

Chapter 4

Pedestrian Design Guide

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Introduction

Most of the public generally considers pedestrian facilities to be limited to sidewalks; however, they encompass a much broader scope of services and facilities. Pedestrian facilities include, but are not limited to, traffic control devices, curb ramps, grade separations (overpasses and underpasses), crosswalks, and design features intended to encourage pedestrian travel (such as traffic calming devices including speed bumps or center refuge islands). In general, these facilities parallel the roadway system and are provided as part of the public right-of-way.

Pedestrian facilities or “pedestrian lanes” provide people with space to travel within the public right-of-way that is separated from roadway vehicles. They improve mobility for pedestrians and provide access and an alternative means of travel to and from home, work, parks, schools, shopping areas, and transit stops. They also provide places for children to walk, run, skate, bike, and play. Where no walkways are provided, or where walkways are in poor repair or have missing sections, the following conditions often result:

- People may be forced to walk in the roadway, resulting in increased pedestrian/motor vehicle collisions. About 8 percent of all pedestrian crashes involve people walking along the road.
- Without a safe and well-maintained place to walk, people are discouraged and, in extreme cases, prevented from walking. For example, children have a difficult time walking to school and seniors cannot access nearby shops.
- The absence of sidewalks can eliminate access to all destinations for some people with disabilities. Even short gaps in sidewalk facilities make nearby destinations completely inaccessible to these individuals.
- Not providing a safe place to walk does not accommodate the needs of people who rely on walking as a mode of travel.

The solution is to provide good facilities for people to walk. Establishing policies and design standards to ensure that safe places to walk will be developed is a good starting point in making a community more walkable. With these policies and design standards in effect, the development of pedestrian linkages becomes routine and a natural part of highway, road, and street planning, design, and construction processes. The policies may be part of a local comprehensive plan, or they can be included in metropolitan or statewide long-range transportation plans. Design standards can also be included as a part of local or county development codes.

Implementation Strategies

Establishing walkable linkages requires a well thought out approach that may take several years to implement. Here are three strategies to consider:

1. Regulate new development and re-development Official policies and related ordinances promote making walkway installation “automatic.” When policies and ordinances are changed, include this type of provision.

2. Capital projects Look for opportunities to install sidewalks as part of capital projects. In urban and/or suburban situations, add sidewalks when widening a road or installing a sewer line in the right-of-way. Typically, sidewalks will add only a small amount to the overall project budget and extra savings can result when expenses, such as excavation, can be lumped together.

3. Adjacent property owners Many communities give property owners the option of installing curbs, gutters, and sidewalks through a Limited Improvement District (LID). With a LID, property owners pay

the cost (or a percentage) over time. This can be expensive and may generate opposition to sidewalks in general. However, if they are locally acceptable, LIDs can be an important part of establishing pedestrian facilities.

Ensuring continuity throughout the pedestrian infrastructure can improve pedestrian safety and increase the likelihood that more people choose to walk more often. This portion of the Kane County Bicycle and Pedestrian Plan shall describe best practices for the design and placement of pedestrian facilities by taking into consideration the following:

- Pedestrian Walkway Types
- Recommended Sidewalk Design
- Sidewalks in Rural & Developing Areas
- Accessibility
- Crosswalks Pedestrian Crossing Enhancements
- Sidewalk Prioritization Criteria
- Safety Education and Enforcement
- Sample Ordinances
- Design References
- Reference Sources



It is obvious that pedestrians use this area, due to the “desire lines.”
Limited right-of-way and utilities will make retrofitting a sidewalk difficult along this arterial road.

Walkway Types

It is much safer for pedestrians to have a walkway separated from automobile or other types of motorized vehicle traffic. However, in many instances, this is not reflective of existing conditions. Hence, there are several different recognized types of walkways.

Sidewalks In urban and suburban environments, the preferred facility for pedestrians is a sidewalk. Sidewalks are typically constructed of concrete and located adjacent to curbs and separated from the roadway by a buffer zone. They provide positive separation from motor vehicle traffic, a hard smooth surface on which to walk, and the opportunity to clearly indicate crossing points and movements at intersections.

This chapter shall focus policy and design recommendations on the placement of pedestrian sidewalks, since they are the most recognized, most widely constructed, and most visible form of walkway.

The recommended standard minimum sidewalk width is 5 feet.

Multi-Use Paths In fringe areas outside or near the limits of an urban boundary, a path may be appropriate along rural roads connecting to just one or two specific destinations. A common example is a path leading to a school in a rural setting, where sidewalks, curbs and drainage are not warranted. A high level of attention must be paid to safety at their intersections with roadways.

Paths may attract multiple user types, including bicyclists and skaters as well as pedestrians. Paths are usually separated from the traveled portion of the roadway and the highway right-of-way. Paths may be paved or unpaved; however, when unpaved, they should be smooth and firm enough to meet ADA requirements.

The recommended width for multi-use paths is 8 - 10 feet, depending on its location and user volume.

Shoulders Shoulders on roadways, when designed according to AASHTO recommendations, are usually wide and smooth enough to accommodate pedestrians in rural areas where the provision of sidewalks or paths may not be practicable or feasible. In rural areas that are more residential in character but do not have high enough densities to warrant sidewalks, there should be at least 4-foot wide shoulders to accommodate pedestrian and bicycle traffic. Shared use of such shoulders by other users, including motor vehicles, should be expected.



In this rural area, there are adequate paved shoulders for pedestrians or cyclists

However, using shoulders as the primary type of pedestrian facility is problematic. It opens up points of conflict between pedestrians and motorists. Paved shoulders should only be a last-resort, low-cost pedestrian facility.

Sidewalks vs. Bikeways Sidewalks are not to be used as bicycle facilities unless no other option is available. Sidewalks should not be identified as part of a bikeway network. Conflicts arise when pedestrians share sidewalks with bicyclists. Due to the horizontal operation space of both parties, a standard sidewalk does not allow for adequate passing space.



