

8. Design Guidelines

This chapter provides design guidelines gathered from local, state and national best practices. It is intended to serve as a guide for City planners, engineers, and designers when designing and constructing bicycle facilities in the City of Columbus.

This chapter includes the following sections:

8.1. Design References describes the documents used to develop the Columbus bicycle facility design guidelines. (Page 8-2)

8.1. Design Principles describes the principles that should be used in implementing the Columbus design guidelines. (Page 8-2)

8.3. Bicycle Facility Classification Descriptions provides general descriptions of shared use paths, bicycle lanes, bicycle routes, and other bicycle facilities. (Page 8-3)

8.4. Bicycle Facility Selection Criteria outlines the criteria that should be followed when selecting a bicycle facility along a roadway. (Page 8-7)

8.5. Complete Streets: Integrating Bikeways into the Roadway illustrates cross-sections for including bicycle facilities in Columbus' standard roadway designs. (Page 8-9)

8.6. Innovative Treatments describes two innovative on-street bicycle facilities: bicycle boulevards and bicycle-bus lanes. (Page 8-13)

8.7 Bicycle Friendly Intersections provides design guidelines for accommodating bicyclists at signalized intersections, railroad crossings, and shared use path crossings. (Page 8-15)

8.7. Pavement Markings outlines pavement marking requirements for bicycle lanes, and includes innovative designs such as shared lane markings and colored bicycle lanes (Page 8-24)

8.9 Bike Facility Crossings provides design guidelines for bicycle undercrossings and overcrossings. (Page 8-26)

8.9. Signage and Wayfinding describes standard on-street signage, wayfinding and special purpose signage, and innovative signage treatments for shared use path crossings. (Page 8-33)

8.11. Bicycle-Parking describes guidelines for placing bicycle parking, and design guidelines for bicycle racks, bicycle lockers, and high-volume bicycle parking options such as bicycle corrals and bike stations. (Page 8-38)

8.1. Design References

The bikeway design principals outlined in this chapter are based on regional, state, and national documents listed below. Many of these documents are available online and are a wealth of information and resources available to the public.

- *Ohio Manual of Uniform Traffic Control Devices* (Ohio Department of Transportation, 2005) <http://www.dot.state.oh.us/default.asp>
- *Breaking Barriers to Bicycling: Bicycle Lanes Best Practices and Pilot Treatments* (MORPC, 2005) <http://www.transportation.morpc.org/documents>
- *Guidelines for the Design of Bicycle Facilities* (Ohio Department of Transportation, March 2005) <http://www.dot.state.oh.us/drrc/>
- *Guidelines for Development of Bicycle Facilities* (American Association of State Highway and Transportation Officials, 1999) www.transportation.org
- Federal Highway Administration *Best Practices Design Guide Part 2, Designing Sidewalks and Trails for Access* (FHWA Pub# FHWA-EP-01-027, 1001)
- *AASHTO Green Book: Policy on Geometric Design of Streets and Highways* (American Association of State Highway and Transportation Officials, 2001) www.transportation.org
- *Bike Lane Design Guide* (City of Chicago and Pedestrian and Bicycle Information Center, 2002) http://www.bicyclinginfo.org/pdf/bike_lane.pdf
- *Bicycle Parking Design Guidelines* (Association of Pedestrian and Bicycle Professionals, 2002) <http://www.bicyclinginfo.org/pdf/bikepark.pdf>

All bikeway facilities are required at a minimum to meet the design guidelines outlined in the *Ohio Manual of Uniform Traffic Control Devices*. The City of Columbus may choose to go beyond these basic design guidelines and apply the innovative design treatments outlined in the other documents. When using design treatments not approved by the *Ohio Manual of Uniform Traffic Control Devices*, the City of Columbus should follow the protocol for testing innovative treatments, outlined in an Appendix to this document.

8.2. Design Principles

The following are key principles for designing the Columbus Bikeway Network:

1. Columbus will have both a complete network of greenways trails, and a complete network of on-street bicycling facilities. These two systems will be interconnected to make it possible for all destinations in Columbus to be accessible by bicycle.
2. All roads in Columbus are legal for the use of bicyclists, (except those roads designated as limited access facilities which prohibit bicyclists). This means that most streets are bicycle facilities, and will be designed and maintained accordingly.

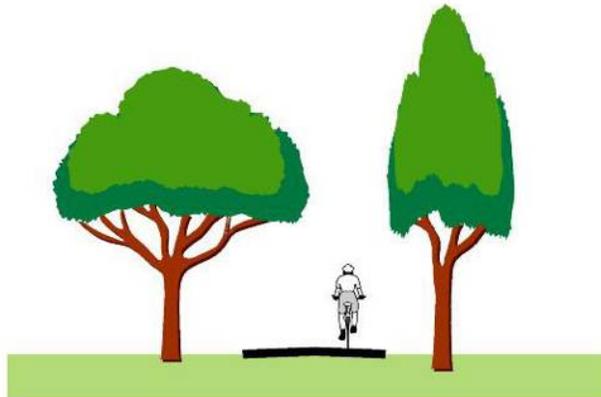
3. Bicyclists have a range of skill levels, from “Type B/C” inexperienced / recreational bicyclists (especially children and seniors) to “Type A” experienced cyclists (adults who are capable of sharing the road with motor vehicles). These groups are not always exclusive – some elite level athletes still like to ride on shared-use paths with their families, and some recreational bicyclists will sometimes use their bicycles for utilitarian travel.
4. At a minimum, facilities will be designed for the use of Type “A” cyclists, with a goal of providing for Type “B” cyclists to the greatest extent possible. In areas where specific user groups have been identified (for example, near schools) the needs of these user groups will be accommodated.
5. Design guidelines are intended to be flexible and should be applied with professional judgment by designers. Design guidelines approved by the *Ohio Manual of Uniform Traffic Control Devices* are differentiated from innovative design treatments that are not yet approved. When using design treatments not approved by the *Ohio Manual of Uniform Traffic Control Devices*, the City of Columbus should follow the protocol for testing innovative treatments.

8.3. Bicycle Facility Classification Descriptions

Bicycle facilities can be classified into several different types, including shared use paths and several variations of on-street facilities. **Table 8-1: Standard Bicycle Facility Treatments** provides basic descriptions. For specific design details refer to the *Ohio Manual of Uniform Traffic Control Devices, Chapter 9* and AASHTO’s *Policy on Geometric Design of Streets and Highways*.

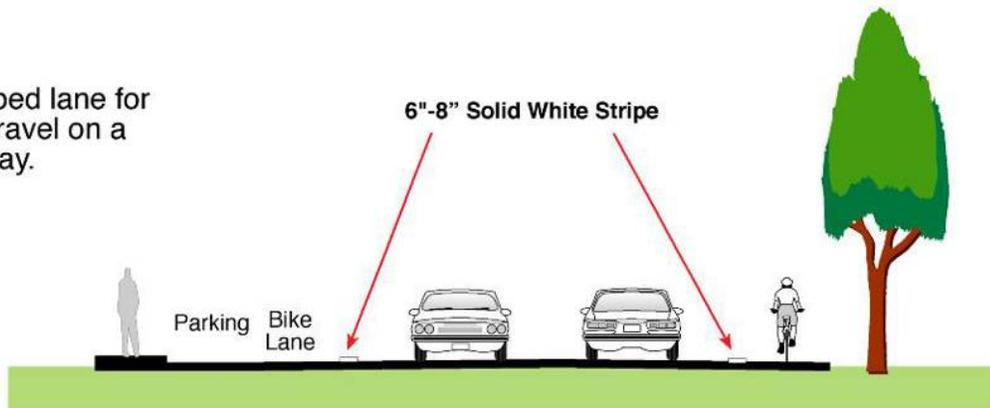
Shared Use Path

Provides a completely separated right of way for the exclusive use of bicycles and pedestrians with crossflow minimized.



Bike Lane

Provides a striped lane for one-way bike travel on a street or highway.



Bike Route Signed Shared Roadway

Provides for shared use with pedestrian or motor vehicle traffic, typically on lower volume roadways.

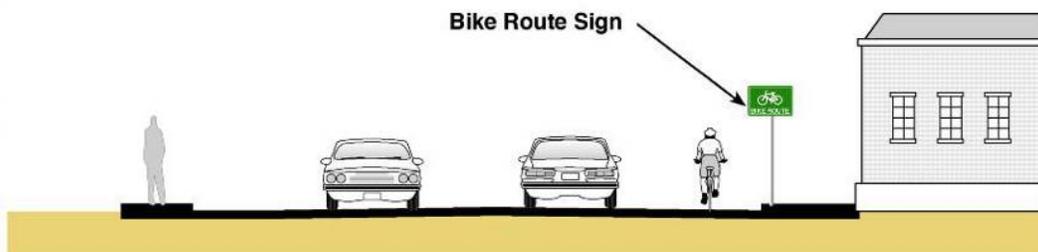


Figure 8-1: AASHTO Bicycle Facility Types

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Table 8-1: Standard Bicycle Facility Treatments

2.3. Design Designation	2.4. Width	2.5. Surface	2.6. Treatment	2.7. Function	2.8. Illustration
Bike Lane	4-6' from curb face 5'-6' from edge of parallel parking	Asphalt	On-street lane striped and signed to MORPC and OMUTCD standards	For bicyclists on roadways. Each lane is one-way. Contra-flow bicycle lanes allow bicyclists to ride against the flow of traffic on a one-way street.	
Signed shared roadways	varies	Asphalt	May either be a low volume (less than 3000 cars per day) roadway with traffic calming and signage to create a safe shared use environment, OR a higher volume roadway with wide (14' or greater) outside lanes.	Used for designated bicycle routes; can include signage and pavement markings Bicyclists ride the same direction as motor vehicle traffic.	
Bicycle Boulevard	varies	Asphalt	Multiple traffic calming treatments combined with bike lanes and/or signed shared roadways to create priority streets for bicyclists	Provides a continuous facility on streets with varying widths, volumes and speeds. Bicyclists ride the same direction as motor vehicle traffic.	

Shared Curb Lane	9 - 12' from gutter pan	Asphalt	Common facility type in low-speed and low-volume street types.	Utilitarian cycling on streets which are not otherwise designated as elements of the bicycle network. Bicyclists ride the same direction as motor vehicle traffic.	
Wide Curb Lane	12- 14' From gutter pan	Asphalt	Smooth pavement, bicycle compatible storm grates	For skilled bicyclists who are capable of sharing the road with motor vehicles. Bicyclists ride the same direction as motor vehicle traffic.	
Paved shoulders	4' minimum	Asphalt	Smooth pavement, smooth transition to roadway, kept swept.	Typical way to accommodate bicyclists on rural roads with narrow motor vehicle lanes or high speeds. Bicyclists ride the same direction as motor vehicle traffic.	
Shared Use Path	10'-14'	Asphalt, concrete or other smooth hard surface	Designed to MORPC and OMUTCD standards. When parallel to roadway, separated by planting strip or fencing.	Typical application for regional trail and some community pathways and bikeways. Accommodates bicycles, pedestrians, wheelchairs. Minimizes potential trail crossing conflicts with autos. Facility is two-way.	

8.4. Bicycle Facility Selection Criteria

The appropriate bicycle facility for any particular roadway should be primarily dictated by vehicle volume and speed of the roadway. At low speeds and low volumes, bicyclists and motorists can comfortably travel in the same lane. As speeds or volumes increase, separation between bicyclists and motorists is desirable. Separation does not just refer to parallel shared use paths, but also to a wide shoulder with stripe, a bicycle lane with median-type striping, or an 8-foot wide bicycle lane.

The question of when to separate bicyclists from motor vehicle traffic is addressed in a study *Bicycle Facility Selection: A Comparison of Approaches*.²⁸ The study compiled bicycle facility selection criteria from seven different countries and ten United States communities. The compiled guidelines are illustrated in **Figure 8-2**.²⁹ These guidelines serve as rules of thumb, with the final decision to sign a roadway as a bike route or install a separate bicycle facility up to a traffic engineer with experience designing and using bicycle facilities. Along the left side of Figure 8-2 are total traffic volumes per day and along the bottom is the speed of travel lane. The different colors represent the type of bikeway facility prescribed given the volume and speed of the travel lane.

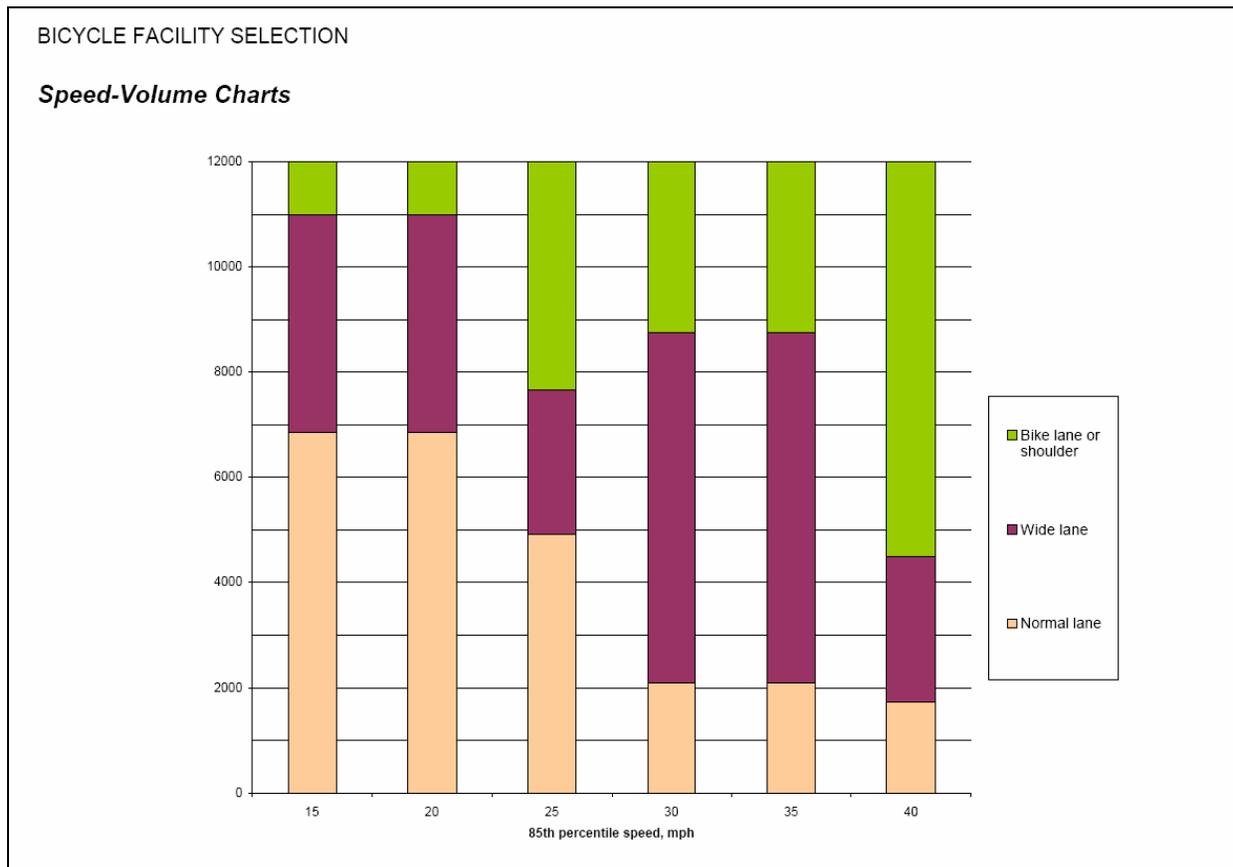


Figure 8-2: North American Speed-Volume Chart

²⁸ Michael King, *Bicycle Facility Selection: A Comparison of Approaches* for the Pedestrian and Bicycle Information Center and Highway Safety Research Center, University of North Carolina, Chapel Hill in August 2002.

