Non-Motorized Transportation Plan

Capital Region Planning Commission

October, 2009

333 North 19th Street, Post Office Box 3355
Baton Rouge, LA 70821
Phone 225.383.5203/Fax 225.383.3804
www.crpc-la.org

Table of Contents

Introduction

The Non-Motorized Plan for the Capital Region Metropolitan Planning Organization is a region wide plan that can be consulted by local communities, developers and transportation agencies to develop non-motorized facilities throughout the region.

The Plan identifies the transportation system's existing non-motorized facilities, establishes a future conceptual network with a map and list of improvements, and identifies resources to help fund the future additions to the non-motorized transportation network.

Benefits of Non-Motorized Transportation

- Cost savings
- Reduces congestion
- Supports transit
- Provides transportation options
- Improves Air Quality
- Economic Vitality
- Improves Health

Statewide Perspective

The Louisiana Bicycle and Pedestrian Master Plan establishes new policies for the Louisiana Department of Transportation and Development to encourage a complete and multi-modal transportation system for the State of Louisiana. The Plan has been developed to ensure that bicycling and walking are fully integrated into the state's transportation system. The Plan is guided by the following vision statement: *The vision for this plan is to enable people to regularly walk and bike safely and comfortably along and across Louisiana's roads to access schools, jobs, social services, shopping, and transit and for health and recreation.*

The state plan provides a detailed policy and action plan that will guide the Department's actions to help achieve its vision. The following are high-level goals that have been established for this plan:

- **Social Equity**—Plan, design and fund a transportation system that enables mobility and access for all residents whether or not the individual has access to a motor vehicle.
- **Personal Safety**—Increased the safety of the walking and bicycling environment and reduce injuries and fatalities by providing a high level of care and consideration for these modes.
- **Economic Development**—Support Louisiana's economic development by planning and maintaining a transportation system that supports walkable and bikeable local shopping districts, offers diversified travel options to visitors, and supports increased tourism and recreational opportunities.
- **Public Health**—Improve the health of Louisiana residents by increasing opportunities for combining physical activity with transportation and recreation.
- **Environmental Stewardship**—Preserve the health of the natural environment, improve air and water quality and reduce energy consumption by increasing the rates of walking and bicycling.

Louisiana Department of Transportation has developed Policies to ensure plan implementation:

Policy 1: Pedestrian and Bicycle Accommodation Policy
To varying extents, bicyclists and pedestrians are present on all highways and transportation facilities in Louisiana where they are permitted. Encouraging increased levels of bicycling and walking supports the Department's goals of increasing mobility, reducing congestion and improving the environment. Therefore, the Department will plan and design roadways that fully accommodate walking and bicycling. The Department will consider the needs of pedestrian and bicycles at appropriate stages during all projects and use current nationally recognized planning and design guidelines, manuals and best practices to ensure facilities are built to appropriate standards.

Policy 2: Pedestrian and Bicycle Safety Policy
The Department will provide for the safety and comfort of pedestrians and bicyclists and make every effort to reduce crashes and injuries associated with these modes. All projects shall consider the impact that improvements will have on pedestrian and bicycle safety and make all reasonable attempts to mitigate negative impacts on these modes. Restricting bicycle and pedestrian access shall not be considered as an appropriate strategy with the exception of those limited access facilities where pedestrians and bicycles are prohibited.

Policy 3: Pedestrian Facility Policy

The Department will plan, fund and design sidewalks on all roadway projects that serve adjacent area with existing or future development including: residences, apartment buildings, public transit facilities, schools, universities, shopping and employment centers, recreational facilities, community centers and public and governmental buildings.

Policy 4: Bicycle Facility Policy

The Department will provide bikeways and bicycle accommodations on all projects where feasible and appropriate. Bike lanes are preferred facility on urban and suburban arterials and collectors. Paved shoulders are preferred on rural arterial collector roadways.

MPO Region-Wide Perspective

The Capital Region Planning Commission is committed to encouraging the use of non-motorized modes of transportation, such as bicycling and walking. CRPC encourages the inclusion of bicycle and pedestrian facilities in reconstruction, resurfacing, and capacity increase projects, to the extent deemed safe and feasible. To this end, CRPC has been proactive in implementing planning and construction efforts aimed at providing a safe and enjoyable environment for non-motorized transportation activities. As a policy, CRPC has and will continue to implement state and federal regulations as required and continue to work with various stakeholders to implement these important projects.

The challenge for transportation planners, highway engineers and bicycle and pedestrian user groups, therefore, is to balance competing interest in a limited amount of right-of-way, and to develop a transportation infrastructure that provides access to all, a real choice of modes, and safety in equal measure for each mode of travel.

Congress passed and the President signed SAFETEA-LU into law. This law authorizes the Federal surface transportation programs (STP) for highways, highway safety and transit for the five year period of 2005 to 2009. This law included Transportation Enhancement funds. It stated that transportation enhancement activities would continue to be funded through a set-aside of 10%, or the amount set aside in FY 2005, whichever is greater, from the STP funds.

Transportation Enhancement funds are popular means of financing bicycle and pedestrian facilities. Since 1993, there have been 30 bicycle and pedestrian projects funded in the Capital Region MPO for a total of $8.26 million (See appendix A – D).

The State of Louisiana and East Baton Rouge Parish City-Parish governments have integrated cycling and walking into the planning for transportation and recreation in the Baton Rouge Urbanized Area. Bicycle and pedestrian plans have been developed to address the feasibility of facilities for these activities.

Typical generators of bicycle and pedestrian traffic in the Baton Rouge area are the central business districts in the Baton Rouge and the smaller surrounding communities. The areas around LSU, local and private schools, public libraries and recreational parks are also primary locations. Some facilities in those areas are shared by cyclists and pedestrians, some are designed just for pedestrians and others are provided just for bicycles.

There are active groups in the Baton Rouge MPO area that are promoting the development and use of bicycle and pedestrian facilities. Such groups include: Capital Region Bicycle/Pedestrian Advisory Committee, the Baton Rouge Bicycle Club, Baton Rouge Advocates for Safe Streets and the parish and local governments of the parishes in the MPO area. The Capital Region Bicycle/Pedestrian Advisory Committee provides a forum for all the groups to meet and discuss engineering, education, enforcement and encouragement issues related to these two non-motorized modes of transportation.

Description

Non-motorized Transportation (also known as *Active Transportation* and *Human Powered Transportation*) includes Walking and Bicycling, and variants such as Small-Wheeled Transport (skates, skateboards, push scooters and hand carts) and Wheelchair travel. These modes provide both recreation (they are an end in themselves) and transportation (they provide access to goods and activities), although users may consider a particular trip to serve both objectives. For example, some people will choose to walk or bicycle rather than drive because they enjoy the activity, although it takes longer.