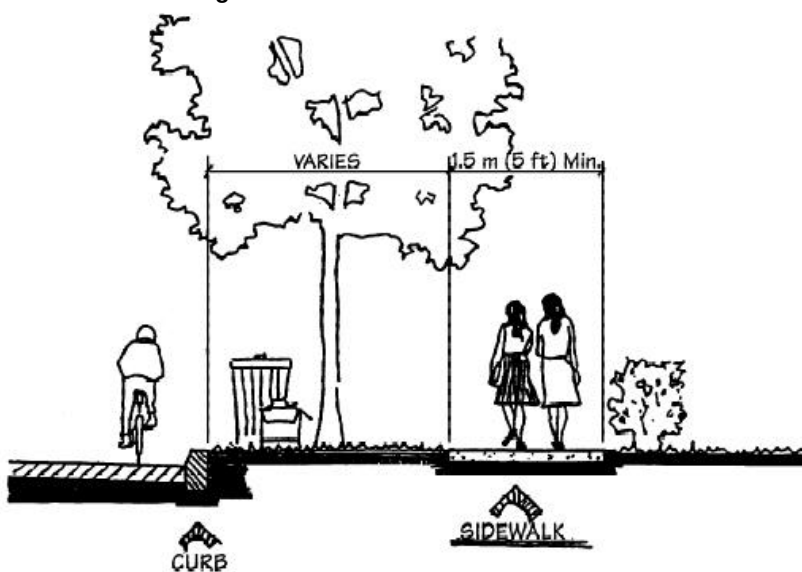
Typically it is only recommended that children operate bicycles on sidewalks. Some local governments, such as the City of Chicago, passed ordinances prohibiting any person over the age of 12 to operate a bicycle on a sidewalk. Other municipalities ban the use of bicycles on sidewalks in downtown districts or areas where there are high levels of pedestrian activity and potential conflicts.

Recommended Sidewalk Design

It is a concern that local governments in Kane County have used varying design standards for sidewalks in urban and rural areas, resulting in lack of continuity of facilities across the county. A commonly applied set of pedestrian facility standards will create a predictable environment for pedestrians that promote network development.

Sidewalk Width For two people walking side-by-side or passing each other while traveling in opposite directions on a sidewalk, the average space occupied is 4 feet 8 inches. In considering accessibility standards, the ADA Design Board calculates that an average wheelchair occupies approximately three feet of horizontal space. It can be reasoned that a wheelchair user and ambulatory pedestrian would occupy at least five feet of horizontal space. Sidewalks in low and high traffic areas should be designed to consider these dimensions.

Figure 1: Pedestrian Sidewalk Widths



Source: New York Department of Transportation Highway Design Manual

The Institute of Transportation Engineers (ITE) has a design guide for the development of roads that includes design standards for curbs, gutters, and sidewalks. It recommends a **minimum sidewalk width of 5 feet** to allow two people to pass comfortably or to walk side-by-side if there is a buffer between the sidewalk and the street. A six-foot wide sidewalk is recommended if it abuts the back of a curb.

The width of a sidewalk or walkway needs to comfortably accommodate the volume of pedestrians normally using it. For example, on a neighborhood

collector that provides a high volume of pedestrian access to a school, park, or other popular destinations, it may be desirable to provide wider sidewalks. In high use areas, such as central business districts, sidewalks can be 10 to 15 feet wide, if necessary. Conversely, when excessively wide sidewalks are located in areas with low pedestrian volumes, the expansive pavement and empty-looking sidewalks are uninviting to pedestrians. Please refer to Table 4, which describes recommended sidewalk and buffering widths.

Sidewalks on bridges may require special consideration. In the State of Connecticut, the minimum sidewalk width on a vehicular bridge for new construction or reconstruction is 5 feet. For pedestrian bridges, the curb-to-curb width should generally match the approach pathway's width. Sidewalks should be carried across a bridge in all circumstances, even if approaching sidewalks are missing, in anticipation of the connecting pedestrian facilities. AASHTO recommends pedestrian-only bridges to be 12 feet wide when serving multi-use trails, to allow for maneuvering of pedestrians and cyclists and for access of emergency vehicles, if necessary.

Constructing sidewalks that “meander” should be avoided. While they may be aesthetically pleasing, they typically do not serve a transportation need, and pedestrians may leave the facility and create their own, informal path.

Table 4 below illustrates recommended sidewalk widths for different street types.

TABLE 4: Recommended Sidewalk Width Based on Street Conditions

	Principal Arterial	Minor Arterial	Neighborhood Collector	Local Residential
# Lanes	4-6	2-4	2	2
Sidewalk Width with Buffer Strip	6 feet	6 feet	5 feet	5 feet
Sidewalk Width on Curb (No Buffer)	6-8 feet	6-8 feet	6 feet	5 feet
Central Business District Sidewalk Width	10 - 15 feet	10 - 15 feet	Not Applicable	Not Applicable

Slope Sidewalks are typically constructed with a maximum cross slope of 2 percent (1:50), which is also the maximum cross slope allowed for accessible routes of travel. The cross slope facilitates positive drainage toward the street or adjacent planting buffer. Drainage grates are best located outside the route of pedestrian travel. If this is not possible, the grate, as well as manhole covers, hatches, vaults and other utility coverings, should not have openings greater than 0.5 inches in width and should be mounted flush with the level of the pavement.

A comprehensive list of pedestrian facility design resources are listed at the end of this chapter.

Location: Both Sides Versus One Side In almost every instance, it is desirable to provide sidewalks on both sides of streets used by pedestrians. Pedestrians are also encouraged to walk on the side of the roadway facing traffic, unlike bicyclists who ride with the direction of travel. Providing sidewalks on both sides enables pedestrians to travel facing traffic in either direction, and minimizes the need for pedestrian crossing points.

Several factors influence the decision of whether to place sidewalks, walkways, and widened shoulders on both sides or one side. These factors include the available space within the right-of-way, the existing physical limitations on the roadside, and which side of the street origins and destinations (such as bus stops) are located. A sidewalk on one side may be adequate for some local streets, especially when this improves a condition where there were no sidewalks previously.