²⁹ This figure is taken from Michael King's research.

The tables below represent four different versions of the bicycle facility selection parameters based on the matrix shown in **Table 8-1**. The selection criteria discussed in this section should be used as planning guidelines, rather than absolute design guidelines. If it is impossible to place a bicycle facility indicated by Figure 8-1 or Figure 8-2 along a roadway designated as a bicycle route, other options should be considered—it is more important to provide some sort of bicycle facility than to provide none at all.

Facility	15 mph	20 mph	25 mph	30 mph	35 mph	40 mph
N Narrow lane	all	<200	--	--	--	--
W Wide lane	--	200-600	--	--	--	--
B Bike lane or shoulder	--	3000-10000	3000-20000	3000-40000	20000-40000	20000-40000
S Separated lane or path	--	--	--	--	--	--

Table 17: Center for Livable Communities Matrix

LEVEL OF SERVICE Speed-Volume Matrices

Facility	15 mph	20 mph	25 mph	30 mph	35 mph	40 mph
N Narrow lane	--	--	--	--	--	--
W Wide lane	--	--	--	--	--	--
B Bike lane or shoulder	--	--	--	--	--	--
S Separated lane or path	--	--	1800-3250	1800-2000	--	--

Table 18: Bicycle Compatibility Index - LOS A Matrix

Facility	15 mph	20 mph	25 mph	30 mph	35 mph	40 mph
N Narrow lane	--	--	--	--	--	--
W Wide lane	--	--	--	--	--	--
B Bike lane or shoulder	--	--	1800-3250	1800-2000	--	--
S Separated lane or path	--	--	3250-18000	2000-18000	1800-18000	1800-18000

Table 19: Bicycle Compatibility Index - LOS B Matrix

Facility	15 mph	20 mph	25 mph	30 mph	35 mph	40 mph
N Narrow lane	--	--	--	--	--	--
W Wide lane	--	--	1800-3000	--	--	--
B Bike lane or shoulder	--	--	3000-11000	1800-10000	1800-8500	1800-7000
S Separated lane or path	--	--	11000-18000	10000-18000	8500-18000	7000-18000

Table 20: Bicycle Compatibility Index - LOS C Matrix

Michael King
for the UNC-HSRC Pedestrian and Bicycle Information Center

Figure 8-3: Tables from “Bicycle Facility Selection: A Comparison of Approaches” Illustrating the Variety of Approaches

8.5. Complete Streets: Integrating Bikeways into the Roadway

The complete streets concept is based on the principal that streets should consider all travel modes, particularly biking and walking, in addition to motor vehicles. In addition to fundamental bicycling design standards, complete streets incorporate innovative amenities, such as bicycle parking in the furniture zone.

Columbus' standard design details include roadway cross sections for 55-foot, 44-foot, 36-foot and 26-foot roadway widths. The standard design details do not indicate the number of motor vehicle lanes or the bicycle facilities that may be accommodated on these roadway widths. This section provides suggested cross sections for including bicycle facilities in Columbus' standard roadway cross-sections.

These cross-sections are intended as a starting point to the longer process of incorporating bike lanes into the City's roadway standards. Incorporating bike lanes in the City of Columbus roadway standards should be thoroughly examined and an official policy/position should be developed. It is recommended that special focus groups be formed to work through design details, similar to the various groups that were developed to work thorough details of Columbus' design manual sections. Group participants should be carefully assembled to represent various background disciplines.

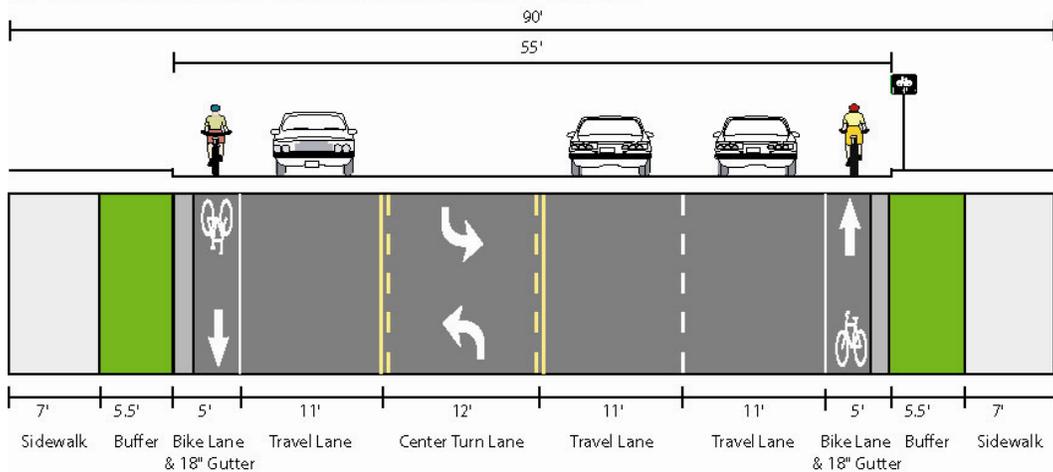
8.5.1. High Volume Roadways

On high volume roadways, bicycle lanes or a parallel separated path should be used to improve bicyclist safety and comfort. A buffer or curb should separate the pathway from the roadway for bicyclist safety. The width of the bicycle lane, buffer, and sidewalk or path should appropriately reflect the volume and speed of the vehicles using the roadway. The minimum bike lane width is 4 ft on open shoulders and 5 ft from the face of a curb, guardrail, or parked cars, with 6 ft the preferred width in urbanized areas.³⁰ The minimum shared use path width is 8' with 10' preferred for facilities that will be shared by pedestrians.

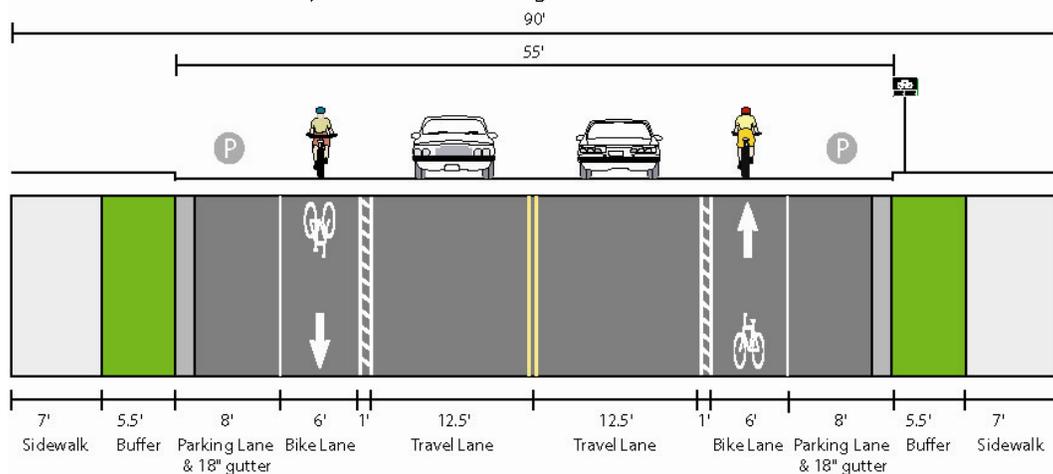
Figure 8-4 illustrates three potential bicycle accommodations in urbanized areas with a 90 foot ROW and 55-foot roadway.

³⁰ AASHTO and MUTCD

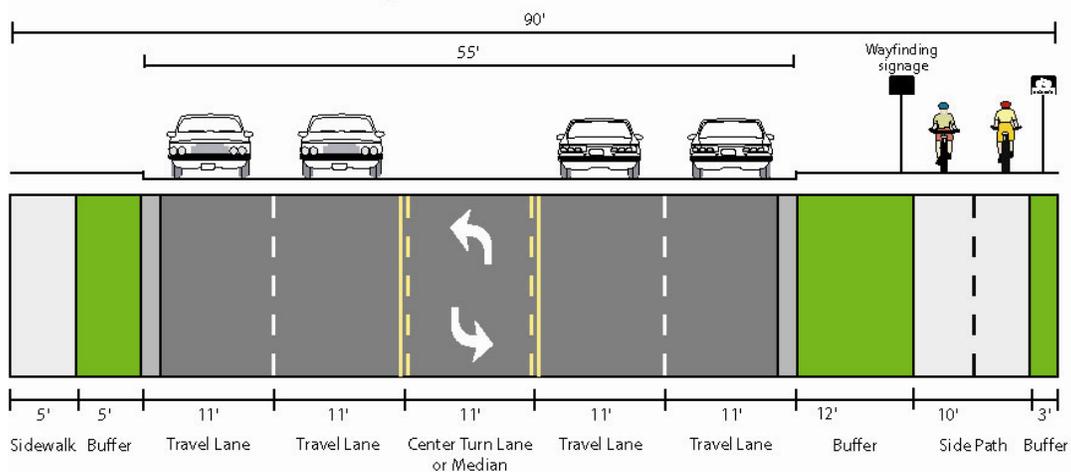
55' Section: Street with 5' Bicycle Lanes and Center Turn Lane



55' Section: Street with 5' Bicycle Lanes and Parking Lanes



55' Section: Street with 10' Side Path, Center Turn Lane and Four Travel Lanes



Note: Side path appropriate on locations with few driveway or intersection crossings.

Figure 8-4: Bikeways on a 55-Foot High Volume Roadway

8.5.2. Moderate Volume Roadway

On moderate volume roadways, such as neighborhood collectors, bicycle lanes are located between the curb and the travel lane and between the bicycle lane and the sidewalk is a planting strip. The volumes of the roadway and the number of cross-streets and driveways determine the need for a left-turn lane.

Figure 8-5: Bikeways on 44-Foot Moderate Volume Roadway illustrates a typical bicycle accommodation in urbanized areas with a 60-foot ROW and a 44-foot travel area. Bicycle lanes are five or six feet wide with 11 or 12 foot travel lanes. When there are no driveways, the center turn lane can be transformed into a planting median.

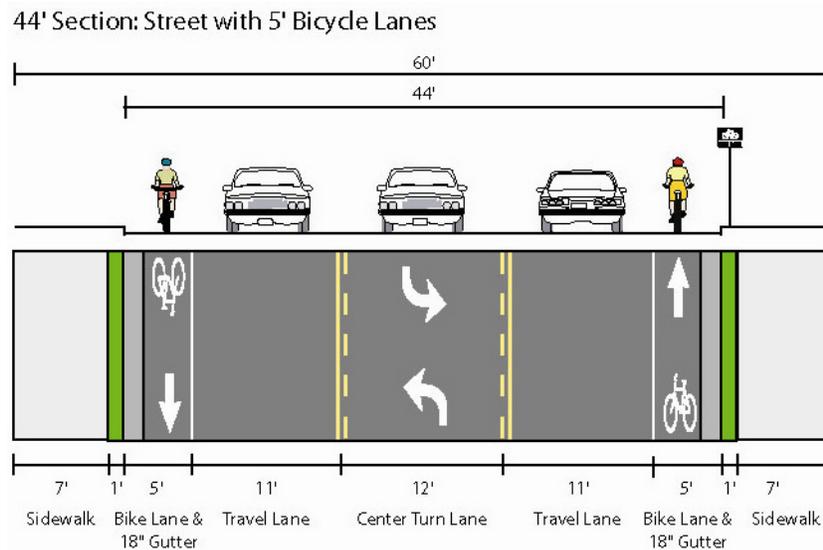


Figure 8-5: Bikeways on 44-Foot Moderate Volume Roadway

8.5.3. Low Volume Roadways

On low volume roadways, such as neighborhood residential streets, bicycle lanes are generally not required. Bicyclists can usually be accommodated on these roadways through bicycle route signage, occasional traffic calming to slow traffic, and intersection improvements where low-volume roadways intersect high-volume roadways.

Figures 8-6 illustrates potential bicycle accommodations in urbanized areas with 50- and 60-foot ROW and a 26- and 32-foot travel area. Bicycle lanes are four or five feet wide with nine to 11 foot travel lanes.

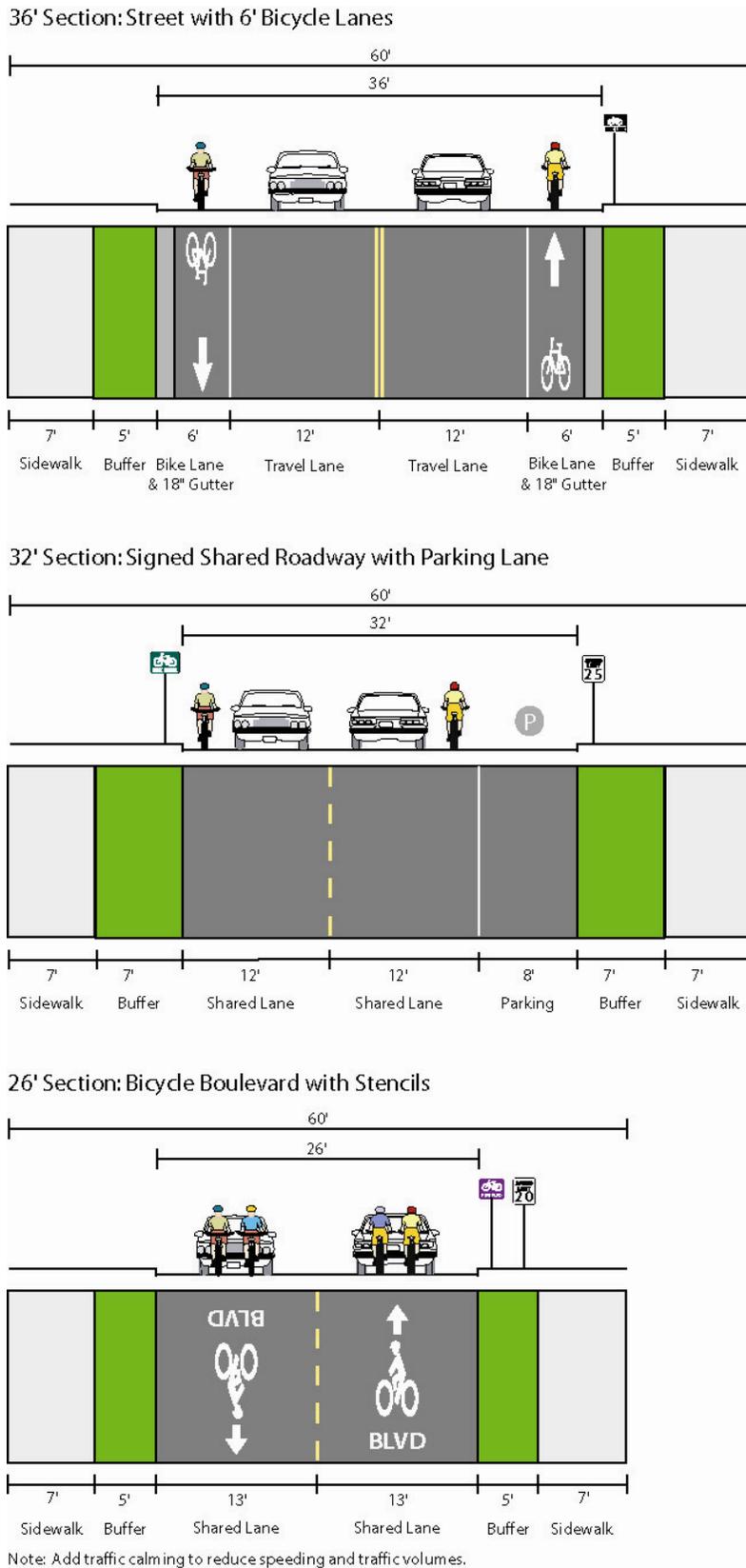


Figure 8-6: Bikeways on 32-Foot and 26-Foot Low Volume Roadways

8.6. Innovative Treatments

8.6.1. Bicycle Boulevards

Bicycle Boulevards have been implemented in a variety of locations including Berkeley, Palo Alto and Davis California, and Portland, Oregon. A Bicycle Boulevard, also known as bicycle priority road, is a roadway that allows all types of vehicles, but which has been modified to enhance bicycle safety and security. Roadways are designed to be places where cars and bicycles can equally share right-of-way. Bicycle Boulevards tend to be residential streets with lower traffic volumes, typically between 3000 to 5000 average daily vehicles, but can include secondary commercial streets.

