks, warning signs, and pedestrian signals.

Observations of pedestrian behavior can also be used to highlight the importance of pedestrian-friendly improvements. Agencies can use these observations to help convey the experience of accessing the local transit system to transit agency staff, governmental agency staff, developers and politicians.

Washington State Department of Transportation has conducted several corridor and intersection evaluations using a standard pedestrian risk evaluation form developed as part of a key transit corridor study.<sup>6</sup>

### D. Pedestrian Crash Data Analysis

Transit agencies can work with local and state transportation and police departments to analyze pedestrian crash data near transit access points to help prioritize improvement areas. Caution should be exercised when using pedestrian crash data as it may not always accurately reflect safety conditions. Police-reported crash data do not typically capture all pedestrian crashes that occur. In



Pedestrians are crossing outside of a crosswalk to reach a bus stop. Observation studies can identify potential safety problems such as this that may not be apparent through an analysis of reported crashes.

addition, there may be few pedestrian crashes because pedestrians tend to avoid walking where they perceive conditions to be dangerous. It may also be difficult to identify patterns of pedestrian crashes for specific sub-groups, such as elderly pedestrians, children, and people who have visual, auditory, or cognitive disabilities, since the overall number of pedestrian trips made by these groups may be small. To see clear trends, three to ten years of crash data may be needed. It is important to note that changes in land use and bus stop locations can affect geographic distribution of pedestrian crashes.

Once the transit agency has reviewed crash and other relevant data, staff should identify priority sites for safety improvements. Sites selected for improvements should

be evaluated comprehensively so that an appropriate combination of pedestrian safety treatments can be applied.

.....  
*Observations of pedestrian and motorist behaviors near transit stops can help identify safety problems.*  
 .....

#### **Case Study: Pedestrian Safety Program<sup>7</sup> Washington State Department of Transportation**

Washington State Department of Transportation (WSDOT) in collaboration with University of Washington's Transportation Research Center (TRAC) developed a method for evaluating both pedestrian and bicycle crash locations on all state highways using Geographic Information Systems. Police records processed by WSDOT provided data on all pedestrians involved in collisions over a six year period (1999 to 2005). The evaluation accounts for a range of contributing factors including:

- Roadway characteristics.
- Traffic conditions at and near the collision site.
- Time of day.
- Driver and pedestrian behavior.
- Land use surrounding the collision site, including transit stop locations.
- Other contributing circumstances.

This evaluation method is now used by WSDOT to develop and prioritize projects and programs focused on reducing the over 400 fatal and serious injury pedestrian- and bicycle-related crashes that occur in the state each year.

Contact: Paula Reeves at (360) 705-7258, Community Design Assistance Branch Manager, ReevesP@wsdot.wa.gov.





## Chapter 2: Approaches to Enhancing Pedestrian Safety and Access

Transit agencies play an important role in improving the safety of pedestrians. Providing safe and comfortable routes to and from transit improves the passenger experience and helps transit agencies maximize ridership and customer satisfaction. This chapter presents policy and organizational approaches that transit agencies can use to help improve safety and access to transit for pedestrians.

The chapter is divided into two sections. The first section, “*Take Internal Action*,” describes actions that transit agencies can typically implement independently to improve pedestrian safety and access. The second section, “*Develop Partnerships*,” describes actions that typically require transit agencies to work in partnership with other organizations to improve pedestrian conditions for their customers. Case study examples are provided throughout the chapter to illustrate how agencies across the United States have successfully undertaken similar initiatives.

### **A. Take Internal Action**

Most transit agencies have the authority to independently implement a number of pedestrian safety initiatives. These actions include making organizational improvements and modifying services and facilities. Even with limited resources, transit agencies can take a number of actions to improve pedestrian safety and access. Other actions may require a commitment of resources that pose a challenge to some transit agencies.

#### 1. Make Organizational Improvements

Transit agencies can make organizational changes that can have long-term positive effects on pedestrian safety and convenience. These actions include reviewing and updating internal policies and procedures, such as:

- Establishing a pedestrian and/or bus stop coordinator position within the agency to work with local and state transportation departments, and

*All transit customers are pedestrians for some part of their journey to the bus or train. Therefore, there should be safe pedestrian conditions in the areas surrounding transit access points.*

citizens, and to review transit agency policies and operations. This coordinator should be in regular contact with transit agency staff working on route planning, scheduling, transit stop facilities, and coordination with other organizations. For example, the *LYNX Customer Amenities Manual* (Orlando, Florida) includes an internal phone list with contact names for specific pedestrian related issues.<sup>8</sup>

- Ensuring that the pedestrian/bus stop coordinator or other staff person is aware of construction activities planned at or around bus stops and other transit facilities and works with roadway agencies and their contractors to assure that adequate pedestrian access routes are provided during construction periods.
- Ensuring that all levels of agency management consider pedestrian safety issues in their day-to-day responsibilities.
- Providing periodic training on pedestrian safety to agency staff, consultants, and operators to improve the quality of transit service and the safety record of bus and train operators (see example). Staff and operators should follow a consistent set of safety guidelines and be clear about individual roles and responsibilities related to pedestrian issues. Potential topics for transit operator pedestrian safety training are listed on the next page. Examples of operator training programs include the Project for Public Spaces training modules for New Jersey Transit staff<sup>9</sup> and a Washington Area Metropolitan Transit Authority (WMATA)<sup>10</sup> bus driver training program that focuses on pedestrian safety, including safety statistics, crash causes, and applicable laws and tips for sharing the road with bicyclists and pedestrians.<sup>11</sup>



Example presentation slides from WMATA's Street Smart pedestrian awareness training for Metrobus Operators. The courses are taught by the District of Columbia Department of Transportation (DDOT). Source: DDOT and WMATA.

### *Pedestrian Safety Training for Transit Operators*

The safety of passengers is a top priority for transit operators. Maintaining the safety of all pedestrians along transit routes is also important. Transit agencies should ensure that transit operators have received adequate safety training that acknowledges a variety of challenges, including:

- Operating in complex urban and suburban environments.
- Maintaining the safety of passengers inside the transit vehicle and the safety of people and vehicles in surrounding areas.
- Collecting patron fares.
- Responding to patron inquiries.
- Monitoring and addressing security concerns.
- Monitoring maintenance issues.
- Dealing with disruptive passengers.
- Adhering to schedules.

The length, frequency, and content of operator training programs should be sufficient to provide in-depth information about pedestrian issues. Training program guidelines and resources are provided by:

- The Federal Transit Administration (<http://www.fta.dot.gov>).
- The American Public Transportation Association (<http://www.apta.com>).
- The Community Transportation Association of America (<http://www.ctaa.org>).

## 2. Update Policies

Transit agencies can also improve pedestrian safety by updating internal policies. Policy actions that can be taken include:

- Compile and maintain a detailed inventory of bus stops and their features so that pedestrian safety and access improvement needs can be identified and prioritized.
- Incorporate pedestrian features into standard plans and standard designs for transit stops, stations and other transit facilities. Ensure that these features are included in cost estimates and programming details from project conception through construction and maintenance.
- Conduct pedestrian safety audits at transit stops and surrounding areas on a regular basis (examples are provided in Chapter 1).
- Develop or update transit-oriented development guidelines to ensure adequate pedestrian facility design, including sidewalks, pedestrian



Enhancements to this bus stop include a shelter, bench, level landing pad, and an improved roadway crossing to increase pedestrian safety near the stop.

crossing facilities, and warning and wayfinding signs. Frequently, transit agencies will need to partner with local governments who are responsible for administering land development guidelines and regulations.

### 3. Modify Services and Facilities

Transit agencies typically have the authority to modify their services and facilities. These types of changes have the potential to improve pedestrian safety and access.

Service improvements may include:

- Changing bus routes and stop locations to reduce walking distances or facilitate transfers.
- Improving coordination between bus and rail schedules to allow for easier transfers and shorter waiting time.

Facility modifications may include:

- Moving bus stops to shorten walking distances, reduce street crossings or improve safety at street crossings for pedestrians accessing transit at each stop.
- Improving signage, seating, shelter, or lighting at bus stops.
- Increasing maintenance (frequency and thoroughness).

### 4. Identify Additional Resources

Limited resources are a common challenge for many transit agencies; transit providers frequently struggle to provide service and maintain their vehicles. Some of the internal actions suggested above require significant resources, so they can be difficult to enact. While there is no dedicated funding source for pedestrian safety improvements near transit stops at the federal level, there are many funding sources that can be leveraged by an agency in order to achieve these goals.

Some potential resources include:

- Consider allocating some capital improvement resources as matching funds to improve pedestrian safety and access in partnership with cities, counties, tribal governments, state departments of transportation (DOTs), regional agencies or other organizations.
- Implement a Tax Increment Financing (TIF) program to generate funding for physical improvements. For example, the MPO in Detroit, Michigan uses a TIF program for improvements to street lighting, sidewalks and curbs.<sup>12</sup>
- Surface Transportation Program (STP) funds, which are often administered through the state DOT, can be used to improve and construct pedestrian walkways and bicycle facilities.<sup>13</sup> Ten percent of each state's STP allocation is set aside for "transportation enhancements", which include pedestrian and bicycle facilities.<sup>14</sup>

- Bus and Bus Facility Grants (Section 5309) provided by the Federal Transit Administration (FTA) provide capital funding for transit-related improvements, including passenger shelters.<sup>15</sup>
- The Congestion Mitigation and Air Quality (CMAQ) Improvement Program, jointly administered by the Federal Highway Administration (FHWA) and the FTA, provides financial and technical resources for transit agencies and metropolitan planning organizations (MPOs) seeking to improve air emissions from transportation-related sources. Often these resources are applied to programs or projects that may also have a safety benefit. For example, the Transit Authority of River City (TARC) in Louisville, Kentucky is using CMAQ funds to acquire new buses that will provide safer rider access and egress and increased system reliability.<sup>16</sup>

## B. Develop Partnerships

While transit agencies can make improvements for pedestrian access at the transit stop or station, they often need to work in partnership with other organizations to make pedestrian improvements in surrounding areas. Transit agencies can seek partnerships with the following groups:

- Local, regional and state agencies.
- Citizens and community groups.
- Developers.
- Other transit agencies.

### 1. Local, Regional and State Agencies

It is important for transit agencies to coordinate with planning, highway, public safety, and public works departments on pedestrian issues. This coordination is important regardless of the transit agency's organizational structure (e.g., separate authority or commission; department within a city, county, regional, or state government; subdivision of a larger department; or separate public or private corporation). Issues related to pedestrian safety near transit, such as sidewalk and pathway design, street crossings, and pedestrian separation from vehicular traffic—are typically the responsibility of other local and state agencies.

Transit operations occur on roads that are maintained and operated by various entities, and often cross through multiple jurisdictions. Typical roadway owners/operators may be state or county agencies, cities, towns or even private organizations (such as toll road operators, retail shopping centers, or homeowners associations). Transit service may have a significant impact on the number of pedestrians walking along the roadway as well as the vehicle capacity of the roadway. Conversely, pedestrian volumes and roadway operations can directly influence the ability of the transit agency to maintain reliable schedules. Working with roadway owners to determine route locations, stop locations and passenger access facilities can yield the solution most appropriate for accommodating all modes of travel.

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*Working with roadway owners to determine route locations, stop locations and passenger access facilities can yield the solution most appropriate for accommodating all modes of travel.*

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### **Case Study: Mariner Park-and-Ride Pedestrian Safety Improvements Community Transit, Snohomish County, Washington**



Existing conditions at Mariner Park and Ride. Project scheduled for completion in 2009.

It is often assumed that pedestrian safety is not an important consideration at Park-and-Ride facilities because transit users are typically arriving by car. However, proper facility design and management is important to ensuring the safety of pedestrians walking to the Park-and-Ride.

Several serious pedestrian and bicycle collisions occurred in the area of the Mariner Park-and-Ride facility in 2006 and 2007. There were no pedestrian shelters, a limited loading area, and difficult roadway crossings. To improve pedestrian safety and mobility in and around the Park-and-Ride facility, a partnership between Community Transit, Snohomish County, Washington, and Washington State DOT (WSDOT) was formed. The project received \$700,000 in funding through WSDOT's Pedestrian and Bicycle Safety Grant Program.<sup>17</sup>

The project is scheduled for completion in 2009. It includes adding pedestrian signals, constructing curbs and ADA accessible ramps, realigning skewed Park-and-Ride entrances to provide more direct pedestrian crossings and slow turning vehicles, and adding new pedestrian lighting and signage. The project also has an education and encouragement component that will expand Community Transit's ongoing efforts to promote pedestrian and bicycle safety. This includes a targeted pedestrian and bicycle safety media campaign using rider alerts, website information, newspaper outreach and other information outlets. Finally, the enforcement component of this project will provide funding to local law enforcement agencies to increase pedestrian and bicycle safety patrols at the Park-and-Ride facility and surrounding areas.