Sidewalk Buffer Area Sidewalks alongside roadways are often separated by planting strips consisting of natural vegetation or landscaping that create a buffer from the noise and splash of moving vehicles often separates sidewalk Buffer Area. Planting buffers (also referred to as planting strips, landscape strips, landscape buffers, and nature strips) are generally considered to be an effective separation treatment between walkways and streets in all types of settings. The added separation of a planting buffer helps a pedestrian feel more comfortable when walking along the street. The buffer area also provides space for streetlights, fire hydrants, utility boxes, and bike racks. Other advantages of buffer areas include:

- Sidewalk can be at a constant level grade across driveways, avoiding dipping at every driveway cut.
- An area is provided for drainage runoff.
- Aesthetic enhancement, increasing the appeal of the walkway and pedestrian environment.
- If planted with trees, they can provide shade and wind protection.

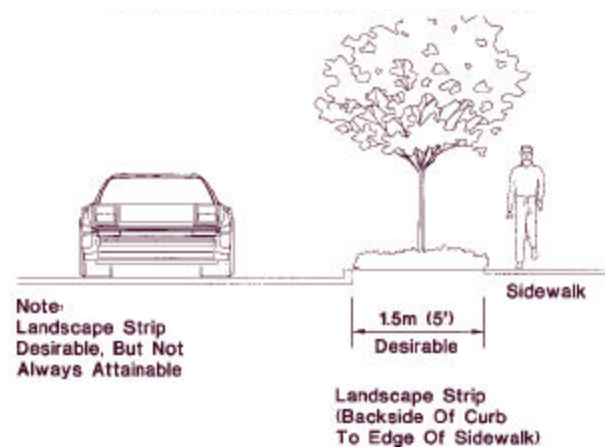


Well-designed arterial and collector streets should include a planting strip as a standard. A planting strip should be **at least 5 feet wide**. Since any buffer is better than no buffer, if right-of-way is limited, a 3-foot buffer may be sufficient. Buffer landscaping should be relatively low maintenance and should not obstruct vision of pedestrians or motorists at intersections. Disadvantages of planting buffer strips may include:

- Maintenance that varies depending on the type of landscaping selected.
- If not designed and maintained properly, landscaping may hinder visibility and cause security problems.
- Root growth can sometimes lift and buckle sidewalks, creating a tripping hazard.

Wider sidewalks covering the full lot frontage facing the public right-of-way are generally justified and often required in commercial areas, through adjoining multiple-residential complexes, near schools and other pedestrian generators, and in areas where border width is restricted. Parked cars also provide a degree of separation and a buffer zone in urban areas.

Figure 2: Planting Buffer between the Sidewalk and Street



A swale ditch is sometimes used as a buffer area. It provides an economical alternative to curb and gutter sections. However, attention should be paid to the slopes of the swale to allow for maintenance.

Street Furnishings, Utilities, and Related Clearances Sidewalks should be continuous and should be part of a system that provides access to goods, services, transit, and homes. Well-designed walking environments are enhanced by urban design elements and street furniture, such as benches, bus shelters, trash receptacles, and water fountains. A pedestrian facility with these features creates an environment that encourages walking and social interactions.



This fireplug is poorly located and obstructs sidewalk movements.

must also be properly maintained and kept clear of debris, overgrown landscaping, tripping hazards, or areas where water accumulates.

However, sidewalks should be clear of all obstructions such as street furniture, sign posts, utility and signal poles, mailboxes, parking meters, fire hydrants, and trees. These obstructions should be placed between the sidewalk and the roadway, to create a buffer for increased pedestrian ease.

A clear travel way of 3 feet minimum is recommended on all sidewalks around obstructions and street furniture. This provides for sufficient clearance of wheelchairs or people with other mobility impairments. Sidewalk areas

Clearance to vertical obstructions, such as signs and tree branches, must be at least 5 feet.

Transit Stop Treatments Well-designed routes to public transportation connections and the transportation stop are important components of pedestrian facility design. Transit stops should be designed to provide safe and convenient access and should be comfortable places for people to wait. Adequate bus stop signing, lighting, a shelter with seating, trash receptacles, and bicycle parking are desirable features.

Proper placement of bus stops is key to user safety. For example, placing the bus stops on the near side of intersections or crosswalks may block the pedestrian's view of approaching traffic, and the approaching driver's view of pedestrians. Approaching motorists may be unable to stop in time when a pedestrian steps from in front of a stopped bus into the traffic lanes at the intersection. The bus stop location should be fully accessible to pedestrians in wheelchairs, should have paved connections to sidewalks where landscape buffers exist, and should not block pedestrian travel on the sidewalk.

Horizontal clearance from transit stop facilities should be equal to that of other street furnishings.

Sidewalks in Rural & Developing Areas

Sidewalks are integral parts of city streets, but few are typically provided in rural areas due to the low perceived usage and high costs to install. Yet, a need exists in many rural areas because higher traffic speed and general absence of lighting increase the potential for accidents for those walking on or adjacent to a roadway. Available data suggests that sidewalks in rural areas reduce pedestrian accidents.

In low use rural areas, many pedestrian movements can be cost-effectively accommodated through improvements to roadway shoulders. In moderate use rural and suburban areas, sidewalks are most justified at points of community development such as at schools, local businesses, and industrial plants that result in pedestrian concentrations near or along the highways. In high-use pedestrian areas such as state parks, recreation areas, and small towns, pedestrian facilities such as sidewalks, crosswalks or grade separations are appropriate.

When suburban residential neighborhoods are first developed, construction of a street hierarchy within the development is necessary. These streets are designed for the safety of motorists through the careful design of street widths, drainage, turning radii, and separation of local and through traffic. While there may be existing roads to access the new development that were constructed by municipal or county governments, development of streets within a new subdivision is typically the responsibility of the developer. Construction of a pedestrian network with sidewalks and paths should also be the responsibility of the developer, using the same type of considerations that are applied in the design of residential streets.

Unfortunately, this responsibility is often deferred to the point of never being realized or the responsibility not clearly defined in the development code. To clarify this responsibility, county and local governing bodies can adopt and implement development regulations (zoning, subdivisions, and building codes), which require property owners in urban areas to provide and maintain sidewalks consistent with local comprehensive plans.

Sample ordinances for the provision of sidewalks in the development of residential neighborhoods are in **Appendix H** and later in this chapter.





The sidewalk precedes development in this suburban-rural location.