Bicycle Boulevards typically include design features such as:

- Traffic calming devices such as traffic circles and curb bulbouts
- Bicycle destination signage
- Pavement stencils indicating status as a Bicycle Boulevard
- Crossing improvements at major arterials such as traffic signals with bicycle-detection, four-way stops and high-visibility crosswalks
- Bicycle-friendly signal preemption at high-volume signalized intersections.
- Stop signs on streets crossing the Bicycle Boulevard
- Some jurisdictions have implemented Bicycle Boulevards by removing on-street parking in select locations.

Bicycle Boulevards can be designed to accommodate the particular needs of the residents and businesses along the routes, and may be as simple as pavement markings with wayfinding signs or as complex as a street with traffic diverters and bicycle signals. Many good candidates for Bicycle Boulevards may benefit most from signage and public education. Substantial capital improvements may not be necessary.

To further identify a street as a preferred bicycle route, lower volume roadways may be modified to function as a through street for bicycles, while maintaining only local access for automobiles. Traffic calming devices can lower traffic speeds and through trips, limiting conflicts between motorists and bicyclists and providing priority to through bicycle movement.



A bicycle boulevard sign in Berkeley, CA

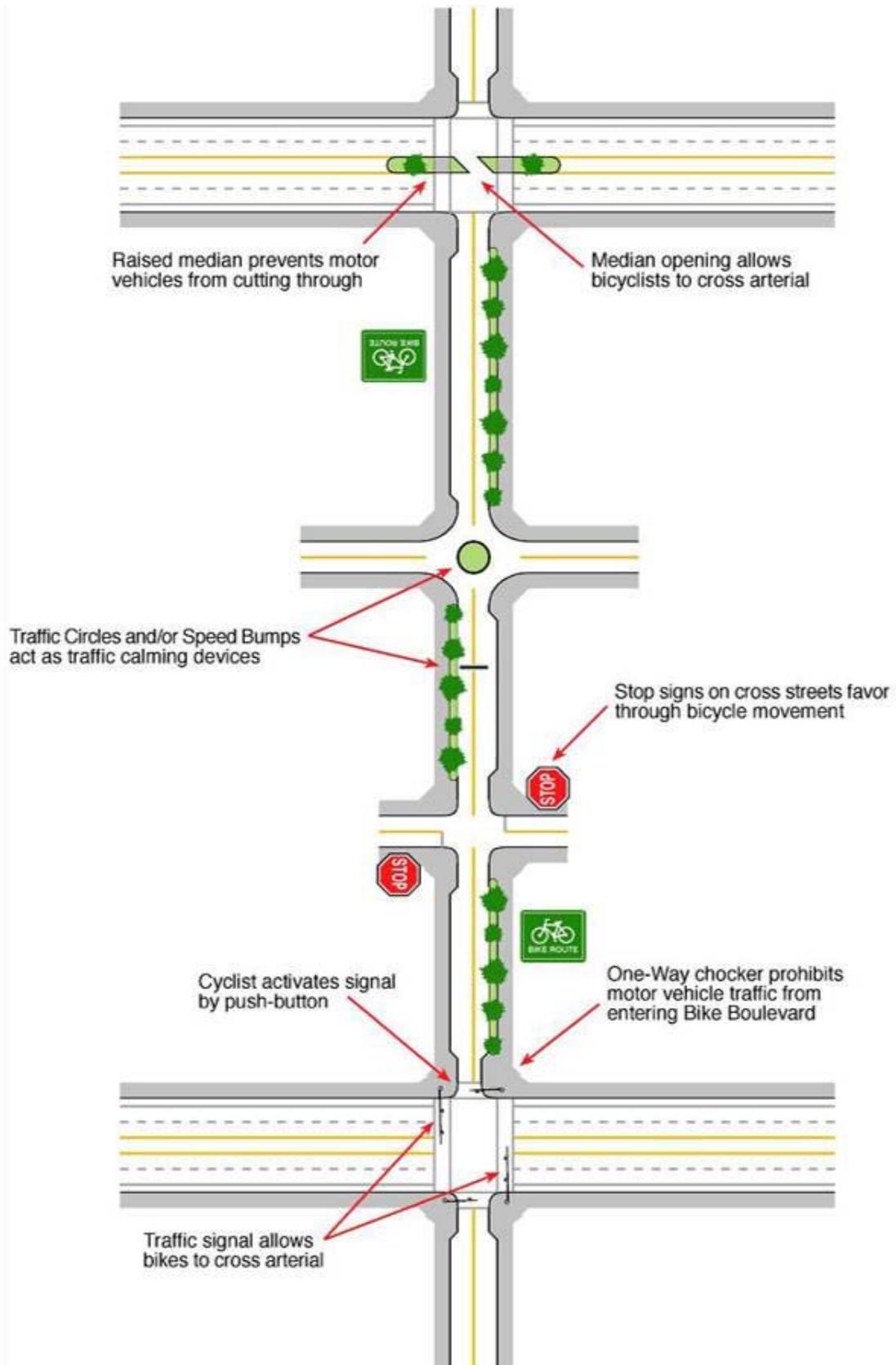


Figure 8-7: Bicycle Boulevard Lane Configuration

8.6.2. Shared Bicycle/Bus Lanes

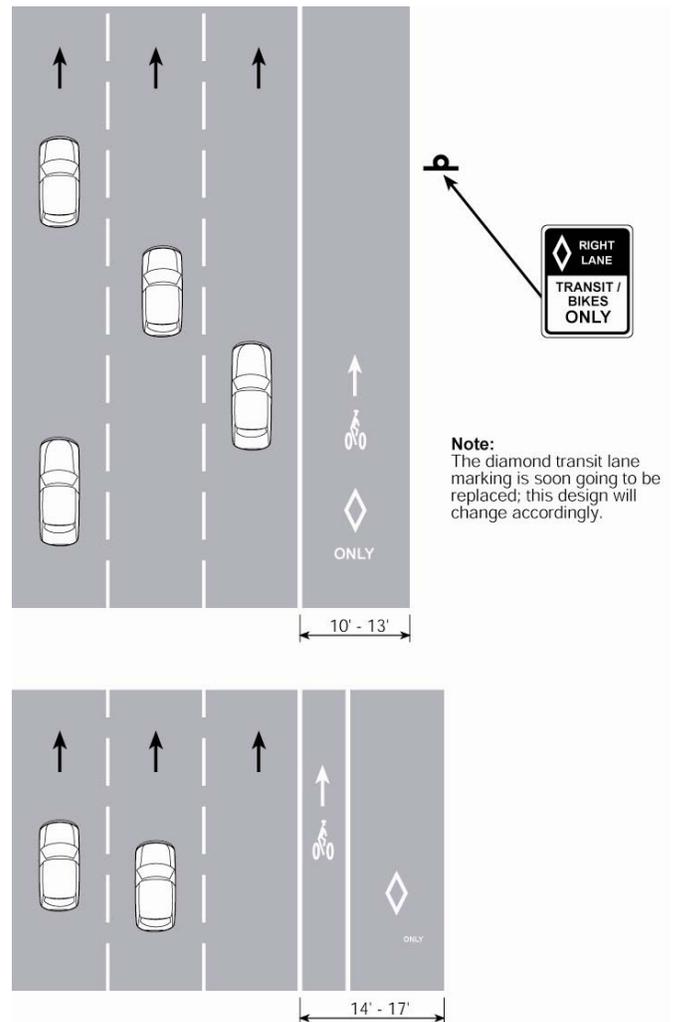
Travel time for bikes and buses can be improved with a dedicated shared bicycle/bus lane, so that neither is hindered or endangered by congestion from other auto traffic. Shared bicycle/bus lanes are commonly used in central business districts where room for dedicated bicycle lanes is limited, and where motor vehicle congestion warrants a separate facility for buses.

Potential locations for bicycle/bus lane implementation include congested streets with moderate or long bus headways, streets with moderate bus headways during peak hours, or places that provide no reasonable alternative routing alignment.

Shared bicycle/bus lanes should be paved with colored asphalt and stenciled as a diamond lane with supporting signage and pavement legends to emphasize their designation. These lanes should be wide enough to allow bicyclists to comfortably pass stopped buses on the left. Twelve feet is the recommended minimum width of shared bicycle/bus lanes.

There are a couple of potential disadvantages of shared lanes. These include a leapfrogging between buses and bikes (when buses and bikes are continually passing one another in the lane) Leapfrogging creates a greater potential for conflicts. The second disadvantage is when vehicles are allowed to use the lane at intersections as a right turn lane. This creates potential conflict points between bicycles and vehicles and slows buses and bicycles significantly.

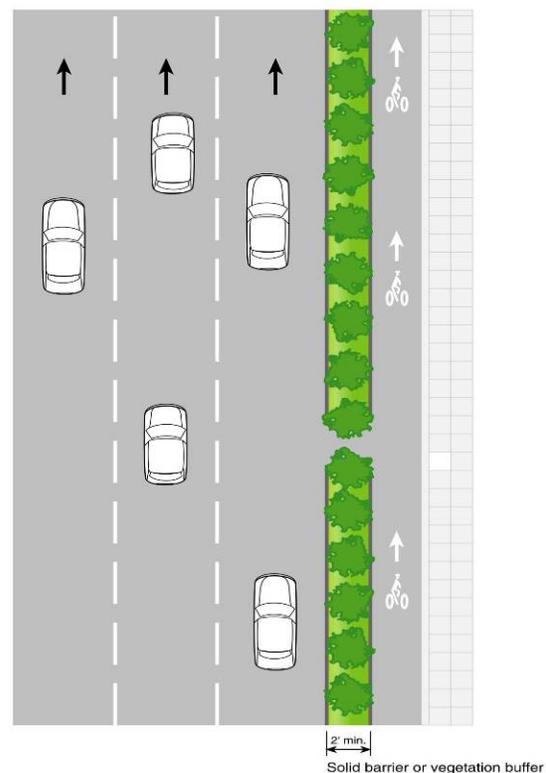
Figure 8-8: Shared Bicycle/Bus Lane Configuration



A Shared Bicycle/Bus Lane

8.6.3. Cycle Tracks

Cycle tracks are European bicycle facilities that are receiving an increasing amount of interest and attention from planners and engineers in the United States. Cycle tracks' are physically separated one-way bike lanes or two-way paths parallel to roadways. These bikeways are located between sidewalks and vehicle travel lanes or parking lanes and are a delineated area specifically for through bicycle traffic. Cycle tracks can be at the same plane as sidewalks but are usually separated by a low curb or barrier. There must be sidewalks adjacent to cycle tracks to prevent pedestrians from confusing cycle tracks with multi-use paths. When crossing cycle tracks, pedestrians always have the right-of-way. On the motor vehicle side of cycle tracks, if there is an on-street vehicle parking lane then there is normally a two to three foot buffer preventing car doors from entering the bikeway. If there is not on-street parking, a larger barrier is put in place to separate bicycles and vehicle traffic.



Cycle tracks are useful along streets with minimal crossings. Careful study is necessary at intersections where cycle track traffic and vehicle traffic cross paths because cycle tracks are off-set from intersection corners. Intersections should be designed to include signage that alerts motorists of bicyclists crossing from the cycle track, and vegetation and parking should be limited near intersections so that bicyclists and motorists can see each other. If cycle tracks are two-way, motorists should be alerted to the fact that bicyclists will be approaching from both directions. To help decrease the number of wrong-way riding bicyclists on one-way cycle tracks, complimentary facilities should be provided on the opposite side of the street. Other innovative treatments, such as colored pavement, can complement these facilities and improve warnings to motorists.



Example of a one-way cycle track from San Francisco Bicycle Plan Design Guidelines. 9th Avenue Cycle Track in New York City. Photo: www.streetsblog.org Oct. 5, 2007 post.

8.6.4. *Bicycle-Friendly Intersections*

Intersections represent a primary collision points for bicyclists. In Columbus, at least 13% percent of bicycle collisions occur at intersections³¹. Large, multi-lane intersections are more difficult for bicyclists to travel through than smaller, two-lane intersections. For this reason, treatments in this section focus on improving bicycling through large intersections.

At large intersections:

- Signals may not be timed to allow slower-moving bicyclists to travel across the intersection.
- Loop detectors or video detection that is used to actuate the signal may not be calibrated to detect bicyclists.
- Bicyclists may not know how to actuate the signal using loop detectors, even if it is calibrated.
- Bicyclists who wish to turn left may be required to travel across several motor vehicle lanes to reach the left hand turn lane.
- Bicyclists who wish to turn left like a pedestrian may experience long delays as they wait through several light cycles.
- Bicyclists who are traveling straight may have to merge across motor vehicle traffic that is turning right from a right-turn lane.
- Motorists may be less likely to be aware of bicyclists at large, multi-lane intersections due to higher traffic volumes, more lanes of traffic and the complexity of large intersections
- Large intersections without bicycle facilities are very auto-centric, leading motorists to assume that bicyclists are not supposed to be on the roadway.

Design treatments can help bicyclists travel through intersections and alert motorists of bicyclists' presence. Good intersection design alerts motorist to bicyclists, indicates to motorists and bicyclists where bicyclists may ride, and guides bicyclists through intersections. The following design treatments can be found in the OMUTCD. For specific design details, refer to the OMUTCD.

Figure 8-9: Bicycle Lane Configurations at Intersections illustrates how road striping and signage can accommodate bicyclists at critical locations.