There are many specific ways to improve non-motorized transportation:

- Improve sidewalks, crosswalks, paths and bike lanes.
- Correct specific roadway hazards to non-motorized transport (sometimes called "spot improvement" programs).
- Improve Non-motorized Facility Management and Maintenance, including reducing conflicts between users, and maintaining cleanliness.
- Universal Design (transportation systems that accommodate people with disabilities and other special needs).
- Develop pedestrian oriented land use and building design (New Urbanism).
- Increase road and path Connectivity, with special non-motorized shortcuts, such as paths between cul-de-sac heads and mid-block pedestrian links.
- Street furniture (e.g., benches) and design features (e.g., human-scale street lights).
- Traffic Calming, Streetscape Improvements, Traffic Speed Reductions, Vehicle Restrictions and Road Space Reallocation.
- Safety education, law enforcement and encouragement programs.
- Integrate with transit (Bike/Transit Integration and Transit Oriented Development).
- Bicycle Parking.
- Address Security Concerns of pedestrians and cyclists.
- Public Bike Systems (PBS), which are automated bicycle rental systems designed to provide efficient mobility for short, utilitarian urban trips.
- Ped-ways, which are indoor urban walking networks that connect buildings and transportation terminals.
- Create a Multi-Modal Access Guide, which includes maps and other information on how to walk and cycle to a particular destination.

Vision

The purpose of the plan is to identify the means to establish a physical and cultural environment that supports and encourages safe, comfortable and convenient ways for pedestrians and bicyclists to travel throughout the Capital Region.

It is further envisioned that this environment will result in a greater number of individuals freely choosing alternative transportation modes (walking, bicycling, mass transit, etc.), which will lead to healthier lifestyles, improved air and water quality, and a safer, more sustainable transportation system.

Project Goals and Objectives

1. Policy and Planning Integration

Goal:
Incorporate non-motorized best practices into all relevant policies, and all aspects and stages of planning available to the MPO Region.

Objectives:
1. Develop best practices guidelines that define a true multi-modal perspective for transportation planning.
2. Identify changes to planning processes, local government policies and regulations that will further non-motorized transportation.
3. Define a sustainable financing mechanism for non-motorized transportation policy development, policy implementation, construction and maintenance of facilities, education, and other needs that may arise to implement the non-motorized transportation plan.
4. Define the process for prioritizing and implementing improvements.

2. Complete System

Goal:
Provide a comprehensive, easy to implement non-motorized network as an integral component of the region's transportation system.

Objectives:
1. Provide convenient and safe non-motorized connections between destinations in every part the community, such as residential, commercial, school, recreational, and other areas.
2. Integrate non-motorized transportation into existing transportation infrastructure.
3. Eliminate obstacles in the current non-motorized network.
4. Minimize conflict between modes of travel while still accommodating all modes.

3. Education

Goal:
Increase awareness of the opportunities for, and benefits of, non-motorized transportation, as well as provide information to all users on safe ways to integrate motorized and non-motorized modes of transportation.

Objectives:
1. Develop strategies to educate the general public on the available non-motorized transportation network and encourage its use.
2. Develop strategies to educate all transportation system users (motorists, cyclists, pedestrians, etc.) on key safety issues related to integrating walking, bicycling and motorized travel to create an atmosphere of respect among all travelers.
3. Develop strategies to emphasize the benefits of and opportunities for non-motorized transportation into public schools.

Appendices

Appendix A—Current Non-Motorized Projects in Ascension Parish
Appendix B—Current Non-Motorized Projects in East Baton Rouge Parish
Appendix C—Current Non-Motorized Projects in Livingston Parish
Appendix D—Current Non-Motorized Projects in West Baton Rouge Parish
Appendix E—Glossary of Terms
Appendix F—Planning and Design Guidelines
Appendix G—Proposed Policies and Programs

Appendix A

Ascension Parish Non-Motorized Projects

Map #	DOTD ID	Federal ID	Year	Project Name	City	$	Federal
1	737-03-0101	MISC (057)	1993	New River Bike Path	Gonzales	$	122,450.00
2	077-02-0013 264-02-0007 264-03-0016	381-1(004) 0301(501) 0301(502)	2000	LA 74-I10 (Sidewalk)	Dutchtown	$	163,205.25
3	744-03-0007	0301(506)	2001	Sidewalks-Irma Blvd.	Gonzales	$	111,044.55
4	063-10-0022 744-03-0008	0301(507)	2001	Sidewalks, Phase 1	Donaldsonville	$	215,600.00
5	744-03-0010 803-23-0010	0302(505)	2002	Bayou Francois Sidewalk	Gonzales	$	495,000.00
6	265-02-0015 744-03-0012	0305(502)	2004	LA 44 Sidewalks	Parish	$	310,600.00
7	744-03-0014	0307(500)	2006	Sidewalks, Phase 2	Donaldsonville	$	222,000.00
8	744-03-0013	0307(501)	2006	LA Pedestrian Path	Parish	$	460,000.00
				Ascension Parish Total		**$**	**2,099,899.80**

*All projects complete

Appendix B

East Baton Rouge Parish Non-Motorized Projects

Map #	DOTD ID	Federal ID	Year	Project Name	City	$	Federal
1	019-01-0036 744-17-0029	1703(533)	2003	Scenic Highway Sidewalks	Baton Rouge	$	227,910.00
2	019-30-0016	399-1(004)	2003	LA64 E Fel Line/Zachary Pedestrian/Bike Path	Zachary	$	250,000.00
3	253-02-0024 744-17-0026	1703(503)	2003	Zachary Pedestrian Pathways*	Zachary	$	190,000.00
4	744-17-0008	8049(006)	1995	Ped Access Imprv/Beautifications	Baker	$	36,000.00
5	744-17-0011	MISC(298)	1997	Greenwell Springs/Monticello St. Sidewalks	Baton Rouge	$	355,000.00
6	744-17-0015	MISC(333)	1999	Pedestrian/Bike Path Improvements-Darlymple Drive**	Baton Rouge	$	628,600.00
7	744-17-0017	1700(523)	2000	LSU Pedestrian Facilities		$	45,993.04
8	744-17-0018	1701(502)	2001	LSU Pedestrian and Bike Paths	Baton Rouge	$	600,000.00
9	744-17-0019	1701(503)	2001	Sidewalk Program	Baker	$	117,602.72
10	744-17-0020	1701(504)	2001	Improvements	Baton Rouge	$	190,000.00
11	744-17-0021	1701(505)	2001	BR River Road Levee Bike/Ped Trail	Baton Rouge	$	1,000,550.00
				East Baton Rouge Parish Total		**$**	**3,641,655.76**

*Project in design phase.
**Project under construction.

