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DELAWARE VALLEY
dvrpc
REGIONAL
PLANNING COMMISSION

Pedestrian and Bicycle Friendly Policies, Practices, and Ordinances

November 2011

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The symbol in our logo is adapted from the official DVRPC seal and is designed as a stylized image of the Delaware Valley. The outer ring symbolizes the region as a whole while the diagonal bar signifies the Delaware River. The two adjoining crescents represent the Commonwealth of Pennsylvania and the State of New Jersey.

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APPENDIX A

Executive Summary

This handbook provides information about practices, policies, and ordinances from various jurisdictions throughout the United States that enhance pedestrian and bicycle safety and accommodations. This report also highlights some educational campaigns that promote the Share the Road concept and encourage the use of non-motorized methods of transportation.

Some points to consider when reviewing the practices highlighted in this report are:

- Whenever possible, local examples are used to illuminate the concepts described in this report.

  The City of Philadelphia and many suburban municipalities already use many of these practices to improve the bicycle and pedestrian environment. Tried and true alternatives exist here in the Delaware Valley, and their proximity may provide inspiration for those seeking to enhance mobility.

- Many of these recommendations can be low-cost improvements.

  Rather than focusing on capital-intensive improvements, many of these recommendations involve paint or signage, or simply codifying already-established practices (such as sharing the road).

- The purpose of making these improvements is to enhance local mobility.

  Improving sidewalk maintenance, developing a system of bicycle-friendly streets, and requiring sufficient bicycle parking at key locations make it easier for people to incorporate walking and bicycling into daily activities.

The policies, practices, and ordinances described in these pages are not exhaustive, but highlight relevant options for municipal pedestrian and bicycle practice. This report should serve as a jumping-off point for local jurisdictions interested in improving accommodations for pedestrians and bicyclists.

Introduction

This handbook provides information about policies and practices in the realm of pedestrian and bicycle planning. It is divided into the following chapters:

Chapter 2: Pedestrian Planning
This chapter highlights information on sidewalk management and maintenance, crosswalk striping, landscaping, and other issues that impact pedestrians.

Chapter 3: Bicycle Planning
This chapter describes different types of bicycle facilities and proper application procedures, as well as bicycle parking practices.

Chapter 4: Education and Encouragement
This chapter reviews several campaigns that educate drivers, cyclists, and pedestrians on proper road etiquette and encourage the use of non-motorized transportation modes.

Chapter 5: Codes and Ordinances
This chapter provides language from several state/municipal codes and ordinances that deal with pedestrians and cyclists, including yield responsibilities at unsignalized crossings, how vehicles should pass bicyclists, and bicycle parking.

Appendix: Other Resources
The appendix lists other useful resources that deal with policies, practices, and ordinances related to pedestrian and bicycle planning.

This is not an exhaustive best practices guide, but a set of recommended policies, programs, and ordinances that have been used in various jurisdictions (including local ones) to strengthen pedestrian and cyclist safety and accommodations in state and city codes. Whenever possible, local examples have been used to illustrate the concepts described in this guide.

CHAPTER 2

Pedestrian Planning

This chapter highlights some best practices in the realm of pedestrian planning. The practices pertain to:

- Sidewalks (accessibility and maintenance);
- Crosswalks (and mid-block crossings);
- Pedestrian signals;
- Lighting;
- Landscaping;
- On-street parking; and
- Internal circulation.

Many of the practices highlighted in this chapter are recommended at the federal level by the Federal Highway Administration (FHWA), the Association of Pedestrian and Bicycle Professionals (APBP), or by other government entities or groups. The examples used to highlight these practices are local whenever possible.

Sidewalks

Accessibility

In order to ensure that sidewalks are accessible to pedestrians, FHWA promotes sidewalk dimensions based on a "zone system." These recommendations are echoed by the American Association of State Highway and Transportation Official's (AASHTO) *Guide for the Planning, Design, and Operation of Pedestrian Facilities*.

The zone system determines the width of the sidewalk corridor and ensures that obstacles, such as newspaper boxes or utility poles, do not limit pedestrian access. This zonal system was initially adopted in Portland, Oregon, and has become a common practice in many cities, including Philadelphia. The four zones and recommended minimum standards that comprise the zone system are listed below in Table 1.

Table 1: Sidewalk Zone System Dimensions

Zone	Minimum Width
Curb Zone	152 mm (6 in)
Planter/Furniture Zone	610 mm (24 in) [1.22 m (48 in) if planting trees]
Pedestrian Zone	1.525 m (60 in)
Frontage Zone	760 mm (30 in)*
Total Sidewalk Corridor	3.10 m (10 ft)*

Source: FHWA, 2001

The curb zone includes the curb as a buffer between the roadway and the pedestrian path. The planter/furniture zone is a designated area for benches, street trees, newspaper boxes, decorative markings, or other type of obstruction between the curb and pedestrian path. The pedestrian zone is the clear sidewalk area. The frontage zone is the buffer between the sidewalk and the building line. Figure 1 shows Haddon Avenue in Collingswood Borough, Camden County. The sidewalk configuration of the street there roughly corresponds to the FHWA recommendations outlined in Table 1.

Figure 1: Sidewalk Zonal System

Source: DVRPC, 2011

Municipalities with walkable commercial districts may want to adopt a similar system to ensure that the pedestrian realm is as accessible as possible, while allowing for landscaping and pedestrian amenities. **The recommended pedestrian zone width in Table 1 (five feet/60 inches) is a minimum standard and insufficient for most urban areas or walkable communities.** For these types of settings, AASHTO's guide recommends six to eight feet (72 to 96 inches) of clear space for pedestrians to walk.

Maintenance

The routine maintenance of sidewalk facilities is paramount to creating a comfortable environment for all pedestrians. Maintenance refers not only to repairing damage caused by tree roots and ensuring that sidewalks remain as level as possible, but also to ensuring that alternative routes are provided and clearly labeled when repairs block sidewalk access.

The primary issue in regard to maintenance is responsibility. In Pennsylvania, the onus of responsibility for sidewalk maintenance is on individual property owners. Some jurisdictions, however, have adopted alternative ways to fund maintenance of sidewalks.

In 2001, the City of Charlotte, North Carolina, switched from a system where residents were responsible for cost of materials and the city was responsible for construction, to a system where the city provides all materials and construction for sidewalk repairs. This change was implemented after a state law amendment enabled the city to spend motor fuel tax revenues on sidewalks. The city chose this approach to normalize the appearance and materials of sidewalks, enforce safety and accessibility standards, and lower administrative costs. Residents must still request repairs, and the city conducts an assessment to determine if that location is in need of maintenance.

The City of Madison, Wisconsin, adopted a 50/50 responsibility plan in which the city splits the costs of maintenance with abutting property owners if the owner requests that the city do the repair work. In cases where property owners decide to do the work themselves, a rebate is available.

Regardless of who is charged with maintenance responsibilities, it is crucial that the options available to property owners are clear and that all repairs be inspected to ensure their compliance with appropriate regulations. FHWA recommends adopting a sidewalk assessment program to document sidewalk conditions and prioritize improvements to best determine when and where maintenance is needed. A template for such an assessment is presented in Chapter 11 of FHWA's publication *Designing Sidewalks and Trails for Access*.

Crosswalks

FHWA's 2000 Uniform Vehicle Code (Section 11-112) defines a crosswalk as:

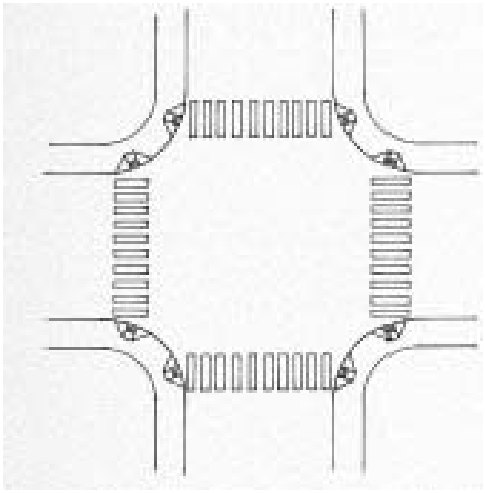
> That part of a roadway at an intersection included within the connections of the lateral lines of the sidewalks on opposite sides of the highway measured from the curbs, or in the absence of curbs, from the edges of the traversable roadway; and in the absence of a sidewalk on one side of the roadway, the part of a roadway included within the extension of the lateral lines of the existing sidewalk at right angles to the centerline.
>
> Any portion of a roadway at an intersection or elsewhere on the roadway that is marked for pedestrian crossing by lines or other symbols.

At an intersection, a crosswalk is an extension of the sidewalk over traffic lanes, whether there is a marking or not. At mid-block locations, crosswalks must be marked. Most local jurisdictions have adopted this stance, making it legal for pedestrians to cross at all intersections, marked or otherwise.

The Manual on Uniform Traffic Control Devices (MUTCD) (Section 3B.17) considers among the benefits of crosswalks that they "provide guidance for pedestrians…by delineating paths to and within intersections" and "serve to alert road users of a pedestrian crossing across roadways not controlled by traffic signals or stop signs." The MUTCD also provides guidance on marking crosswalks:

> Crosswalk width should not be less than 1.8 meters (6 feet);
>
> Crosswalk lines should extend across the full width of the pavement;
>
> Crosswalks should be marked at all intersections where there is significant conflict between motorists and pedestrians; and
>
> Crosswalk markings should be provided at points of pedestrian concentration, such as at pedestrian loading islands, mid-block pedestrian islands, and/or where pedestrians need assistance in determining the proper place to cross the street.

Figure 2: Continental Crosswalk Treatment



Source: FHWA, 2011

For marking crosswalks, FHWA recommends 'continental crosswalks' as the safest treatments. Figure 2 depicts the typical pattern associated with continental crosswalks. Recommended by FHWA because of its visibility to drivers, the ladder design is created with white longitudinal lines at a 90 degree angle to the line of the crosswalk. **It is recommended that the continental design be used consistently to mark all crosswalks.**

In traditional town centers and busy pedestrian-oriented main street shopping districts where lower vehicle speeds are desirable, enhanced crosswalks may be appropriate. Textured, colored, and raised crosswalks can be used for traffic calming to further slow vehicle speeds and improve pedestrian visibility. Figure 3 depicts a brick crosswalk in Camden, New Jersey.