Contact: Paula Reeves, Community Design Assistance Branch Manager, (360) 705-7258, [ReevesP@wsdot.wa.gov](mailto:ReevesP@wsdot.wa.gov).

It is important to coordinate activities between the transit agency and the agency responsible for the roadway. Through regular dialogue, the local public works department or department of transportation may be able to incorporate specific improvements into their projects that could benefit pedestrian safety for transit customers including:

- Construction or enhancement of sidewalks near transit.
- Relocation and design of bus stops that promotes safer pedestrian access and egress.

- Appropriate roadway design speeds in areas where pedestrians access transit.
- Intersection signalization that facilitates safer pedestrian crossings.
- Regular maintenance of pedestrian facilities.
- Incorporation of transit access improvements into land development or redevelopment projects.

Coordination between transit agencies and local agencies can also ensure that adequate provisions are made for safe pedestrian access to transit during periods of roadway construction.

Actions that transit agencies can take to foster partnerships with local, regional and state transportation agencies to improve pedestrian safety and access include:

- Develop quick reference contact list of key departments, agencies and staff with responsibilities related to pedestrian safety. In particular, transit agencies should communicate regularly with local, regional and state pedestrian and bicycle coordinators.
- Develop intergovernmental agreements and memoranda of understanding on pedestrian facilities in areas surrounding transit access points.
- Arrange regular meetings to discuss pedestrian safety and access issues.
- Develop bus stop placement agreements for private roads.
- Engage in project review and scoping processes with local and state planning departments. Make every effort to be included from the earliest stages of the planning process.
- Host workshops to discuss pedestrian safety issues with local jurisdictions and organizations.
- Establish joint pedestrian and bicycle task forces and committees with local jurisdictions and organizations.

**Example: Virginia Department of Transportation**

The Virginia Department of Transportation (VDOT) has a pedestrian coordinator who reviews all development projects to ensure the accessibility of pedestrian and bicycle facilities. VDOT conducts periodic workshop programs on pedestrian safe design for local government officials, contractors and consultants. By coordinating with VDOT staff, a local transit agency can establish an advocate in the development process who will encourage designers to account for pedestrian safety near transit.<sup>18</sup>

### **Case Study: Interagency Partnerships Tri-Met, Portland, Oregon<sup>19</sup>**

Tri-Met, the transit agency serving the Portland metropolitan area, has developed a coordinated plan for bus stop management that recommends developing intergovernmental agreements and memoranda of understanding with city, state and county departments and agencies. Tri-Met and the City of Portland now have such an agreement in place that aids in the siting and permitting of bus shelters and other transit facilities. Tri-Met also works with local jurisdictions to review major development plans and request improvements at or near bus stops. Furthermore, if the agency determines that sufficient ridership potential exists at a new site, they can request that the developer provide and maintain bus stop facilities.

The transit agency also developed an agreement with the City's Project Planning Department and the Bureau of Maintenance. Success lies in clearly defining the role and responsibility of each person and agency. Tri-Met's detailed recommendations regarding interdepartmental coordination can be found in the agency's *Bus Stop Guidelines 2002*. The document outlines responsibilities related to bus stops for each department and position, such as:

- Project Planning Department's Capital Projects Management Section (responsible for design and placement of bus stop amenities):
  - o Programs Manager.
  - o Project Planner.
  - o Maintenance Supervisor.
  - o Adopt-a-Stop Program Coordinator.
  - o Planner/Analyst.
  - o Community Relations Specialist.
- Additional departments for Bus Stop Section to coordinate with:
  - o Service Planning Department and Scheduling Department.
  - o Field Operations Supervisors.
  - o Maintenance Technicians.
  - o Information Development Department.
  - o Marketing Department.
  - o Committee on Accessible Transportation.
  - o Public Art Program.
  - o Safety, Training and Real Property.

Contact: Young Park, (503) 962-2138, parky@trimet.org.

## 2. Residents and Community Groups

Transit agencies can take advantage of relationships with citizens and community groups to improve pedestrian safety for their customers. Several strategies for enhancing these relationships are described in this section:



- Work with residents to identify pedestrian access issues that need improvement.
- Educate residents about pedestrian and transit safety issues.
- Work with community members to develop solutions to improve pedestrian safety.

### Work with Residents to Identify Pedestrian Issues

Positive relationships with community members enhance the public image of a transit agency. This can also help increase transit ridership and lead to increased funding.

Transit agencies can take advantage of partnerships with community groups to gather important information about pedestrian access issues and needs. Agencies can assess existing conditions for pedestrian safety near transit stops and stations by doing the following:

- Encourage the creation of community task forces for new construction and redevelopment projects.
- Encourage community participation in project advisory committees.
- Encourage resident participation in community safety teams.
- Enlist community help with transit accessibility audits.
- Develop “Adopt-A-Stop” programs with riders and businesses.
- Encourage residents to report safety issues.
- Develop quick reference phone lists for residents to contact the appropriate person in your transit agency.
- Develop easy-to-use websites with information directed at community groups.

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*Positive relationships with community members enhance the public image of a transit agency.*

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#### **Case Study: Community Pedestrian Safety Committee Brookline, Massachusetts<sup>20</sup>**

In October 1987, an elderly pedestrian was killed by an automobile while she was trying to access the Beacon Streetcar line in Brookline, Massachusetts. Immediately following the incident, community advocates worked with town officials to install a pedestrian signal at the site of the crash. However, many of the 12 other heavily-used surface stops in the corridor still had no pedestrian signals. By 1994, another seven people had been killed trying to access these surface stops. When activists again demanded action, they learned that Beacon Street was being re-designed by the state highway department. The highway department agreed to fund 90% of the replacement cost for the street’s old traffic lights contingent upon the town addressing the high pedestrian and automobile accident rate. The town created a 20 person committee comprised of residents, members of the Planning Board, Conservation Commission, Chamber of Commerce and the Transportation Board, a pedestrian safety advocate, and a planner from the Massachusetts Bay Transit Authority (MBTA). The committee met bi-weekly to make recommendations on design aspects of the project. Key design features for safe access to the streetcar included:

- Street narrowing to two lanes in each direction plus parking lanes.
- Pedestrian signals.
- Increased tree plantings and landscaping.
- Increased separation between passenger boarding areas and moving traffic.
- Curb extensions at many street corners.
- Tighter curb radii.
- Bulb-outs at stations to provide safe waiting areas for streetcar passengers.

By the end of the design process, the committee was able to get almost all recommendations implemented, balancing the needs of pedestrians, transit users, and vehicles.

Many of the improvements recommended by the committee were installed at stations in 2007. The pedestrian signals (many equipped with a countdown) and signal preemption system have improved pedestrian safety and transit operations. However, obstructed sightlines and inconsistent signalization can still make crossing the street to access the streetcar line challenging.

Contact: Dorte Haas, WalkBoston, (617) 232-0104, dhaas@walkboston.org.

### ***Case Study: Pilot Bus Stop Audit Program<sup>21</sup> Boston, Massachusetts***

*WalkBoston*, a non-profit organization dedicated to improving walking conditions in cities and towns across Massachusetts, launched a demonstration program, the Neighborhood Bus Stop Program, in Roxbury/Dorchester, Massachusetts in 1998. The program was designed to improve access to transit, walking conditions, lighting, street crossings, signage, bus stop amenities and landscaping with the ultimate goal of increasing bus ridership.

The Neighborhood Bus Stop Program included a comprehensive audit of bus stops in Roxbury/Dorchester and recommendations for improvements that would enhance pedestrian safety and increase ridership. *WalkBoston* presented results of the audit and potential improvement strategies to the transit agency to demonstrate program feasibility and cost effectiveness. Key lessons learned from this effort include:

- Start with a demonstration project, not the whole system.
- Reach out to citizens and major employers whose customers and employees use transit for advocacy, funding and auditing support.
- Encourage advertising on transit shelters to generate revenue.
- Meet with the neighborhood groups and recruit assistance.
- Be positive and continue coordination between governments, transit agencies and neighborhoods.

Based in part on the efforts of *WalkBoston*, the project has grown into a system-

wide program throughout the metropolitan Boston area. Over the past several years attractive glass shelters have been installed throughout the region, especially at stops in low-income and minority areas. Using an innovative public/private partnership, these bus stops are installed and maintained by a private firm that finances the effort through advertising sales.

Contact: DorteHa Haas, WalkBoston, (617) 232-0104, dhaas@walkboston.org

### **Educate Community Members about Transit and Pedestrian Safety**

There are a number of programs that transit agencies can initiate or participate in to provide pedestrian safety education to community members. These include:

- School safety programs for students walking to and riding public transit buses (classroom training can include videos, site specific photos, hand-outs etc.).
- Local police enforcement of pedestrian-related traffic laws.
- Local police enforcement at highway/rail crossing gates.
- Pedestrian safety training theaters with videos for schools, businesses, churches, community events, etc.
- Distribution of safety materials to group events.

Successful educational outreach programs increase pedestrian safety for existing riders, and can also serve as orientation programs for new riders.

### **Work with Community Members to Solve Pedestrian Issues**

Leveraging community resources has proven to be an inexpensive and effective method for improving conditions for pedestrians accessing transit. Transit agencies can involve community members and groups in developing policies for improving the design and siting of transit stops. These activities allow residents to have input into how transit is integrated into the community as a whole.

Volunteer bus stop maintenance programs are another way to involve the community in improving transit. These programs can be established between transit agencies and businesses, commercial centers, volunteer agencies, youth programs and even citizens in exchange for various incentives. Programs can increase community involvement in transit and encourage citizens to take ownership of their local bus stops. In addition, they can reduce agency maintenance costs and improve safety by alerting transit agencies of special maintenance needs, vandalism or suspicious activities. Many transit agencies have developed these types of programs including:

- Tri-Met's Adopt-A-Stop<sup>22</sup> and Keep-A-Can<sup>23</sup> programs in Portland, Oregon: 800 adopted stops and 80% reduction in litter in exchange for 10 free bus rides each month.
- MTA's Adopt-A-Shelter Program in Flint, Michigan.<sup>24</sup>
- King County Metro's Adopt-A-Stop Program in Seattle, Washington.<sup>25</sup>

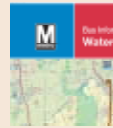
Transit agencies can also involve community residents and organizations in

pedestrian safety by inviting them to participate in safety workshops. These meetings allow citizens to highlight problem locations for pedestrians, brainstorm ideas for improving rider safety, and have open discussions with agency staff about pedestrian safety policies.

### **Case Study: Regional Pedestrian & Bike Safety Workshop<sup>26</sup> Washington Metropolitan Area Transit Authority, Washington DC**

In 2006 and 2007, the Washington Metropolitan Area Transit Authority (WMATA) hosted a series of regional workshops focusing on pedestrian and bicycle safety issues related to transit access.

Amenity	Customer Boarding Activity per Day				
	< 50	50-100	100-300	300-500	Over 500
Concrete pad					
Safe access					
Adequate lighting					
Accurate bus stop signs					
Standard shelter					
Trash receptacle					
Detailed schedule					
Larger/Multiple shelter(s)					
Benches in shelter					
System map					
Real time travel info					
Potential conversion to transit center					



WMATA staff presented an example of bus stop facility standards based on boardings per day. Source: DDOT and WMATA.

WMATA staff discussed new bus route maps provided at rail stations to encourage riders to use local buses.

The workshops brought together a wide range of stakeholders to discuss important pedestrian and bicycle safety concerns. Participants in the workshops included WMATA and other transit agency staff, pedestrian and bicycle advocates, engineers and public works staff from several Washington area jurisdictions, as well as members of and advocates representing the interests of people with disabilities in the community. Elected officials and decision-makers at the highest level of WMATA took part in the events. Committees were established to develop recommendations and priorities for improving pedestrian and bicycle access to transit. The overarching goals of the plan included safety, sustainability, and partnerships.