Appendix C

Livingston Parish Non-Motorized Projects

Map #	DOTD ID	Federal ID	Year	Project Name	City	$	Federal
1	744-32-0001	MISC(143)	1994	Livingston Sidewalk Program	Livingston	$	118,346.00
2	744-32-0003	MISC(241)	1995	Livingston Sidewalk Project, Phse II	Livingston	$	134,289.00
3	744-32-0004	MISC(341)	1997	S. Range Ave Sidewalks (LA 3003-US 190)	Denham Springs	$	232,000.00
4	744-32-0006	MISC(501)	1999	Albany Sidewalks, Phse I	Albany	$	58,444.40
5	013-07-0024 260-06-0012 744-32-0009	3201(501)	2001	Albany Sidewalks, Phse II	Albany	$	108,035.00
6	262-02-0031 744-32-0008 832-02-0019 832-05-0016 832-40-0001	6401(500)	2001	Watson Sidewalk Program	Watson	$	208,000.00
7	744-32-0012	3201(504)	2001	Livingston Sidewalk Program Phse III**	Livingston	$	258,000.00
8	013-07-0025 270-01-0013 270-02-0020 744-32-0011	3201(503)	2001	Holden Sidewalk Program*	Holden	$	224,000.00
9	744-32-0020	3208(504)	2007	Springfield Community Sidewalks*	Springfield	$	114,000.00

*Project in design phase.
**Project under construction.

Livingston Parish Total **$ 1,455,114.40**

Appendix D

West Baton Rouge Parish Non-Motorized Projects

Map #	DOTD ID	Federal ID	Year	Project Name	City	$	Federal
1	744-61-0004	6100(501)	2000	Levee Top Improvments Phase I	Port Allen	$	122,450.00
2	744-61-0007	6102(503)	2003	Levee Top Improvments Phase II	Port Allen	$	163,205.25
				West Baton Rouge Parish Total		**$**	**285,655.25**

*All projects complete

Appendix E

Glossary of Terms

Within this document there are a number of terms that may be unfamiliar to many people. The following is a brief glossary of some of the transportation terms that are found in this document:

AASHTO – American Association of State Highway & Transportation Officials

Bicycle Quality/Level of Service (Bike Q/LOS) – a model for evaluating the perceived safety and comfort of bicycling in a roadway based on conditions within the road (not surrounding land uses) expressed as a letter grade with "A" being best and "F" being worst.

Bike Lane – a portion of the roadway designated for bicycle use. Pavement striping and markings sometimes accompanied with signage are used to delineate the lane. Examples can be found on portions of Packard Road and State Street.

Bike Route – is a designation that can be applied to any type of bicycle facility. It is intended as an aid to help bicyclists find their way to a destination where the route is not obvious.

Bulb-outs – See Curb Extensions

Clear Zones – area free of obstructions around roads and Shared-use Paths, and Walkways.

Clearance Interval – is the flashing "Don't Walk" or flashing "Red Hand" phase of pedestrian signals. It indicates to pedestrians that they should not begin to cross the street. A correctly timed clearance interval allows a pedestrian who entered the crosswalk during the "Walk" phase to finish crossing the street at an unhurried pace.

Crossing Islands – a raised median within a roadway typically set between opposing directions of traffic that permits pedestrians to cross the roadway in two stages. A crossing island may be located at signalized intersections and at un-signalized crosswalks. These are also known as **Refuge Islands.**

Crosswalk – the area of a roadway that connects sidewalks on either side at an intersection of roads (whether marked or not marked) and other locations distinctly indicated for pedestrian crossings by pavement markings.

Curb Extensions – extending the curb out at intersections in order to minimize pedestrian crossing distance, also known as **Bulb-outs**.

Dispersed Crossing – where pedestrians typically cross the road at numerous points along the roadway, rather than at an officially marked crosswalk.

Fines – finely crushed gravel 3/8" or smaller. The fines may be loosely applied or bound together with a stabilizing agent.

E-Bike – a bicycle that is propelled by an electric motor and/or peddling.

Inside Lane – the travel lane adjacent to the center of the road or the Center Turn Lane.

Ladder Style Crosswalk – a special emphasis crosswalk marking where 1' to 2' wide white pavement markings are placed perpendicular to the direction of a crosswalk to clearly identify the crosswalk.

Lateral Separation – horizontal distance separating one use from another (pedestrians from cars, for example) or motor vehicles from a fixed obstruction such as a tree.

Leading Pedestrian Interval – is a traffic signal phasing approach where the pedestrian "Walk" phase precedes the green light going in the same direction by generally 4 to 5 seconds.

Level of Service (LOS) – a measurement of the motor vehicle flow of a roadway expressed by a letter grade with "A" being best or free flowing and "F" being worst or forced flow/heavily congested. Also see Bicycle Level of Service and Pedestrian Level of Service.

Long-term Plan – reflects the vision of the completed non-motorized system. Some improvements may require the reconstruction of existing roadways, the acquisition of new right-of-way, or significant capital investments.

Mid-block Crossings – locations that have been identified based on land uses, bus stop locations and the difficulty of crossing the street as probable candidates for Mid-block Crosswalks. Additional studies will need to be completed for each study to determine the ultimate suitability as a crosswalk location and appropriate solution to address the demand to cross the road.

Mid-block Crosswalk – a crosswalk where motorized vehicles are not controlled by a traffic signal or stop sign. At these locations, pedestrians wait for a gap in traffic to cross the street, motorists are required to yield to a pedestrian who is in the crosswalk (but not if the pedestrian is on the side of the road waiting to cross).

Mode-share / Mode split – the percent of trips for a particular mode of transportation relative to all trips. A mode-share / mode split may be for a particular type of trip such as home-to-work.

Mode – distinct types of transportation (cars, bicycles and pedestrians are all different modes of travel).

Near-term Opportunities – are improvements that may generally be done with minimal changes to existing roadway infrastructure. They include road re-striping projects, paved shoulders, new sidewalks and crossing islands. In general, existing curbs and drainage structures are not changed.

Out-of-Direction Travel – travel in an out-of-the-way, undesirable direction.

Outside Lane – lane closest to the side of the road.

Pedestrian Desire Lines – preferred pedestrian direction of travel.

Pedestrian Quality/Level of Service (Ped. Q/LOS) – a model for evaluating the perceived safety and comfort of the pedestrian experience based on conditions within the road ROW (not surrounding land uses) expressed as a letter grade with "A" being best and "F" being worst.

Refuge Islands – see Crossing Islands

Roundabouts – yield-based circular intersections that permit continuous travel movement.

Shared Roadway – where bicycles and vehicles share the roadway without any portion of the road specifically designated for the bicycle use. Shared Roadways may have certain undesignated accommodations for bicyclists such as wide lanes, paved shoulders, and/or low speeds.

Shared Use Path – a wide pathway that is separate from a roadway by the minimum an open unpaved space or barrier or located completely away from a roadway. A Shared Use Path is shared by bicyclists and pedestrians. There are numerous sub-types of Shared Use Paths including Sidewalk Bikeways that have unique characteristics and issues.

Shy Distance – the distance that pedestrians, bicyclists and motorists naturally keep between themselves and a vertical obstruction such as a wall or curb.