³¹ A study of bicycle crashes in Columbus, Ohio that occurred between 2000 and 2004 shows that at least 13.3% of crashes occurred at intersections. This number is likely to be higher. Overall, the location of the bicyclist when struck was not indicated or was listed as "unknown" in 610 of the 1053 bicycle crashes in Columbus during the study period. Of the known locations, 249 or 24 percent of the crashes were classified simply as "In roadway" accidents. Accidents classified as "Marked crosswalk at intersection" comprised of 72 crashes, or 6.8 percent. Accents classified as "At intersection, but no crosswalk" comprised of 69 crashes, or 6.5 percent.

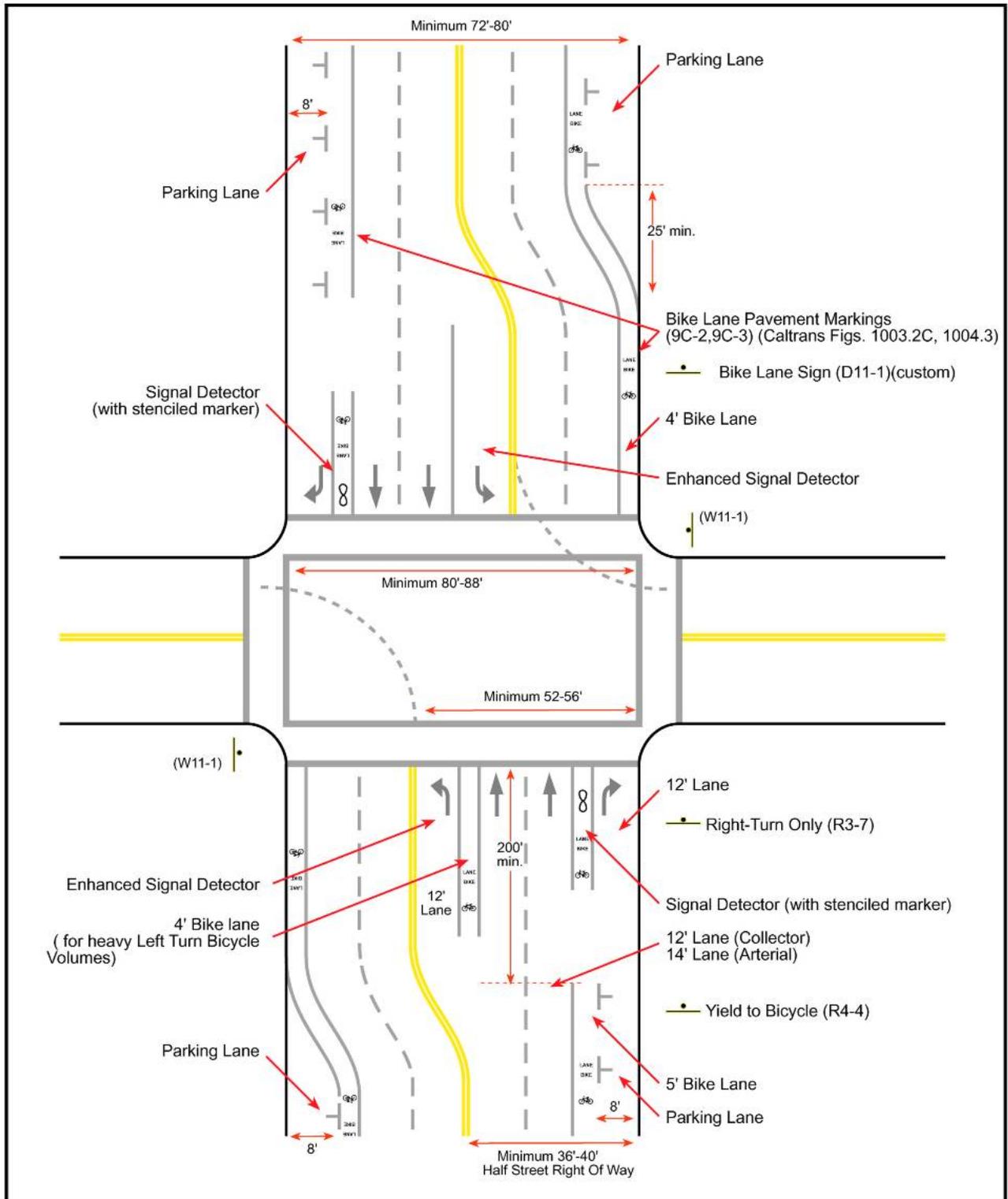


Figure 8-9: Bicycle Lane Configurations at Intersections (Illustrative purposed only. Further engineering would be required.)

Right-Turn Only Lanes

Right-turn only lanes can present challenges for bicyclists traveling through an intersection. Bicyclists must merge to the left to position themselves in the through travel lane. Jurisdictions will sometimes stripe bike lanes on the right-side of right-turn only lanes, which places the through-cyclist in direct conflict with a right-turning vehicle. The appropriate treatment for right-turn only lanes is to either drop the bike lane entirely approaching the right-turn lane, or to place a bike lane pocket between the right-turn lane and the right-most through lane.

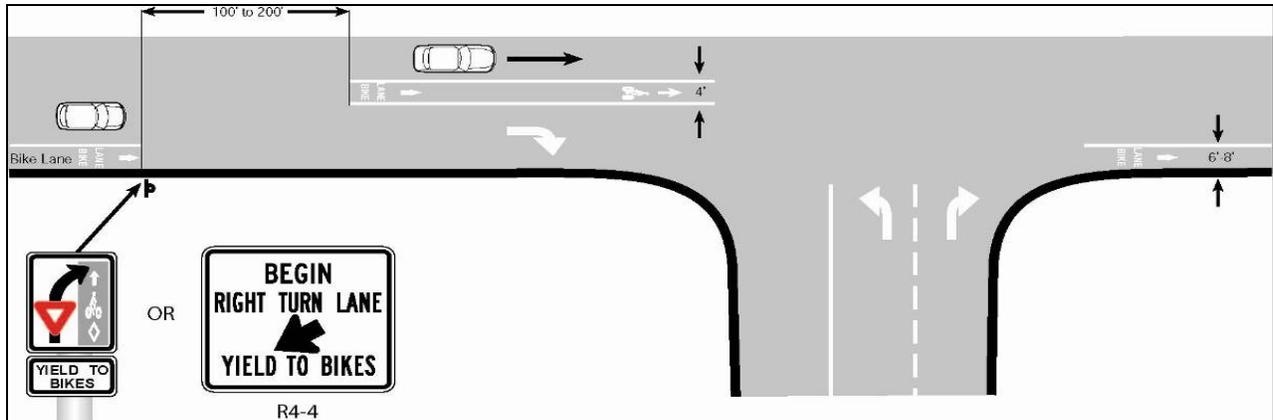


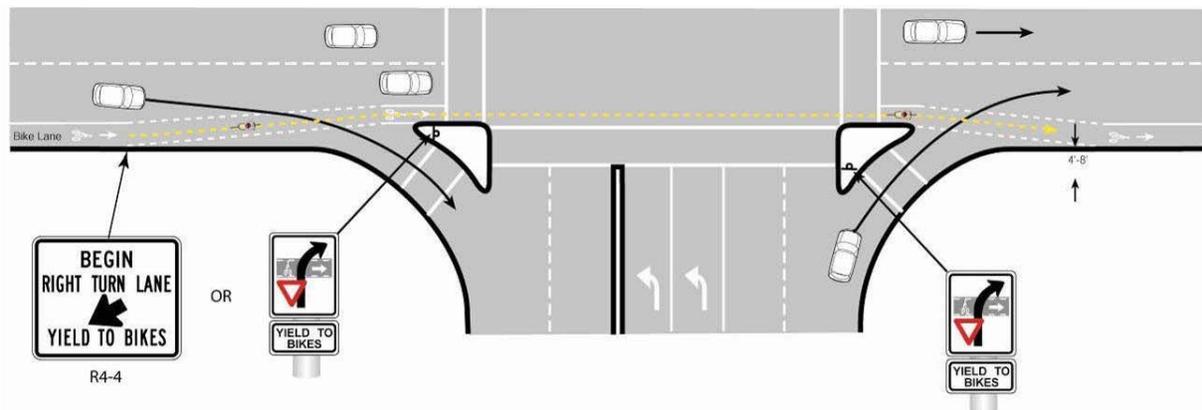
Figure 8-10: Bike Lane Adjacent to Right Turn Only Lane.

Free Right Turns with Porkchop Islands

Many arterial intersections are designed with free right-turn lanes at each corner, separated from the through lanes by triangular “pork chop” islands. The free right turn lanes are typically Yield controlled. While the pork chop configuration can provide a pedestrian refuge area, they can present some difficulties for bicyclists. The bike lane striping is typically dropped approaching the right-turn lane. Bicyclists traveling straight need to merge left across the right-turn lane in order to position themselves along the right side of the through lane. Some bicyclists may wait until too late to merge, which can cause conflicts because of the wider turn radius and relatively higher turning speeds afforded by the free right configuration. A vehicle in the free right lane would not be anticipating a bicyclist along the curb to suddenly merge over near the island to continue straight. In addition, the pork chop island configuration provides no dedicated space for bicyclists waiting to proceed straight, as the concrete island, if not well designed, cuts off the normally available shoulder width.

Figure 8-11 illustrates how a dedicated dashed bike channel through the merge zone and along the right side of the through lane helps guide bicyclists and alert motorists. This option may require a reduction in the travel lane widths at the intersection in order to provide a three or four foot bike lane channel.

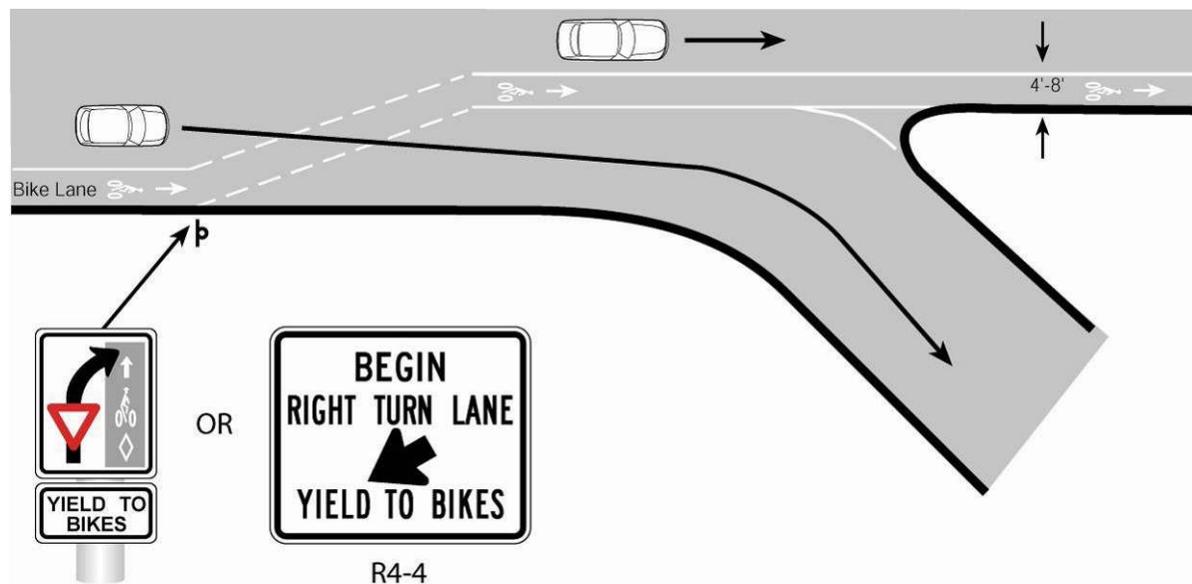
Figure 8-11: Bike Lane through Right Turn Island Intersection with Free Right Turn Lanes



Freeway on- and off-ramps

Freeway on- and off-ramp crossings present another potential conflict zone for bicyclists, as bike lanes are typically dropped and cyclists must merge across travel lanes where vehicles are accelerating or decelerating from freeway speeds. As with the free right turn lanes, the appropriate cyclist behavior is to merge left away from the curb so as to be positioned in the through lane well before the mouth of the on-ramp, and to remain out away from the curb until past the off-ramp. **Figure 8-12: Bike Lane through Freeway Ramps** shows this design.

Figure 8-12: Bike Lane through Freeway Ramps



8.6.5. Bicycle Actuated Signals

Another way to make intersections more “friendly” to bicyclists, involves changing how they operate. Improved signal timing, calibrating loop detectors to detect bicyclists, and camera detection

make it easier and safer for cyclists to cross intersections. This section focuses primarily on loop detectors.

Loop detectors are installed within the roadway to allow the metal of a motor vehicle to trigger a change in the traffic signal. Many standard motor vehicle loop detectors can be calibrated to detect bicyclists. This allows the cyclist to stay within the lane of travel and avoid maneuvering to the side of the road to trigger a push button. Signals can be configured so that if a bicycle is detected, an extended green time can be provided.

OMUTCD standards suggest intersections utilize markings to indicate the location where a bicyclist is to be positioned in order to actuate a signal. Adjacent signage is also recommended to emphasize the connection between the marking and the signal.