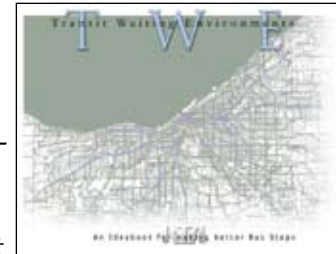
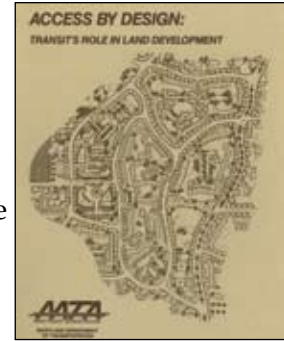
These workshops represented one of the first times that officials for WMATA, the Metro Washington Council of Governments (MWCOG), and from almost all of the local jurisdictions in the DC region worked collaboratively to address issues of transit accessibility and safety. In the spring of 2008, WMATA and MWCOG will undertake a joint project to identify and address obstacles to transit access for disabled users of the regional transit system. Additionally, WMATA and local governments are providing safety training for transit operators in a series of workshops held throughout the region.

Contact: Kristen Haldeman, WMATA Office of Business Planning & Project Development, (202) 962-1848.

### 3. Land Developers

Transit agencies should provide developers with development guidelines and standards prior to any project's design phase to ensure that the development is transit-oriented. A good working relationship between the transit agency and the planning and zoning department and/or planning and design standards committee is critical as well. Transit agencies can provide developers with the following tools:

- The transit agency's guidelines and standards. Several agencies provide guidelines for developers. For example, the Tri-County Metropolitan Transportation District of Oregon in Portland produced the *Planning and Design for Transit Handbook*.<sup>27</sup>
- Transit oriented development (TOD) guidelines. For example, the *Suburban Mobility Authority for Regional Transportation (SMART) Guide for Creating a Friendly Transit Environment*<sup>28</sup> provides TOD guidance for businesses, government agencies, citizens, and design professionals in suburban Detroit; the San Diego Metropolitan Transit Development Board's *Designing for Transit*<sup>29</sup> guide suggests 10 ways to design more transit-oriented communities; and the Greater Cleveland Regional Transit Authority (GCRTA) provides guidance for local municipalities to create mixed-use developments and moderate to high densities near transit stops in the Cleveland region.<sup>30</sup>
- Transit accessibility checklists. *SMART's Guide for Creating a Friendly Transit Environment* and the Maryland Transit Administration's *Access by Design*<sup>31</sup> guides include accessibility checklists for developers.
- Technical assistance estimating impact fee or developer fee reductions due to the inclusion of transit- and pedestrian-oriented design features.



#### **Case Study: Agreements for Bus Stop Placement<sup>32</sup> Pierce Transit, Takoma, Washington**

The jurisdictions in the Takoma, Washington region have given Pierce Transit the opportunity to review most major new development and redevelopment projects within its service area.<sup>33</sup> Each jurisdiction served by the transit agency has established guidelines whereby the developer may be required to provide transit enhancements when specific criteria are met. Additionally, the agency can recommend infrastructure changes such as sidewalks, through-streets, or other enhancements for improving pedestrian safety and access to transit when a site is developed.

Pierce Transit has also developed a standard agreement that gives the agency the ability to locate bus stops on private roads.<sup>34</sup> Pierce Transit signs this agreement with the owners of private property on which they would like to locate a stop. These agreements allow the agency to locate the bus stop in the most accessible location for pedestrians.

Contact: Linda Shaffer, Planner Construction Projects, (253) 983-2714, lshaffer@piercetransit.org.

## Chapter 3: Actions to Increase the Safety of Pedestrians Accessing Transit



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*Good pedestrian design should account for the needs of all potential users, including those with physical or mental limitations.*  
 .....

There are a variety of actions that can be implemented by transit agencies and their partner organizations to improve safety for pedestrians traveling to transit. These actions include engineering (physical infrastructure), education, and enforcement efforts. The most successful strategies often involve a combination of these treatments.

### A. Engineering Actions

The design of paths, sidewalks, and transit stops contribute to a passenger's experience and perception of safety on the transit system. Well-connected sidewalks should be installed in all areas with regular transit service so that transit patrons will not be forced to walk in the street while traveling to or from a stop or station. In addition, roadway crossings should be made safer with an appropriate combination of facilities, such as marked crosswalks, median crossing islands, warning signs, and pedestrian signals.



A wide sidewalk in the photo above has been provided to allow pedestrians to access this bus stop.

Good pedestrian design should account for the needs of all potential users, including those with physical or mental limitations. When applied appropriately, this design concept known as “universal design” ensures the built environment is usable and can be shared by all people, thus eliminating the need for specialized design. The *Americans with Disabilities Act Accessibility Guidelines (ADAAG)*<sup>35</sup> describes the minimum designs for providing accessibility for all pedestrians. However, the ADAAG is just the starting point for ensuring that universal design is applied. The following resources describe some best practices for accommodating all pedestrians:

- FHWA *Designing Sidewalks and Trails for Access, Part I, A Review of Existing Guidelines*, <http://www.fhwa.dot.gov/environment/sidewalks/>.
- FHWA *Designing Sidewalks and Trails for Access Part II, Best Practices Guide*, <http://www.fhwa.dot.gov/environment/sidewalk2/>.
- AASHTO *Guide for the Planning, Design, and Operation of Pedestrian Facilities*, [https://bookstore.transportation.org/item\\_details.aspx?id=119](https://bookstore.transportation.org/item_details.aspx?id=119).

## 1. Sidewalk Design

Creating safer places for pedestrians to travel along roadways can encourage more people to use transit systems. It is critical to ensure that sidewalks and other pedestrian pathways have appropriate width, surface, separation from motor vehicle traffic, lighting, and signage along roadways.

### Width

Sidewalks should be wide enough to accommodate the expected levels of pedestrian traffic. Narrow sidewalks that cannot accommodate the volume of foot traffic may encourage pedestrians to walk in the roadway or take alternate routes, increasing the potential for conflict with motor vehicles. It is desirable to provide a sidewalk clear width (i.e., lateral space available for pedestrian travel for the length of a corridor) at least wide enough to accommodate two people walking side-by-side.<sup>36</sup> ADA guidelines specify a minimum clear width of 5 feet to accommodate users in wheelchairs.<sup>37</sup> In areas with high pedestrian volumes (often areas near transit stops and stations) sidewalks may need to be wider to accommodate pedestrians. Street furniture (e.g. pay phones, trash cans, newspaper racks, etc.), utilities, and street trees present obstacles to pedestrians, and reduce the sidewalk clear width. Obstacles should be placed outside of the normal pedestrian travel path ideally in the buffer zone (i.e., between the street and the sidewalk) to ensure direct pedestrian paths are provided.



This shelter is not connected to a sidewalk system, so pedestrians must either travel in the road or grass to get to the bus stop. This is especially problematic for wheelchair users.

### TCRP Report 125, *Guidebook for Mitigating Fixed-Route Bus and Pedestrian Collisions*.

This guidebook was developed to provide guidance to transit agencies on preventing collisions between buses and pedestrians and reducing the severity of collisions that do occur. Factors contributing to crashes are explained to improve understanding of how and why crashes occur. Strategies discussed for mitigating the collisions include traffic engineering improvements, driver training, and public education and outreach.



This sidewalk is not wide enough for all three children to walk side-by-side.

### Surface

The full clear width of a sidewalk should be paved with a smooth, stable and slip-resistant material to accommodate wheelchairs, bicycles, and strollers. The sidewalk should be clear of obstructions, including overhanging branches, utility poles, and signs.



Sidewalks should be smooth, stable, slip-resistant and free from obstructions to allow all pedestrians (including people with disabilities) to access transit safely. Notice the obstacle presented by the overhanging branches.



Sidewalks with surface defects, such as gaps, cracks, joints, or heaved pavement can be a hazard to pedestrians accessing transit, especially those with disabilities.

### Buffer

For the safety and comfort of pedestrians, it is often desirable to provide a buffer area between the sidewalk and roadway (i.e., sidewalks should not be located against the curb, directly adjacent to the lanes of moving traffic). Some form of buffer should be included to protect pedestrians from noise, wind, and vehicle splash caused by passing vehicles and errant vehicles. Landscaping, such as a simple grass strip, shrubs, and/or trees can be used. A tree-lined buffer has the added benefit of improving roadway aesthetics, providing shade, and improving pedestrians' perceptions of safety with respect to motor vehicle traffic.<sup>38, 39</sup> On-street parking can also serve as a buffer between moving vehicles and pedestrians while simultaneously slowing vehicular traffic.



Buffer space between the sidewalk and moving vehicles makes pedestrians feel safer. Trees and other objects in the buffer further enhance pedestrian comfort.



The pedestrian on this sidewalk is in a potentially dangerous situation, walking very close to vehicles in the outside travel lane.

### Additional Considerations

There are several other amenities which should be considered when designing sidewalks including:



- Driveway crossing design is important for providing safe, accessible sidewalks. Grade changes between the sidewalk and the driveway should be minimized. Corner radii should be made as small as possible to encourage drivers to turn slowly and yield to pedestrians. More details can be found in the ADAAG.
- Ample, consistent, and uninterrupted lighting is helpful in ensuring the safety and security of all pedestrians, including customers accessing transit. The FHWA guide, *A Resident's Guide for Creating Safe and Walkable Communities* (FHWA-SA-07-016), includes more information about lighting requirements for pedestrian facilities. ([http://safety.fhwa.dot.gov/ped\\_bike/ped/ped\\_walkguide](http://safety.fhwa.dot.gov/ped_bike/ped/ped_walkguide)).
- Directional signage should be installed around heavily-used transit stops to direct passengers to local points of interest. Signage should be scaled for pedestrians and should be designed to be understood by all pedestrians, including those with visual impairments and limited English proficiency.
- Visual obstructions, such as large shrubs or utility boxes that impair the ability of drivers to see pedestrians should be avoided.

#### **Example Pedestrian Facility Design Resources**

*ADA Accessibility Guidelines for Buildings and Facilities*. United States Access Board, 2002. <http://www.access-board.gov/adaag/html/adaag.htm>.

*AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities*. American Association of State Highway and Transportation Officials, 2004.

*Pedestrian and Transit-Friendly Design: A Primer for Smart Growth*. R. Ewing for Smart Growth Network in Florida, 1999. [http://www.epa.gov/smartgrowth/pdf/ptfd\\_primer.pdf](http://www.epa.gov/smartgrowth/pdf/ptfd_primer.pdf).

*Designing Sidewalks and Trails for Access, Part I of II: Review of Existing Guidelines and Practices*. US Department of Transportation, Federal Highway Administration, 1999. <http://www.fhwa.dot.gov/environment/bikeped/Access-1.htm>.

*Accessible Rights-of-Way: A Design Guide*. United States Access Board, 1999. <http://www.access-board.gov/provac/guide/PROWGuide.htm>.

*PEDSAFE: Pedestrian Safety Guide and Countermeasure Selection System*. U.S. Department of Transportation, Federal Highway Administration, Authors: D.L. Harkey and C.V. Zegeer, September 2004. <http://www.walkinginfo.org/pedsafe/>.

*Pedestrian Facilities Planning and Design Handbook*. Florida Department of Transportation, 1999. [http://www.dot.state.fl.us/safety/ped\\_bike/ped\\_bike\\_standards.htm#Florida%20Ped%20Handbook](http://www.dot.state.fl.us/safety/ped_bike/ped_bike_standards.htm#Florida%20Ped%20Handbook).

*Alternative Treatments for At-Grade Pedestrian Crossings*. Nazir, Lalani for Institute of Transportation Engineers, September 2001.

## 2. Roadway Crossings

It is often necessary for pedestrians to cross roadways when traveling to and from transit stops and these crossings should be made as safe as possible. Marked crosswalks are commonly used to identify preferred locations for pedestrian crossings. However, in many cases, particularly on multi-lane roads with high speeds and traffic volumes, marked crosswalks alone are not sufficient to assure pedestrian safety. FHWA guidelines state, "In most cases, marked crosswalks are best used in combination with other treatments (e.g., curb extensions, raised crossing islands, traffic signals, roadway narrowing, enhanced overhead lighting, traffic calming measures etc.)."<sup>40</sup> Therefore, combinations of the following types of safety treatments are described below and are recommended to improve crossings near transit:



This midblock crossing in Silver Spring, Maryland uses multiple engineering strategies, including pedestrian-activated signals and a median refuge area, to improve safety for pedestrians crossing the street at this busy, urban location.