Sidewalk Bikeways – a specific type of Shared Use Path that parallels a roadway generally within the road right-of-way. This is also known as a **Sidepath**.

Signalized Crosswalk – a crosswalk where motor vehicle and pedestrian movements are controlled by traffic signals. These are most frequently a part of a signalized roadway intersection but a signal may be installed solely to facilitate pedestrians crossings.

Speed Table – raised area across the road with a flat top to slow traffic.

Splitter Islands – crossing islands leading up to roundabouts that offer a haven for pedestrians and that guide and slow the flow of traffic.

UTC – Uniform Traffic Code, is a set of laws that can be adopted by municipalities to become local law that address the operation of motor vehicles and other modes of transportation.

Yield Lines – a row of triangle shaped pavement markings placed on a roadway to signal to vehicles the appropriate place to yield right-of-way. This is a new pavement marking that is used in conjunction with the new “Yield to Pedestrians Here” sign in advance of marked crosswalks.

Appendix F

Planning and Design Guidelines

These planning and design guidelines should be consulted when planning new facilities or reconstructing or modifying existing facilities. This section includes some background information on pedestrians and bicyclists to support the guidelines.

Topics:

Planning for pedestrian and bicycle travel is significantly different than planning for motor vehicle travel. In measurements of age, uniform education, licensing, physical abilities, and even the speed range on a given facility, pedestrians and bicyclists are tremendously diverse groups as compared to motor vehicle operators. A wide range of abilities must be planned and accommodated for, since there is no such thing as a typical pedestrian or bicyclist.

2.1 Understanding Pedestrian Travel

Approximately 1/3 of the US population does not hold a driver's license. There are clearly a substantial number of people for whom walking (or perhaps bicycling) is their only transportation choice. For those who use public transportation, the connections to the pedestrian network are critical. The same holds true for all motor vehicle operators, because with the exception of a trip to a drive-through, all drivers begin and end their trips as pedestrians.

The Importance of Place in Pedestrian Travel

Pedestrian travel varies greatly based on the setting in the community. The setting includes the number of fellow pedestrians as well as many qualitative measures. Walking in and around Baton Rouge's downtown area is enjoyable for most, and dramatically different than walking along busy suburban arterials such as Airline Highway or Florida Boulevard or in the primarily residential neighborhoods in surrounding parishes. Walking in the downtown area is facilitated by a system of generally continuous wide sidewalks, attractive street furniture and furnishing, and interesting buildings with a variety of activities housed within the structures themselves. Care and attention is evident in the environment, as pedestrian activity is afforded with berth in, pavement markings and location of building entrances opening onto the sidewalk. Blocks are relatively short, providing pedestrians a choice in paths to satisfy their travel needs. Pedestrians in this environment rarely feel alone, as there is a generous amount of street life creating a sense of safety and comfort offered by the activity in the Downtown District.

Walking along side a high-speed arterial in a suburban part of the region has a much different feel. The sidewalk itself, although still constructed of durable materials, is generally not as wide or as interesting. There is a limited amount of street furniture and an intrusion of noise, smell and rushing air created by passing cars, trucks and buses. There are limited opportunities to cross busy streets as distances between traffic signals were planned to facilitate traffic flow. The pedestrian signal interval allows for safe crossing, but the signals are timed to meet the minimum pedestrian time, minimize the effect on traffic flows. A pedestrian is treated and feels much like an outsider in this auto-dominated landscape. Adding to this feeling are buildings that are set back, behind parking lots, increasing the distance between building entrances and the sidewalk.

Similar auto dominant features are found in suburban neighborhoods. The ability to meet needs other than visiting a neighbor are challenged by the great distances from the home to commercial areas. Sidewalks are available, but contain no street furniture and are less interesting. The pedestrian landscape is varied and depends on the care and attention offered by adjacent residents. Traffic speeds in neighborhoods are generally slower than arterials, although sidewalks may be right up to the curb line or non-existent within some subdivisions. Houses are sometimes oriented with garage doors facing the street; intrusive driveways and their aprons create a less than level surface for the pedestrian.

Clearly, place matters. In designing policies and programs for pedestrians, the Capital Region must support the best elements of a safe, efficient, attractive pedestrian system and an environment that invites and celebrates human activity. Baton Rouge is well served by the growing downtown district; priority must be given to maintaining the special qualities of this part of the community. We must also plan to meet the needs of other parts of the region and create an attractive system of sidewalks that provides access to local activities. We must strive to create first class linkages assuring all residents the opportunity to comfortably meet their travel needs using non-motorized ways to travel.

Key factors for pedestrians

Travel time and continuity of travel path are key factors that influence the likelihood of a person attempting a trip on foot, versus in the car or on a bike. The average speed for a pedestrian is 3 to 4 mph. This speed varies greatly according to age, trip purpose and fitness level. Pedestrians, like drivers, are significantly affected by the number of traffic signs and signals encountered. The number of traffic signs and signals significantly affect travel time for pedestrians as well as motor vehicles.

The buffer between the sidewalk and the street as well as the degree of exposure in the crosswalks has a significant impact on the pedestrian's experience.

Because walking is such a comparatively slow method of transportation, most trips that are Taken by pedestrians are limited to short distances. Nationally 44% of trips taken by foot are for personal or family business, with social and recreational trips close behind at 35%. Earning a living only counts for 7% of pedestrian trips. The percentage of people who will choose walking as a form of transportation drops off significantly for trips of over a mile-and-a-half and is negligible for trips over 3 miles. Pedestrians generally take the shortest possible route available, and are not willing to go far out of their way. For example, many pedestrians will make a dash across a busy street if they must walk more than a typical downtown city block to a signalized intersection.

Perhaps the most important factor affecting a pedestrian trip is exposure to motor vehicles and the speed at which the motor vehicles are moving. For both safety and aesthetic reasons, the quality of a pedestrian's journey is much different when walking along a tree-lined path versus along a busy five-lane road with heavy truck traffic and no vegetation for shade. Also, it is much safer and more pleasant to walk along a street where the speed limit is 25 mph versus a street where the speed limit is 40 mph. National statistics show that a pedestrian's probability of death if hit by a motor vehicle increases from 15% when the car is going 20 mph to 85% if the car is going 40 mph.

Most likely, for a trip of any length, a pedestrian will need to cross a roadway. Are pedestrian crossing facilities available? Is there a signalized intersection conveniently placed? Do the busy roads have crossing islands? Will the pedestrian have to make a mid-block dash in order to avoid going significantly out of their way? All of these factors influence the quality and safety of a pedestrian's journey, and may well determine whether or not they will attempt the journey in the first place—or, whether they will attempt that same journey again.

2.2 Understanding Bicycle Travel

One of the most controversial issues with regard to accommodating bicyclists within the road right-of way is whether they are better accommodated in the roadway itself or on a path along side the road. Also, if bicycles are to be accommodated within the roadway, should a portion of the roadway be officially designated for bicycles? When addressing these issues, legal rights, safety, travel efficiency, nationally accepted guidelines and conflicts with pedestrians need to be considered.