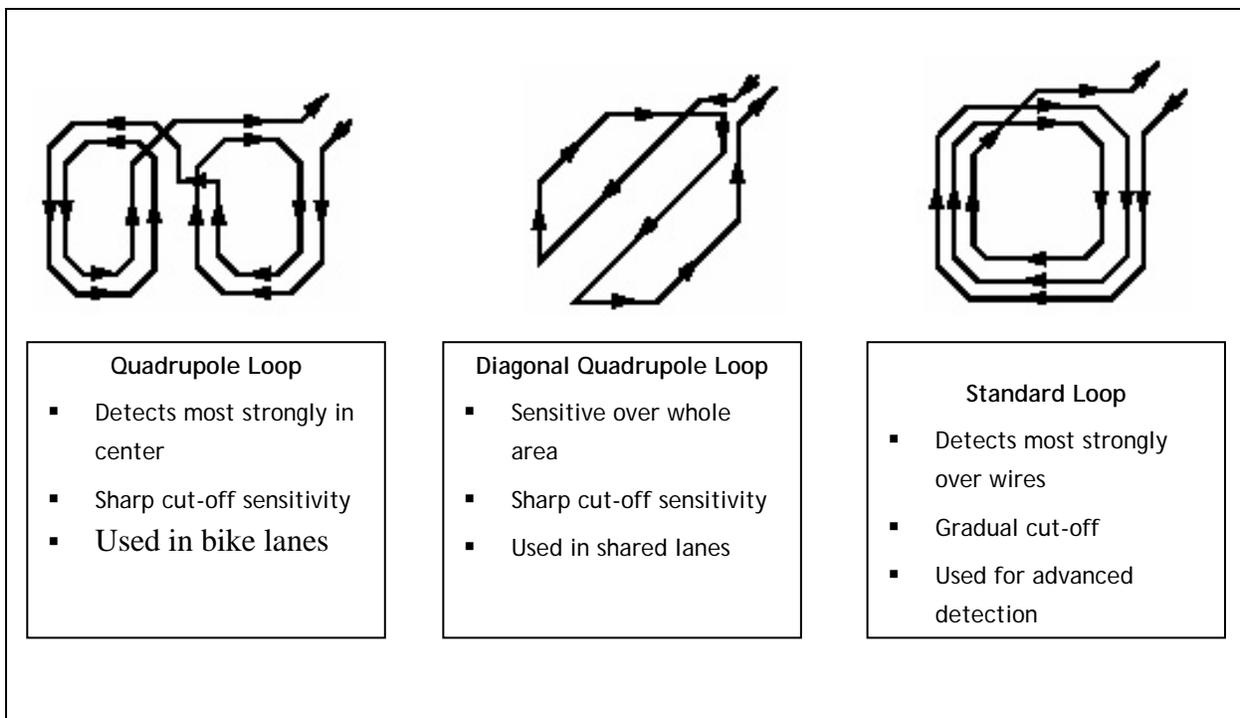
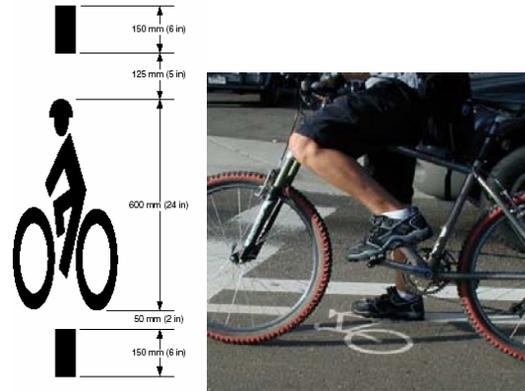


Figure 8-13: Types of Loop Detectors

8.6.6. Bicycle Specific Traffic Control Signals

A bicycle signal is an electrically powered traffic control device that may only be used in combination with an existing traffic signal. Bicycle signals may be used to address an identified safety or operational problem involving bicycles. Signals use green, yellow and red lighted bicycle

symbols, to control bicycle movement through an intersection. Germany uses bicycle signals that are mounted lower than motor vehicle traffic signals and located near the bicyclist.

The following is an example of a warrant used to justify the placement of a new signal or signal phase that serves bicyclists.

A bicycle signal may be considered for use only when the volume and collision or volume and geometric warrants have been met:

1. Volume. When $W = B \times V$ and $W > 50,000$ and $B > 50$.

Where: W is the volume warrant.

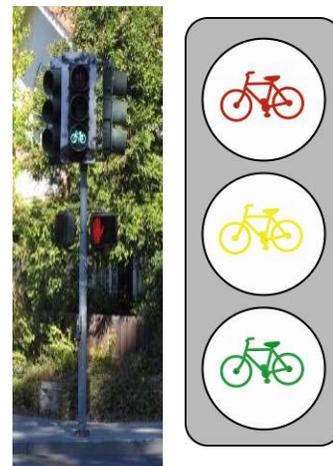
B is the number of bicycles at the peak hour entering the intersection.

V is the number of vehicles at the peak hour entering the intersection.

B and V shall use the same peak hour.

2. Collision. When 2 or more bicycle/vehicle collisions of types susceptible to correction by a bicycle signal have occurred over a 12-month period and the responsible public works official determines that a bicycle signal will reduce the number of collisions.

3. Geometric.
 - a. Where a separate bicycle/multi use path intersects a roadway.
 - b. At other locations to facilitate a bicycle movement that is not permitted for a motor vehicle.



Bicycle traffic signal.



Bicyclists use bicycle traffic signals leaving the University of California Davis campus

The Bicycle Specific Traffic Control Signal is not included in the Ohio MUTCD, however it is in the MUTCD 2003 and MUTCD 2003 California Supplement (May 20, 2004), Sections 4C.103 & 4D.104

<http://www.dot.ca.gov/hq/traffopps/signtech/mutcdsupp/>

8.6.7. Bike Box /Advance Stop Line

A bike box is a relatively simple innovation to improve turning movements for bicyclists without requiring cyclists to merge into traffic to reach the turn lane or use crosswalks as a pedestrian. The bike box is formed by pulling the stop line for vehicles back from the intersection, and adding a stop line for bicyclists immediately behind the crosswalk. When a traffic signal is red, bicyclists can move into this “box” ahead of the cars to make themselves more visible, or to move into a more comfortable position to make a turn. Bike boxes have been used in Cambridge, MA, and Eugene, OR and a number of other localities. **Bike Boxes are not included in the OMUTCD.**

Potential Applications:

- At intersections with a high volume of bicycles and motor vehicles
- Where there are frequent turning conflicts and/or intersections with a high percentage of turning movements by both bicyclists and motorists
- No right turn on red
- Can be combined with a bicycle signal (optional)



Bike box in Eugene, OR. (Photo: Evaluation of an Innovative Application of the Bike Box, FHWA, 2000.)



Bicycle Box in England filled in with color to emphasize allocation of space to bicycle traffic.

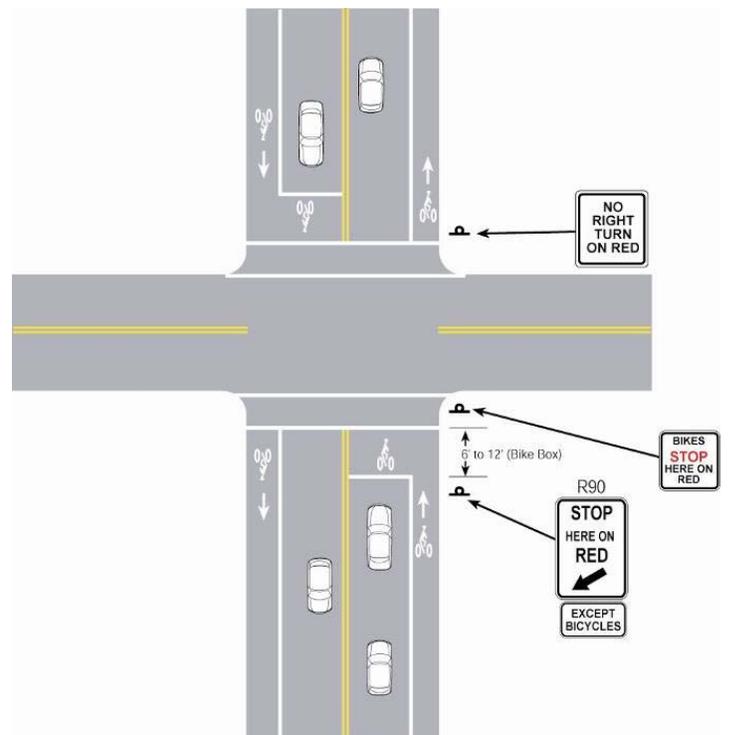


Figure 8-14: Plan View of a Bicycle Box

8.7. Pavement Markings

The *Ohio Manual on Uniform Traffic Control Devices* provides guidance for lane delineation, intersection treatments, and general application of pavement wording and symbols for on-road bicycle facilities and off-road paths.

8.7.1. Bike Lanes

The figure below provides examples for bike lane marking and striping. Further details regarding bicycle lane demarcation—specifically addressing turn movements—can be found in the OMUTCD.

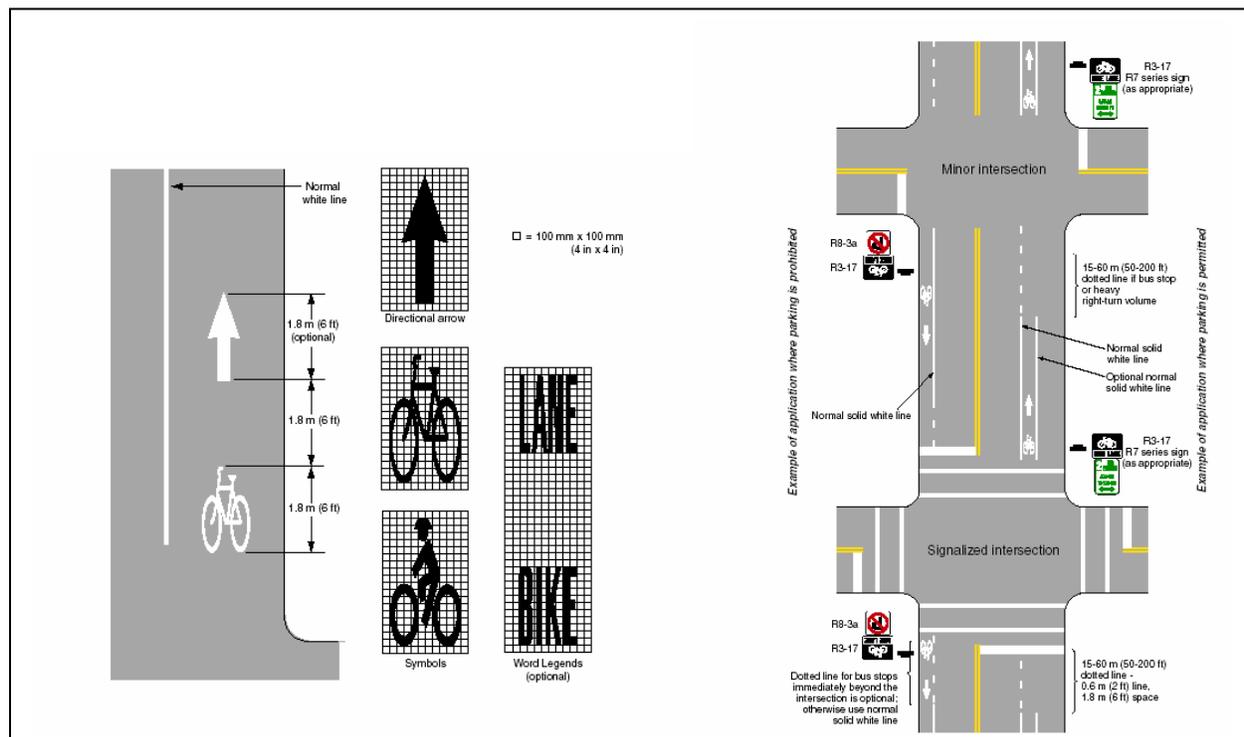


Figure 8-15: OMUTCD Examples of Optional Word and Symbol Pavement Markings for Bicycle Lanes.



Shared Lane Markings on Polk Street in San Francisco

8.7.2. Shared Lane Marking

In September 2005, the Shared Lane Marking was approved by the California Traffic Control Devices committee for use by California jurisdictions.³² The primary purpose of the Shared Lane Marking (sometimes referred to as “sharrows”) is to provide positional guidance to bicyclists on roadways that are too narrow to be striped with bicycle lanes and to alert motorists of the location a cyclist may occupy on the roadway.

³² Policy Directive 05-10 “Shared Roadway Bicycle Marking”, passed on September 12, 2005, outlines implementation guidelines for placing Shared Lane Markings. <<http://www.dot.ca.gov/hq/traffops/signtech/signdel/policy.htm>>

Shared Lane Markings are intended to reduce the chance of a cyclist colliding with an open car door of a vehicle parked on-street, parallel to the roadway. The California MUTCD only allows Shared Lane Markings to be used on urban roadways with on-street parallel parking. The next version of the Federal MUTCD will include shared lane markings, and will allow them to be included at all locations, not just next to parked cars.

Shared Lane Markings are appropriate on bicycle network streets that are too narrow for standard striped bicycle lanes, areas that experience a high level of "wrong-way" riding, along with bicycle network streets that have moderate to high parking turnover, typically commercial areas. Shared Lane Markings are intended for use on roadways without striped bicycle lanes or shoulders.

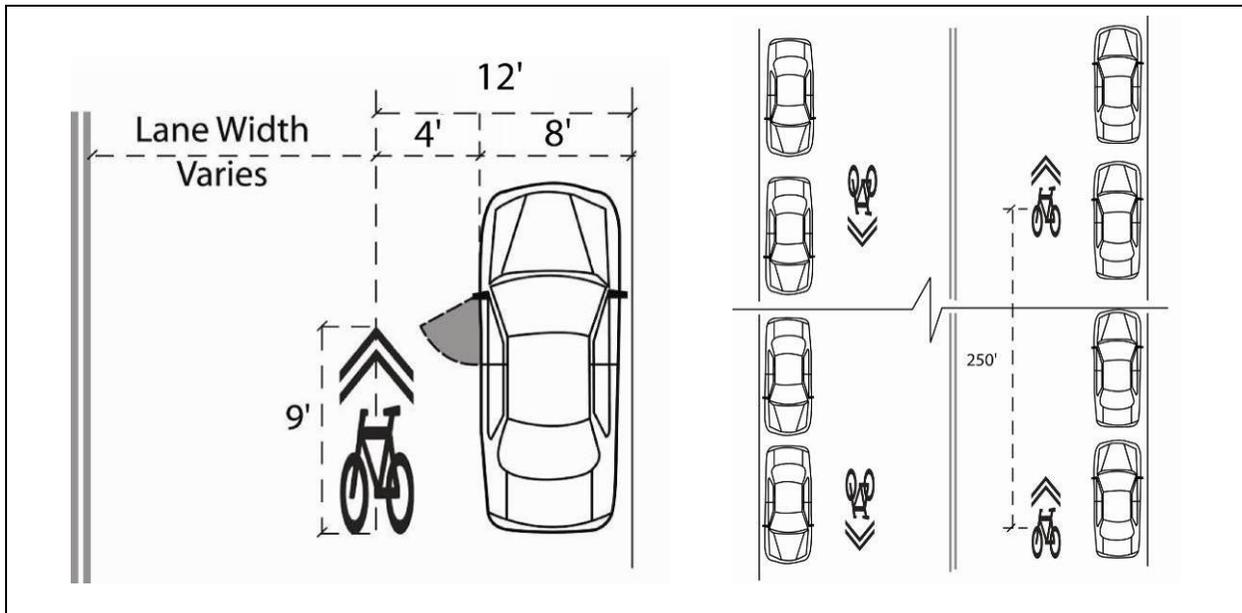


Figure 8-16: Shared Lane Marking Design Guidelines

Shared Lane Markings should be spaced approximately 250' center to center, with the first marking on each block or roadway segment placed immediately after the nearest intersection. On long blocks, supplemental markings may be necessary. **Shared Lane Markings are not included in the OMUTCD, but will be included in the next version of the Federal MUTCD.**

8.7.3. Colored Bike Lanes

European countries have used colored pavement – red, blue, yellow, and green—for bike lanes where this is a higher probability of vehicle conflicts. Examples of such locations are freeway on- and off-ramps where motorists move into a right turn pocket. In the United States, the City of Portland has experimented with blue bike lanes and supportive signage with favorable results. Studies showed that more motorists were using their turn signals and slowing or stopping at the blue



This blue bike lane in Portland is used to warn motorists approaching the on-ramp that bicyclists have a through lane.