Accessibility

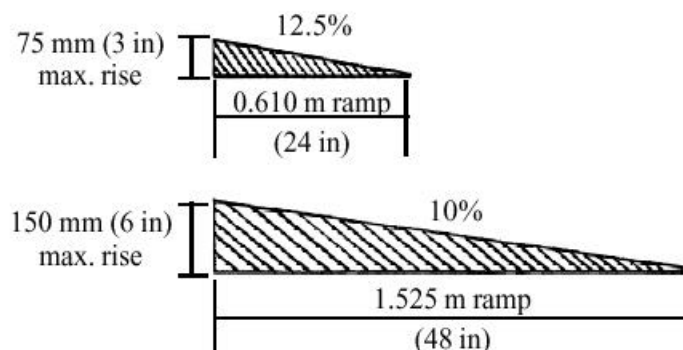
Sidewalks should be accessible to all users -- including those with disabilities. Whenever sidewalks or walkways serve as a route of travel between public buildings or facilities, they are required to be designed in accordance with the provisions of the Americans with Disabilities Act (ADA). The key provisions to comply with the ADA include: curb cuts, limiting slopes of ramps, intersection crossings, and sidewalk width. Here are some specific ADA design and construction considerations for pedestrian facilities:

- The desirable sidewalk width is 5 feet and the minimum passage width is 3 feet.
- If a 3-foot wide walkway must be used, a 5-foot by 5-foot passing area is required at intervals not to exceed 200 feet.
- For walkways adjacent to a roadway, the walkway may follow the natural grade of the land.
- The maximum allowable cross-slope of a walkway is 2 percent (1:50).

Curb Ramps Curb ramps or wheelchair ramps provide access between the sidewalk and roadway for people using wheelchairs, strollers, walkers, crutches, handcars, bicycles, and also for pedestrians with mobility impairments. Curb ramps must be installed at all intersections and mid-block crossing locations. Where feasible, separate curb ramps for each crosswalk at an intersection should be provided rather than having a single ramp at a corner for both crosswalks. This provides improved orientation for visually impaired pedestrians.

Figure 3: Ramp Slopes

If an 8.33% slope is not achievable, the profiles below are acceptable ramps for alterations of existing facilities. They are NOT acceptable slopes for new facility construction.



Source: USDOT FHWA *Designing Sidewalks and Trails for Access: Part I of II: Review of Existing Guidelines and Practices*

The Access Board, the governing body of the ADA Accessibility Guidelines, recommends a clear width of a curb ramp of at least 48 inches, excluding flares. However, the Uniform Federal Accessibility Standards (USAF) recommend just a 36-inch minimum curb ramp width. The average wheelchair is approximately 28 inches wide, so a 48-

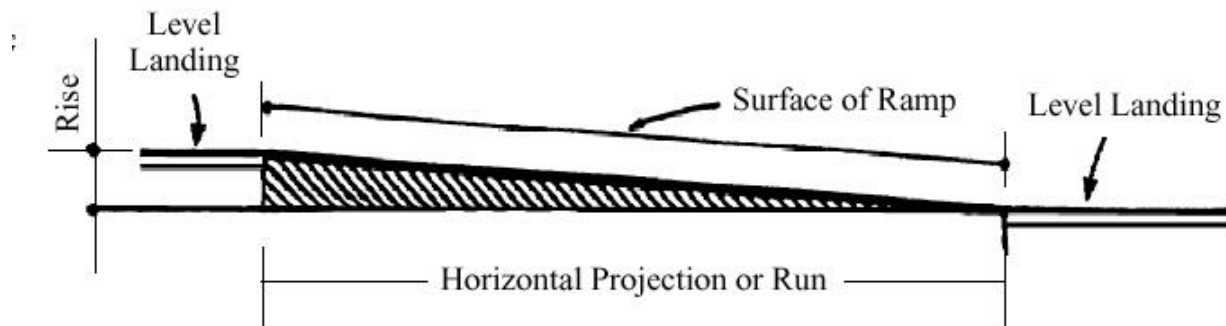
inch ramp allows for an ambulatory person and wheelchair user to navigate a curb ramp side by side, and may be the preferred standard.

The least possible slope should be used for any ramp. Wheelchair ramps must have a slope of no more than 1:12 (1 in/ft) or a maximum grade of 8.33 percent, with a maximum side slope of 1:10, and must be designed in accordance with the ADA guidelines. In retrofitting situations where space prohibits the installation of an 8.33 percent ramp, ADAAG allows a slope between 8.33 percent and 10 percent for a maximum rise of 6 inches or a slope between 10 percent and 12.5 percent for a maximum rise of 3 inches. This is demonstrated in **Figure 3** (previous page).

Curb Ramp Landings. Landings provide a clear level space at the top of the curb ramp and flush with the street at the bottom of the sidewalk. If there are no landings, a wheelchair user may accidentally begin to roll back into the street. Minimum landing dimensions are derived from the need to provide a five-foot diameter turning circle. Landings need to be positioned at locations that provide the user with directional choices or where the user must wait for a suitable time to cross the street. Landings should have a minimum clear dimension of a 60-inch by 60-inch square or 60-inch diameter circle.

A curb ramp and landing is necessary wherever the pedestrian route crosses a sidewalk/ street transition, including intersections, mid-block crosswalks, medians and islands traversed by crosswalks, alleys, and accessible parking aisles.

Figure 4: Curb Ramp Landings



Accessible Push Buttons Pedestrian actuators or push buttons should also be accessible to people with disabilities. The location of push buttons should meet following minimum requirements:

- **Adjacent to landing.** The push button shall be mounted adjacent to a clear ground space or a landing at least 32 inches by 54 inches. This clear ground space may overlap entirely with the pedestrian access route.
- **Proximity to approach.** Where a parallel approach to the push button is provided, controls shall be centrally placed within 10 inches of the clear ground space, measured horizontally.
- **Direction of control face.** The control face of the push button shall be parallel measured horizontally to the direction of the crosswalk controlled by the push button, and no closer than 30 inches to the curb face.
- **Mounting height.** The centerline of the push button shall be mounted 42 inches above the clear ground space for approach.

- **Close to crosswalk.** The push button shall be mounted no further than 5 feet from the extension of the crosswalk lines, and within 10 feet of the curb face, unless the curb ramp is longer than 10 feet.