- Marked crosswalks.
- Median islands.
- Curb extensions.
- Reduced curb radii.
- Narrowed and reduced number of motor vehicle travel lanes.
- Pedestrian warning signs.
- Pedestrian signals.

Detailed engineering analysis will help to determine the appropriate combination of treatments for a pedestrian crossing.<sup>41</sup> These infrastructure improvements, when implemented with education and enforcement programs, can make crossings safer and more convenient for transit customers and can help reduce pedestrian crashes.

One critical aspect of pedestrian crossing safety is the sight distance between pedestrians and drivers approaching a crossing. Adequate sight distance should be provided for drivers to see pedestrians entering a crosswalk and stop their vehicles. Sight distance can be limited by hills, curves, buildings, parked cars, landscaping, trees, and other objects. At roadside transit stops, poorly-placed shelters or non-transparent shelters can limit the ability of drivers to see pedestrians at or near the stop. In addition, transit vehicles servicing passengers at stops can block the sight lines between pedestrians crossing the roadway and other approaching drivers. Crossings placed near bus stops in low-density and rural areas may be of particular concern because minimum geometric standards may not be consistently met or maintained and pedestrians arrive less frequently, meaning motorists may be less likely to expect them. Many of the roadway crossing treatments presented in this section can help address these sight distance issues.



Pedestrians crossing the street to reach the bus stop circled in the photograph above will be hidden by the crest of the vertical curve.

## Marked Crosswalks

Legally, crosswalks exist where two streets intersect whether or not they are denoted with markings.<sup>42</sup> Crosswalk markings can be used to indicate preferred crossing areas for pedestrians and to help make drivers more aware of pedestrians crossing the roadway.

Marked crosswalks are most commonly denoted by standard crosswalks (two parallel lines) or high-visibility crosswalks (thick white bars parallel to the direction of travel, both “continental” and “ladder” style crosswalks). Other crosswalk treatments include different striping patterns, stamped asphalt or pavers, or raised pavement surfaces (raised crosswalks). It is critical that drivers approaching a crosswalk can easily see the crosswalk treatment. High-visibility crosswalks (see photos below) are the most visible to drivers.



High-visibility crosswalks have thick markings that are easy for approaching drivers to see. Pictured is a ladder type crosswalk marking.



High-visibility crosswalks can be supplemented by “in-roadway pedestrian crossing signs” that remind drivers of state laws requiring them to yield or stop for pedestrians in the crosswalk. Pictured is a ladder type crosswalk marking, with an in-roadway pedestrian crossing sign.

Accessible curb ramps should be provided at both ends of marked crosswalks wherever the roadway crossing is at a different level than the adjacent sidewalk. All curb ramps should meet the requirements of the ADAAG.



This roadway was modified from a four-lane, undivided roadway to two through lanes with a center turn lane and bicycle lanes. This change provided space to construct median islands and increase the safety of midblock crossings.



The median island near this transit stop includes an angled cut-through for pedestrians. This feature encourages pedestrians to face to the right and look for oncoming traffic before crossing.



These pictures show a location where a median crossing island was installed to improve the safety of pedestrians accessing a well-used bus stop on a busy, high-speed roadway. The photo on the left was taken before and the photo on the right was taken after the improvement was made.

### Median Islands

Median islands (or pedestrian crossing islands) allow pedestrians to cross one direction of motor vehicle traffic at a time. Studies show that islands can reduce up to 40 percent of pedestrian crashes on certain types of roadways.<sup>43</sup> On particularly long crossings, the islands can provide pedestrians with a place of refuge to pause and rest. This is especially important for slow-moving pedestrians who require longer gaps to cross at unsignalized crossings or who may not be able to fully cross the street in the time provided at a signalized intersection. A minimum median width of six feet should be provided in order for the median to be used as a pedestrian refuge.

### Curb Extensions

Curb extensions (or curb bulb-outs) can be used on roadways with on-street parking to shorten pedestrian crossing distances and increase the visibility of pedestrians at roadway crossings. By narrowing the curb-to-curb width of a roadway, curb extensions may also help reduce motor vehicle speeds and improve pedestrian safety. Curb extensions at bus stop locations can help preserve on-street parking because fewer parking spaces need to be removed in order for buses to pull to the curb. They may also improve transit operations by enabling a bus to pull to the curb more easily and board and alight passengers more quickly. Locating bus stops on curb extensions may have the additional benefit of providing increased clear-width on sidewalks by locating the shelter out of the pedestrian travel way.



Curb extensions shorten pedestrian crossing distances by reducing the curb-to-curb distance across the roadway. They also add sidewalk space for transit stops, waiting areas, bicycle racks, or street furniture.

### Reducing Curb Radii

Wide curb radii allow motorists to make high-speed turning movements. Reducing the curb radii at the corners of an intersection can help reduce the speed of turning vehicles, improve sight distance between pedestrians and motorists,

and shorten the crossing distance for pedestrians. It is important to evaluate surrounding land uses and the traffic composition on the roadway (types of vehicles) when considering this treatment. If a curb radius is too small, trucks and buses may have to drive on the curb to turn, which can endanger pedestrians. An engineering study should be conducted to determine the impacts of this treatment on all types of vehicles, including transit, motor vehicles, bicycles, and pedestrians.

### Narrowing and Removing Motor Vehicle Travel Lanes

Pedestrian safety and access near transit stations can be improved by narrowing or removing existing roadway travel lanes. Narrowing travel lanes can provide more space for sidewalks, shoulders, buffers, and bicycle lanes and may reduce motor vehicle speeds on some roadways. Removing travel lanes can be accomplished by eliminating through-travel lanes or replacing a center-turn lane with raised median islands or a median strip. Both treatments can reduce pedestrian crossing distances and exposure of pedestrians to vehicular traffic.

Removing travel lanes often requires tradeoffs between travel modes within a roadway corridor. For example, reducing a road from four lanes to two lanes will impact the vehicle carrying capacity of the roadway. Engineering analyses should be conducted to evaluate the impact of removing travel lanes on all modes, including transit, automobiles, bicycles, and pedestrians and on parallel streets.

### Pedestrian Warning Signs

High-visibility pedestrian warning signs can increase driver awareness of pedestrians, especially in areas where pedestrians may not be expected. A fluorescent yellow-green color (W11-2 Pedestrian Crossing Sign) is approved in the national *Manual on Uniform Traffic Control Devices* (MUTCD) and should be used for pedestrian warning signs (MUTCD Section 2C.41). According to the MUTCD, these signs “should only be used at locations where the crossing activity is unexpected or at locations where street crossings are not readily apparent.” These signs are typically most effective when combined with other treatments. Signs should be used judiciously—too many signs can cause visual clutter and lead to non-compliance.



Fluorescent yellow-green pedestrian warning signs can increase driver awareness of pedestrians crossing the road near transit stops.



This pedestrian warning sign has been placed at a crosswalk that many pedestrians use to access a bus stop.

“In-roadway pedestrian crossing signs” are bright yellow signs placed in the middle of the road at marked crosswalks. These signs are included in Section 2B.12 of the MUTCD. The signs are designed to remind drivers of their responsibility to yield to pedestrians in the crosswalk by stating, “STATE LAW—YIELD TO/STOP FOR PEDESTRIANS IN CROSSWALK.” They should not be used at signalized intersections (MUTCD Section 2B.12).



“In-roadway pedestrian crossing signs” can increase the percentage of drivers who yield to pedestrians in crosswalks.

### Pedestrian Signals

Pedestrian signals should be provided at signalized intersections near transit stops. These signals alert pedestrians to the appropriate time to cross during the traffic signal cycle. It is important to time the traffic signal so that pedestrians of all abilities have enough time to complete crossing the street before opposing traffic is allowed to proceed. Where possible, a median refuge area at least six feet wide should be provided for pedestrians who fail to complete the crossing during the pedestrian phase.

Pedestrian countdown signal heads are beneficial at intersections with high pedestrian crossing volumes and/or long crossing distances. Countdown signal heads indicate the number of seconds remaining for pedestrians to complete crossing the street before opposing traffic is allowed to proceed.



Since most intersections near transit stops and stations are used frequently by pedestrians, traffic signals should always provide adequate crossing time for pedestrians. Pedestrian countdown signals (left photo) show the amount of time pedestrians have to complete crossing the roadway. Pedestrian push-buttons (right photo) should be installed at locations with pedestrian-activated signals.

Signal phasing should balance the available crossing time with the wait time between pedestrian crossing phases. Long wait times may increase the prevalence of pedestrians crossing against the traffic signal. Pedestrian signals can also be combined with traffic signals that restrict vehicles from making turning movements that could impair pedestrian safety. Standards and guidance for pedestrian signal timing are included in the MUTCD (Section 4E.10).

At busy midblock pedestrian crossings, pedestrian-activated traffic signals should be considered for regulating vehicular traffic. Extensive guidance and standards for pedestrian signal warrants are provided in the MUTCD (Section 4C).

Accessible pedestrian signals (APS) provide audible and tactile indications of the walk interval from a pushbutton. These may be used at signalized intersections to help people with visual disabilities to cross safely. Standards and guidance on APS are included in the MUTCD (sections 4E.06 and 4E.09) and the Draft Public Rights-of-Way Accessibility Guidelines (Sections R208 and R306).

### Grade Separated Crossings

Pedestrian overpasses (bridges) and underpasses (tunnels) allow pedestrians and bicyclists to cross streets while avoiding potential conflicts with vehicles. Because they are expensive to construct, grade separated crossings should be reserved for locations where there is high demand for crossings by pedestrians, bicycles and individuals with physical disabilities and the hazards of crossing the roadway are high. Ideally, overpasses and underpasses should take advantage of the topography of a site—grade separations are less expensive to construct and more likely to be used if they can help pedestrians avoid going up and down slopes, ramps, and steps.

Grade separated crossings should be located conveniently so that pedestrians are not forced to go out of their way to use them. When a long detour is necessary, pedestrians and bicyclists will often choose to cross at-grade regardless of the safety conditions on the street. The overpass or underpass should provide adequate width (for users to pass each other comfortably), lighting, and surveillance to increase pedestrians' perceptions of security and comfort.



This grade-separated crossing over a freeway allows pedestrians to cross from their neighborhood to a nearby transit station.



Multiple safety treatments are used at this pedestrian at-grade railroad crossing, including fencing, and warning signs.

### 3. Pedestrian Crossings of Rail Systems

In some areas, pedestrians may need to cross railroad or light rail tracks to access a transit station or stop. The design of these crossings is critical, as pedestrian/train collisions typically result in severe or fatal injuries. While most current standards and requirements for railroad at-grade warning systems are tailored to motor vehicle traffic, the Federal Highway Administration's *Railroad-Highway Grade Crossing Handbook*<sup>44</sup> provides guidance about pedestrian crossings. Additional guidance is provided by the MUTCD (see Part 8 and Part 10),<sup>45</sup> American Railway Engineering and Maintenance of Way Association (AREMA) *Signal Manual* (see Volume 1, Section 3),<sup>46</sup> and Code of Federal Regulations 49 (see Part 234).<sup>47</sup> Different standards apply to at-grade crossings of light rail tracks which often have no gates or warning devices.

Railroads shall provide a minimum of 20 seconds of warning time, with the active devices (bells, flashing lights, barricades, etc.) fully deployed five seconds before the arrival of a transit vehicle.<sup>45</sup> This gives a pedestrian a minimum of 15 seconds to complete crossing the tracks. Longer crossings may necessitate

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 More information about specific treatments for at-grade rail crossing can be found in the *Federal Railroad Administration's Compilation of Pedestrian Safety Devices In Use at Grade Crossings*.  
<http://www.fra.dot.gov/us/content/1953>  
 .....

additional warning time built into the train detection system. In addition to time, the type of surface material used at the rail crossing must be designed in accordance with the ADAAG.

At-grade crossings with multiple tracks can present additional dangers to pedestrians who may assume that a warning has been deployed for a train that is currently stopped on one of the tracks when in reality, a second train is also coming on another track. Separate warnings may be necessary for these locations to help alert pedestrians of the full extent of the danger of the at-grade rail crossing.



These pedestrian crossings illustrate many of the safety treatments that can be used at at-grade railroad crossings including: gates, warning stripes on the walkway, pedestrian walk signal similar to those used on roadways (left photo), flashing lights, warning signs and fencing (right photo). The pedestrian walkways are clearly marked and provide stable surfaces.