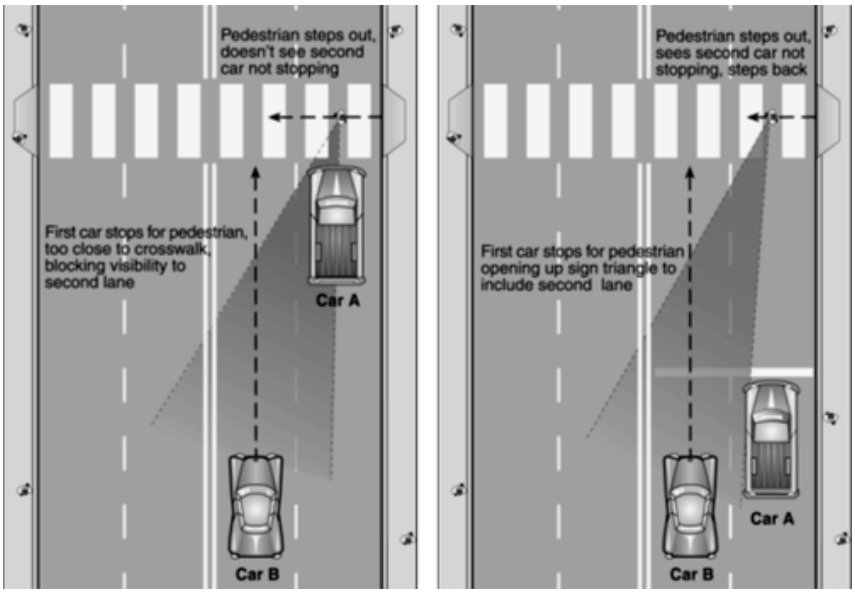
Figure 3: Enhanced Brick Crosswalks

Source: DVRPC, 2011

The crosswalk design above in Figure 3 allows ample room for pedestrians to cross the street safely, while also being more attractive than traditional crosswalks. The bricks also offer a reminder to drivers that they should not be stopped in the crosswalk. **There are, however, some drawbacks to these decorative crosswalks. Their visibility is less than that of traditional continental crosswalks, and textured surfaces can be difficult for wheelchairs.** The cost of upkeep must also be considered. There are several other ways to increase pedestrian safety and visibility. Some of these methods are described on the following pages and displayed in Figures 4, 5, and 6.

Figure 4 shows a diagram of an advance stop/yield bar at a mid-block crossing. Placing a stop bar in advance of an intersection (roughly four feet) allows pedestrians and drivers to have clearer views of each other. At mid-block crossings, a stop bar placed well in advance of the crossing can reduce the likelihood of a 'multiple threat' style pedestrian crash by providing more clear sight lines to both pedestrians and drivers. These stop bars should be supplemented with 'pedestrians cross here' signs.

Figure 4: Advance Stop/Yield Bar



Source: PBIC, 2011

Curb extensions, like those shown in Figure 5, extend the sidewalk into the parking lane, shortening the distance a pedestrian must cross as well as slowing traffic by narrowing the cartway. Additionally, they prevent cars from parking too close to the intersection, allowing pedestrians to better see oncoming traffic.

Figure 5: Bulb-Out/Curb Extension

Source: DVRPC, 2011

Figure 6 depicts a pedestrian refuge, a raised island placed in the middle of the road (at intersections or mid-block) to help protect crossing pedestrians from moving vehicles. This allows pedestrians to deal with traffic one direction at a time, but should not necessarily force pedestrians to take two signal phases to cross a street. Some roadways will be too wide to enable a single-phase crossing.

Figure 6: Pedestrian Refuge

Source: West Windsor Bicycle and Pedestrian Alliance, 2011

Mid-Block Crossings

Mid-block crossings are non-intersection locations where marked crosswalks have been provided. Mid-block crosswalks vary greatly in terms of driver compliance and safety, depending on a number of environmental factors.

Figure 7 depicts a mid-block crossing that has been enhanced with signage and a speed bump. In this context, the mid-block crossing provides pedestrian access from a residential area to an elementary school across the street.

Figure 7: Mid-Block Crosswalk with Signage

Source: League of Michigan Bicyclists, 2010

Pedestrian Signals

FHWA recommends that pedestrian signal indicators be used at all signalized crossings (unless pedestrians are prohibited), and the MUTCD recommends that the international pedestrian symbol be used.

Figure 8: International Pedestrian Symbol

Source: Gothamist, 2010

Figure 8 depicts the international pedestrian symbol signal recommended by the MUTCD. Rather than indicating 'walk' or 'don't walk,' this signal utilizes a man walking for 'walk' and a red hand indicating that pedestrians should not cross. It is recommended that as the 'walk' and 'don't walk' signals reach the end of their useful lives, they be replaced with this signal.

Pedestrian crossing times should be calculated based on a maximum walking speed of 3.5 feet per second, although many jurisdictions use a more generous (lower) calculation. **The crossing signal phase should be long enough to ensure that children, disabled individuals, and the elderly have time to cross.**

Crosswalks with high volumes of pedestrians and turning vehicles are often locations of conflict, when vehicles attempt to turn through intersections as pedestrians cross. These conflicts can be alleviated by utilizing a Leading Pedestrian Interval (LPI), where the pedestrian signal head shows the walk phase for several seconds prior to the traffic signal changing to the go phase for vehicles. The LPI gives pedestrians a head start to cross the street safely.

Intersections with the highest volumes of pedestrian activity could benefit from a pedestrian-only phase, also called a pedestrian scramble. This is a signal phase where vehicle traffic in all directions has a solid red, or stop phase, while the pedestrian signal heads show the walk phase in all directions. This type of phasing may allow pedestrians to cross an intersection diagonally, increasing mobility at high volume locations or intersections with major destinations situated diagonally across from each other.

Figure 9: Pedestrian-Only Signal Phase

Source: Traffic Safety Center, University of California at Berkeley, 2008

Figure 9 depicts a pedestrian-only phase in Oakland, California. All vehicular traffic is stopped and pedestrians can cross to whatever location they desire. This treatment only makes sense in areas with large pedestrian volumes. A pedestrian scramble phase requires longer delays for all directions of traffic, which may lead to driver frustration and improper crossing. Other locations that use pedestrian scrambles include Washington, D.C., and Seattle, Washington.

Lighting

Quality outdoor lighting can help establish a pedestrian-friendly environment, especially in business districts. **Crosswalks, in particular, should be given special attention so that pedestrians waiting at curbside or in the crosswalk are visible to drivers**.

Overhead "cobra-head" lamps that are intended to light the roadway may provide sufficient illumination to meet baseline standards for lighting the sidewalk, but this type of lighting does nothing to make a streetscape look more attractive to pedestrians, nor to enhance the feeling of safety. However, lighting should not be installed for decorative purposes alone.

Places with significant pedestrian activity or with walkable business districts should supplement their existing roadway lighting with pedestrian-oriented lamps. These poles should be approximately 13 feet high, with poles made of aluminum or cast-iron. The design of these poles, like other pieces of street furniture, should be coordinated to fit the overall character of the corridor.

Project for Public Spaces recommends spacing pedestrian lamps no more than 50 feet apart and staggering them on opposite sides of the roadway to maximize illumination. (Project for Public Spaces, *Lighting Use and Design*). Poles should be positioned in the planting/furniture zone (see Sidewalks, Figure 1, page 6 for definition) to avoid blocking the pedestrian zone.

Street Trees/Landscaping

Planted areas, landscaping, and street trees can greatly enhance the attractiveness of a walkable community or a business district. These improvements also provide benefits for stormwater management. Elements of "green streets," such as trees, planted buffers and curb extensions, stormwater planters, rain gardens, and bioswales, can significantly reduce stormwater runoff and improve natural stormwater filtration.

To effectively provide shade and absorb stormwater runoff, street trees should be placed no more than 50 feet apart. They should be planted in tree basins with a large opening or capped with a pervious material to allow for maximum water absorption. A common complaint about street trees is that their roots may crack the pavement. If planted properly so that they receive adequate water, the root structure is less likely to spread toward the surface. Street trees should be small trees of native species, with canopies that stay relatively compressed. Additionally, municipalities may want to avoid trees that drop fruit or berries.

In many places, the cost of maintaining landscaping can be a barrier. However, there are programs that utilize low-maintenance plants and designs that minimize the required attention and cost of maintenance.

Figure 10: Green Streets in Yeadon, Delaware County

Source: Pennsylvania Horticultural Society, 2009

Figure 10 depicts one example of "green street" elements in Yeadon Borough, Delaware County, Pennsylvania. The treatment includes street trees with open tree pits and semi-permeable bricking as a buffer between the sidewalk and the curb line. This work in Yeadon was installed through the TreeVitalize program, a public-private partnership launched by the Pennsylvania Department of Conservation and Natural Resources to restore tree cover in Southeast Pennsylvania.

On-Street Parking

The design of on-street parking in a commercial district has a great impact on the pedestrian environment. On one hand, parking creates a buffer between pedestrians and traffic and narrows the crossing width of streets. On the other, cars parked too close to intersections inhibit pedestrian sightlines, putting them at risk when crossing the street. There are several ways to make on-street parking safer for pedestrians:

- Remove parking from approaches to intersections (between 15 to 20 feet) to increase visibility of oncoming traffic;
- Build bulb-outs to shorten crossings and increase sight lines (and minimize the loss of on-street parking spaces); and
- Institute back-in, diagonal parking to slow traffic down (like that shown in Figure 11).

Figure 11: Back-In Angled Parking

Source: Save our Lands, Save our Towns, 2010

The back-in angled parking depicted in Figure 11 improves conditions for drivers by allowing them a better view of traffic, eliminates dooring threats (for bicyclists), protects pedestrians from traffic, and shortens the crossing distance of the cartway. Several communities in the DVRPC utilize back-in angled parking, including Pottstown, Montgomery County and Wayne, Delaware County.