Accessible Crossing Time There should be sufficient time in the traffic signal cycle to permit people to cross the street. The general standard for rate of pedestrian travel in a crosswalk is 4 feet per second; however, it is believed that this rate is not representative of the general population, particularly persons with disabilities. If there is an expected high volume of people with disabilities, elderly people, or school children, signal phase timing should be calculated using a pedestrian walk speed of 3.5 feet per second. Also, designers should consider extending the time for pedestrian crossing beyond the calculated requirement if the grade of the crosswalk is greater than 1:20 or the crosswalk length is greater than 50 feet with no intermediate pedestrian refuges.

Accessibility Resources. There may be other accessibility issues with crosswalks, curb cuts, and pedestrian signals that should be carefully examined. These issues include placement of curb cuts, pedestrian signals with audio warnings and accessibility at transit stops. Design guidance for these facilities as well as the ones already described can be obtained from the resources listed below. These resources were used in the compilation of this section.

Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG), 1991

U.S. Architectural & Transportation Barriers Compliance Board
1111 18th Street, N.W., Suite 501
Washington, D.C. 20036-3894
(202) 653-7834 v/TDD
<http://www.access-board.gov/adaag/ada-ag.txt>

Public Rights-of-Way Access Advisory Committee -- Final Report

January 2001
Architectural and Transportation Barriers Compliance Board (ATBCB)
1331 F Street, NW, Suite 1000
Washington, DC 20004-1111
(202) 272-0080
<http://www.access-board.gov/prowac/commrept/index.htm>

Uniform Federal Accessibility Standards (UFAS), 1984

Architectural and Transportation Barriers Compliance Board (ATBCB)
1331 F Street, NW, Suite 1000
Washington, DC 20004-1111
(202) 272-0080
<http://www.access-board.gov/ufas/ufas-html/ufas.htm>

Crosswalks and Pedestrian Crossing Enhancements

A crosswalk is defined as the portion of roadway designated for pedestrians to use in crossing the street. They indicate preferred locations for pedestrians to cross and help designate right-of-way for motorists to yield to pedestrians. Crosswalks are often installed at signalized intersections and other selected locations. They are typically assumed to be most beneficial at signalized intersections, particularly in urban areas and at locations where there are pedestrian signals.



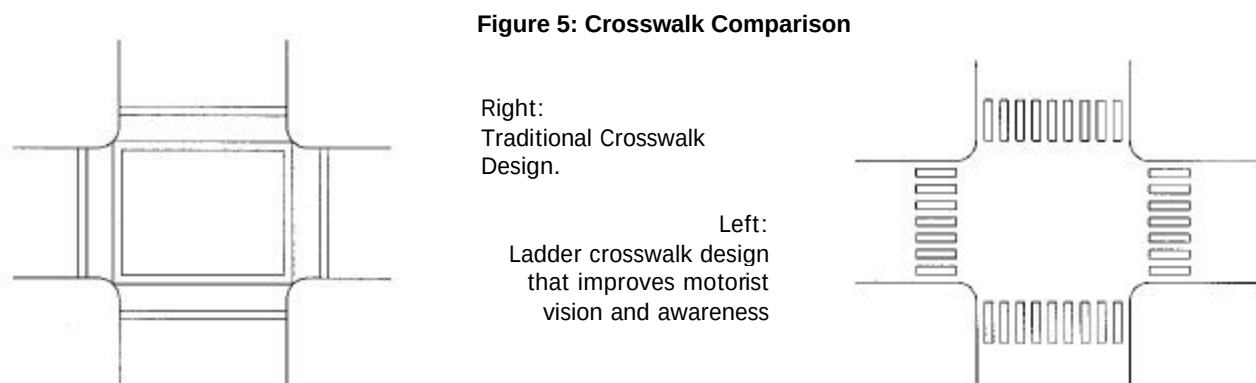
Marked vs. Unmarked Crosswalks There is some controversy concerning the effectiveness of installing crosswalks at every street intersection. There have been numerous studies in the last 20 years on this subject. Some of these studies indicate that motorists are more likely to yield at a marked crosswalk rather than an unmarked one. Other studies indicate that standard marked crosswalks may not command the attention and respect of motorists, offering little significant improvement in pedestrian safety.

No set of guidelines can cover every situation or guarantee improved safety. For marked crosswalks to be continually effective they must be located and designed in accordance with good judgment and accepted engineering practices. *The Manual of Uniform Traffic Control Devices (MUTCD)* states that “crosswalk markings should not be used indiscriminately.” Overuse should be avoided to maximize the effectiveness of those crosswalks that are marked. Marked crosswalks are generally recommended at the following locations:

- Locations that can concentrate or channelize multiple pedestrian crossings to a single location.
- Locations where there is a need to delineate the optimal crossing location, due to confusing geometrics or traffic operations.
- Approved school crossings or at crossings on recommended safe routes to school.
- Other locations with high numbers of pedestrian crossings (more than 25 pedestrians per hour) or conflicts between pedestrians and vehicles.
- Locations where pedestrian cross to channelized islands when the volume of pedestrians times the number of vehicles exceed 800 per hour. Crosswalks are not recommended at lower levels of conflict.

Crosswalks should be placed in accordance with the MUTCD. However, it is often stated that the most essential tool for use in determining crosswalk placement is engineering judgment. Public input should also be heeded in selecting locations for crosswalks.

Design of Crosswalks In designating a pedestrian crosswalk, a minimum 6-inch solid white line is recommended. ITE recommends crosswalk lines between 10 and 12 inches, with wider lines or advanced stop lines used when greater emphasis is considered helpful. However, other patterns are now being used to provide more distinction.



The MUTCD requires a minimum crosswalk width of 6 feet. The Florida Department of Transportation (FDOT) recommends a 10-foot wide crosswalk at crossings that receive high use.

Crosswalks need to be kept close to the turning traffic so that pedestrians stay within a driver's line of sight. The MUTCD recommends keeping the crosswalk lines within 2 feet of the lateral lines of the highway. If this cannot be achieved, it is essential to stay as close as possible.