Legal Rights
Bicyclists, for the most part, are granted the same rights and subject to the same regulations as motorists. There are some exceptions, such as their use being restricted from freeways, and some special rules regarding their operation.

Safety
While it may seem that bicyclists would be safer on a Sidewalk Bikeway than riding in the roadway, the inverse is actually true in most cases for experienced adult cyclists. This is due primarily to the bicycles traveling at a high rate of speed in an area where the drivers of turning vehicles are not looking. This is illustrated in Fig. 2.2A *Bicycle Lane visibility Vs. Sidewalk Visibility* illustration on the next page. The more frequent and busy the road and driveway intersections are the more chances there are for conflicts.

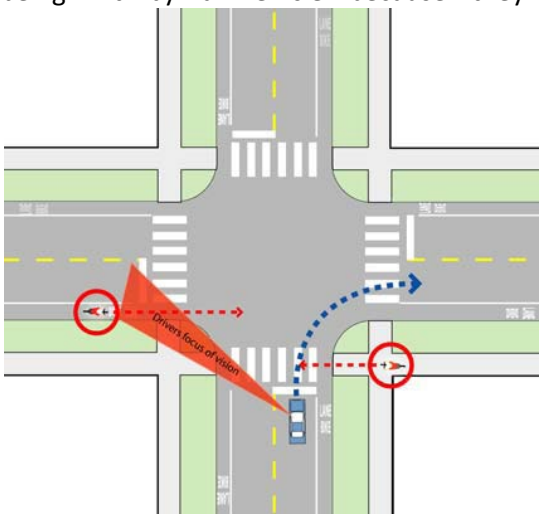
Travel Efficiency
One of the most significant drawbacks to bicycling on sidewalks as opposed to bicycling in the roadway is the loss of right-of-way when traveling along collectors and arterials. When riding in the roadway of a major road, the vehicular traffic on side streets that do not have a traffic light generally yield to the bicyclists on the main road. If riding on a sidewalk, the bicyclist must yield to vehicles in those same side streets. In addition, the cyclist must approach every driveway with caution due to the visibility issues cited in the previous section and the fact that drivers rarely give right-of-way to a bicyclist on sidewalks. As well, the placement of many push-buttons used to trigger walk signals are often inconveniently placed for a cyclist.

Bicyclists are also required by law to yield to all pedestrians when riding on a sidewalk and provide an audible signal of their approach. As the number of pedestrians increase, a bicyclist's progress can be impeded.

The location of sidewalks is often such that when a vehicle on an intersecting driveway or roadway is stopped and waiting for traffic to clear on the through road, their position blocks the sidewalk. This requires difficult and often dangerous maneuvering to ride around the stopped vehicle. As a result of all of the above factors, bicyclists who are using their bike for utilitarian purposes infrequently use sidewalks because they essentially have to yield to all other users in the road corridor. Although separate facilities are appropriate in most cases, shared facilities will continue to be a preferred facility by some bicyclists in some cases.

Fig. 2.2A. Bicycle Lane Visibility Vs. Sidewalk Visibility

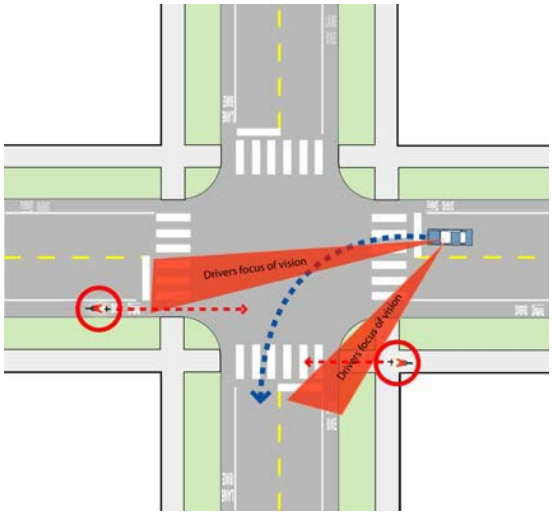
Bicycles traveling in the opposite direction of traffic on sidewalks have significantly greater chance of being hit by a vehicle because they are outside of the driver's typical field of view.



Car turning right

Bicyclist in Bike Lane is in the driver's focus of vision as they scan oncoming traffic and is easily seen.

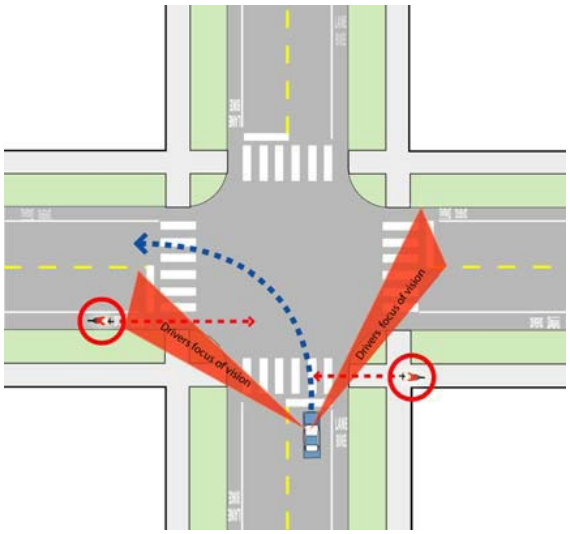
Bicyclist on Sidewalk Bikeway/Sidewalk is not in the driver's focus of vision and can't easily be seen until just before impact.



Car turning left

Bicyclist in Bike Lane is in the driver's focus of vision as he/she scans oncoming traffic and is easily seen.

Bicyclist on Sidewalk Bikeway/Sidewalk is not in the driver's focus of vision and can't easily be seen until they are in crosswalk.



Car turning left

Bicyclist in Bike Lane is in the driver's focus of vision and is easily seen.

Bicyclist on Sidewalk Bikeway/Sidewalk is not in the driver's focus until just before impact.

Graphics based on those prepared by Richard Moeur, P.E. for his Good Bicycle Facility Design Presentation available at http://www.richardcmoeur.com/docs/bikepres.pdf

Pedestrian Conflicts

As the number of bicyclists and pedestrians increase on a shared facility, the number of conflicts increase and pedestrians' comfort decreases. Pedestrians typically travel 2 to 4 miles per hour and bicyclists travel between 8 and 20 miles per hour. The speed difference is significant and the stealthy nature of a bicycle means that pedestrians generally have little to no audible warning of a bicycle approaching from behind. Pedestrians and bicyclists can both be severely injured in bicycle / pedestrian crashes.