Internal Circulation

In areas where large parking lots exist, it is important to ensure that there are adequate internal pathways for pedestrian circulation. Parking lots that do not include internal sidewalks are unattractive and can create potentially dangerous conditions when pedestrians are required to travel in areas where drivers are entering and exiting parking stalls and do not expect to see pedestrians.

Internal circulation systems should include sidewalks accessible from every parking stall. Figure 12 depicts a parking lot with a sidewalk accessible from each parking spot.

Figure 12: Pedestrian-Friendly Internal Circulation

Source: DVRPC, 2009

Summary

This section highlights some best practices in the realm of pedestrian planning, particularly those that can be incorporated through policy planning and implementation. A selection follows:

- The FHWA recommended pedestrian zone width of five feet/60 inches is a minimum standard and insufficient for most urban areas or walkable communities. In these communities, pedestrian zones should be between six and eight feet wide.
- It is recommended that the continental design be used consistently to mark all crosswalks due to its visibility to pedestrians and vehicles.
- Crossing signal phases should be long enough to ensure that children, disabled individuals, and the elderly have time to cross.
- In terms of pedestrian lighting, crosswalks should be given special attention so that pedestrians waiting at curbside or in the crosswalk are visible to drivers.

Chapter 5 describes some ordinances that may help to address pedestrian issues. The appendix provides names and descriptions of the resources used in assembling this information, as well as papers and reports that have utilized other factors when analyzing ways to enhance the pedestrian environment.

CHAPTER 3

Bicycle Planning

Bicycles can play an important role in the transportation system for recreational trips, errands, social visits, and commuting. While a relatively small percentage of the adult population regularly use bicycles, establishing safer bicycle facilities and more bicycle-friendly policies can increase the number of cyclists on the road, provide active transportation options, increase individual mobility, and improve regional environmental health.

This chapter covers a number of bicycle-related planning topics, including:

- Bicycle facility types;
- Application of bicycle facilities; and
- Bicycle parking.

This section discusses the above topics in some detail. First, however, it is important to determine what level of cyclist to plan for. While cyclists have been divided into classes in different ways, the FHWA document *Selecting Roadway Design Treatments to Accommodate Bicyclists* uses two simple classes to define different types of cyclists.

- Group A cyclists are experienced riders who can operate under most traffic conditions. These riders prefer direct access to destinations via existing streets and the ability to operate at maximum speeds. Separation from vehicular traffic is unimportant.
- Group B/C cyclists are newer adult and youth riders who prefer comfortable access to destinations, residential streets with lower vehicular volumes and speeds, and, if possible, separated access from cars on busy arterial and collector streets.

The FHWA document goes on to recommend that all streets (where bicyclists are allowed to operate) are designed for Group A cyclists, while select streets, based on various criteria, are designed specifically for the needs of B/C cyclists.

It is recommended that planning authorities take a similar approach when considering new bicycle facilities. **All roads (except those that expressly forbid bicycle access) should be designed for Group A cyclists, while a set of prioritized roadways, based upon criteria such as road geometry, vehicle counts, and the number of potential destinations should be planned for B/C cyclists.**

Bicycle Facility Types

Bike Trails and Multi-Use Paths

According to AASHTO, some important principles when considering trails are:

Off-road paths should complement on-road bicycle facilities, not attempt to replace them;

Trails function best as independent rights-of-way with as few crossings as possible; intersections with roadways pose the biggest challenge in trail design;

Many different users frequent trails and move in both directions; the design should reflect this;

Paths should be connected to the greater transportation system; and

Shared-use paths should be designed with safety as the guiding principle.

In trail planning, some design guidelines should be followed. There may be factors that make following some of these recommendations difficult, but it is important to make trails as safe and accessible as possible to all users, not just bicyclists. Some of AASHTO's basic guidelines are as follows:

For width and clearance, 10 feet (three meters) is the recommended minimum width for a two-way shared-use path on a separate right-of-way. Eight feet may be used in locations where there is particularly low usage (and good sightlines), and 12 feet may be necessary if there is heavy use or poor visibility. A vertical clearance of eight feet should be maintained at all times.

For speed and grade, the likely speed of users and the ability of cyclists to turn corners should be considered, but 20 miles per hour is the minimum design speed to use in trail design, while 15 miles per hour should be used on unpaved paths. Trails should generally not have grades that exceed five percent. The AASHTO Guide for the Design of Bicycle Facilities has detailed recommendations for both of these topics.

For drainage, trails should be sloped in one direction when possible (rather than crowning in the middle). Grates should be placed out of the travel path of bicyclists unless they can be made completely bike friendly. For optimum stormwater management, preserve as much natural ground cover adjacent to the trail as possible.

For signage and pavement marking, the Manual on Uniform Traffic Control Devices (MUTCD) provides several examples of control measures that may be applied to trails. These include warning signs when recommended design criteria cannot be met (wide curves, high grades, or other unexpected conditions), informational signs that include location information and distances between destinations, and striping to separate direction of flow or different modes of users (pedestrians and bicyclists).

Many other factors, such as surface materials, sight distances, and lighting, must be considered in trail design. The appendix lists resources that provide information on these topics and many more.

Bicycle Lanes

Bike lanes are defined as a portion of the roadway that has been set aside by striping, signage, and pavement marking for the exclusive use of bicycles. In general, bike lanes should be:

- One way, carrying bicyclists in the same direction as the adjacent travel lane;
- On the right side of the roadway; and
- Located between the parking lane (if there is one) and the travel lane.

Standards for striping on-road bicycle lanes have been established by AASHTO, and while alternative striping designs may be considered in some situations, several critical practices should be observed:

- Four feet (1.2m): minimum width of the bike lane on roadways with no curb and gutter;
- Five feet (1.5m): minimum width of the bike lane when adjacent to parking or where a curb exists;
- Six-inches (150mm): solid white line separating the bike lane from the motor vehicle lane (increased to 8-inches (200mm) where emphasis is needed); and
- Four-inches (100mm): optional solid white line separating the bike lane from parking spaces.

These are the minimum standards that should be met in applying bicycle lanes to roadways. Any alterations made should be done only to enhance the safety of bicyclists and other users.

Figure 13 depicts the buffered bike lane on Spruce Street. To add greater distance between bicycles and traffic, it may be desirable, if space permits, to enhance the bicycle lane with a buffer. The City of Philadelphia added buffers to the lanes on Spruce and Pine Street when bicycle lanes were added.

Figure 13: Buffered Bicycle Lane

Source: Bicycle Coalition of Greater Philadelphia, 2010

There are some other innovative approaches to establishing bicycle lanes. While these methods diverge from typical standards, they are endorsed by AASHTO and have been used to provide bicycle facilities in the DVRPC region and throughout the country. Some of these approaches are described below.

Left-Side Bicycle Lanes

On one-way streets it may be appropriate to paint a bicycle lane on the left side of the road. Left-side bicycle lanes can reduce conflicts with parked automobiles because it lowers the chances of being 'doored' because, while all cars have drivers, a significantly lower amount have passengers. Left-side bicycle lanes also reduce potential conflicts with buses curbing to make stops.

The Guide for the Development of Bicycle Facilities (1999), published by AASHTO, considers the use of left-side bicycle lanes appropriate in certain situations after careful evaluation. The FHWA also suggests that bicycle lanes may be considered on the left side of a roadway as necessary to reduce conflicts. FHWA recommendations also allow for left-side bicycle lanes on one-way streets where there are frequent bus or trolley stops, unusually high numbers of right-turning motor vehicles, or if there is a significant number of left-turning bicyclists. Several cities in the United States have experimented with left-side bicycle lanes (including Philadelphia).

Figure 14 depicts a left-side bicycle lane. Striping bicycle-only lanes on the left side of the road is a design that many cyclists (and drivers) are unfamiliar with and should only be used after careful evaluation.

Figure 14: Left-Side Bicycle Lane

Source: Bicycle Coalition of Greater Philadelphia, 2010

Contraflow Bike Lanes

Traditionally, bicycle lanes, whether on the right or left side of the road, travel in the same direction as traffic. High bicycle volume locations, however, may warrant two directions of bike lanes on a one-way street. Contraflow bicycle lanes have been used in several cities, including Madison, Wisconsin and Portland, Oregon, to provide access to attractors or streets with bicycle facilities.

Contraflow bike lanes work best on streets that are short, provide direct access to an important location, provide sufficient width to accommodate a standard bicycle lane, and have low traffic volumes.

The image in Figure 15 shows a contraflow bicycle lane on New Hampshire Avenue in Washington, D.C. Contraflow lanes have a limited utility and should be used only as appropriate and after careful evaluation. Because contraflow lanes move against traffic, use of proper signage and striping is crucial to maintaining safety.

Figure 15: Contraflow Bike Lane

Source: DDOT, 2011

Painted Bike Lanes

Painted bicycle lanes have been used in Europe for several years and are now beginning to show up in American cities, generally used to indicate potential safety conflicts between cyclists and motorists and transition cyclists around the conflict.

The blue lane depicted in Figure 16 shows cyclists traversing the Walnut Street Bridge. The blue lane helps transition cyclists across a right turn only lane. There are other locations in Philadelphia that have utilized blue lanes, such as on 6th Street north of Race Street to transition cyclists across a freeway off-ramp

Figure 16: Painted Bike Lane

Source: Bicycle Coalition of Greater Philadelphia, 2010

Another painted bicycle lane is located near the intersection of Aramingo Avenue and Cumberland Street in Philadelphia, where the road and bicycle lane veer left but where drivers and cyclists can also go straight. It should be noted that green is becoming the standard color for this type of facility to avoid any confusion with the blue color standard that is intended to denote ADA accessibility.