Mid-Block Crossings In some urban areas where distances between intersections are long, a mid-block crossing provides pedestrians an opportunity to cross the street safely. Mid-block crossings also provide convenience and safety in less developed areas where pedestrian activity is high, such as by apartment buildings, stores, schools, parks, or transit stops.

Locations considered for a mid-block crossing need to be carefully studied. The following guidance for determining locations for mid-block crossing installation is provided by the ITE manual, *Design and Safety of Pedestrian Facilities*:

- Where the crossing can serve to concentrate or channelize multiple pedestrian crossings to a single location.
- At approved school crossings or crossings on recommended safe school walk routes.
- Where land uses create high concentrations of pedestrians needing to cross (such as residential areas across from retail or recreation, and transit stops across from residential or employment).
- Where pedestrians could not otherwise recognize the proper place to cross or there is a need to delineate the optimal location to cross.

There are design variations to consider at mid-block crossings. Determining methods of crossing design treatments and related traffic control requires careful consideration and traffic engineering analysis of existing conditions on a case-by-case basis.

Advance pedestrian warning signs should be installed to warn motorists of pedestrian crossing activity. There are crosswalk markings that stand out at night or during adverse weather conditions. The crosswalk and signage should be adequately lit and additional lighting may be helpful. The crossing should be designed to ensure there is adequate sight distance for the motorist and pedestrian. Any obstacles that would interfere with visibility at the crossing location (mailboxes, utility poles, street furniture, and landscaping) should be removed or relocated.

Whenever possible, and especially on busy arterial or multi-lane streets, a median refuge island should be installed at mid-block crossing locations. This allows pedestrians who cross mid-block to focus on one direction of traffic at a time, thus simplifying the crossing task, and breaking a longer crossing into two shorter crossings.

It should be noted that marked crosswalks at mid-block crossings are meant to guide pedestrians to cross at the safest location. Mid-block crosswalks, unless signalized, should generally be avoided under the following circumstances:

- Located less than 300 feet from a traffic signal or bus stop where motorists are not expecting pedestrians to cross.
- Within 600 feet of another crossing point, except in central business districts or other locations where there is a well defined need. The recommended minimum separation in most cases is 300 feet.
- On high-speed streets with speed limits above 45 mph.

Crosswalk Materials It is important to ensure that crosswalk markings are visible to motorists, particularly at night. Some municipalities have chosen to use special reflective striping or pavement materials to make pedestrian crossings more visible. These special treatments are frequently used in special districts, such as historic districts or areas with high levels of pedestrian travel.



Any special crosswalk marking or paving should keep in mind the needs and safety of the pedestrians they are trying to protect. For example, thermoplastic tape or striping should not be slippery or create tripping hazards.

Some downtowns have made a significant investment in the use of color rich paver stones to delineate the intersection and crosswalks or create useful patterns. However, special attention should be paid to the materials; non-slip bricks or unit pavers should be used. Scored or stamped colored concrete surfaces can also be used and are generally more durable over the long term than unit pavers, with more uniform joints and less chance of displacement. If paver stones are used, they must be designed to eliminate the movement of the stones or bricks. Special paving surfaces should be installed and maintained in a smooth, level, and clean condition that does not negatively impact accessibility.

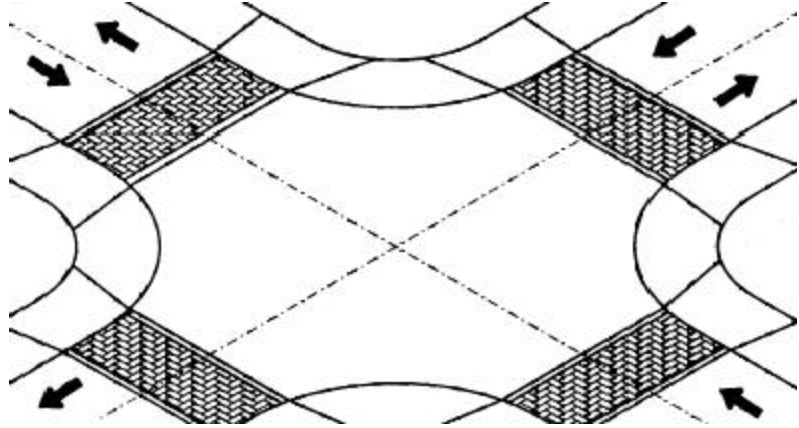


Figure 6: Example of crosswalk with special paving material

Crosswalks marked with buttons or reflective raised markers (RRMs) are not recommended. Any rumble effect given to motorists at this point is provided too late for use as advance warning, and the pedestrians who walk along the lines (especially older adults and blind pedestrians) may trip on the RRM's. They are also detrimental to wheelchairs and bicyclists. In addition, these devices should not be used in bike lanes or where bicycling traffic can be anticipated.



Recessed Stop Bar for traffic turning left

Stop Bars Stop bars may be used as a guide to indicate the optimal stopping location for motorists, and may be used in advance of marked crosswalks to help encourage motorists to stop further back from the crosswalk. Stop bars are normally 12 to 24- inch wide white stripes that extend across all approach lanes. Stop bars need to be located at least 4 feet in advance of the crosswalk, as indicated in the MUTCD and the *Wisconsin Department of Transportation Design Manual*.

Recessed stop bars are commonly applied. This improves the visibility of pedestrians and increases the stopping time for motorists before an intersection. Another benefit of recessed stop bars is that they allow larger vehicles turning left (or right) extra maneuverability space.

Additional Crosswalk Infrastructure Crosswalks can be used in conjunction with other measures, such as curb extensions, to improve the safety of a pedestrian crossing. This is particularly applicable on multi-lane roads with average daily traffic (ADT) above 10,000. Special crosswalk designs may include:

- **High Visibility Crosswalk Markings** Various crosswalk-marking patterns, such as ladder and zebra designs, are illustrated in the MUTCD. In



Zebra Crosswalk at the Great Western Trail

some cases, they can be raised and may be installed in conjunction with other enhancements that physically reinforce crosswalks and reduce vehicle speeds. Zebra crosswalks can be advantageous because they are higher visibility and require reduced maintenance. Properly placed, the wheels of crossing motorists can fall between the open spacing, thus allowing the markings to remain visible much longer than with other markings.