Nationally Accepted Guidelines

The American Association of State Highway and Transportation Officials (AASHTO) publishes *A Policy on Geometric Design of Highways and Streets* that is also known as "The Green Book." This set of guidelines is the primary reference for street design used by federal, state, county and local transportation agencies. For guidance on how to accommodate bicycles, The Green Book references AASHTO's *Guide for the Development of Bicycles Facilities*. Federal and most state sources of funding require that bicycle projects conform to these guidelines. AASHTO's guidelines specifically discuss the undesirability of Sidewalks as Shared Use Paths. Sidewalk Bikeways are considered unsatisfactory for the all of the reasons listed above. Only under certain limited circumstances do the AASHTO guidelines call for Sidewalk Bikeways to be considered. On page 20 of the guidelines these circumstances are spelled out as:

a) To provide bikeway continuity along high speed or heavily traveled roadways having inadequate space for bicyclists, and uninterrupted by driveways and intersections for long distances.

b) On long, narrow bridges. In such cases, ramps should be installed at the sidewalk approaches. If approach bikeways are two-way, sidewalk facilities also should be two-way.

Additional Considerations

Children Riding on Sidewalks – Young children will most likely continue to ride bicycles on sidewalks even if on-road facilities are provided. The risks previously mentioned still hold true, but factors such as unfamiliarity with traffic and the limited depth perception typical of young children should also be considered when choosing the most appropriate facility to use. Also, young children, in general, may be riding at lower speeds than adults.

Adults Riding on Sidewalks – Even with the presence of on-road bicycle facilities, many adults will not feel comfortable riding in the roadway in some or all situations. It should be recognized that the choice to ride in the road or on a sidewalk will vary with each individual's skills, weather and roadway conditions.

Transition Points – One of the difficulties in creating a system where bicycle travel is accommodated within a patchwork of on- and off-road facilities is the transition from one facility to the other. The point where the bicyclist leaves the sidewalk to join the roadway is especially difficult at intersections.

Consistent Expectations – One of the overall goals in transportation planning is to improve safety through clear and consistent expectations between road users. Educating bicyclists to ride in different manners from place to place or region to region causes confusion for all of the users.

Redundancy of Facilities – Bicyclists are not restricted from riding in most roadways, nor is it likely that bicyclists will ever be required to ride on a Sidewalk Bikeway given their known safety issues. Therefore, the presence of bicycles in the roadway should be anticipated. Any off-road facilities that are constructed should be viewed as supplemental to accommodations within the roadway.

Driver and Bicyclist Behavior – There is ample room for improvement to the behavior of bicyclists and motorists alike in the way they currently share (or don't share) the roadway. Community education programs coupled with enforcement programs are the best approach for addressing this issue.

Passing on the Right – In a shared roadway scenario, it is dangerous for a bicyclist to pass a line of cars on the right. Bike lanes have the important advantage of allowing bicyclists to safely pass a line of cars waiting at an intersection. Much like the rewards for carpoolers traveling in a high occupancy vehicle lane, a bike lane gives bicyclists preference in moving through congested areas. Bikes can move to the front of an intersection more easily, allowing for better visibility and safer integration among motor vehicles, as well faster travel.

2.3 Travel Along Road Corridors

The Capital Region's roadway network has been designed primarily to move motor vehicles safely, efficiently, and with minimal disruption. This network includes major arterial streets that place motor vehicles in multiple lanes moving at high speeds for long distances. These major transportation corridors usually present tremendous challenges when trying to retrofit them with non-motorized facilities. There are two primary types of non-motorized movements related to road corridors:

- Travel Along the Road Corridor (Axial Movements) that utilizes sidewalks, paved shoulders, bike lanes and bikeways.
- Travel Across the Road Corridor (Cross-corridor Movements) that utilizes intersections, crosswalks, and grade-separated crossings such as bridge overpasses or tunnel underpasses.

Pedestrian travel along road corridors is accommodated by sidewalks or shared-use paths.

Bicycle travel along road corridors is accommodated by bike lanes, shared roadways, and shared-use paths.

Evaluating Alternative Scenarios for Accommodating Bicycle and Pedestrian Travel Along Road Corridors

There is no single solution for handling bicycle traffic along road corridors that will be the most appropriate facility in all cases. But the region should still strive to establish a consistent approach as possible so that motorists and bicycles have clear and consistent expectations of each other.

Restricting bicycles to a path along the side of a roadway—while potentially a legal option—is fraught with safety concerns. This diminishes the attractiveness of using a bicycle for transportation for many adult cyclists. On the other hand, there exists a great diversity of bicycling skills and comfort levels and the system should attempt to safely accommodate all users to the degree possible. Also, where a bicyclists chooses to ride has an impact on the pedestrian's experience.

Quality and Level of Service Evaluation of Alternative Scenarios

In order to evaluate the alternative approaches to accommodating bicycle and pedestrian travel along the roadway, quality/level of services models were used. The Bicycle and Pedestrian Level of Service Models are statistically reliable methods for evaluating the quality and effectiveness of pedestrian and bicycle conditions of a given roadway environment. Various models have been developed over the past decade. The Bicycle and Pedestrian Level of Service Models used for this plan, developed by Bruce Landis, PE, AICP of Sprinkle Consulting, Inc., models bicycle and pedestrian environments based on data gathered from a wide cross section of users who evaluated numerous real world scenarios. Simplified versions of these models have been incorporated in the Florida Department of Transportation's Multimodal Quality/Level of Service Model, which is the only LOS analysis that FDOT currently accepts. The Quality/Level of Service score is a measurement of the perceived safety and comfort of pedestrians and bicyclists.

It should be noted that the Bicycle Quality/Level of Service model applies only to bicycle environments *within* the roadway. There currently are not any well-researched models for Bicycle Quality/Level of Service for Shared Use Paths. The Pedestrian Quality/Level of Service Model also does not account for the increased conflicts with bicyclists that are likely to occur on a Shared-use Path.

Pedestrian Quality/Level of Service - Key Factors (in order of statistical significance):
1. Presence of a sidewalk
2. Amount of lateral separation between pedestrians and motor vehicles
3. Presence of physical barriers and buffers (including parking) between pedestrians and motor vehicles
4. Motorized vehicle volume
5. Motorized vehicle speed

Bicycle Quality/Level of Service - Key Factors (in order of statistical significance):
1. Presence of bicycle lane or paved shoulder
2. Proximity of bicyclists to motorized vehicles
3. Motorized vehicle volume
4. Motorized vehicle speed
5. Motorized vehicle type (percent truck/commercial traffic)
6. Pavement condition
7. The amount of on-street parking

The key factors for both modes are the existence of their own space, how far that space is from the traffic, and the nature of the traffic. The Bicycle and Pedestrian Quality/Level of Service score system has been developed using the same letter grading system with the same connotations as the letter grades used in schools: A being the best and F being the worst.