Safety treatments that can be used at rail locations include:

- *Traditional gate/flasher/bell assemblies*—These devices are useful for warning pedestrians of oncoming vehicles, but all of these devices should be considered “supplemental” and are typically deployed as part of an engineering decision or a diagnostic team review. While these traditional devices have been reliable and effective in the past, newer devices are entering the marketplace such as digital voice announcements and strobe lights.
- *Active or Passive Warnings*—Active warnings, such as bells or whistles mounted near the crossing or on the train, are recommended at pedestrian at-grade crossings. Passive warnings, such as signs, can also be used.
- *Fencing*—Fences can be used to discourage pedestrians from crossing rail tracks in undesigned locations.
- *Grade-separated crossings*—Railroad tracks with high-speed and high-frequency train service may require pedestrian tunnels or overpasses to ensure the safety of crossing pedestrians.
- *Surveillance, education, and enforcement*—Enforcement can help reduce the number of pedestrians trespassing (e.g., walking along railroad tracks).

When considering what, if any, pedestrian warning is to be deployed, a thorough review of the environment around the crossing is recommended. This includes



evaluating the frequency of rail service and number of tracks that are present. It is also important that the assessment include land uses and frequently-used pedestrian pathways in the vicinity of the railroad track. Railroads near schools, playgrounds, hospitals, retail centers, and other major pedestrian generators may have a much greater need for safety treatments than a railroad track in a rural setting.



A shared use path runs parallel to the Los Angeles MTA Orange Line exclusive busway (left photo). While this is not a rail corridor, buses pass this location every two to three minutes during peak travel periods. A signalized crossing has been provided across the busway to allow pedestrians, bicyclists, and other users to access the path safely. The crossing includes signals and warning signs for buses, a high visibility crosswalk, pedestrian signals, and a fence to direct pedestrians to the preferred crossing location (right photo).

#### 4. Bicycle Considerations

Roadways and pathways should be designed to facilitate safe interactions between bicycles and cars, trucks, transit vehicles, and pedestrians. In all areas with expected bicycle traffic, bicycle-specific facilities (e.g., on-street bicycle lanes, climbing lanes, or shared lane pavement markings) should be installed. Any off-street facilities provided for both pedestrians and bicyclists should provide a safe area for bicyclists but not impede or endanger pedestrians. *The AASHTO Guide for the Development of Bicycle Facilities*<sup>48</sup> should be followed during planning, design, and construction projects to ensure that appropriate bicycle facilities are provided.



Well-designed bicycle lanes can increase the safety and comfort of bicyclists. These designated lanes can also help increase the predictability of bicycle movements on roadways with transit service.



Shared-use pathways provide space for non-motorized users that is separated from the roadway system. Safety is critical when pathways have high volumes of mixed pedestrian and bicycle traffic. This often occurs when pathways are near transit stations. Widening trails and/or designating separate areas for pedestrians and bicyclists can help increase user safety.

## 5. Transit Vehicle Design

The design of transit vehicles can increase the safety of passengers and reduce the risk of collisions with pedestrians. Examples of transit vehicle technologies that can improve safety include:<sup>49</sup>

- *Collision avoidance technology on buses*—This system provides operators with an advance warning or alarm when pedestrians or other objects are within close proximity of the bus.
- *Strobe lights on top of buses*—The strobe lights are intended to get the attention of pedestrians when buses approach bus stops and shelters.
- *Door safety interlocks*—These automatic controls prevent buses from moving once doors are open.
- *Right rear wheel safety guards*—These devices can reduce the risk and severity of rear wheel pedestrian accidents.
- *Front brake lights*—Brake lights mounted on the front of the bus indicate to pedestrians crossing the street in front of a bus when the bus is stopped and when it has started to move.



Safety innovations, such as the strobe lights shown above the destination display on this WMATA bus, can increase the visibility of buses and improve the safety of pedestrians as they access transit.

## 6. Transit Stop Location and Design

The location and design of transit stops can significantly impact the safety and comfort of pedestrians accessing transit services. This section describes several considerations that are important to the location and design features of bus stops.

### Bus Stop Location

Bus stop location can impact the convenience and safety of pedestrians accessing transit. The site of a bus stop should be selected considering a number of factors, including:

- *Sight lines between approaching buses and passenger waiting and loading areas*—Bus drivers and passengers waiting at bus stops should be able to see each other easily to ensure drivers have sufficient time to stop for waiting passengers. Similarly, passengers waiting for a bus should have a clear view of approaching buses so that they do not step into the roadway in front of an approaching bus.
- *Predominant pedestrian patterns along the roadway and at nearby intersections*—Bus stops should be positioned in locations that serve the highest numbers of pedestrians, minimize total walking distance, and reduce the number of roadway crossings for pedestrians.
- *Proximity to destinations in the surrounding area*—Bus stops should be located to reduce walking distance to key destinations. Where possible, stops

serving major pedestrian generators should be located on the same side of an intersection as the destination so pedestrians do not need to cross additional streets to access the stop.

- *Ease of transfers to other bus routes*—Stops where pedestrians frequently transfer between different bus routes should be located on the same side of intersections.
- *Locations of traffic signals and other crossing facilities*—Bus stops should be located close to adequate crossing facilities to encourage pedestrians to use crossing and reduce jaywalking.
- *Locations of sidewalks and other pathways that provide access to the stop*—Bus stops should be located to take advantage of existing sidewalk and pathway infrastructure and to avoid dropping passengers off where they must walk in the roadway, on embankments, or in dirt, grass, or mud.
- *Location of access driveways* – Bus stops next to driveways can block vehicular circulation, inconvenience business owners or motorists using the driveway, and require passengers to wait in a driveway for the bus, elevating the potential for pedestrian/vehicle conflicts.
- *Impacts of the bus stop on other transportation modes*—Bus stop locations can impact motor vehicle, bicycle, and other users of the roadway. The needs of these other modes should be considered and balanced with the goals of optimizing bus service efficiency and providing safe and convenient pedestrian access.<sup>50</sup>



Bus stops may benefit by having separated marked areas for bicyclists to wait for the bus.

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*Bus stops should be provided in locations with the safest and most convenient pedestrian access possible.*

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Bus stops should be provided in locations with the safest and most convenient pedestrian access possible. In some areas, the best bus stop location may be on private property (e.g., in a shopping mall parking lot) which may require a formal agreement between the transit agency and the property owner. Pierce Transit in Takoma, Washington has developed a sample agreement for private road bus stop placement.<sup>51, 52</sup>

### Flag Stops

In rural areas with low volumes of transit riders, flag stops are often implemented instead of standard bus stops. This system allows passengers to wait along the side of the road at a convenient location that may not necessarily be a designated bus stop. When the bus encounters a passenger waiting alongside the road, the bus driver can use their professional judgment to determine whether it is safe enough to stop at that location. Transit agencies using flag stops should develop specific policies for drivers and passengers to use for determining when and where it is safe to pick-up or discharge passengers.

Transit stop infrastructure is not required for this system, so it is cheaper to implement than the standard system of bus stops used in most urban areas. Because no landing pads, sidewalks or other pedestrian facilities are provided, it is important that pedestrians, drivers and transit operators receive training on safety procedures for using flag stops.

### Near-side and Far-side Bus Stops at Intersections

At intersections, bus stops can be located either on the near-side or the far-side of the intersection, depending on many factors. Far-side bus stops have the safety benefit of encouraging pedestrians to cross the roadway at the intersection behind the bus. This increases the visibility of pedestrians to drivers traveling through or turning at the intersection. In contrast, pedestrians crossing an intersection in front of a near-side bus stop are not as visible to drivers approaching the intersection from behind the bus. They may also risk being hit by the bus itself. The sight lines between pedestrians and approaching vehicles are blocked by the stopped bus. There is also increased potential for conflict between pedestrians crossing in front of a bus as pedestrians may not be clearly visible to a bus driver pulling out of the stop.

Transit stops can also be located at midblock locations. Midblock stops can reduce the distance pedestrians need to travel to reach destinations in the middle of long blocks. However, midblock stops may encourage pedestrians to cross roadways at locations where there is no traffic control. Midblock stops should be designed carefully in order to ensure the safety of pedestrians using the bus. Transit agencies should coordinate with the agency or jurisdiction responsible for the roadway to pursue the installation of proper pedestrian crossing facilities and motorist warning devices before the stop is installed.

An excellent resource for determining bus stop locations is *FDOT's Accessing Transit: Design Guidelines for Florida Bus Passenger Facilities* (available online at: <http://www.dot.state.fl.us/transit/Pages/AccessingTransitHandbookLow.pdf>). This document includes boarding thresholds for providing facilities at bus stops

Bus Stop Locations					
Advantages and Disadvantages of Location Relative to Street Intersections					
Near-Side		Far-Side		Mid-Block	
Advantages	Disadvantages	Advantages	Disadvantages	Advantages	Disadvantages
Minimizes interfaces when traffic is heavy on the far side of the intersection.	Conflicts with right turning vehicles are increased.	Minimizes conflicts between right turning vehicles and buses.	Intersections may be blocked during peak periods by queuing buses.	Minimizes sight distance problems for vehicles and pedestrians.	Requires additional distance for no-parking restrictions.
Passengers access buses closest to crosswalk.	Stopped buses may obscure curbside traffic control devices and crossing pedestrians.	Provides additional right turn capacity by making curb lane available for traffic.	Sight distance may be obscured for crossing vehicles.	Passenger waiting areas experience less pedestrian congestion.	Encourages patrons to cross street at mid-block.
Intersection available to assist in pulling away from curb.	Sight distance is obscured for cross vehicles stopped to the right of the bus.	Minimizes sight distance problems on approaches to intersection.	Increases sight distance problems for crossing pedestrians.	Passengers access buses closest to crosswalk.	Increases walking distance for patrons crossing at intersections.
No double stopping. Buses can service passengers while stopped at a red light.	The through lane may be blocked during peak periods by queuing buses.	Encourages pedestrians to cross behind the bus.	Stopping far-side after stopping for a red light interferes with bus operations and all traffic in general.		
Provides driver with opportunity to look for oncoming traffic including other buses with potential passengers.	Increases sight distance problems for crossing pedestrians.	Requires shorter deceleration distances for buses.	May increase number of rear-end accidents since drivers do not expect buses to stop again after stopping at a red light.		
	Pedestrians may cross the street in front of the bus, unseen by traffic in the left lane.	Gaps in traffic flow are created for buses re-entering the flow of traffic at signalized intersections.			

This chart lists some of the advantages and disadvantages of near-side, far-side, and mid-block bus stop locations. Source: Accessing Transit. Florida Department of Transportation, March 2004.

**For Further Information- Bus Stop Location and Design Resources**

*ADA Accessibility Guidelines for Buildings and Facilities.* United States Access Board, 2002. <http://www.access-board.gov/adaag/html/adaag.htm>.

*Accessing Transit: Design guidelines for Florida Bus Passenger Facilities.* Florida Department of Transportation and Florida State University, Tallahassee, Florida, 2004. <http://www.dot.state.fl.us/Transit/Pages/AccessingTransitHandbookLow.pdf>.

*Maryland Transit Guidelines.* Maryland Transit Administration, 2002.

*PEDSAFE: Pedestrian Safety Guide and Countermeasure Selection System.* US Department of Transportation, Federal Highway Administration, Authors: D.L. Harkey and C.V. Zegeer, September 2004. <http://www.walkinginfo.org/pedsafe/>.

*Project ACTION: Toolkit for the Assessment of Bus Stop Accessibility and Safety.* Easter Seals, 2006. [http://projectaction.easterseals.com/site/PageServer?pagename=ESPA\\_BusStopToolkit](http://projectaction.easterseals.com/site/PageServer?pagename=ESPA_BusStopToolkit).

*Planning and Design for Transit Handbook.* Tri-County Metropolitan Transportation District of Oregon, Portland, Oregon, 1996.

and flowcharts to help transit planners determine the appropriate bus stop type and location. It also includes a chart displaying advantages and disadvantages of near-side, far-side and midblock bus stop locations (see previous page).