Shared Facilities

Since all roadways in Pennsylvania are, by law, usable by bicycles (except those where bicycles are expressly prohibited), no signs or pavement markings of any kind are required to enable bicycle use on most roadways. However, in situations where a bicycle lane is impractical or unnecessary, there are other types of on-road treatments that can enhance the safety and visibility of cyclists and indicate to drivers that bicyclists may be present and have the right to a full traffic lane.

These treatments, which combine various types of signage and pavement markings, are referred to as bike routes, shared routes, or marked-shared routes (amongst other things). Utilizing these treatments indicate that these roads are preferable for bicycle use. AASHTO's Design Guide gives several explanations for why it may be important to use bike route designations (rather than leaving roads unmarked):

- To provide continuity between bicycle lanes, trails or other bicycle facilities;
- To mark a common route for bicyclists through a high-demand corridor;
- To direct cyclists to low volume roads or those with a paved shoulder; and
- To direct cyclists to particular destinations (e.g., park, school or commercial district).

Share the Road Signs and Pavement Markings

A Share the Road sign is used to notify drivers that the road in question is a bicycle route. Figure 17 shows a Share the Road sign on Susquehanna Road in Abington, Montgomery County.

Figure 17: Share the Road Sign

Source: Bicycle Coalition of Greater Philadelphia, 2010

The roadway depicted in Figure 17 does not have the width to accommodate separated bicycle lanes on both sides, but it is considered an important bicycle route and is marked accordingly. PennDOT deploys these signs at pinch-points where the cartway narrows.

Another sign that may be used to designate a shared road is the 'Cyclists May Use Full Lane' sign, shown in Figure 18, approved in the 2009 MUTCD.

Figure 18: Cyclists May Use Full Lane Sign

Source: Manual of Uniform Traffic Control Devices, 2009

According to the MUTCD, this sign may be used on roadways without sufficient width for bicycle lanes and where traffic lanes may be too narrow for bicyclists and automobiles to operate side by side. The sign may also be used in locations where it is important to notify drivers that cyclists are entitled to use the full width of the lane. To that end, it goes further than the Share the Road sign in treating bicycle and cars equally. **These signs are often paired with on-road markings to ensure that cyclists are well protected.**

In situations where added guidance may be necessary to direct both cyclists and motorists, it may be appropriate to pair the signs shown above with on-road pavement markings like those depicted in Figure 19.

Figure 19: Shared Lane Marking

Source: DVRPC, 2011

This shared lane marking, or sharrow, is another symbol recently approved in the update of the MUTCD. The purpose of this symbol is to direct cyclists to the center of the traffic lane to avoid conflict with parked cars (due to dooring) in a lane that is not wide enough for cars and bicyclists to operate side-by-side. Finally, it alerts drivers that cyclists are permitted use of the traffic lane. **According to the MUTCD, these markings should not be used on roadways that have a speed limit above 35 MPH and should be placed immediately after intersections and at intervals no greater than 250 feet to reinforce the cyclist's right to the road.**

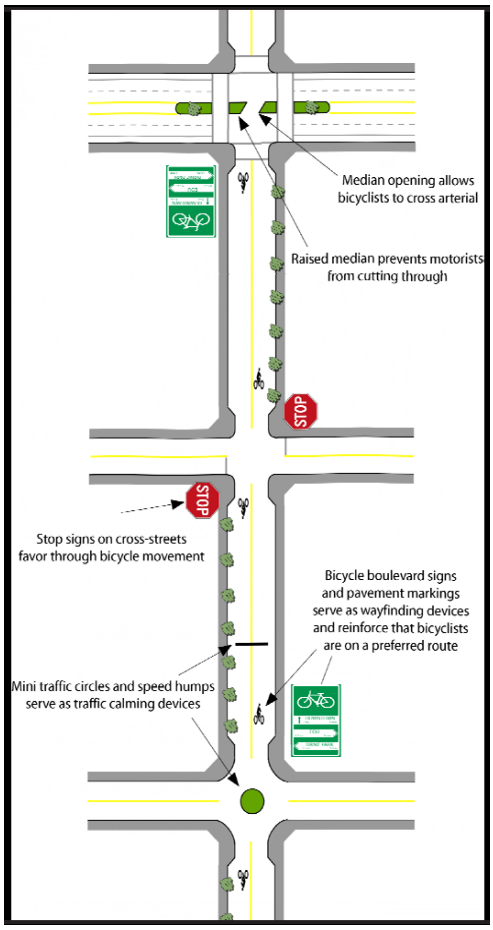
Bicycle Boulevards

Bicycle boulevards are low-volume and low-speed streets that have been optimized for bicycle travel through a variety of different traffic- and speed-calming measures. Typically, cyclists using a bicycle boulevard share the road with other types of vehicles, and the boulevard should be long enough to facilitate trips of two to five miles to ensure its utility. Amongst the elements used to create bicycle boulevards (reported in the 2009 document *Fundamentals of Bicycle Boulevard Planning and Design*) are:

- Signage (wayfinding and warning signs);
- Bicycle prioritization elements (stop signs on cross streets, pavement markings);
- Intersection treatments (bike boxes, bicycle activated signals, crossing islands);
- Traffic-calming elements (traffic circles, speed tables, chicanes); and
- Traffic reduction (non-motorized only crossings).

Different treatments can be combined to provide the best fit for a specific location and to control costs. Figure 20, on the following page, shows how different treatments can be combined to create a bicycle boulevard. This example comes from Portland, Oregon. The bicycle boulevard concept has only been used in a few locations, including Portland, and Berkeley, California. While some on-road treatments used in these locations may not be accepted practice in Pennsylvania, most are standard traffic measures, combined in innovative ways to create a useful, linear bicycle facility. Before selecting the treatments, it is important to pick locations where a bicycle boulevard makes the most sense. Locations chosen for these types of treatments should be close to arterials with destinations that are attractive to bicyclists.

Figure 20: Bicycle Boulevard Diagram



Source: Initiative for Bicycle and Pedestrian Innovation, 2010

Application of Bicycle Facilities

Various factors can determine what type of bicycle facility (if any) should be used on roadways, particularly in regard to the application of bicycle lanes. *The Smart Transportation Guidebook*, used by both PennDOT and NJDOT to better integrate all modes of transportation into the design of streets and highways, recommend evaluating the appropriateness of bicycle lanes in several cross-section types. There are, however, other examples of documents that make more specific recommendations based on factors such as roadway geometry, speed, and traffic volume.

Roadway Geometry

In terms of roadway geometry, the two main considerations, when determining whether a bicycle lane should be added to a roadway, are the travel lane and the parking lane (if applicable). AASHTO recommends minimum widths of 10 to 12 feet for vehicular lanes on urbanized roads (nine to 12 feet on local roads), and an eight-foot parking lane (seven feet is acceptable).

PennDOT generally follows this practice and tries to reduce the travel lane when possible during restriping projects.

A document prepared by the Pedestrian and Bicycle Information Center (PBIC) for the City of Chicago details how bicycle lanes can best be implemented in roadways of varying widths. The manual includes detailed drawings of roadway cross-sections and may be a useful resource. See Appendix A for details.

Table 2: Striping Plans for Roadways of Varying Widths

Roadway Width	Directions	Vehicle Lane	Bicycle Lane (stripe)	Parking Lane
44 feet	2	10 feet	5 feet (6 inches)	7 feet
46 feet	2	10 feet	5.5 feet (6 inches)	7 feet
48 feet	2	11 feet	5.5 feet (6 inches)	7.5 feet
50 feet	2	11 feet	6 feet (6 inches)	8 feet
55 feet	2	10.5 feet (with an 11 foot center turning lane)	5 feet (6 inches)	7 feet
Under 44 feet	2	10 feet	5 feet (8 inches)	N/A
44 feet	2	11 feet	5.5 feet (8 inches)	N/A
50 feet	2	10 feet	5 feet (8 inches)	N/A
48 feet	1	12 feet	6 feet (6 inches)	9 feet

Source: Chicago Bike Lane Design Guide, 2009

Table 2 shows some of the proposed striping plans for roadways of varying geometries. While counties and municipalities in the DVRPC region may have to alter these measurements to better represent the geometry of local streets, it is informative to look at how other regions design their streets for examples of how to provide pavement space to all users. **It should be noted that these measurements do not mean that every street must have bicycle lanes, but if lanes on a certain street are desired, these dimensional standards may be used as a reference.**

Speed and Volume of Vehicular Traffic

The speed and volume of traffic are major factors when considering any type of bicycle facility. Many agencies have linked the two in studying how to best apply bike lanes, creating a matrix of scenarios and which type of bike facility should be used for each.

In terms of speed, the 85th percentile speed (the speed at which 85 percent of traffic travels), not the posted speed limit, should be considered when planning bicycle lanes because it more accurately represents local roadway conditions. In its report *Selecting*

Roadway Design Treatments to Accommodate Bicycles, FHWA uses four different speed ranges in determining appropriate facilities. These are:

- Less than 30 MPH;
- 30 to 40 MPH;
- 41 to 50 MPH;
- Over 50 MPH.

In regard to traffic volumes, the FHWA report cited above uses three different Annual Average Daily Traffic (AADT) ranges:

- Under 2,000 AADT;
- 2,000 to 10,000 AADT;
- Over 10,000 AADT.

Other reports use similar breakdowns to distinguish between which types of on-road bike facilities should be used. Some create more classes (a 2,000 to 5,000 grouping and a 5,000 to 10,000 AADT grouping), while others distinguish between two and four-lane roads. Table 3 is adapted from the Minnesota DOT's report *The Mn/DOT Bikeway Facility Design Manual*.