lanes. **Colored Bike Lanes are not included in the OMUTCD.**

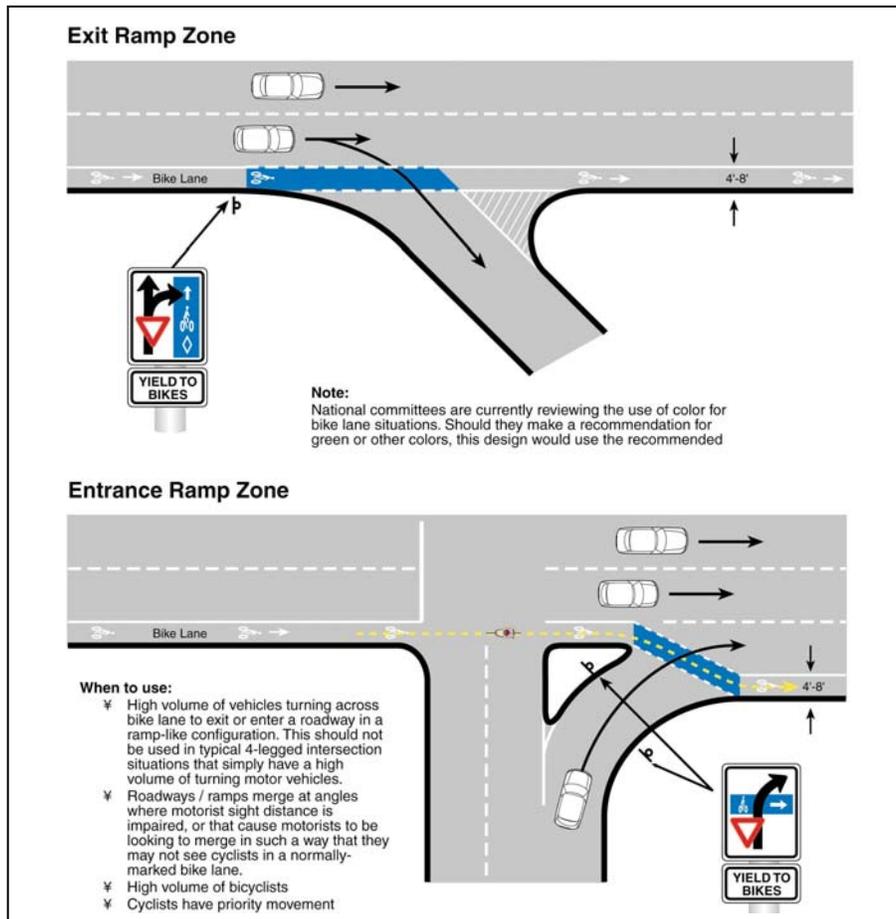


Figure 8-17: Colored Bike Lane Treatment through Conflict Areas

8.7.4. *Contra-Flow Bicycle Lanes*

Contra-flow bicycle lanes entail a striped lane for bicycles going against the flow of automobile travel. The lanes should be separated by a double-yellow line. **Contra-Flow Bike Lanes are not included in the Ohio MUTCD**

Contra-flow bike lanes are designated lanes that allow bicycles to move in the opposite direction of traffic on a one-way street. Functionally, streets with contra-flow bicycle lanes are set up so that motor vehicles can only move one way on the road, while bikes can move in both directions—with traffic or opposite traffic in the contra-flow lane.



A contra-flow bicycle lane in Cambridge, MA

Their implementation is controversial primarily because, contrary to standard road rules, they encourage cyclists to ride against motor-vehicle right of way, which can lead to increased bicycle/motor-vehicle crashes.

However, in some circumstances, they may offer substantial savings in out-of-direction travel, by providing more direct routes. For popular destinations and high-use bikeways, a contra-flow lane can increase safety by reducing the number of bicyclists, and the number of conflicts, along the longer indirect route.

Potential Applications:

- Provides direct access to key destination
- Improves safety
- Infrequent driveways on bike lane side
- Bicyclists can safely and conveniently re-enter traffic at either end
- Sufficient width to provide bike lane
- No parking on side of street with bike lane
- Existing high bicycle usage of street
- Less than three blocks in length
- No other reasonable route for bicyclist

Contra-flow lanes are most successful on streets with few intersecting driveways, alleys or streets on the side of the lane; on streets where bicyclists can safely and conveniently re-enter the traffic stream at either end of the lane; on streets where a substantial number of bicyclists are already using the street; and on streets with sufficient width to accommodate a bike lane.

Special features to incorporate into contra-flow bike lane design include the following.



The contra-flow lane on the left in Madison, WI is grade-separated.

- The contra-flow bike lane must be placed on the right side of the street (to motorists' left) and must be separated from oncoming traffic by at least a double yellow line; vertical separation or grade separation is encouraged. This indicates that the bicyclists are riding on the street legally, in a dedicated travel lane.
- Any intersecting alleys, major driveways, and streets must have signs indicating to motorists that they should expect two-way bicycle traffic.
- Existing traffic signals should be fitted with actuators for bicyclists (i.e. loop detectors, video cameras, infrared or push buttons).
- Existing traffic signals should be modified (if necessary) so that bicyclists traveling in the contra-flow direction can see the signal head, and any conflicting turn phasing shall be eliminated.

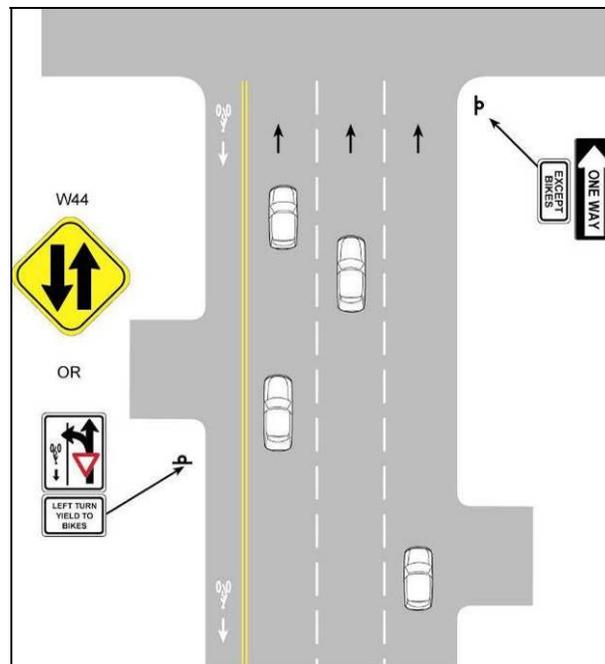


Figure 8-18: Plan View of a Contra-Flow Bicycle Lane

8.8. Bike Facility Crossings

8.8.1. At-Grade Intersection

When shared-use paths cross streets, proper design should be developed on the pathway as well as on the roadway to alert bicyclists and motorists of the crossing. Sometimes on larger streets, at mid-block pathway crossing locations as shown in **Figure 8-19: Shared Use Path Mid-Block Crossing** an actuated signal is necessary. A signal allows bicyclists a clear crossing of a multi-lane roadway. If a signal is or is not needed, appropriate signage and pavement markings should be installed, including stop signs and bike crossing pavement markings.

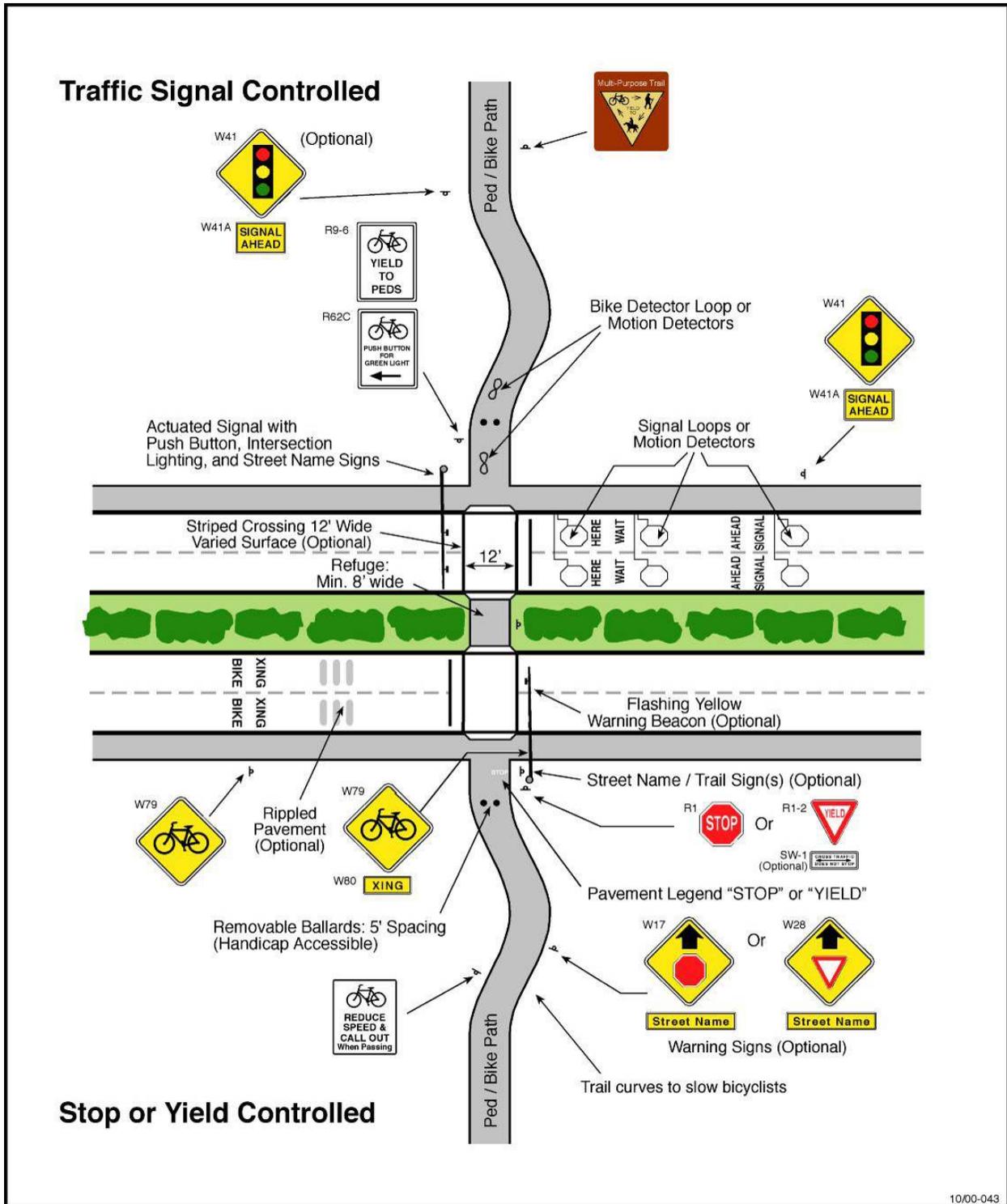


Figure 8-19: Shared Use Path Mid-Block Crossing

8.8.2. Undercrossings

Undercrossings are an important component of bikeway design.

Some design considerations for undercrossings include:

- Must have adequate lighting and sight distance for safety
- Must have adequate over-head clearance of at least 3.1 m (10 ft)
- Tunnels should be a minimum 4.3 m (14 ft) for several users to pass one another safely; a 3.0 m x 6.0 m (10 ft x 20 ft) arch is the recommended standard
- “Channeling” with fences and walls into the tunnel should be avoided for safety reasons
- May require drainage if the sag point is lower than the surrounding terrain.



This undercrossing provides ample vertical and horizontal clearance and a clear sight line through the structure, improving the feeling of safety.

8.8.3. Overcrossings

Overcrossings are also an important component of bikeway design. Barriers to bicycling often include freeways, complex interchanges, and rivers. When a route is not available to cross these barriers a bicycle overcrossing is necessary. **Figure 8-20: Undercrossing Design Guidelines** illustrates basic design standards for typical designs.

Some design considerations for overcrossings include:

- Pathways must be a minimum 6 feet wide, with a preferred width of 8 or 10 feet wide
- Slope of any ramps must comply with ADA Guidelines
- Screens are often a necessary buffer between vehicle traffic and the bicycle overcrossing