Because letter-grade Level of Service assessments are typical for vehicular traffic, there may be a desire to compare Vehicular Level of Service to that of Bicycle and/or Pedestrian Level of Service. However, the two evaluation systems are quite different and should not be directly compared. One illustration of the difference is that a Pedestrian Level of Service of "E" is likely the result of there not being any accommodations for a pedestrian. A Vehicular Level of Service "E" is defined as a point along an existing facility in which operations are at or near capacity and are quite unstable.

Three Scenarios for Providing Multi-modal Road ROW's
There are three typical scenarios for accommodating pedestrians, bicycles and motorists within a road Right-of-Way:
- Sidewalk (for pedestrians) and a Shared Roadway (for bicyclists and motorists).
- Sidewalk (for pedestrians) and a Bike Lane (a separate bike-only lane in the roadway).
- Shared Use Path (for pedestrians and some cyclists) and a Shared Roadway (for other bicyclists and motorists).

The following section looks at these three different scenarios for accommodating bicyclists, pedestrians and motorists. To evaluate each of these scenarios, a generalized cross section was prepared for each scenario along three different classifications of primary roadways. While there are significant variances among different road classifications, the generalized input used for each covers most roadway situations.

The following table summarizes the input used in this analysis: along the road corridor have been explored using a Quality/Level of Service Analysis to determine which combination is the most beneficial for users:

Table 2.3A . Generalized Road Conditions and Existing AASHTO Guidelines

Criteria		**Urban Principal Arterial**	**Urban Minor Arterial**	**Urban Collector**
ADT motor vehicles	Generalized Average Daily Traffic Volumes for Both Directions	30,000	20,000	10,000
Number of Lanes	Generalized Average	4 Total (2 each way)	4 Total (2 each way)	4 Total (1 each way)
Posted Speed	Generalized Average	40 MPH	35 MPH	30 MPH
Sidewalk Width	AASHTO Pedestrian Guidelines	5’ Minimum 6 – 8’ Prefered 10 – 15’ in CBD & High Use Areas	5’ Minimum 6 – 8’ Prefered 10 – 15’ in CBD & High Use Areas	5’ Minimum
Buffer Width	AASHTO Pedestrian Guidelines (from edge of road to sidewalk)	5’ Minimum 6’ Prefered	5’ Minimum 6’ Prefered	2’ Minimum 4’ Prefered
Bike Lane Width	AASHTO Bicycle Guidelines	3.5’ Minimum (5’ total width including gutter)	3.5’ Minimum (5’ total width including gutter)	3.5’ Minimum (5’ total width including gutter)
Shared Outside Lane	AASHTO Bicycle Guidelines	14’ recommended 15’ maximum	14’ recommended 15’ maximum	14’ recommended 15’ maximum

Notes:

- 4’ minimum walks may be used if 5’ wide passing spaces for wheelchair users are provided at reasonable intervals.
- AASHTO also provides guidelines for curb-attached sidewalks (no buffer is provided between the sidewalk and roadway). The minimum width is 6’, 8 – 10’ is recommended along busy Arterials.
- There are many variables that AASHTO considers that are not articulated in this simplified chart.

Refining the Scenarios

In comparing the different scenarios, the following design criteria were taken into consideration:

- **Widening the Buffer to Accommodate Trees** – As noted in the Pedestrian Quality /Level of Service – Key Factors, the lateral separation of pedestrians from the roadway and the presence of physical barriers such as trees, are the most important factors after the existence of a sidewalk. While trees provide benefits for pedestrian and roadway aesthetics, they are considered hazards to motorists. To minimize vehicular crashes with fixed roadside objects such as trees and light poles, current guidelines recommend placing the fixed objects at least 5' from the face of curb on urban arterials and 2' on collectors. Trees should be setback from the sidewalk at least 2' to allow for root growth and to provide a clear zone for the sidewalk users. To determine the total minimum desirable buffer with for Arterials, 6" is allocated for the width of a new tree trunk and the 18" from the face of curb to the edge of road is included. The result is that the minimum desirable buffer for Arterials is set at 9' wide. For Collectors, 4' is considered the minimum width for a planting strip that could support trees. This results in the total minimum desirable buffer for Collectors being set at 6' wide. As a general rule, the buffer should be as wide as reasonable for the conditions to minimize vehicular crashes with fixed objects, allow optimum planting conditions for trees, and improve the pedestrian environment.

- **Guidelines and Precedents for Narrow Lanes** - AASHTO guidelines and the MDOT Road Design Manual indicate that 12' lanes are most desirable and should be used where practical. They both indicate that in urban areas on low-speed roads (45 mph or less) 11' lanes are often used, and that 10' lanes may be used in restricted areas where there is little or no truck traffic.

- P**reserved Capacity with Narrower Lanes** - an 11' vehicular lane with an adjacent bike lane likely operates at near the same capacity as a 12' vehicular lane adjacent to a curb.

- **Narrow Turn Lanes -** AASHTO guidelines note that continuous two-way left-turn lanes may be as narrow as 10'.

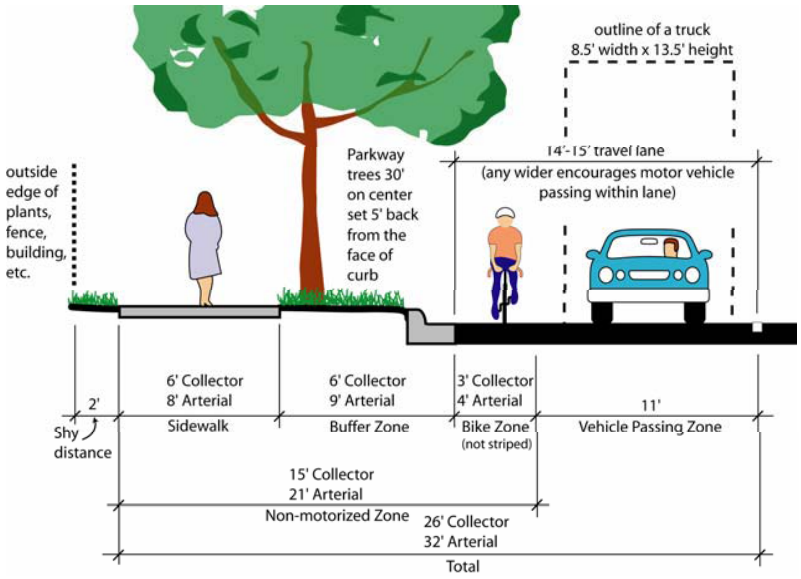
- **Vehicle Widths** - A generalized sport utility vehicle is 6'- 4" wide, City buses and trucks are 8'- 6" wide.

- **Working Within Existing ROW** - Typical ROW Widths are 66' and 99', which means that the combined width of the sidewalk, buffer zone (space between the road and the sidewalk), bike lane (if any), and outside vehicle lane should be no wider than 33' in order to avoid the need for additional ROW. Using inside and continuous two-way left-turn lanes of 11', a four-lane road can be accommodated in 88' and a five-lane road can be accommodated in 99'.