Table 3: Bikeway Design Selection for Urban Cross Sections

AADT (2 Lane)		**<500**	**500-1,000**	**1,000-2,000**	**2,000-5,000**	**5,000-10,000**	**>10,000**
AADT (4 Lane)		**N/A**	**N/A**	**2,000-4,000**	**4,000-10,000**	**10,000-20,000**	**>20,000**
Motor Vehicle Speed	25 mph	SL	WOL	WOL	WOL	BL=5 ft	N/A
	30 mph	SL w/sign	WOL	BL=5 ft	BL=5 ft	BL=6 ft	BL=6 ft
	35-40 mph	WOL	BL=5 ft	BL=5 ft	BL=6 ft	BL=6 ft	BL=6 ft or PS=8 ft
	45 mph and up	BL=5 ft	BL=5 ft	BL=6 ft	BL=6 ft	BL=6 ft or PS = 8 ft	SUP or PS=10 ft

BL=Bicycle Lane, SL=Shared Lane, WOL=Wide Outside Lane, SUP=Shared-Use Path, PS=Paved Shoulder

Source: Adapted from the Minnesota DOT Bikeway Facility Design Manual

Table 3 lists the speed/volume guidelines the Minnesota DOT uses to determine what (if any) bike facilities are appropriate on roadways. This particular table focuses on urban roadways; there is a separate matrix for rural roads. Eventually, the combination of higher speeds and vehicle volumes require bicycle-specific facilities. It is important to note that these are recommended guidelines, not requirements for bicycle facilities to be placed on all roads.

Chapter Three in the document *NJDOT Bicycle Compatible Roadways and Bikeways* adopts a similar approach in determining where bicycle lanes may be appropriate. There are other factors

that have been used to determine what type of bicycle facility should be used; these include mix of traffic (trucks, cars, etc.), the presence and volume of on-street parking, and the number of intersections. In general, though, these factors are secondary to the road geometry and vehicular speeds and volumes.

Bicycle Parking

All cyclists should have a safe and secure location to park their bikes at the end of their trip without damaging trees or private property. The type and amount of parking depends on the location that is being served and the surrounding uses. Shopping districts, parks, and other local attractions should have ample short-term bicycle parking, while long-term attractors such as employment centers and transit hubs should have more enhanced parking facilities to account for longer periods of use. In all cases, but particularly in the case of enhanced facilities, the parking area should be well lit and easily accessible.

Short-term bicycle parking

In shopping districts or other potential attractors, short-term bicycle parking should be provided. There are a variety of forms of bicycle parking available. Many municipalities have adopted the Association of Pedestrian and Bicycle Professionals (APBP) bicycle parking standards. According to these requirements, racks should:

- Support the frame of the bicycle and not just one wheel;
- Prevent the wheel of the bicycle from tipping over;
- Enable the frame and one or both wheels to be secured;
- Support bicycle with a step-through bicycle frame;
- Allow front-in parking: a U-lock should be able to lock the front wheel and the down tube of an upright bicycle; and
- Allow back-in parking: a U-lock should be able to lock the rear wheel and seat tube of the bicycle.

Figure 21 depicts an Inverted U Bicycle Rack, one of the rack types recommended by the Association of Pedestrian and Bicycle Professionals, whose standards have been adopted all over the country. This rack is particularly popular because it is easily manufactured and it has two contact points with the ground, making it very secure.

Figure 21: Inverted-U Bicycle Rack

Source: Bike Rack Source, 2011

In terms of placement, in traditional main street settings, it is preferable to disperse racks throughout the shopping district rather than have specific parking areas to enable shoppers to park as close to their destinations as possible. In shopping centers or locations where large parking lots are present, bicycle parking should be consolidated into locations no further from shopping destinations than the closest non-ADA parking spot. This parking should be covered, well-lit, and clearly marked.

Long-Term bicycle parking

In locations such as employment centers or transit hubs, where cyclists park their bicycles for an entire day or longer, indoor, covered bicycle parking may be appropriate. The need for a higher level of security and protection from the elements is greater, but the immediate convenience of the parking facility may not be as important. For secure all-day or overnight parking, for instance, the Portland bicycle parking guide assumes that riders will be willing to walk a short distance (e.g., 750 feet) to or from their destination.

There are several options for long-term bicycle parking. These include:

- Individual lockers for one or two bicycles;
- Racks in an enclosed, lockable room;
- Racks in an area that is monitored by security cameras or guards (within 100 feet);
- Racks or lockers in an area always visible to employees; and
- Racks in covered parking garages.

In the past few years several communities have supported the creation of centrally located bicycle parking facilities with lockers and showers. In most cases cyclists pay a monthly fee to use these facilities. Such facilities have been built in Washington, D.C., Seattle, Washington, and Long Beach, California. The McDonald's Center in Chicago's Millennium Park also provides cyclists with lockers, showers, and a repair service.

Summary

Chapter 3 highlights some best practices in the realm of bicycle planning, particularly in regard to the planning of on-street bike facilities. A selection of these are:

- All roads (except those that expressly forbid bicycle access) should be designed for Group A cyclists, while a set of prioritized roadways, based upon criteria such as road geometry, vehicle counts, and the number of potential destinations should be planned for B/C cyclists.
- At minimum, when applying bicycle lanes to roadways, AASTHO standards are the minimum that should be considered. Any alterations made should be done only to enhance the safety of bicyclists and other users.
- 'Cyclists May Use Full Lane' signs are often paired with on-road markings such as sharrows to ensure that cyclists are well protected.
- The speed and volume of traffic are the most important factors when considering if on-road bicycle facilities are appropriate on a roadway.

Chapter 5 describes some ordinances that may be useful in establishing more bicycle-friendly policies. The appendix lists resources that may be useful in researching these topics further.

Education and Encouragement

This section highlights educational and encouragement campaigns that advocate sharing the road in a safe and equitable way, as well as promote walking and cycling as viable modes of transportation.

Safe Routes to School

Safe Routes to School (SRTS) is an international initiative created with the purpose of encouraging children to walk or bike to school. In the United States, much of the funding that USDOT has made available for this program is intended for infrastructural improvements adjacent to schools. However, a portion of the funding may be used for encouragement and educational activities. These activities promote lifelong healthy lifestyle choices and generate excitement in walking and cycling even after the program is over.

Many different activities have been incorporated into SRTS programs; some of the more popular are:

- Walking school buses or bike trains, where students (with parent and teacher supervision) walk or bike to school as a large group;
- Mileage clubs or contests where children are encouraged to track the miles they walk or bike. Small prizes can be offered to students (or classes) who tally the highest number of miles;
- Incorporating walking and bicycling into everyday activities, such as gym class, recess, or even before or after school clubs; and
- Educational events geared toward proper cycling habits such as bicycle rodeos.

Successful SRTS programs involve high levels of cooperation between the planners and engineers working on infrastructural improvements, and teachers, parents, and school administrators. While federal money makes the physical improvements possible, it is the programmatic elements that sustain walking and cycling in the participating communities.

Share the Road

Share the Road campaigns exist throughout North America in a variety of forms, most having to do with encouraging drivers and cyclists to coexist in a more harmonious manner. While the slogan, and the Manual on Uniform Traffic Control Devices (MUTCD) signs that have resulted from the earliest days of the campaign, may have lost some of their impact as other, more

innovative campaigns and signage have been adopted, Share the Road is still used as a rallying cry for more equitable roadways. The MUTCD Share the Road sign is depicted in Figure 22.

Figure 22: Share the Road Sign

Source: Manual of Traffic Control Devices, 2009

Several jurisdictions in the country still use Share the Road as part of their bicycle education and safety campaigns. The city of Oxford, Ohio used Share the Road as part of a comprehensive program that included designating bicycle lanes on several city streets, a Safe Routes to School initiative, establishing bicycle paths through the Miami of Ohio campus, and increased law enforcement at designated locations. Some states, such as Colorado and Florida, provide opportunities to purchase 'Share the Road' license plates, with part of the proceeds intended for bicycling education programs.

Minnesota has structured much of its bicycle education campaign around the 'Share the Road' message. The program's website (http://www.sharetheroadmn.org/) offers information on bicycle safety for adults and children, information about helmets and other equipment, and cycling events.

While the Share the Road jargon has been used in many different programs, the intentions of all the programs are clear; that cyclists should be respected by motorists and that they belong on the road. Some recent campaigns have been more graphically stimulating, and newer MUTCD signs (such as 'Cyclist May Use Full Lane') are more aggressive in carving out space for cyclists on the roadway. However, this early example of an effective bicycle campaign remains relevant.

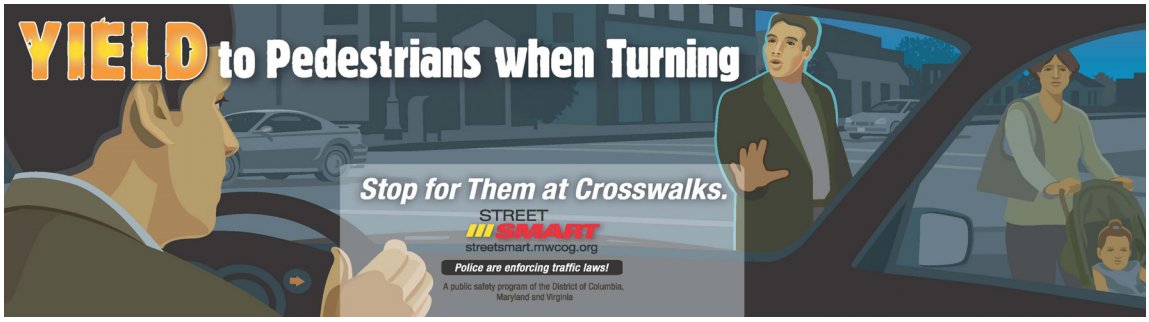
StreetSmart (Washington, D.C)

In 2002, the National Capital Region Transportation Planning Board (TPB), the Metropolitan Planning Organization (MPO) for the greater Washington D.C. area, which includes the capital, northern Virginia, and parts of suburban Maryland, enacted a mass media campaign called StreetSmart. This campaign aimed to improve pedestrian and bicyclist safety by reaching out to users of all modes of transportation and educating them on proper etiquette on roadways and

sidewalks. The program is administered by the MPO and supported by federal funds, as well as money from participating jurisdictions.

The campaign uses various forms of media, such as posters at bus shelters and on buses, radio spots, and television commercials, to highlight different types of dangerous user behavior that can lead to crashes and injuries. Figure 23, below, depicts a 'Yield to Pedestrian when Turning' sign that was placed on the back of buses throughout the metropolitan Washington area.