- **Raised Crosswalks** Raised crosswalks raise the level of the pavement to the height of the curb. The grade change slows traffic and heightens a motorist's perception of the intersection environment. However, they are not recommended on busy arterial streets.
- **Streetlights** Sufficient lighting should insure that drivers can see pedestrians.
- **Adequate Sightlines** Traffic engineers should design crossings while being aware to remove clutter such as street furniture, newspaper boxes, or utility boxes which impede a pedestrian's vision of traffic or a motorist's vision of pedestrians.
- **Street Print** Asphalt can be indented or colored to set it apart from the rest of the roadway at crosswalks. This increases visibility for both motorists and pedestrians.
- **Mounted Warning Lights** Recently MUTCD approved a crosswalk design with inset warning lights. The lights flash, which greatly improves their visibility on wet pavement or at night.
- **Turning Restriction** "No Turn on Red" signs and regulations reduce conflicts between motorists and pedestrians at intersections.
- **Pedestrian Signals** Pedestrian signals provide a form of traffic control for pedestrians. Although pedestrians may ignore them, it is better to have them present. Recent pedestrian signal designs include a count down signal, which tells pedestrians the remaining time to cross a street.
- **Traffic Calming** As stated above, using methods to calm or slow down traffic gives pedestrians better opportunities to cross streets and gives motorists more reaction time to avoid potential crashes. Popular methods of traffic calming at intersections include curb bulb outs, center median refuge islands, and increased curb radii.

Sidewalk Prioritization Criteria

In providing pedestrian facilities, local government responsibility typically include adopting comprehensive plans that include interconnected systems for pedestrian movement in urban areas. Other responsibilities may include maintaining crosswalks, traffic control devices, and sidewalks within urban areas to ensure convenient and safe pedestrian connections across roadways under their control. However, the typical responsibility concerning pedestrian facilities may not include identifying and completing the gaps in facilities, although they are encouraged to do so.

Some municipalities have set aside funds and initiated annual walkway installation programs. A second method to encourage governments to install sidewalks is to include these facilities when designing and constructing curbs, gutters, and drainage structures.

Since available financial resources limit the amount of walkways to be installed in a given year, projects should be selected with care. Here are several factors that may be used to rank candidate projects to fill in missing gaps in sidewalks:



- Sidewalk locations that would be used by school children, the elderly, or the disabled.
- Sidewalk gaps that provide connections to public transportation facilities.
- Sidewalk improvements requested by neighborhood groups, especially those that meet other priorities such as providing a route for school children.



This area is along a suburban arterial. As the area continues to develop, it becomes more important to have adequate pedestrian facilities.

Model Plan to Prioritize Sidewalks: Bloomington, Indiana

The City of Bloomington, Indiana, developed a four-step approach to systematically fill in missing sidewalk segments that are most needed in the community. The steps in their approach include:

- 1) Initial identification of general areas needing improvements
- 2) Data collection for the identified areas
- 3) Data entry analysis and ranking of segments; and
- 4) Revision of segments and decision-making process.

In step one, parents of area elementary school students were asked to identify areas around schools that needed improvements. Along with the parents' suggestions, proposed public works projects constituted the initial list of sidewalk segments to be studied further.

In step two, the type of data to be collected and analyzed for each street segment was determined based on draft criteria for project selection and prioritization as developed by the public works department. The sidewalk linkage criteria included: safety considerations, roadway classifications, pedestrian usage, proximity to destination points, and costs/feasibility.

Step three, data analysis, focused on roadway characteristics that made walking within a transportation corridor a pleasant or unpleasant experience. A scoring system developed for this analysis helped determine if a particular corridor could be made significantly safer for pedestrians by construction of a sidewalk (see the worksheet on the next page). To determine segment rankings, each missing sidewalk segment was assigned points for each roadway characteristic. The more points a segment scored, the higher priority was awarded to that particular link.



Sidewalk Prioritization Worksheet

Prioritization Category	Category Detail	Range	Point Value
Safety Characteristics – 12 Points Maximum	Traffic Speed	Greater than 45 mph	3
		40 mph	2
		30 mph	1
	Lane Width	Less than 11 feet	3
		12 feet	2
		13 feet	1
	Traffic Volume	Greater than 9000 ADT	3
		5000 - 9000 ADT	2
		1000 - 5000 ADT	1
	Street Classification	Primary arterial	3
		Secondary arterial	2
		Collector	1
Pedestrian Usage -- 12 Points Maximum	Proximity Attractor	Less than 1/3 mile	3 per attractor
		1/3 to 2/3 miles	2 per attractor
		2/3 to 1 mile	1 per attractor
Project Feasibility -- 12 Points Maximum	Intuitive point assignment based on field observations and public works cost estimates		1 - 12
Additional Factors -- 4 Points Maximum	Located along a bus route		2
	No sidewalk on either side of street		2
TOTAL POINTS			XX

Note: Higher total point value represents a higher priority for pedestrian facility construction.

In step four, the results of the ranking and prioritization process were balanced with an intuitive look at the overall community needs. Over time, the effectiveness of the prioritization system will be re-evaluated to ensure that programming of missing sidewalk linkages meets the changing needs of the community.



Model Sidewalk Capital Funding Plan: Arlington County, Virginia

In 1998, Arlington County created a Capital Construction Fund to be used for its Street Modernization Program. This program upgrades existing local and collector streets that are lacking curb, gutter, and sidewalk. It provides sufficient funding to improve approximately five miles of streets annually. In order to use the limited funds effectively and efficiently, a prioritization system is utilized. The prioritization factors are as follows:

- **Street Classification (10 points)** Collector streets (usually one-half mile streets) receive 10 points, local streets receive 5 points, and all others receive no points.
- **Available Right-of-Way (10 points)** This is based on the percentage of available right-of-way along the proposed project. The property owner must donate needed right-of-way or the street cannot be improved.
- **Developed Land Use (10 points)** This factor is based on the land use of the adjoining properties. Residential properties receive full credit, all others receive one-half credit and vacant property receives no credit.
- **Existing Condition (10 points)** Half streets (streets that are only improved to the centerline) get 10 points. Streets without curb and gutter on both sides get 5 points.
- **Neighborhood Revitalization (10 points)** This factor is based on the level of neighborhood support. Petitions and/or letters from property owners supporting the project are examples of support.
- **Other Factors (5 points each)** Other factors include access to schools, connection to bus routes, on a bike route, access to parks, bottleneck condition, and access to other large traffic generators (churches, shopping malls, etc).