**Bus Stop Design**

Bus stop design is more than just putting up a sign or a shelter. Many features and amenities are available to improve a passenger's experience by creating a pleasant and safe environment to wait. Transit stops should be designed to make boarding and alighting easy and safe for passengers of all abilities. This section addresses issues that should be considered by transit agencies in order to improve the function and design transit stops. All bus stop designs must follow the ADAAG.<sup>53</sup>



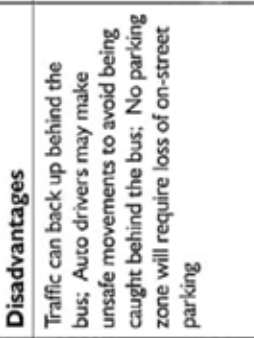
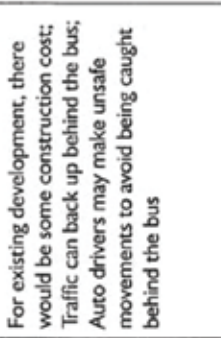
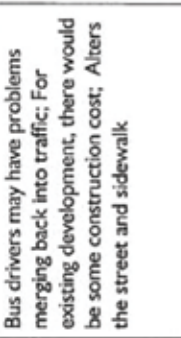
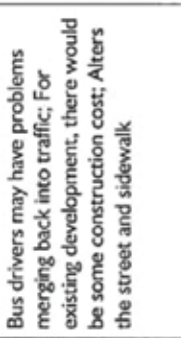
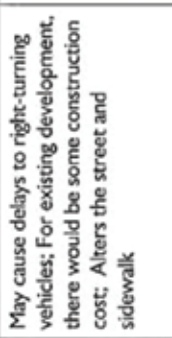
This bus stop includes an attractive pole with route and schedule information. It also includes a shelter, bench, trash can, bicycle rack, and has excellent access to the local sidewalk network.

**Loading Zone**

There are a number of options for the configuration of on-street loading zone areas. The most common configuration is the location of stops at the curbside, (typically) adjacent to a sidewalk. Bus stops can also be located at curb extensions. Locating stops at curb extensions allows transit passengers to wait in the extension area, out of the main pedestrian flow on the sidewalk. Another option is for buses to stop in bus bays, out of the flow of traffic on the roadway. However, this may require the sidewalk to curve around the bus bay, reducing the buffer area between vehicles and pedestrians, and providing less space for signs,

### Sidewalk Bus Loading Zone Considerations

Source: TARC Transit Standards Manual

<p><b>I) TYPE OF LOADING AND UNLOADING ZONE</b></p> <p><b>Curbside Stop: either Near-side, Far-side, or Mid-block</b></p> 	<p><b>Advantages</b></p> <p>Provides easy access for bus drivers and minimal delay for bus; Simple in design, easy to install and relocate; Most common type of stop; No parking zone will require loss of on-street parking</p>	<p><b>Disadvantages</b></p> <p>Traffic can back up behind the bus; Auto drivers may make unsafe movements to avoid being caught behind the bus; No parking zone will require loss of on-street parking</p>	<p><b>Use when:</b></p> <p>Most common type of stop; See following page for more detail.</p>
<p><b>Nub</b></p> 	<p>Removes fewer parking spaces; Improves pedestrian movements at the intersections; Provides additional sidewalk area for pedestrians; Results in minimal delay for the bus</p>	<p>For existing development, there would be some construction cost; Traffic can back up behind the bus; Auto drivers may make unsafe movements to avoid being caught behind the bus</p>	<p>There is adequate space in the right of way and sidewalk can be altered; Nub design also works well for pedestrian crossings at the corner.</p>
<p><b>Bus Bay: with acceleration and deceleration lane</b></p> 	<p>Passengers get on and off the bus away from the travel lane; Minimizes delay to through traffic</p>	<p>Bus drivers may have problems merging back into traffic; For existing development, there would be some construction cost; Alters the street and sidewalk</p>	<p>There is no on-street parking; There is a high volume of traffic; Street traffic speeds are 40 mph; Traffic exceeds 250 vehicles during the peak hour; Bus needs layover time at end of route.</p>
<p><b>Open Bus Bay</b></p> 	<p>Has same advantages as Bus Bay, PLUS Allows bus to decelerate as it moves through the intersection</p>	<p>Bus drivers may have problems merging back into traffic; For existing development, there would be some construction cost; Alters the street and sidewalk</p>	<p>There is no on-street parking; There is a high volume of traffic; Street traffic speeds are 40 mph; Traffic exceeds 250 vehicles during the peak hour; Bus needs layover time at end of route.</p>
<p><b>Queue Lumber Bus Bay</b></p> 	<p>Has same advantages of Bus Bay and Open Bus Bay, PLUS Allows bus to bypass traffic queues at a signal</p>	<p>May cause delays to right-turning vehicles; For existing development, there would be some construction cost; Alters the street and sidewalk</p>	<p>There is no on-street parking; There is a high volume of traffic; Street traffic speeds are 40 mph; Traffic exceeds 250 vehicles during the peak hour; Bus needs layover time at end of route.</p>

benches, shelters, and other amenities. Additional characteristics of bus loading zone configurations, including advantages and disadvantages, have been identified by the Transit Authority of River City (see table) in Louisville, Kentucky.<sup>54</sup>

### Landing Pad

ADA guidelines (10.2.1) require a landing pad to be located at all bus stops to allow pedestrians to enter and exit the bus safely without entering the street. This landing pad must have a firm, stable surface that is free of obstructions. It must have a minimum length of eight feet (from the curb or roadway edge) and a minimum width of five feet (in the direction parallel to the roadway).<sup>53</sup> It must also be connected to the adjacent sidewalk network. In addition to satisfying ADA guidelines, properly designed landing pads create a safe place for pedestrians to wait away from grass, mud, and traffic.



A level landing pad has been provided at this bus stop.

### Shelters and Other Pedestrian Waiting Facilities

A pleasant waiting area can improve a passenger's experience and increase transit usage. A wide range of passenger amenities can be installed at transit stops including shelters, seating and trash cans. Amenities at each stop should be selected based on the volume and needs of the pedestrians in the area. Seating and shelters are most often installed at stops with high volumes. Seating is also important at stops near hospitals and senior centers where passengers are less able to walk or stand for long periods of time. Other amenities can be installed as needed, and many transit agencies determine the appropriate amenities to install at a particular stop based on the number of passenger boardings.<sup>55</sup> For example, the Greater Cleveland Regional Transit Authority recommends that in an urban area, only stops that have over 50 daily boardings should be provided with shelters.<sup>56</sup>



This bus stop includes a range of passenger amenities including bus stop signage, pedestrian scale lighting, a shelter and landscaping elements.

Shelters can potentially cause safety problems if not properly designed. Well-designed shelters should have the following characteristics:

- Bus drivers should have a clear sight line to the bus stop or shelter, so that they have sufficient time to see and stop for passengers.
- Passengers waiting at the bus stop and in the shelter should have sufficient time to see and hail the bus, especially at bus stops serving more than one route.
- Bus shelters should be transparent and well lit.

### Identification and Wayfinding Signs

Signage can be useful for pedestrians accessing transit stops and stations by clearly identifying routes and destinations. Pedestrians who know where they are going are less likely to be distracted and better able to focus on their



This real-time information sign counts down the time until the arrival of the next bus on Los Angeles' Metro Rapid system.

personal safety while walking. Two common types of signs are identification (i.e., bus stop and transit stop sign posts) and wayfinding (i.e., maps and direction) signs. Identification signs should be provided at all stops and stations and they should be recognizable signs that are visible to both pedestrians and transit drivers.<sup>57</sup> These identification signs may also provide schedules and other information about the transit routes that serve the particular stop or station. At stations with high passenger volumes, it may be appropriate to provide signs that display real-time information about bus/train arrival times.

Wayfinding signs are important for providing pedestrians with directions to local destinations and information about points of interest in the area. Both maps and signposts can provide wayfinding information. A transit agency may coordinate with local jurisdictions on the design, content, and installation of wayfinding signs that serve a certain area, such as directional signage in a historic district.

It is recommended that signage be available and accessible to all potential passengers including those with visual impairments (through the use of audio or tactile signage) and those who cannot read English (through the use of pictograms, graphics and text in other languages).

### **Security at Transit Stops**

Pedestrian security is a major concern at all stops and stations. If passengers do not feel safe at transit stops, they will be much less likely to use transit. Several methods have been used to improve the security of transit stops and stations, including providing:

- Clear sight lines into and out of waiting areas (including shelters).
- Well lit waiting areas.
- Landscaping that does not create dead-ends or hiding places.
- Emergency call boxes.
- Video camera surveillance.
- Increased police presence.

### **Maintenance**

All of the elements of bus stop design that have been discussed in this section should have routine maintenance to ensure continued functionality and safety of pedestrians. This includes updating maps, emptying trash cans and picking up litter, removing ice and snow, trimming landscaping, cleaning glass walls, and repairing signs, benches, landing pads and shelters. Agencies should account for maintenance costs when planning bus stops and stations. In addition to performing maintenance internally, some transit agencies utilize adopt-a-stop or adopt-a-station<sup>58</sup> programs or contract maintenance out to advertisers to ensure continued upkeep.





## B. Education and Enforcement Actions

Transit agencies have a responsibility to educate the community regarding transit safety. Examples of agencies providing pedestrian safety information for their customers include:

- The Detroit Department of Transportation website has important tips about safety while waiting for the bus, identifying the correct bus, boarding the bus, riding on the bus, and leaving the bus.<sup>61</sup>
- The Metropolitan Transit Authority (MTA) in Los Angeles has a web page and has developed videos on pedestrian safety near bus and rail transit lines. Several of the videos are designed for children, and most are available in both English and Spanish.<sup>62</sup>
- The Toledo Area Regional Transit Authority (TARTA) visits school classrooms to teach children about safe transit behaviors. They provide a video, handouts, and buttons to send the message, “Let the bus go. Then you go!”<sup>63</sup>
- New Jersey Transit provides web pages with safety information for pedestrians near heavy rail, light rail, and bus lines.<sup>64</sup>
- The Transit Authority of River City (TARC) in Louisville, Kentucky provides free “Hop on Board” presentations at schools.<sup>65</sup> The presentations include a TARC activity book for each student and can be taught on board a TARC bus.



Poster for the youth-oriented transit safety education effort sponsored by TARTA.



Children learning about safety when riding transit in Los Angeles.

Many agencies, such as the MTA in Los Angeles, California, have found a dramatic decrease in accidents as a result of community education efforts.<sup>66</sup> Transit agency safety education efforts often focus on the following topics:

- Waiting for the bus/train.
- Identifying the correct bus/train.
- Boarding the bus/train.
- Riding on the bus/train.
- Leaving the bus/train.
- Understanding train operations (that trains cannot stop fast or swerve).
- Crossing train tracks.
- Being aware of railroad bridge and trestle hazards.

It is also important for transit agencies to coordinate with local transportation departments and other



The “THINK” campaign has been implemented in England to educate drivers and pedestrians about pedestrian safety.

organizations that offer pedestrian safety education and materials that focus on reducing conflicts between pedestrians and all types of motor vehicles that use the roadway (e.g. USDOT, NHTSA, State DOTs). While pedestrian collisions with transit vehicles are an important safety issue to address, most pedestrian fatalities are a result of crashes with cars and light trucks.<sup>67</sup> Transit agencies should be a partner in these education and safety awareness efforts because their customers often face conflicts with motor vehicles when traveling to transit stops and stations.

### **Case Study: StreetSmart Pedestrian Safety Campaign<sup>68</sup> Washington, DC**

Local governments around the Washington, DC, Metropolitan Area joined forces to implement the StreetSmart Campaign to improve bicycle and pedestrian safety in the region. The goal of this multi-year campaign is to increase awareness of bicycle and pedestrian safety issues thereby reducing the number of crashes and fatalities through enforcement and education. Enforcement of pedestrian-related traffic laws is increased for one month each spring, timed to coincide with a publicity blitz. The Washington Metropolitan Area Transit Authority (WMATA) has participated in these outreach activities. StreetSmart enforcement and education activities complement engineering projects (such as improved signalization and improving crosswalk visibility) completed throughout the year by local jurisdictions.

Enforcement activities during the 2005 Campaign included:

- Pedestrian/bicycle enforcement training for police officers.
- District of Columbia police officers handed out over 2,500 citations and distributed more than 9,000 safety handouts.
- Two targeted crosswalk enforcements.

Educational and publicity elements included:

- Radio advertisements.
- Newspaper advertisements (English and Spanish language publications).
- Outdoor posters on buses and shelters.
- Brochures.



Posters displayed on WMATA buses as part of the StreetSmart Campaign in the Washington, DC region. Source: StreetSmart public safety program of the District of Columbia, Maryland, and Virginia.