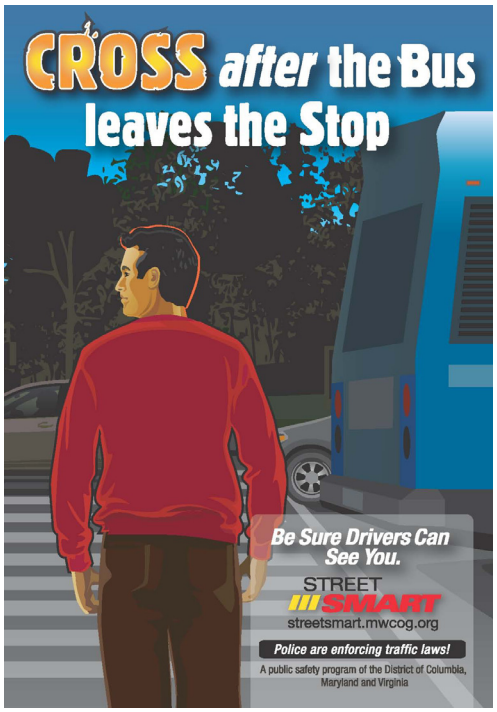
Figure 23: StreetSmart Yield to Pedestrian Sign



Source: Metropolitan Washington Council of Governments, 2009

This placard is one of the StreetSmart campaign advertisements geared toward drivers. Figure 24 is a similar sign intended for pedestrians, reminding them to cross after the bus leaves designated bus stops.

Figure 24: StreetSmart Cross After Bus Sign



Source: Metropolitan Washington Council of Governments, 2009

To coincide with the ad, law enforcement efforts throughout the region were increased, although this was done on a voluntarily basis by local police forces (with no additional funding). There was a pledge made between all participating authorities to share information pertaining to traffic incidents and a standardized enforcement reporting form was introduced throughout the region to enhance the knowledge of the number and types of citations being issued so that a comprehensive data set could be created.

To evaluate the efficacy of the media campaign, phone surveys have been performed every year since StreetSmart was introduced in 2002. The surveys focus on whether users are aware of the campaign, whether police are enforcing laws, and whether observable behaviors (drivers yielding to pedestrians, pedestrians crossing legally) have changed for the better.

The survey conducted after the 2009 campaign (the most recent available) found that all road users were more aware of the messages featured in the advertisements and posters after the campaign than before. Also, drivers were more aware of police efforts to enforce laws related to pedestrian safety.

In 2009 the Baltimore Metropolitan Council, the MPO for the Baltimore region, adopted a similar program (also called StreetSmart). This campaign also used multiple forms of media to disseminate its messages and geared the message to all types of road user.

Coexist Campaign (Fort Collins, Colorado)

This campaign, conceived of by the Fort Collins City Planning Commission, was designed to address some of the most common conflicts between bicyclists, pedestrians, and motorists. The educational messages were identified through national and local sources. The "Coexist" campaign's objectives include educating bicyclists about how to ride in an urban setting, educating motorists about how to drive cautiously, particularly around more vulnerable road users, and emphasizing mutual respect and responsibility.

Figure 25 depicts one of the posters used in the Coexist campaign; this one deals with cyclists using the sidewalk, rather than the street. Other campaign posters stressed the importance of bicycling with a helmet, bicycling on the right side of the road with traffic, driving carefully while backing up, and no right-hand turns in front of the path of cyclists.

Figure 25: Coexist Campaign Poster

Source: City of Fort Collins, Colorado, 2009

San Francisco has its own 'Coexist' campaign that is similar both in message and visual style to the Fort Collins campaign. New York City's bicycle and pedestrian advocacy organization, Transportation Alternatives, ran a similar campaign that humorously targeted all road users. This campaign featured a more direct approach, having advocates join with local law enforcement to hand out fake tickets to drivers and cyclists who did not respect other road users by blocking bicycle lanes, turning without signaling, or cycling on the sidewalk.

Drive Nice, Tacoma (Tacoma, Washington)

Created in 2010, Tacoma's Drive Nice campaign was designed to counteract a high volume of bike and pedestrian crashes along arterials in the city. The city sought to create a campaign geared toward improving safety for pedestrians and bicyclists and focused specifically on certain driver behaviors.

Figure 26 depicts one of the posters used in the campaign. The ads were graphically and textually simple and intended to be lighthearted or humorous. Posters were placed on bus shelters and on the backs of buses and light rail cars. The city also printed postcards and bumper stickers. The campaign became very popular, but did create some controversy due to the fact that it was solely targeted at driver behavior rather than all users equally.

Figure 26: Drive Nice, Tacoma Poster

Source: City of Tacoma, Washington, 2010

Unlike the other campaigns, which were sustained efforts over time, Drive Nice, Tacoma was done with a limited time frame and budget. Nonetheless, it serves as a good model for a road safety campaign, albeit one aimed solely at drivers.

New York City's 'Look' campaign also emphasized driver actions in their materials, although they used edited photographs rather than illustrations to depict their messages. Washington County, Oregon's 'And We Bike' campaign, also directed towards drivers, used life-sized cutouts of people with bikes to appeal emotionally to drivers to be careful around cyclists.

Summary

The campaigns highlighted in this chapter are just a selection of those that have been used in the service of improving safety for non-motorized users and encouraging bicycling and walking. Some key points are:

- Successful Safe Routes to School programs involve high levels of cooperation between the planners and engineers working on infrastructural improvements, and teachers, parents, and school administrators.
- While Share the Road jargon has been used in many different programs throughout the country, the intentions of all the programs are clear; that cyclists should be respected by motorists and that they belong on the road.

- It is typical to design campaigns to reach a multitude of different road users, not just pedestrians and bicyclists.
- Humor is an important component to many campaigns.

The appendix contains other resources with more information about safety, education, and encouragement campaigns.

Codes and Ordinances

This chapter highlights several codes and ordinances that have been enacted with the purpose of improving bicycle and pedestrian safety and accommodations. This is not a comprehensive list of potential codes and ordinances. The ordinances address problematic situations where a law mitigates specific conflicts between roadway users.

Operation of Bicycles on Sidewalks

Issue

The operation of bicycles on sidewalks has become a hot-button issue in Philadelphia, as well as in other municipalities with well-developed main street shopping districts. While it may not always seem safe for bicyclists to ride on the street, riding a bike on a sidewalk creates potential conflicts with pedestrians. Many cycling education campaigns (like the Fort Collins Coexist campaign mentioned in Chapter 4) point out that cyclists belong on the road and not on sidewalks. Clarifying this potential conflict in law is important to both pedestrian and cyclist safety.

Example Code

Legislating against bicycles operating on sidewalks is a complicated issue. On one hand, the safety of pedestrians is critical, particularly in locations with substantial pedestrian activity. On the other hand, if bicyclists feel unsafe riding in traffic and no designated facilities are provided for them, municipalities may require ordinances that are less restrictive and allow cyclists to use sidewalks where that is preferable.

Pennsylvania's bicycle laws on this subject are quite clear. The Pennsylvania vehicle code states:

Title 75 of Pennsylvania's Consolidated Statutes: Chapter 35 Special Vehicles and Pedestrians

Section 3508. Pedalcycles on sidewalks and pedalcycle paths.

(a) Right-of-way to pedestrians.- A person riding a pedalcycle upon a sidewalk or pedalcycle path used by pedestrians shall yield the right-of-way to any pedestrian and shall give an audible signal before overtaking and passing a pedestrian.

(b) Business districts - A person shall not ride a pedalcycle upon a sidewalk in a business district unless permitted by official traffic-control devices, nor when a usable pedalcycle-only lane has been provided adjacent to the sidewalk.

Pennsylvania prohibits bicycles on sidewalks in business districts unless otherwise indicated by control signals. Most municipalities generally abide by these laws with some variations, mainly by allowing children under a certain age to ride bicycles on sidewalks.

One way to avoid confusion and provide for the safety of all users is to add an item to the state laws on bicycle use that would preclude municipalities from enacting laws that require bicycles to be operated on the sidewalk. Ohio enacted this law in 2006:

Ohio Revised Code: Title 45, Motor Vehicles: Traffic Laws-Operation of Motor Vehicles

4511.711 "... no local authority may require that bicycles be operated on sidewalks."

Including this language in the state code protects pedestrians on the sidewalk, while still ensuring that cyclists are permitted to ride in the street. While it may not be in the interest of a municipality to completely ban cyclists from utilizing sidewalks when necessary, it should not be permissible to ban cyclists from riding in the roads either.

If bicycles are permitted to use sidewalks in a municipality, it should be clear that cyclists must yield to pedestrians on sidewalks at all times. Florida's motor vehicle code states:

Florida Vehicle Code Section 316.2065

A bicyclist riding on sidewalks or in crosswalks must yield the right-of-way to pedestrians and must give an audible signal before passing.

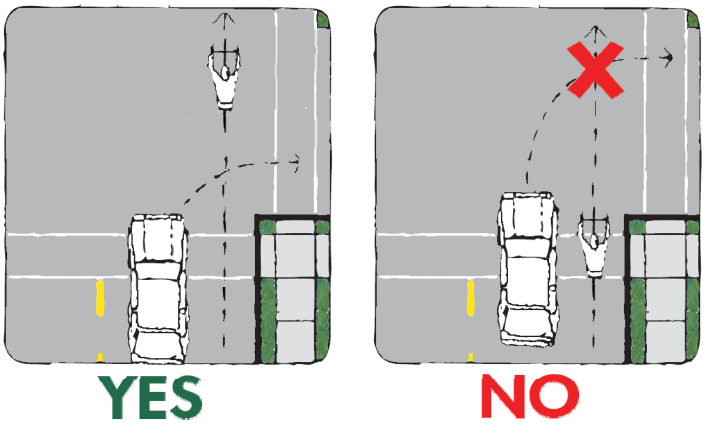
Combining these ordinances makes it possible to provide safe accommodations for cyclists, while still protecting pedestrians' right-of-way on sidewalks and crosswalks.