Safe Routes to School analysis also contains a systematic method to evaluate pedestrian conditions on routes to schools. It includes an analysis of public perceptions, traffic accident data, and field surveying to select areas that may require pedestrian facility improvements. Similar methodology can be used to prioritize missing gaps in pedestrian facilities in conjunction with capital funding set aside for their construction.

Safety Education and Enforcement

Pedestrian fatalities from accidents with motorists have decreased almost every year between 1990 and 2000. Yet in 2000, 4,739 pedestrians were killed by motor vehicles in the U.S, or about 13 per day. In addition, another 78,000 were injured or about one every 7 minutes. While the public perceives the typical pedestrian accident occurring with young children, people of all ages and backgrounds are regularly victims. Accidents also occur in all parts of the country: on highways, low-volume country roads, and busy urban streets.

The federal government, local government, and numerous interest groups have initiated pedestrian programs to address pedestrian accidents. One component of success in many of these programs revolves around addressing the need for education on pedestrian issues. A pedestrian safety plan could be developed to address the following pedestrian safety education and enforcement goals:

- Achieving consistency in enforcement of traffic laws protecting pedestrians.
- Reaching uniformity and consistency in the accurate reporting of vehicle/pedestrian collisions across



Posting crossing signs may not be enough to protect pedestrians



- jurisdictions and within reporting agencies.
- Reducing substance impairment for both motorists and pedestrians.
- Raising the importance of pedestrian safety education in schools in order for it to receive comparable recognition with other social issues that schools address as part of their health curricula.
- Working with the media to raise public awareness on the benefits of walking.
- Developing an ongoing public information campaign for pedestrians and motorists that focuses on pedestrian awareness and safety laws.
- Incorporating more pedestrian safety issues as part of drivers education courses.
- Promoting “Safe Route to Schools.”
- Developing community support to create walkable communities.

The National Highway Transportation Safety Administration (NHTSA) developed a resource guide on laws related to pedestrian and bicycle safety. This guide contains traffic laws that are thought to affect pedestrian or bicycle safety, either positively or negatively. It can be used to select laws that enhance pedestrian or bicycle safety, to assess a state's position with respect to other states, or to examine the extent to which prevailing vehicle and traffic laws may impact the generation of pedestrian or bicycle crashes. To obtain a copy of this guide, visit the NHTSA website, listed below.

The State of Connecticut recommends the development and implementation of a special bicycle and pedestrian safety program targeted at pre-school and school age children. Education, engineering and enforcement are three key factors to be considered for bicycle and pedestrian safety. Helmet use, training children to ride bicycles safely, and an overall awareness of roadway dangers by cyclists, pedestrians, and motorists are critical components for making our roads safer for everyone.

References:

National Highway Transportation Safety Administration
<http://www-nrd.nhtsa.dot.gov/departments/nrd-30/ncsa/AvailInf.html>

Traffic Safety Facts 2000. The National Highway Traffic Safety Administration, U.S. Department of Transportation.

Pedestrian Facility Installation Ordinances

Establishing policies to ensure that there are safe places to walk promotes walking as a mode of transportation. With good policy and its implementation, the development of pedestrian linkages becomes a routine and a natural part of highway, road, and street planning, design, and construction processes. A good policy is to mandate the development of sidewalks with the development or improvement of any location along a public right-of-way. Tying in the construction of accessible pedestrian facilities can be a requirement to obtain an occupancy certificate for a residential, commercial, or industrial structure. Sample ordinances containing provisions for pedestrian accommodations are found in **Appendix H**.

Pedestrian & Bicycle Facility Design Resources

Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG), 1991
U.S. Architectural & Transportation Barriers Compliance Board
<http://www.access-board.gov/adaag/html/adaag.htm>

Design and Safety of Pedestrian Facilities, A Recommended Practice, 1998.
Institute of Transportation Engineers

Designing Sidewalks and Trails for Access (Part I & II)
U.S. Department of Transportation, Federal Highway Administration



Manual on Uniform Traffic Control Devices (MUTCD)

U.S. Department of Transportation,
Federal Highway Administration, 2000

Pedestrian Compatible Roadways-Planning and Design Guidelines, 1995.

Bicycle / Pedestrian Transportation Master Plan, Bicycle and Pedestrian Advocate
New Jersey Department of Transportation

Pedestrian Facilities Guidebook, 1997.

Washington State Department of Transportation, Bicycle and Pedestrian Program

Pedestrian Facilities Users Guide: Providing Safety and Mobility

U.S. Department of Transportation, Federal Highway Administration

Planning and Implementing Pedestrian Facilities in Suburban and Developing Rural Areas, Report No. 294A, Transportation Research Board

<http://nationalacademies.org/trb/>

Chapter 4 References

U.S. Department of Transportation Federal Highway Administration

Pedestrian Facilities Users Guide Providing Safety and Mobility

Connecticut Department of Transportation

Connecticut Bike and Pedestrian Transportation Plan, 1988

Florida Department of Transportation

Pedestrian Facility Design Handbook, 1999

Minnesota Department of Transportation

Minnesota Statewide Transportation Plan, 2000

Sustainable Transportation Initiatives

New Jersey Department of Transportation

NJDOT Pedestrian Compatibility, 1999

Oregon Department of Transportation

Oregon Bicycle and Pedestrian Plan, 1996

Washington State Department of Transportation, September

Washington State Pedestrian Facilities Guidebook, 1997

United States Architectural & Transportation Barriers Compliance Board

Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities, 1991

United States Department of Transportation - Federal Highway Administration

Manual on Uniform Traffic Control Devices, Millennium Edition, 2000

Wisconsin Department of Transportation

Wisconsin Bicycle Planning Guidance - Guidelines for Metropolitan Planning Organizations & Communities in Planning & Developing Bicycle Facilities, 1993