A freeway overcrossing in Davis, CA

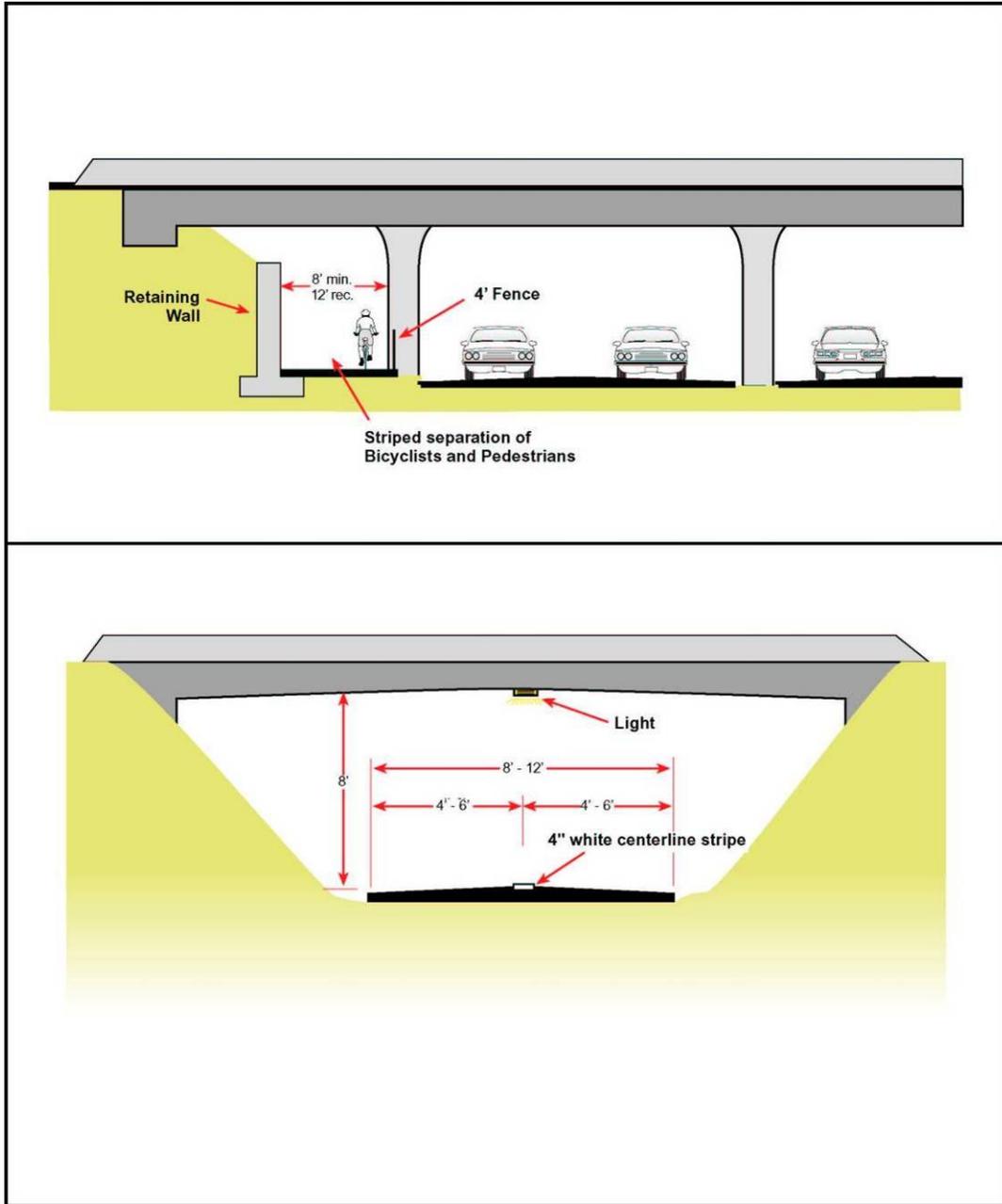


Figure 8-20: Undercrossing Design Guidelines

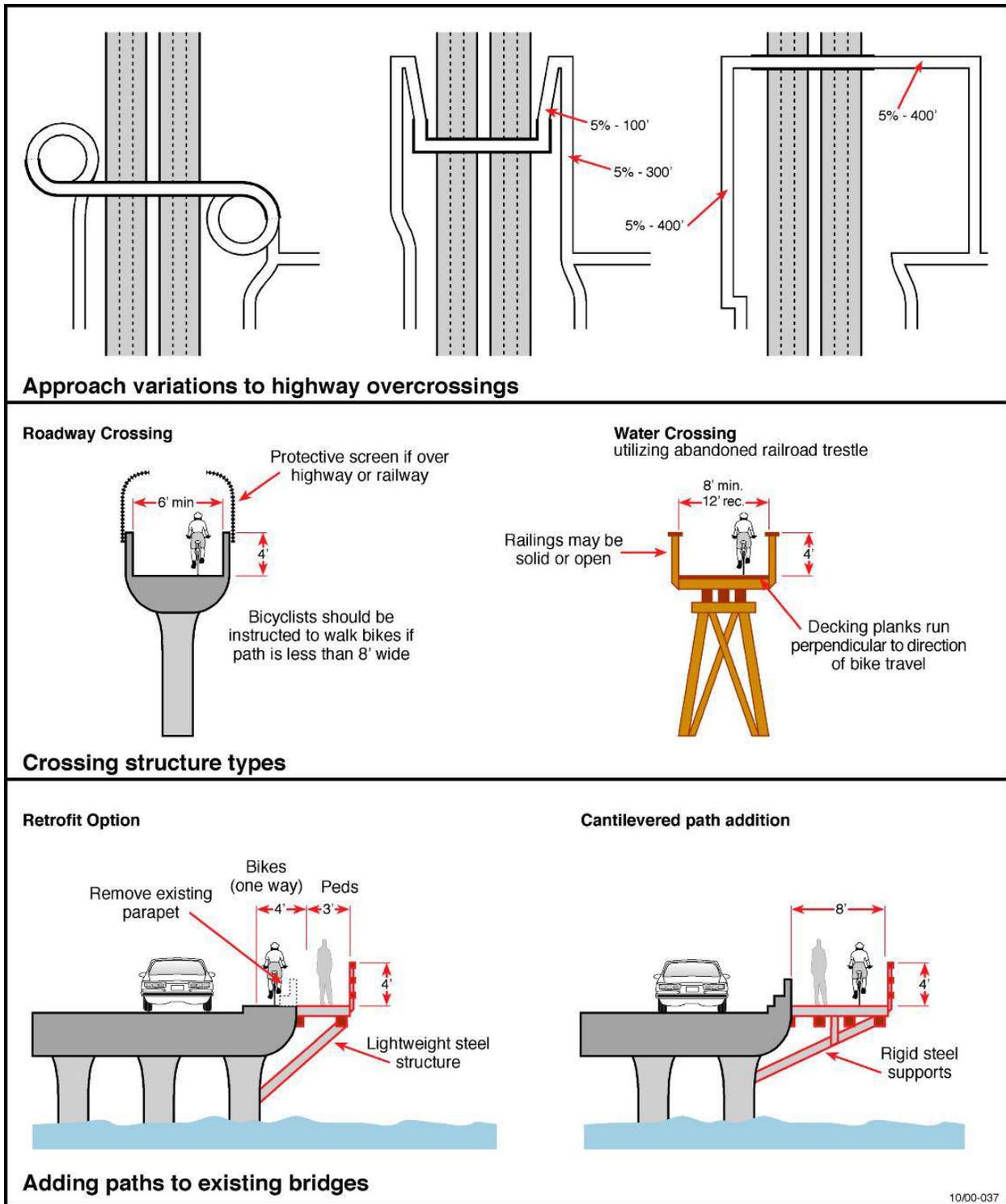


Figure 8-21: Overcrossing Design Guidelines

8.8.4. At-Grade Railroad Crossings

Railroad tracks can be a hazardous to bicyclists. If bicyclists do not ride at a 90 degree angle over the tracks, bicyclists' wheels can catch in the tracks and potentially lead to a collision. **Figure 8-22: Bike Lanes Crossing at Railroad Tracks** shows the proper design for a bike lane crossing railroad tracks. Bike lanes should cross train tracks at 90 degrees, helping to prevent collisions.

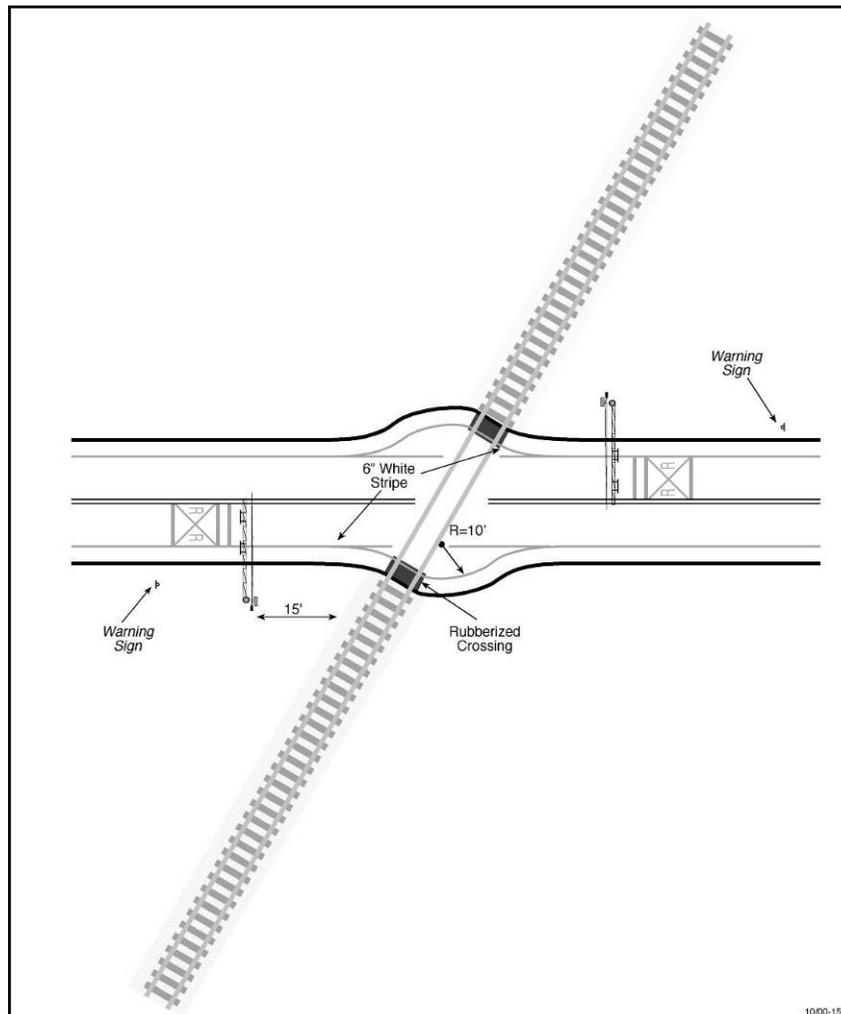


Figure 8-22: Bike Lanes Crossing at Railroad Tracks

8.9. Signage and Wayfinding

8.9.1. Wayfinding

Wayfinding signage is an important part of the bicycle network. Implementing a well-planned and attractive system of signage can greatly enhance bikeway facilities, making their presence aware to motorists, as well as existing and potential bicyclists. By leading people to city bikeways that offer safe and efficient transportation, effective signage can encourage residents and visitors to bicycle.

Way-finding can include mile-markers, road identification at undercrossings, and informational kiosks.

Figure 8-23: Example of Wayfinding Signage, Portland, Oregon shows a number of different signs and markings, both on poles and on the roadway, that the City of Portland has adopted for their new bicycle signage program. Signs such as these improve the clarity of travel while illustrating that destinations are really only a short ride away. The signs below are provided only as point of reference and not being adopted by Columbus.

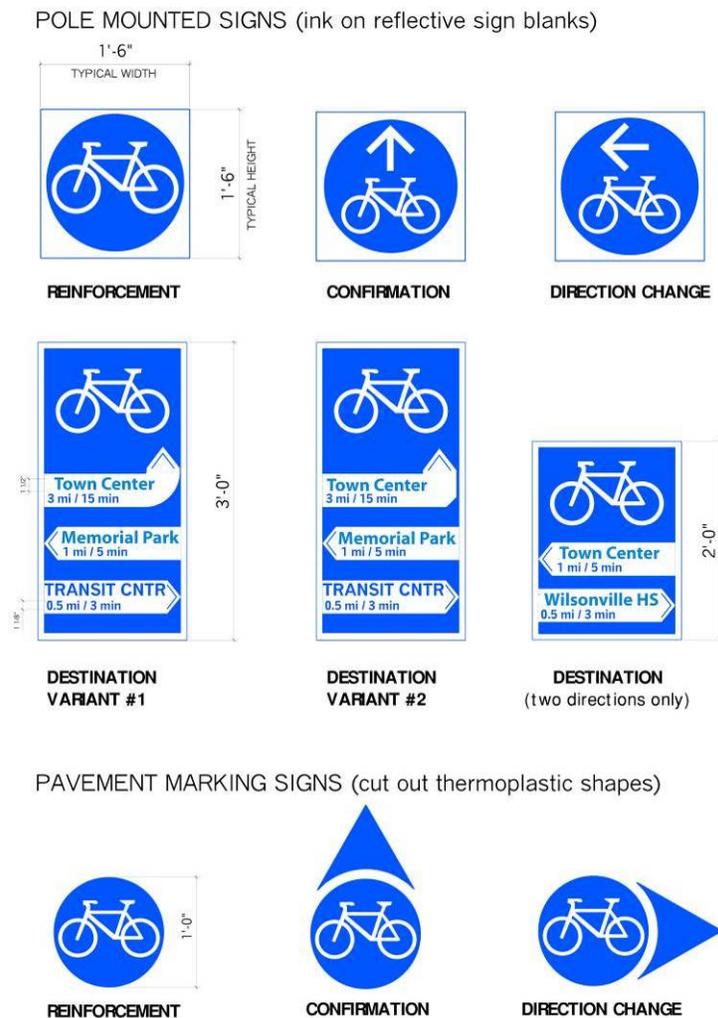


Figure 8-23: Example of Wayfinding Signage, Portland, Oregon

Destination Signage

Destination signage helps bicyclists use the bikeway network as an effective transportation system. These signs typically display distance, direction and in some cases, estimated travel time information to various destinations. In Columbus, destination signage would be helpful for destinations such as downtown, The Ohio State University, Easton, Polaris, the Arena District, or other shopping

centers, parks and schools. Signage can also assist users to navigate towards major bikeways, transit hubs, or greenway trails. Finally, way-finding can help bicyclists avoid difficult and potentially hazardous road scenarios, like steep terrain, dangerous intersections, highway and river crossings, or deteriorating road conditions. The signs below are provided only as point of reference and not being adopted by Columbus.

SIGNAGE

color palette

- Street & Bike Route**
c100/m0/y100/k0
- undesignated**
c92/m45/y9/k2
- Downtown**
c0/m60/y80/k0
- Ohio State University**
c2/m76/y55/k0
- Nationwide Arena**
c53/m62/y2/k0



design concept:

Create signage that is similar to the standard OMUTCD signage, but uses a wider palette of colors that are complementary to the standard green color.

identity concept:

Use signage to establish designated corridors as streets that are bicycle and pedestrian friendly.



sign size and placement:

Design and placement of signs should be oriented toward the needs of bikers. Bikers' comfortable cone of vision is approximately 30 degrees--15 degrees above and below the direct line of sight. To be effective, signs should be placed within the bicyclists' cone of vision. A biker traveling at 10mph is covering 14.6 feet per second. Signage text should be sized to be read easily without having to slow down.

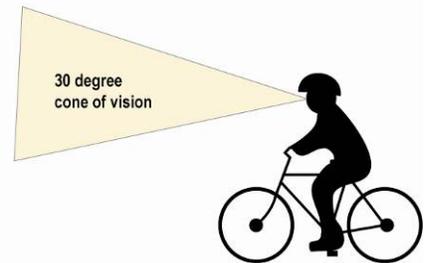


Figure 8-24: Example of Destination Signage for Columbus

Regional Way-finding

For on-street facilities, MORPC primarily defers to the OMUTCD, which is consistent with MUTCD standards. These require both the use of the words “Bike Route” and a bicycle symbol for any route designation. Additional panels are required to provide destination name, route numbers or directional arrows.

For off-street facilities, like shared-use trails and pathways, MORPC policy states the need for informational signs to notify users where they are, where they are going, what cross streets they are crossing, how far away destinations are, and what services are available close to the path.



MORPC specifically implements the Central Ohio Greenways Signage Program for way-finding along greenways. This program details a color and posting system throughout the greenway network, which crisscrosses the Columbus metropolitan area.

Columbus Way-Finding Recommendations

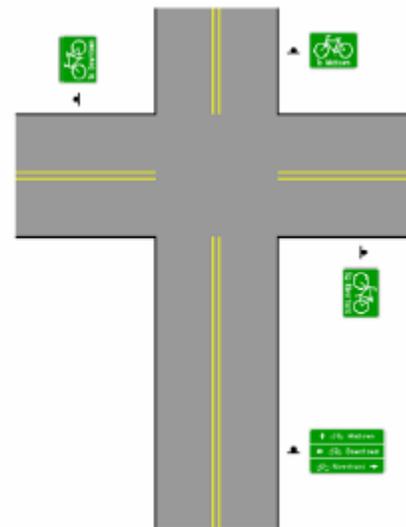
Way-finding for the Columbus Bicentennial Bike Plan, should accommodate regional standards while implementing more recent innovations.

On-Street Route Signs

In terms of placement, route signs should consistently be located at every turn, after every major signalized intersection, or every quarter-mile.

Signage along straight portions of routes should use a single panel, simply showing a bicycle symbol and destination.

Signage where routes intersect should include panel signs that provide cyclists with destination, direction and distance.



This new signage system offers less sign clutter, lower costs, and greater clarity at locations with multiple bike routes, compared to the current OMUTCD and City standards.

Off-street Trail and Shared-Use Path Signs

The Central Ohio Greenways Signage Program presents thoroughly detailed design guidelines. Additionally, many communities neighboring the trail network have already agreed to the program, providing a convenient politically-approved system for incorporation and implementation of Columbus bikeway signage.