The StreetSmart Campaign has been well-received throughout the Metropolitan Area and has increased awareness of pedestrian and bicycle laws and safety issues. The combined approaches of education and enforcement have helped improve the behavior of both pedestrians and drivers and have led to some long-term improvements in safety, as shown by the following statistics:

- Frequently observe drivers not yielding to pedestrians (76% in 2002 to 54% in 2006).
- Drivers swerving to avoid pedestrians (32% in 2004 to 14% in 2006).

- Frequently observe pedestrians jaywalking (40% in 2002 to 30% in 2006).

In 2008 the program will be expanded to include a bi-annual campaign. In addition, WMATA will expand its role from participating only in outreach to become a full funding partner of the program.

More information is available at:

<http://www.mwcog.org/streetsmart/default.asp>.



Enforcement activities conducted during the 2006 StreetSmart campaign targeted both drivers and pedestrians to elicit safer behavior.



## Chapter 4: Background Information on Pedestrian Safety and Access to Transit

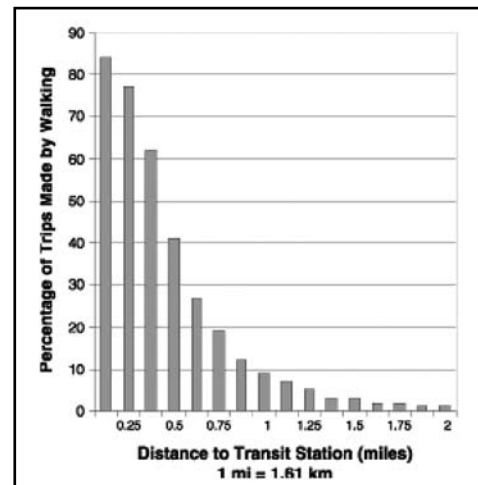
Understanding pedestrian characteristics and facilities (e.g., sidewalks, crosswalks, pedestrian signals, etc.) is an important step in providing safe access to transit systems. This section introduces basic pedestrian safety concepts to help readers understand issues, solutions, and resources that are presented in other parts of this guide. Concepts addressed in this chapter include:

- Typical walking distance to transit.
- Motor vehicle speed and pedestrian safety.
- Pedestrian characteristics and behavior.

### A. Typical Walking Distance to Transit

Most people are willing to walk for five to ten minutes, or approximately  $\frac{1}{4}$ - to  $\frac{1}{2}$ -mile to a transit stop (see figure below). However, recent research has shown that people may be willing to walk considerably longer distances when accessing heavy rail services. Therefore, in order to encourage transit usage, safe and convenient pedestrian facilities should be provided within  $\frac{1}{4}$ - to  $\frac{1}{2}$ -mile of transit stops and stations, and greater distances near heavy rail stations. Note that bicyclists are often willing to ride significantly further than  $\frac{1}{2}$ -mile to access rail transit stations, so safe facilities should be provided for bicycling within a larger catchment area around transit hubs.

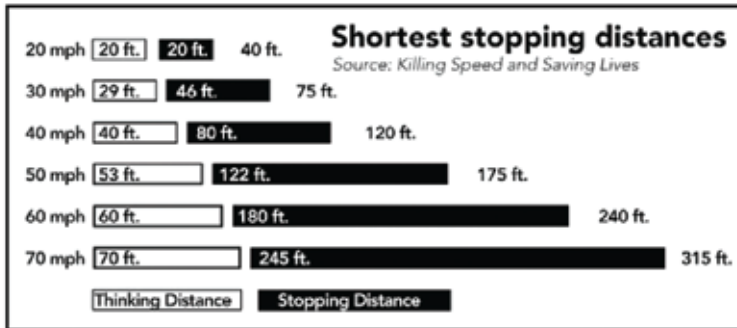
Transit route spacing and location are important considerations for pedestrian access to transit. For example, in a city with a regular street grid pattern of streets, appropriate stop spacing can be achieved when transit routes are spaced between  $\frac{1}{2}$ - to 1-mile apart. If the stops on these routes are spaced  $\frac{1}{8}$ - to  $\frac{1}{4}$ - mile apart, then a majority of the people in the neighborhoods served by the transit system will be within  $\frac{1}{4}$ - to  $\frac{1}{2}$ -mile of a transit stop.<sup>70</sup>



Relationship between Distance to Transit Facility and Pedestrian Mode Choice. Source: PEDSAFE: *Pedestrian Safety Guide and Countermeasure Selection System*.<sup>69</sup>

### B. The Effect of Motor Vehicle Speed on Pedestrian Safety

Pedestrians accessing transit stops and stations must often walk along or cross roadways that carry motor vehicle traffic. Pedestrians may feel less comfortable and safe as nearby motor vehicle speeds increase. The faster a driver is traveling, the more difficult it is to stop (see figure below).<sup>71</sup> Larger vehicles, such as buses and trucks require even longer stopping distances.



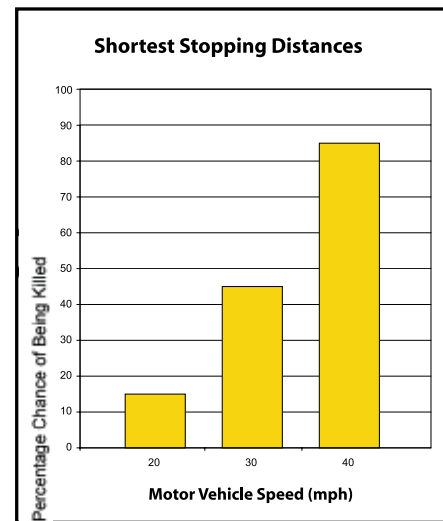
Stopping distances for automobiles. Source: *Killing Speed and Saving Lives*<sup>71</sup>

Reducing motor vehicle speeds on roadways near transit stops and stations can improve conditions for transit customers and encourage more people to walk and to use transit. Lower vehicle speeds can reduce the severity of injuries when crashes occur. When hit by a vehicle traveling at 40 miles per hour, a pedestrian has an 85% chance of being killed; at 30 miles

per hour, the likelihood decreases to 45%; and at 20 miles per hour the pedestrian fatality rate is only 5% (see figure below).<sup>71</sup>

Several of the roadway crossing treatments described in this guide, such as median crossing islands, curb extensions, and reduced intersection turning radii, may help decrease motor vehicle speeds.

When identifying pedestrian safety issues and solutions, communities should keep in mind that pedestrians have varied characteristics (e.g., age, gender, disabilities, etc.). Different classes of pedestrians travel at different speeds, are comfortable walking different distances, and have varied levels of comfort with traffic, temperature, and time spent waiting at a transit stop. It is important for transit agencies and other partners to consider how environmental conditions impact all types of pedestrians.



Pedestrian Fatalities Based on Speed of Vehicle. Source: *Killing Speed and Saving Lives*.<sup>71</sup>

### C. Pedestrian Characteristics and Behavior

In addition to walking speed, pedestrians can be differentiated by spatial needs, mobility issues and cognitive abilities. It is crucial to understand the characteristics of the range of pedestrians that may be accessing transit to help develop the safest possible system.

The following table summarizes some important pedestrian characteristics to consider when making pedestrian safety improvements near transit.

Pedestrian Group	Characteristics & Behaviors
Child Pedestrians	<ul style="list-style-type: none"> <li>• May have difficulty choosing where and deciding when it is safe to cross the street.</li> <li>• May have difficulty seeing (and being seen by) drivers of all types of vehicles, including buses because of less peripheral vision and shorter stature than adults.</li> <li>• May have difficulty judging the speed of approaching vehicles.</li> <li>• May need more time to cross a street than adults.</li> </ul>
Older Pedestrians	<ul style="list-style-type: none"> <li>• May have reduced motor skills that limit their ability to walk at certain speeds or turn their heads.</li> <li>• May need more time to cross a street than younger adults.</li> <li>• May have difficulty with orientation and understanding traffic signs, so they may need more information about how to access transit and get around safely.</li> <li>• May have difficulty judging the speed of approaching vehicles.</li> </ul>
Recent Immigrants	<ul style="list-style-type: none"> <li>• May have limited understanding of English, traffic laws, or typical roadway behaviors.</li> <li>• May not understand the traffic signals that indicate when to walk.</li> <li>• May not have the experience to know how to interact safely with drivers.</li> </ul>
People with Disabilities (e.g., people using wheelchairs, crutches, canes, or people with visual or cognitive impairments)	<ul style="list-style-type: none"> <li>• May be more affected by surface irregularities in the pavement and changes in slope or grade.</li> <li>• May need more time to cross a street than people without disabilities.</li> <li>• May benefit from pedestrian signal information provided in multiple formats (audible, tactile, and visual).</li> <li>• May have trouble seeing (and being seen) by drivers of all types of vehicles due to seated position (for people using wheelchairs).</li> <li>• Pedestrians who are blind or who have low vision may have trouble detecting yielding vehicles or communicating visually with drivers in crossing at unsignalized crosswalks.</li> </ul>

.....  
*Safe roadway crossing facilities should be located at the most direct crossing locations.*  
 .....

Understanding common pedestrian behavior is essential to promoting pedestrian safety near transit. Pedestrians typically take the most direct line possible to minimize the distance and time they must walk to reach their destination. Therefore, safe roadway crossing facilities should be located at the most direct crossing locations, which can subsequently make the safest location for crossing attractive to pedestrians. Poorly-designed environments often result in pedestrians using informal paths through properties and crossing roadways at locations without pedestrian safety enhancements.

Pedestrians traveling to transit stops are frequently preoccupied with reaching the stop before the bus or train arrives. As a result, pedestrians who are running late may take more risks than they typically would under normal conditions.

Pedestrians traveling to the bus or train may exhibit some of the following behaviors:

- Running to catch transit.
- Jaywalking, or crossing at locations that do not have pedestrian crossing facilities or safety enhancements.
- Walking between stopped or parked vehicles, including buses.
- Stepping into street to get around people waiting at a stop.

The safety treatments listed in Chapter 3 can help reduce the potential harmful effects of risky pedestrian behavior near transit stops.

## Chapter 5: Legal Issues



It is important to understand the legal context for pedestrian safety in the areas around transit stops and stations. Federal and state laws, local statutes and case precedent all dictate the level of responsibility assigned to a transit agency to address pedestrian safety issues, even if the transit agencies lack the authority to make changes to the roadway or roadway operations. This emphasizes the need for transit agencies to partner with other organizations and assign responsibility for ensuring pedestrian safety and enacting engineering improvements. Ensuring compliance with these laws not only protects the transit agency but can provide the best possible service to pedestrians and transit customers. The legal topics that are discussed in this chapter include:

- Pedestrian laws.
- Recent legal cases on pedestrian safety and transit access.

The laws and cases summarized in this chapter are not exhaustive and include only a selection for illustrative purposes. Transit agencies should understand the laws and rulings applicable in their jurisdictions.

### ***A. Example Laws Pertaining to Pedestrian Access to Transit<sup>72</sup>***

Although many states and local governments have adopted the *Uniform Vehicle Code*, other state and local statutes differ by jurisdiction. It is the responsibility of every transit agency to know and follow the applicable laws when designing for pedestrian access to its stations. Many of these laws provide minimum requirements and should be thought of as starting points for designers and planners, who have the flexibility to create facilities beyond the minimum design standards. This list is not exhaustive, but is intended to provide initial guidance.

#### 1. Uniform Vehicle Code

The National Committee on Uniform Traffic Laws and Ordinances is a private, non-profit membership organization dedicated to providing uniform traffic laws and regulations through the timely dissemination of information and model



legislation on traffic safety issues. The Committee produces a variety of publications related to traffic laws and ordinances. The primary document produced by the Committee is the *Uniform Vehicle Code* (UVC).

Most states have adopted, in whole or part, the UVC as the basis for legislation and regulation related to the operation of motor vehicles on public roadways. The excerpts from the UVC presented below illustrate the basic traffic laws that govern the interactions between pedestrians and motor vehicles. Where applicable, these laws provide the starting point upon which upgrades and improvements are based. Wherever the existing environment does not provide for the safe movement of pedestrians under these rules, additional engineering, education, and enforcement improvements may be necessary.