Right Hook Incidents

Issue

One of the most common types of automobile/bicycle crashes is the 'right hook' when a car turning right contacts a bicycle moving straight ahead through the same intersection. Figure 27 depicts this crash type.

Figure 27: Right Hook Crash



Source: Bicycle Federation of Wisconsin, 2008

There is much confusion about the right course of action for road users in this common situation. DVRPC dealt with a similar issue in Bicycle-Bus Conflict Study (Publication # 09041), which detailed conflicts between bicycles and buses at locations where buses were pulling into bike lanes to pick up and drop off passengers. Pennsylvania's vehicle code indicates that right-of-way belongs to the party that arrives at the intersection first. Laws should be used to clarify this scenario, when bicycle lanes are present or otherwise.

Example Code

In California's case, the state requires that automobiles move into the bicycle lane before completing the turn, but to make sure that they first yield the lane to bicycles. This ensures that bicycles coming upon the intersection clearly see the car making the turn.

California Vehicle Code Section 21209: Motor Vehicles and Motorized Bicycles in Bicycle Lanes

Motor Vehicles in Bicycle Lanes

21209. (a) No person shall drive a motor vehicle in a bicycle lane established on a roadway pursuant to Section 21207 except as follows:

(1) To park where parking is permitted.

(2) To enter or leave the roadway.

(3) To prepare for a turn within a distance of 200 feet from the intersection.

Turning Across Bicycle Lanes

21717. Whenever it is necessary for the driver of a motor vehicle to cross a bicycle lane that is adjacent to his lane of travel to make a turn, the driver shall drive the motor vehicle into the bicycle lane prior to making the turn and shall make the turn pursuant to Section 22100 [general turning regulations].

Other states deal with this issue differently. Oregon, for example, prefers that cars should yield to bicycles in these situations. Either way, clearly defining right-of-way in this situation is crucial to preserving the safety of all road users.

In case there is no bicycle lane present, it makes sense to further clarify yield responsibilities. As part of its vehicle code, Massachusetts states:

Massachusetts State Code, General Laws, Chapter 90: Motor Vehicles and Aircraft, Section 14 Precautions for safety of other travelers

No person operating a vehicle that overtakes and passes a bicyclist proceeding in the same direction shall make a right turn at an intersection or driveway unless the turn can be made at a safe distance from the bicyclist at a speed that is reasonable and proper.

This and other laws regarding the legality of cyclists being able to pass to the right of automobiles clarify the actions that drivers should take in these situations. Cambridge, Massachusetts, created a poster campaign around this very issue, using photographs to depict the way the law should work. A photograph used in that campaign is shown in Figure 28.

Figure 28: Vehicle Turning Behind a Cyclist Through an Intersection

Source: City of Cambridge, Massachusetts, 2008

Safe Passing Laws

Issue

According to Pennsylvania law, when bicycles operate in the roadway, they have all the same rights and responsibilities as automobiles. Pennsylvania code requires safe overtaking for all vehicles, but does not provide specifics in terms of appropriate distances. Establishing an official safe passing distance is becoming more common and eliminates the confusion over what constitutes a safe distance.

Example Ordinance

This type of ordinance may require state-level participation for inclusion in the motor vehicle code. Some cities, however, have added a more defined law to their own codes. One such city is Denver, Colorado, which has established a three-foot minimum distance for cars passing bicycles on a roadway. Its code states:

Denver Municipal Code: Chapter 54: Traffic Regulations, Sec. 54-229. Overtaking a vehicle on the left.

(2) The driver of a motor vehicle overtaking a bicyclist proceeding in the same direction shall allow at least a three-foot separation between the right side of the driver's vehicle, including all mirrors or other projections, and the left side of the bicyclist at all times.

Other cities have introduced similar ordinances into their municipal codes, including Austin, Texas, and Boise, Idaho, among others.

Pedestrians Crossing at Unsignalized Intersections

Issue

Stop signs and traffic signals clearly delineate the roles and responsibilities at marked intersections. However, unmarked intersections do not provide directions and may be confusing for approaching parties. In Pennsylvania, where pedestrian crossings are not prohibited by posted signs and sidewalks are present on both sides of a road, an 'implied crosswalk' may be legally present even though it is unmarked. At these types of intersections, specific laws may be necessary to clarify the responsibility of drivers.

Example Ordinance

The City of Ann Arbor, Michigan has codified the need for automobiles to stop and yield at unsignalized crosswalks when pedestrians are either within or approaching the crosswalk. This goes further than most other ordinances, which generally denote the need to stop for pedestrians only when they are within the crosswalk. New Jersey adopted a similar law in 2010.

Code of the City of Ann Arbor, Michigan Section 10:148, Chapter 126. Pedestrians crossing streets

(a) When traffic-control signals are not in place or are not in operation, the driver of a vehicle shall stop and yield the right-of-way to every pedestrian approaching or within a crosswalk.

(b) A pedestrian shall not suddenly leave a curb or other place of safety and walk or run into a path of a vehicle that is so close that it is impossible for the driver to yield.

(c) 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.

On-Street Parking

Issue

In traditional 'main-street' style communities, on-street parking plays a large part in the central business districts and how pedestrians and bicyclists experience the environment. Parking configurations can go a long way toward increasing safety and perceptions of safety. In recent years, there has been renewed interest in back-in, angled parking. Angled-in parking enhances bicycle safety by preventing dooring and making all road users more visible. Angled-in parking also assists pedestrians by shrinking the road cross-section. This method of parking has been

adopted in Pottstown, Montgomery County, along one side of High Street, the borough's main commercial corridor, shown previously in Figure 11 on page 16.

Example Ordinance

Borough of Pottstown Motor Vehicle and Traffic Codes: Ordinance 1920, Section 408 Angle Parking Required on Certain Streets

Only angle parking or back-in angle parking as designated, shall be permitted on the following portions of streets:

Street	Side	Between	Parking Type
High Street	North	Madison to York	Back-In Angle Parking

Radnor Township, Delaware County, has front-in angled parking along Wayne Avenue through its commercial district. The ordinance, adopted in 2004, states:

Township of Radnor, Pennsylvania Municipal Code, Chapter 255-40.1, Subdivision of Land, Multi-Family and Attached Dwelling Residential Development, Town Center Residential

C. Perpendicular and angle parking may be permitted along public streets.

D. Parking and driveway design shall allow vehicles to back out of a lot on to a local street.

Unlike Pottstown's ordinance, Radnor's ordinance does not require angled parking be used; it provides the framework for it to be considered in the proper context.

Bicycle Parking

Issue

In commercial districts, it is important to provide enough parking to prevent cyclists from locking bikes to random traffic signs and street trees. Parking should also be supplied at shopping centers, office parks, and in parking garages for people to use when running errands and commuting. The volume and placement of bicycle parking should be codified to ensure that it is secure and accessible to cyclists.

Example Ordinance

Philadelphia's zoning ordinance prescribes the city's requirements in terms of volume and placement of bicycle parking facilities. The ordinance defines different tiers of bicycle parking (spaces versus covered facilities) and makes clear that bicycle parking is a requirement, not a

choice. It also offers reduced automobile parking minimums in exchange for additional bike parking. While the code in its entirety is too long to include here, some highlights of Philadelphia's bicycle parking code are featured below.

City of Philadelphia, The Philadelphia Code, Title 14: Zoning and Planning, Chapter 14-1400 Parking and Loading Facilities

Required Bicycle Parking Spaces. Bicycle parking spaces shall be provided in accordance with the following tables:

(.1) For all uses except single and multiple family dwellings, public parking lots, and low occupancy facilities:

Gross Floor Area	Required Minimum Number of Bicycle Parking Spaces
0 - 7,500 square feet	0
7,501 - 20,000 square feet	2
Over 20,000 square feet	1 per every 10,000 square feet or fraction

Construction of Bicycle and Pedestrian Facilities

Issue

Municipalities often want to enhance their existing bicycle or pedestrian infrastructure, but financing the construction of these facilities may be problematic, and years of building solely for automobile traffic have left many gaps. While there are federal and state programs to assist with the construction of bike facilities or sidewalks, receiving this funding can be a long, difficult process. There may be more immediate alternatives available if municipal codes reflect the desire of a community to supply these facilities and require developers to provide them.

Example Ordinance

Gibbsboro Borough, in Camden County, New Jersey has a strong ordinance that requires developers to build, according to borough standards, a sidewalk or bikeway alongside new developments

Borough of Gibbsboro Municipal Code, Chapter 358 Subdivision of Land, Article VII: Design Standards Sidewalks and bikeway

(1) Concrete sidewalks, four inches thick, Class B, shall be constructed along the entire frontage of all commercial, residential, industrial or park land sites as part of any site plan, use variance or Zoning Board approval.

(2) Concrete sidewalk shall be four feet wide and shall be constructed at an offset from the center line of the right-of-way as determined by the Municipal Engineer or County Engineer.

(3) If concrete sidewalk currently exists on a site, but is in poor deteriorated condition, the sidewalk shall be removed and replaced to the specifications described above.

(4) If the Planning Board or Zoning Board should determine that it is not necessary to construct sidewalk as part of an application, the applicant shall make a contribution to the Borough calculated as follows: length of the frontage of the property times four feet divided by nine square feet per one square yard. The number of square yards calculated, times $65 per square yard, shall be the required value of the contribution.

(5) If the Planning Board or Zoning Board make a determination that concrete sidewalk is not required and a bituminous bikeway would be more appropriate, the applicant shall be required to construct a bituminous path to serve as such.

(6) Bituminous bikeways shall be eight feet wide and shall be constructed along the frontage of the subject property at an offset to be determined by the County Engineer or Municipal Engineer.

(7) Bituminous bikeways shall be bituminous surface course, FABC-1, Mix I-5, two inches thick over dense graded aggregate, four inches thick over a well-compacted subgrade.

(8) If the Planning Board or Zoning Board should determine that it is not necessary to construct a bike path, then the applicant shall make a contribution to the Borough calculated as follows: Length of frontage of the property times eight feet divided by nine square feet per square yard. The number of square yards calculated, times $55 per square yard, shall be the required value of the contribution.