Facilities connecting to these greenways and trails should feature a hybridized system combining on-street route signs with the Central Ohio Greenways Signage Program. This system should encourage use of trails for recreational as well as functional bicycling trip-purposes, with amenities like informational kiosks.



innovative signage is developed to increase bicycle awareness and improve visibility. Any signs to be installed on public roadways in Ohio must be approved by ODOT’s Traffic Control Devices Committee. (See appendices for further information.)

New experimental designs can also be utilized after approval. This continuing process of developing better way-finding or safety-warning signs is important for designing safer and more enjoyable bicycling facilities, as well as improving the overall transportation system.

Additionally, customized signs provide an opportunity to make signage a unique feature of Columbus. Many communities in California have customized the bike route logo sign by modifying the upper third portion with a distinct graphic.



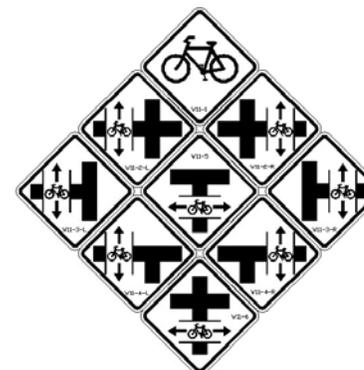
“Share the Road” signs, are designed to advise motorists that bicycles have as much of a right to a narrow roadway as motor vehicles. The “Bikes Allowed Full Use of the Lane” sign is currently used on an experimental basis in several American cities.



8.9.4. Parallel Path Warning Signage

When paths are located parallel and adjacent to roadways, vehicles turning into and out of streets and driveways must cross the path. Conflicts between bicyclists and pedestrians and turning motorists are common at these types of intersections. Turning motor vehicles do not expect to see bicyclists or pedestrians coming in the opposite direction of traffic.

Starting in the early 1990’s, the City of Denver, Colorado began using experimental warning signage at its parallel paths. The signage is modified from the standard MUTCD railroad warning signage.



An example of Denver’s parallel path warning signage

Experimental signage, similar to the Denver parallel path warning signs, could help alert motorists to the presence of bicyclists and pedestrians on parallel paths. This would involve the City working with the Ohio Department of Transportation Control Devices Committee (ODOTCDC) through their process for implementing and testing “experimental” signage.

8.10. Bicycle-Parking

As more bikeways are constructed and bicycle usage grows, the need for bike parking will increase. Short-term parking at shopping centers and similar land uses can support bicycling as well as long-term bicycle parking at transit stations and work sites.



An example of Denver’s parallel path warning signage in context

8.10.1. Guidelines for Locating Bicycle Parking

Bicycle parking should be installed on public property, or available to private entities on an at-cost basis. Bicycle parking facilities should be provided at other public destinations, including government buildings, community centers, parks, schools and shopping centers.

All bicycle parking should be in a safe, secure area visible to passersby. Commuter locations should provide secure indoor parking, covered bicycle corrals, or bicycle lockers. Bicycle parking on sidewalks in commercial areas should be provided according to specific design criteria, reviewed by merchants and the public, and installed as demand warrants.

Figure 8-26: Recommended Guidelines for Bicycle Parking Locations and Quantities provides basic guidelines on ideal locations for parking at several key activity centers as well as an optimum number of parking spaces.

Land Use or Location	Physical Location	Bicycle Capacity
City Park	Adjacent to restrooms, picnic areas, fields, and other attractions	8 bicycles per acre
City Schools	Near office entrance with good visibility	8 bicycles per 40 students
Public Facilities (city hall, libraries, community centers)	Near main entrance with good visibility	8 bicycles per location
Commercial, retail and industrial developments over 10,000 gross square feet	Near main entrance with good visibility	1 bicycle per 15 employees or 8 bicycles per 10,000 gross square feet
Shopping Centers over 10,000 gross square feet	Near main entrance with good visibility	8 bicycles per 10,000 gross square feet
Commercial Districts	Near main entrance with good visibility; not to obstruct auto or pedestrian movement	2 bicycles every 200 feet
Transit Stations	Near platform or security guard	1 bicycle per 30 parking spaces

Figure 8-26: Recommended Guidelines for Bicycle Parking Locations and Quantities

8.10.2. Short Term Bicycle Parking

Short term bicycle parking facilities are best used to accommodate visitors, customers, messengers and others expected to depart within two hours. Bicycle racks provide support for the bicycle but do not have locking mechanisms. Racks are relatively low-cost devices that typically hold between two and eight bicycles, allow bicyclists to securely lock their frames and wheels, are secured to the ground, and are located in highly visible areas. They are usually located at schools, commercial locations, and activity centers such as parks, libraries, retail locations, and civic centers. See **Figure 8-27: Recommended Short-Term Bicycle Parking Facilities**.

Figure 8-27: Recommended Short-Term Bicycle Parking Facilities

1. THE RACK ELEMENT

Definition: the rack element is the part of the bike rack that supports one bicycle.

The rack element should:

- Support the bicycle upright by its frame in two places
- Prevent the wheel of the bicycle from tipping over
- Enable the frame and one or both wheels to be secured
- Support bicycles without a diamond-shaped frame with a horizontal top tube (e.g. a mixte frame)
- Allow front-in parking: a U-lock should be able to lock the front wheel and the down tube of an upright bicycle
- Allow back-in parking: a U-lock should be able to lock the rear wheel and seat tube of the bicycle



Comb, toast, school-yard, and other wheel-bending racks that provide no support for the bicycle frame are NOT recommended.

The rack element should resist being cut or detached using common hand tools, especially those that can be concealed in a backpack. Such tools include bolt cutters, pipe cutters, wrenches, and pry bars.

INVERTED "U"
One rack element supports two bikes.

"A"
One rack element supports two bikes.

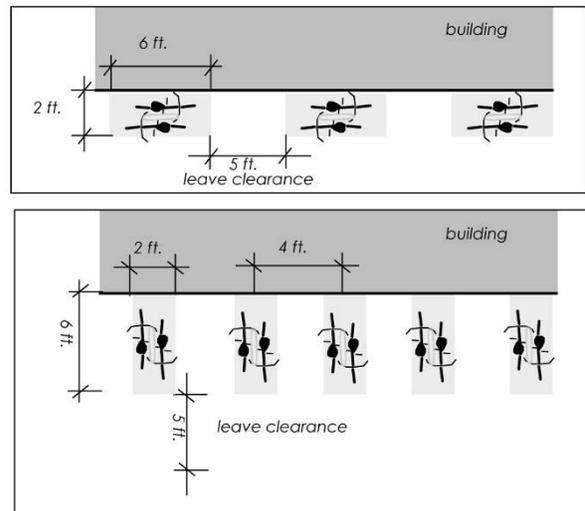
POST AND LOOP
One rack element supports two bikes.

COMB
One rack element is a vertical segment of the rack.

WAVE
One rack element is a vertical segment of the rack. (see additional discussion on page 3)

TOAST
One rack element holds one wheel of a bike.

Not recommended



Recommended bicycle parking spacing dimensions

Bicycle racks should be installed with the following guidelines in mind:

- The rack element (part of the rack that supports the bike) should keep the bike upright, supporting the frame in two places and allowing one or both wheels to be secured.
- Install racks so there is enough room between adjacent parked bicycles. If it becomes too difficult for a bicyclist to easily lock their bicycle, they may park elsewhere. A row of inverted “U” racks should be installed with 15 inches minimum between racks.
- Empty racks should not pose a tripping hazard for visually impaired pedestrians. Position racks out of the walkway’s clear zone.

When possible, racks should be in a covered area protected from the elements. Long-term parking should always be protected.

Generally, ‘U’ type racks bolted into the sidewalk are preferred and should be located intermittently or in front of key destinations. Bicycle racks should be installed to meet ADA standards and not block pedestrian through traffic.



U-locks with shelter installed near a building entrance.

The City may want to consider custom racks that can serve not only as bike racks, but also public artwork or as advertising for a specific business. The “post and ring” style rack is an attractive alternative to the standard inverted-U, which requires only a single mounting point and can be customized to have the city name or emblem stamped into the rings. These racks can also be easily retrofitted onto existing street posts, such as parking meter posts. While custom racks can add a decorative element and relate to a neighborhood theme, the rack function should not be overlooked: All racks should adhere to the basic functional requirement of supporting the bicycle by the frame (not only the wheel) and accepting a U-lock.



Possible alternatives to the inverted-U bike rack include the simple post-and-ring style (left), or a custom artistic rack such as the heart shaped rack (middle) or the abstract rack (right). All styles allow the bicycle to be secured by the frame with a U-lock.

8.10.3. Long Term Bicycle Parking

For long-term parking, the city may want to consider bicycle lockers. Bicyclists are usually more comfortable storing their bicycles in lockers for long periods because they offer increased security and protection from natural elements. Although they may be more expensive to install, they can make the difference for commuters deciding whether or not to bicycle.

Lockers can be controlled with traditional key systems or through more elaborate subscription systems. Subscription locker programs, like e-lockers, or park-by-phone systems allow even more flexibility within locker use. Instead of restricting access for each patron to a single locker, subscribers can gain access to all lockers within a system, controlled by magnetic access cards, or caller ID. These programs typically have fewer administrative costs because they simplify or eliminate key management and locker assignment.



Long Term bicycle parking facilities accommodate employees, students, residents, commuters, and others expected to park more than two hours. This parking, as shown in **Figure 8-28: Recommended Long-Term Bicycle Parking Facilities** should be provided in a secure, weather-protected manner and location. Long-term bicycle parking will either be a bicycle locker, or a secure area like a ‘bike corral’ that may be accessed only by bicyclists.

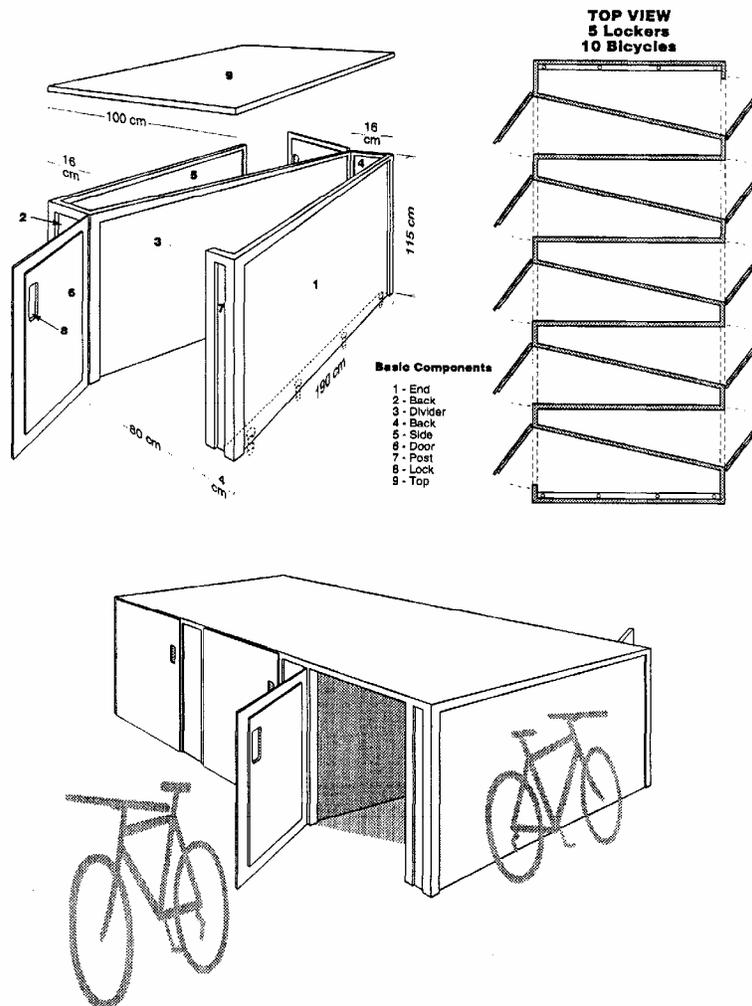


Figure 8-28: Recommended Long-Term Bicycle Parking Facilities

8.10.4. Innovative High Volume Bicycle Parking

In many locations, individual U-racks located on the sidewalk can be sufficient to meet bicycle parking demand. Where bicycle parking demand is higher, more formal structures and larger facilities need to be provided. Several options for high-volume bicycle parking are outlined below.

On-Street Bike Parking Corral

A relatively inexpensive solution to providing high-volume bicycle parking is to convert one or two on-street motor vehicle parking spaces into on-street bicycle parking. Bike racks are installed in the street and protected from motor vehicles with removable curbs and bollards. These Bike Parking Corrals



*Bike Corral in Portland, Oregon
Photo: Bill Stiles*

move bicycles off the sidewalks, and leave space for sidewalk café tables or pedestrians. Bicycle parking does not block sightlines like motor vehicles do, so it may be possible to locate bicycle parking in no-parking zones near intersections and crosswalks. Installing a Bike Corral for thirteen bikes in Portland, Oregon costs approximately \$8000.

Bike Oasis.

In 2008, the City of Portland, Oregon began installation of several “Bike Oases” in commercial districts. These signature bicycle parking facilities are installed on curb extensions and consist of attractive covered bike parking and an information panel. Portland’s Bike Oases provide parking space for ten bikes. Bike and walking maps are installed on the information panel.

Bike Stations

Bike stations serve as one-stop bicycle service centers for bicycle commuters. They include 24-hour secure bicycle parking and may provide additional amenities such as a store to purchase items (helmets, raingear, tubes, patch kits, bike lights, and locks), bicycle repair facilities, showers and changing facilities, bicycle rentals, and information about biking. Some bike stations provide free bike parking, while others charge a fee or require membership.

Bike stations have been installed in several cities in California, including Long Beach, San Francisco, Los Angeles and Berkeley, as well as Chicago, Illinois and Seattle, Washington.

Valet Bike Parking

As described in Chapter 5, the City of Columbus partners with the Central Ohio Bicycle Advocacy Coalition (COBAC) to provide valet bike parking at City festivals and other community events. Indoor locations for storing bicycles should be designed into venues that host sporting events, festivals, and other events where large numbers of people gather.

In San Francisco, attended bicycle parking is provided at the AT&T Stadium, home of the San Francisco Giants. The bicycle valet sees between 100 and 180 bicycles per game on average. (The stadium’s capacity is 41,503.) In addition to



Bike Oasis installed in Portland, OR near NE 43rd and Hancock



*Mayor Daley of Chicago at the ribbon-cutting ceremony for Chicago’s Millennium Bicycle Station
Photo: Chicagoland Bicycle Federation*



*Valet bicycle parking at the San Francisco Giant’s stadium
Photo: San Francisco Bicycle Coalition and StreetFilms*

providing bicycle valet parking, the City and stadium heavily promote using alternative modes to get to the stadium, emphasizing that “if you drive you will get stuck in traffic.”

Their valet parking system works much like a coat check: the bicyclist gives their bicycle to the attendant, who tags the bicycle with a number and gives the bicyclist a claim stub. The valet also will take non-motorized devices such as rollerblades, baby strollers and push scooters. When the bicyclist returns to get their bicycle, they present the claim stub and the attendant retrieves their bicycle for them. Locks are not needed. The valet is open from two hours before the game to thirty minutes after.