### **Pedestrians at Street Crossings**

Several sections of the UVC address the relationship between vehicles and pedestrians. These rules primarily focus on right of way assignment at street crossings where pedestrians are legally allowed to cross the street. Driver education and licensing exams are potential methods for educating drivers about these rules and their responsibilities with regard to pedestrians. Drivers should not assume that all pedestrians know all of the rules below, and every effort should be made to educate the walking public about the appropriate laws.

#### *UVC § 11- 502(a) Pedestrians' right of way in crosswalks*

When traffic-control signals are not in place or not in operation, the driver of a vehicle shall yield the right of way, slowing down or stopping if need be to yield, to a pedestrian crossing the roadway within a crosswalk when the pedestrian is upon the half of the roadway upon which the vehicle is traveling, or when the pedestrian is approaching so closely from the opposite half of the roadway as to be in danger.

#### *UVC § 11-1112 Stop when traffic obstructed*

No driver shall enter an intersection or a marked crosswalk or drive onto any railroad grade crossing unless there is sufficient space on the other side of the intersection, crosswalk or railroad grade crossing to accommodate the vehicle such driver is operating without obstructing the passage of other vehicles, pedestrians or railroad trains notwithstanding any traffic-control signal indication to proceed.

#### *UVC § 11- 501(a) Pedestrian obedience to traffic-control devices and traffic regulations*

A pedestrian shall obey the instructions of any official traffic-control device specifically applicable to such pedestrian, unless otherwise directed by a police officer.

#### *UVC § 11- 503(a) Crossing at other than crosswalks*

Every pedestrian crossing a roadway at any point other than within a marked crosswalk or within an unmarked crosswalk at an intersection shall yield the right of way to all vehicles upon the roadway.

#### *UVC § 11- 503(b) Crossing at other than crosswalks [Tunnel or bridge available]*

Any pedestrian crossing a roadway at a point where a pedestrian tunnel or overhead pedestrian crossing has been provided shall yield the right of way to all vehicles upon the roadway.

#### *UVC § 11- 503(c) Crossing at other than crosswalks [Crossing between adjacent intersections]*

Between adjacent intersections at which traffic-control signals are in operation pedestrians shall not cross at any place except in a marked crosswalk.

### **Pedestrians at Transit Stops**

The rules outlined in this section dictate driver behavior at transit stops where a transit vehicle is loading and unloading passengers. Under these circumstances pedestrians are expected, and drivers are required to stop or slow to provide more pedestrian-friendly conditions. Pedestrians should still be aware of their environment and should recognize that the transit service is operating in mixed traffic.

#### *UVC § 11-1403 Passing streetcar on right*

The driver of a vehicle overtaking upon the right any streetcar stopped or about to stop for the purpose of receiving or discharging any passenger shall stop at least five feet to the rear of the nearest running board or door of such streetcar and remain standing until all passengers have boarded or upon alighting have reached a place of safety, except that where a safety zone has been established, a vehicle need not be brought to a stop before passing any such streetcar but may proceed past such car at a speed not greater than is reasonable and proper and with due caution for the safety of pedestrians.

#### *UVC § 11-1402 (b) Passing streetcar on left*

The driver of any vehicle when permitted to overtake and pass upon the left of a streetcar which has stopped for the purpose of receiving or discharging any passenger shall reduce speed and may proceed only upon exercising due caution for pedestrians and shall accord pedestrians the right of way when required by other sections of this chapter.

### **Pedestrians Near At-Grade Railroad Crossings**

The following rules dictate that for safety reasons, everyone (including drivers and pedestrians) must obey warning signs at at-grade railroad crossings.

#### *UVC § 11-701(b) Obedience to signal indicating approach of train*

No person shall drive any vehicle through, around or under any crossing gate or barrier at a railroad crossing while such gate or barrier is closed or is being opened or closed.

#### *UVC § 11- 513(b) Bridge and railroad signals [Railroad barrier opening/closing]*

No pedestrian shall pass through, around, over, or under any crossing gate or barrier at a railroad grade crossing or bridge while such gate or barrier is closed or is being opened or closed.

## **2. Americans with Disabilities Act**

The Americans with Disabilities Act (ADA) was passed as a Federal law in 1990 and has been updated continually. The ADA is designed to ensure that public facilities are accessible for all people, regardless of physical characteristics and capabilities.

The United States Access Board is the agency responsible for developing and maintaining design criteria for the built environment, transit vehicles, telecommunications equipment, and for electronic and information technology. It also provides technical assistance and training on these requirements and on accessi-

ble design that may be useful to transit agencies implementing ADA compatible designs. The Access Board's website provides a wide range of reference materials, resources and helpful links.

As previously discussed in this guide, the ADAAG describes requirements and design guidelines for all types of public facilities, including transportation stops, vehicles and rights-of-way. Chapter 10 of the ADAAG is devoted to transportation facilities. The ADAAG is a minimum design standard for compliance and should be used with discretion. Where additional accommodations are necessary or desirable, the final design should exceed the ADAAG's design standards.

The full text of the ADAAG can be found online at:  
<http://www.access-board.gov/adaag/html/adaag.htm>.

## **B. Legal Cases**

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Past rulings from legal cases can also impact the required level of safety and accessibility that must be provided by a transit agency. These precedents are established in each state individually, although state courts can use out-of-state rulings as background when making decisions. It is important for transit agencies to be familiar with the cases presented below and additional similar cases in their own states.

One of the major legal areas of concern in the complex environment of pedestrian safety is liability. Every organization, government and agency is concerned with avoiding lawsuits and claims against them. Liability for injuries sustained while accessing transit has been assigned to various types of agencies and governments in the past, including transit agencies. The following are some recent legal cases that address transit agency liability for safety of pedestrians while accessing transit. Improvements to pedestrian safety through the types of coordinated efforts detailed in this guide have the potential to decrease the risk of judgements against transit agencies during litigation.

### **1. Transit Agency's Role in the Safety of Pedestrian Access Routes to Transit Stops** *Bonanno v. Central Contra Costa Transit Authority (CCCTA)*<sup>73,74,75</sup>

On the morning of November 16, 1993, Darlene Bonanno was hit by a car and seriously injured while attempting to cross Pacheco Boulevard—an unsignalized intersection with a painted crosswalk—to get to a CCCTA bus stop. The CCCTA had received numerous complaints about the safety of this bus stop starting in the early 1980s. Among other agencies, Bonanno sued the CCCTA claiming the location of the bus stop constituted a “dangerous condition.” In April 2003, the California Supreme Court affirmed the decision that the CCCTA was partially liable for the accident because:

1. The property was in a dangerous condition at the time of the injury.
2. The injury was proximately caused by the dangerous condition.
3. The dangerous condition created a reasonably foreseeable risk of the kind of injury which was incurred.

4. The public entity had actual and constructive notice of the dangerous condition a sufficient time prior to the injury to have taken measures to protect against the dangerous condition. (Government Code section 835).

The CCCTA unsuccessfully argued that the intersection—controlled by the County—and not the bus stop, was the dangerous condition proximately causing the injury. However, the California Supreme Court relied on established law recognizing “that hazards present on adjoining property may create a dangerous condition of public property when users of the public property are necessarily exposed to those risks.” (California Supreme Court, *Bonanno v. CCCTA*, 9). Although the CCCTA did not control the intersection, it did control the bus stop and was aware of the dangerous intersection its patrons were required to cross to reach the stop. Furthermore, CCCTA could have relocated or removed the bus stop without facing an undue burden. Although CCCTA was found to be only one percent liable in the accident, they were ordered to pay the plaintiff \$1.6 million. **This ruling suggests that transit agencies should broaden their consideration of safe pedestrian access to include ingress and egress routes to transit facilities across adjacent property. Transit agencies should also work with the agencies that own and operate the roadways in their jurisdiction to avoid dangerous access conditions around transit stops.**

## 2. Transit Agency Liability for Pedestrian Safety During Transfers *Southeastern Pennsylvania Transportation Authority (SEPTA)*<sup>76</sup>

In February 2006, Tenisha Walker was struck by a car while crossing an intersection to transfer between a SEPTA trolley and a SEPTA bus parked across the street. Since the accident was a hit-and-run and Walker lacked insurance, she filed a claim with the state insurance fund, Assigned Claims Plan, which in turn sought compensation from the transit agency. A Pennsylvania court ruled that transit agencies could be held liable for damages resulting from a passenger being hit by a car while transferring between transit vehicles. Under Pennsylvania law, a person standing or walking outside of a vehicle can still qualify as a vehicle occupant if there is a connection between the injury sustained and the use of the vehicle. The trial court ruled that “the transit carrier for both the vehicle from which the passenger disembarked and the vehicle to which she was intending to transfer were the same.” Therefore, Walker was eligible to recover damages from SEPTA because she remained a SEPTA passenger throughout the duration of her transfer. Defining transferring customers as vehicle “occupants” is an important holding because it means that Pennsylvania transit agencies can be sued as common carriers when transferring riders sustain injuries. **This case supports a national trend that safe pedestrian access is the responsibility of the transit agency even when a patron is not on a vehicle or even property owned by the agency. When locating stops, planners and engineers should account for the movements of all passengers accessing a vehicle, especially those transferring between vehicles, to provide for their safety.**

### 3. Transit Agency Liability for Pedestrian Safety at Drop-off Locations

*Niagara Frontier Transportation Authority (NFTA)*<sup>77</sup>

On the morning of December 14, 1995, Cynthia Wiggins was struck by a dump truck as she attempted to cross a busy highway after alighting a NFTA bus; she died of her injuries 19 days later. At the time of the accident, Wiggins was on her way to work at the Walden Galleria Mall in suburban Erie County, a 50-minute bus ride from her home in inner-city Buffalo, New York. Since Pyramid Companies, the mall owner, did not allow buses serving inner-city Buffalo to stop in the mall's parking lot, Wiggins got off at the closest bus stop, which was 300 yards away from the mall and across a seven-lane highway with no sidewalk. It was while weaving through parked cars at an intersection on this highway that Wiggins was hit when the light turned green before she was safely across. The Wiggins family sought \$150 million in damages from multiple defendants, including NFTA. The lawsuit claimed that NFTA was negligent in dropping off a rider at a location without appropriate pedestrian access, which NFTA knew or should have known made the bus stop dangerous. Instead, the transit agency should have dropped off riders on mall property or at least near a crosswalk. NFTA argued that it fulfilled its obligation to Wiggins by delivering her safely to her destination. Furthermore, the transit agency had attempted to establish a bus stop on mall property, but the mall owners refused to allow it. The lawsuit was settled for \$2.55 million, with NFTA responsible for \$300,000 of the damages. **Although this case ended without a court ruling and no admission of wrongdoing, it suggests that transit agencies face liability risks when they drop passengers off at bus stops in proximity to dangerous pedestrian conditions and should work with local landowners and developers to provide the safest access possible.**

Overall, case law indicates that transit agencies bear some responsibility in ensuring that their passengers can access stops and stations safely, even on property that the agency does not own. This means that transit agencies should locate bus stops where pedestrian access facilities are safe and adequate. Even in situations where the roadway, crossing facilities, and pathways are not under the direct control of the transit provider, the agency should work with other involved transportation agencies to provide the necessary facilities or relocate the bus stop to a more suitable location. A coordinated effort by transit agencies and owners and operators of related transportation facilities will result in the provision of safe facilities for pedestrians. In addition to the benefit of reduced liability for the transit agency, improved safety can translate to a more appealing transportation option and ultimately lead to increased ridership.

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1. “That part of a roadway at an intersection included within the connections of the lateral lines of the sidewalks on opposite sides of the highway measured from the curbs, or in the absence of curbs, from the edges of the traversable roadway; and in the absence of a sidewalk on one side of the roadway, the part of a roadway included within the extension of the lateral lines of the existing sidewalk at right angles to the centerline.
2. Any portion of a roadway at an intersection or elsewhere distinctly indicated for pedestrian crossing by lines or other markings on the surface.”

Thus, a crosswalk at an intersection is defined as the extension of the sidewalk or the shoulder across the intersection, regardless of whether it is marked or not. The only way a crosswalk can exist at a midblock location is if it is marked. Most jurisdictions have crosswalk laws that make it legal for pedestrians to cross the street at any intersection, whether marked or not, unless the pedestrian crossing is specifically prohibited.”

Text taken from: *Safety Effects of Marked versus Unmarked Crosswalks at Uncontrolled Locations: Executive Summary and Recommended Guidelines*. C.V. Zegeer, J. Stewart, and H. Huang, US Department of Transportation, Federal Highway Administration, Report No. FHWA-RD-01-075, March 2002.

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