Establishing these responsibilities through municipal ordinances has provided Gibbsboro the opportunity to enhance accommodations for bicyclists and pedestrians and improve the appearance of the borough’s streets through streetscaping.

Complete Streets

Issue

To ensure that the needs of pedestrians and bicyclists are considered in the planning and construction of roadway projects, it may be appropriate for municipalities to adopt a Complete Streets policy. Complete Streets is a movement that asks planners and engineers to design and build roads for all users, not just motor vehicles. Most importantly, Complete Streets pays attention to context. What would be considered a complete street in a major urban area would not look like one in a suburban or rural one. New Jersey has adopted a statewide policy, but counties and municipalities must also adopt them to ensure that pedestrians and bicylcists are considered in all roadway projects.

Example Ordinance

Different types of jurisdictions have adopted different policies. New Jersey is one of the few states to adopt a policy. The full text of the ordinance is available online at http://www.completestreets.org/webdocs/policy/cs-nj-dotpolicy.pdf. A portion of the policy is shown below.

> IV. POLICY
>
> The New Jersey Department of Transportation shall implement a Complete Streets policy though the planning, design, construction, maintenance and operation of new and retrofit transportation facilities, enabling safe access and mobility of pedestrians, bicyclists, transit users of all ages and abilities. This includes all projects funded through the Department's Capital Program. The Department strongly encourages the adoption of similar policies by regional and local jurisdictions who apply for funding through Local Aid programs.

New Jersey's policy commits to designing all facilities to current best standards, researching new technologies that promote safety for all road users, and providing training. The ability for Complete Streets to become the standard for how road projects are done moving forward requires local jurisdictions to adopt similar policies. These policies differ from location to location. The following example is from West Windsor Township in Mercer County.

RESOLUTION

WHEREAS, the Township of West Windsor is committed to creating a pedestrian and bikeway system that makes walking and cycling a viable alternative to driving, and which improves bicyclist and pedestrian safety, by creating street corridors that safely accommodate all road users of all abilities and disabilities; and

WHEREAS, the New Jersey Department of Transportation's Complete Streets policy states "A Complete Street is defined as means to provide safe access for all users by designing and operating a comprehensive, integrated, connected multi-modal network of transportation options."; and

WHEREAS, significant accomplishments have already been achieved by incorporating pedestrian safety and traffic calming measures when public streets are improved; and

WHEREAS, the Township Council supports this "complete streets" initiative and wishes to reinforce its commitment to creating a comprehensive, integrated, connected street network that safely accommodates all road users of all abilities and disabilities and for all trips; now therefore

NOW, THEREFORE, BE IT RESOLVED that all public street projects, both new construction and reconstruction (excluding maintenance) undertaken by the Township of West Windsor shall be designed and constructed as "complete streets" whenever feasible to do so in order to safely accommodate travel by pedestrians, bicyclists, public transit, and motorized vehicles and their passengers, with special priority given to bicyclist and pedestrian safety, and subject to the following conditions:

a. Pedestrian and bicycle facilities shall not be required where they are prohibited by law.

b. Public transit facilities shall not be required on streets not serving as transit routes and the desirability of transit facilities will be determined on a project specific basis.

Summary

This chapter focuses on ordinances that impact non-motorized modes in relation to vehicular traffic, parking, bicycle and pedestrian-specific facilities, and bicycle and pedestrian interaction. Ordinances related to issues such as land use and building setbacks are also important. The appendix lists other resources that contain codes and ordinances that may be used to enhance the environment for cyclists and pedestrians.

APPENDIX A

Other Resources

This section contains links and descriptions to resources that were used to assemble information for this report, as well as links to other sources that may be useful when considering issues that impact cycling and walking. This appendix is divided into several sections, these are:

- Local Resources

  These resources have been developed by local authorities to provide guidance in bicycle and pedestrian issues.

- Online Clearinghouses

  These resources contain significant information related to all aspects of pedestrian and bicycle planning, as well as links to local bike/ped plans, education campaigns, and reports.

- Local Pedestrian/Bicycle Plans and Reports

  These are links to municipal or regional plans that may be informative for municipalities developing their own plans.

- Papers and Studies

  These are links to studies related to bike/ped safety and accommodations.

- Federal/Institutional Guidance

  These documents, published by governmental or institutional agencies, provide more overviews of best practices and recommendations for bicycle and pedestrian planning and policy.

- Online Education/Encouragement-Oriented Resources

  These are links to campaigns created to educate road users on sharing the road and encourage walking and bicycling in general.

- Other

  Other links that may prove useful or informative.

Local Resources

Bucks County Bicycle Plan: Project Website
http://projects.jmt.com/bucks-county-bicycle-plan/

Chester County Trail and Path Planning Guide
http://www.chesco.org/planning/lib/planning/documents/trailpath/trailguidetoc.pdf

City of Philadelphia Pedestrian and Bicycle Master Plan
http://www.tooledesign.com/philadelphia/

Delaware County Bicycle Plan
http://www.co.delaware.pa.us/planning/transportation/bikeplan.html

Montgomery County Town Center District Planning Ordinance
http://planning.montcopa.org/planning/cwp/view,a,1458,q,42477.asp

Montgomery County Transportation Plan
http://www2.montcopa.org/planning/cwp/view.asp?a=3&q=2248

PennDOT Bicycle and Pedestrian Portal
http://www.dot.state.pa.us/Internet/Bureaus/pdBikePed.nsf/BikePedHomepage?openframeset

Pennsylvania Association of Boroughs Publications (requires purchase)
http://boroughs.org/publications/publications.php

Pennsylvania Greenway's Clearinghouse
http://www.pagreenways.org/

Online Clearinghouses

Alta Planning and Design, Case Studies (Alta Planning)
http://www.altaplanning.com/research+_+studies.aspx

National Center for Safe Routes to School Online Clearinghouse
http://www.saferoutesinfo.org/

National Complete Streets Coalition
http://www.completestreets.org/

National Highway Traffic Safety Administration (NHTSA) Bicycles Portal
http://www.nhtsa.gov/Bicycles

The New Jersey Bicycle and Pedestrian Resource Center
http://www.njbikeped.org/

The Pedestrian and Bicycle Information Center (PBIC)
www.walkinginfo.org, www.bicyclinginfo.org

Pedestrian/Bicycle Plans and Reports

Central Savannah River Area Regional Development Center, Model Bicycle and Pedestrian Facilities Land Use Regulations
http://www.csrardc.org/docs/planning/Transportation/ModelBicycleandPedestrianLandUseRegulationGuide.pdf

Chicago Bike Lane Design Guide
http://www.activelivingresources.org/assets/chicagosbikelanedesignguide.pdf

Minnesota Department of Transportation Bikeway Design Guide
http://www.dot.state.mn.us/bike/designmanual.html

Planning and Policy Models for Pedestrian and Bicycle Friendly Communities in New York State (Initiative for Healthy Infrastructure at the University of Albany)
http://www.albany.edu/~ihi/ModelZoningCode.pdf

Papers and Studies

An Evaluation of Road Shoulders as a Bicycle and Pedestrian Facility (Florida DOT)
http://www.dot.state.fl.us/safety/ped_bike/handbooks_and_research/research/redstudy.pdf

Bicycle-Bus Conflict Area Study (DVRPC)
http://www.dvrpc.org/reports/09041.pdf

Implementing Pedestrian Improvements at the Local Level (USDOT)
http://safety.fhwa.dot.gov/ped_bike/docs/localpedguide.pdf

Pedestrian and Bicycle Planning: A Guide to Best Practices (Victoria Transport Policy Institute)
http://www.mrsc.org/artdocmisc/PedBikePlanGuide.pdf

Safety Effects of Marked Versus Unmarked Crosswalks at Uncontrolled Locations (USDOT)
http://www.fhwa.dot.gov/publications/research/safety/04100/

Safety Evaluation of Yield-to-Pedestrian Channelizing Devices (PennDOT)
ftp://ftp.dot.state.pa.us/public/pdf/YTPCDFinalReport.pdf

Federal/Institutional Guidance

Association of Pedestrian and Bicycle Professionals, Bicycle Parking Guidelines
http://www.apbp.org/resource/resmgr/publications/bicycle_parking_guidelines.pdf

FHWA's Bicycle and Pedestrian Planning Guidance
http://www.fhwa.dot.gov/ENVIRONMENT/bikeped/index.htm

Guide for the Development of Bicycle Facilities (AASHTO)
http://www.sccrtc.org/bikes/AASHTO_1999_BikeBook.pdf

Manual of Unifform Traffic Control Devices (MUTCD) Traffic Control for Bicycle Facilities
http://mutcd.fhwa.dot.gov/pdfs/2009/part9.pdf

National Association of City Transportation Officials (NACTO) Urban Bikeway Design Guide
http://nacto.org/cities-for-cycling/design-guide/

Online Educational/Encouragement-Oriented Resources

City of Fort Collins, Colorado Coexist Campaign
http://www.fcgov.com/bicycling/coexist.php

I Bike Fresno
http://ibikefresno.org/

Washington, D.C.'s StreetSmart Site
http://www.bestreetsmart.net/

Minnesota DOT's Share the Road Program
http://www.sharetheroadmn.org/

Other

Model Municipal Bicycle Code by Frederick Oswald
http://bikelaws.org/Model-Muni-Code.htm

Project for Public Spaces Lighting Use and Design Guidelines
http://www.pps.org/articles/streetlights/
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Publication Title:	Pedestrian and Bicycle Friendly Policies, Practices, and Ordinances
Publication Number:	11019
Date Published:	November 2011
Geographic Area Covered:	Examples of practices and ordinances are from all over the country.
Key Words:	Pedestrian, Bicycle, Best Practices, Bicycle Lanes, Sidewalks, Trails, Crosswalks, Safety, Education
Abstract:	This report provides information about recommended practices and ordinances that enhance pedestrian and bicycle safety and accommodations. Encouragement and safety campaigns are also highlighted.

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