- **Maximizing Bicycle and Pedestrian Level of Service** - Three scenarios were initially designedbased on AASHTO guidelines. The scenarios were then refined by adjusting variables within the parameters of AASHTO guidelines such as the sidewalk width, the width of the buffer between the road, sidewalk and tree spacing, the bike lane width, and right lane width, all to achieve the most desirable Quality/Level of Service score possible within the typical ROW's.

The following pages include an overview of the three scenarios, their general advantages and disadvantages, and the results of the Quality and Level of Service analyses for the three road classifications.

Fig. 2.3B. Scenario A – Sidewalk and Shared Roadway



In this scenario, there are no specifically designated bicycle facilities within the roadway. Bicycles are accommodated through increased righthand lane width (14' to 15') and reduced traffic speeds. Education and enforcement programs along with signage and potential pavement markings, such as the Shared-use Arrow, are utilized to alert motorists to the bicyclist's presence in the roadway.

Evaluation Results:

Road Classification	Pedestrian Q/LOS	On-road Bike Q/LOS	Notes
Principal Arterial	3.05 = C	4.55 = E	Extremely poor Bicycle Q/LOS
Minor Arterial	2.32 = B	4.23 = D	
Collector	2.47 = B	4.22 = D	Tied for worst Bike Q/LOS w/ scenario C

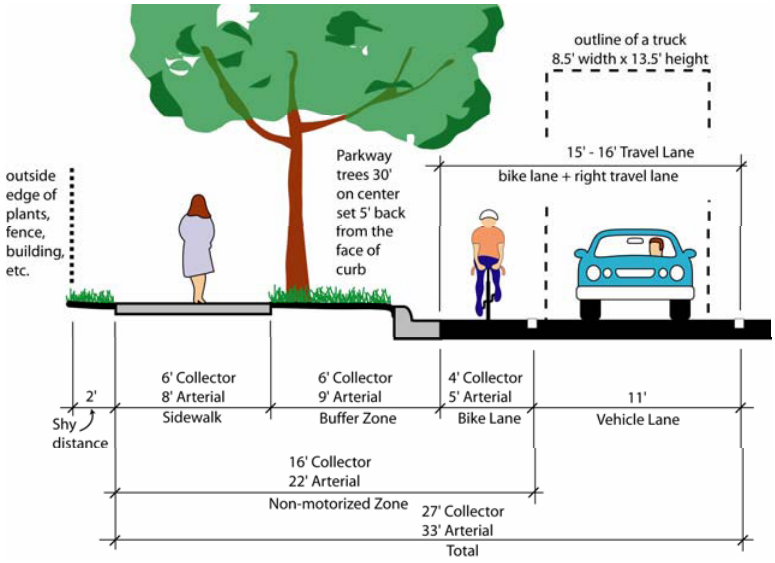
Advantages:

- Simple treatment at intersections.
- Considered by some to be the safest way to integrate bicyclists and motorized vehicles.
- Wide curb lane vs. bicycle lane studies have shown no significant safety differences in separation distances between the bicyclist and motorist.
- Appeals to experienced bicyclists who are often commuters.

Disadvantages:

- Unlikely to attract many new cyclists.
- May be viewed as a do nothing approach by many.
- Many bicyclists will still ride on the sidewalk.
- Cars tend to move further to the left and encroach into adjacent travel lanes when passing a cyclist with wide curb lanes than with bicycle lanes.
- Wider lanes may encourage higher speeds and may require traffic calming measures.

Fig. 2.3C. Scenario B – Sidewalk and Bike Lane (Preferred Option)



In this scenario, striped bicycle lanes or designated paved shoulders are provided on all collectors and minor arterials. Principal Arterials may have bike lanes or widened curb lanes, as determined most prudent for specific situations. The width of the bicycle lanes or shoulders should increase in areas with poor sight lines and/or higher vehicular speeds and volumes.

Evaluation Results:

Road Classification	Pedestrian Q/LOS	On-road Bike Q/LOS	Notes
Principal Arterial	3.04 = C	3.47 = C	Best Bike Q/LOS, only Scenario with a C rating
Minor Arterial	2.31 = B	3.15 = C	Best Bike Q/LOS, only Scenario with a C rating
Collector	2.46 = B	3.39 = C	Best Bike Q/LOS, only Scenario with a C rating

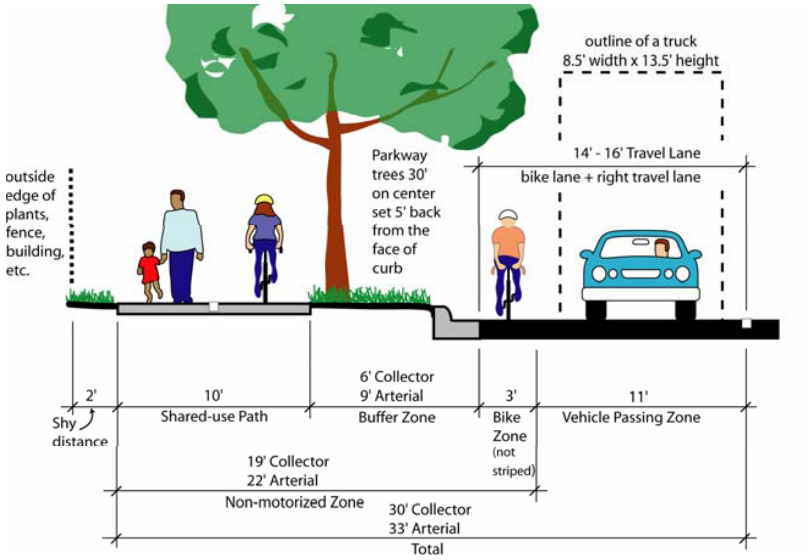
Advantages:

- Highly visible, designated facilities encourage increased bicycle use.
- Designated facilities alert motorists of the presence of bicyclists in the roadway.
- May have a slight traffic calming impact in some situations.
- Concurrent with AASHTO guidelines for most situations.
- Motorists are much less likely to encroach into the adjacent lane when passing a bicyclist.
- Motorists have less variation in their lane placement.

Disadvantages:

- Bicycle lanes require supplemental maintenance to be kept free of debris.
- Intersections must be designed carefully to minimize conflicts with turning movements.
- Presence of lanes may attract less experienced bicyclists to busier roadways.
- Motorists have less variation in their lane placement.
- Some bicyclists will still ride on the sidewalk.

Fig. 2.3D. Scenario C – Shared-use Path



In this scenario, off-road shared-use paths are provided on Principal and Minor Arterials. Bicycle lanes or designated paved shoulders are provided on Collectors. Some collectors may also have shared-use paths. Driveways crossing shared use paths are modified to improve bicyclist and pedestrian safety.

Evaluation Results:

Road Classification	Pedestrian Q/LOS	On-road Bike Q/LOS	Notes
Principal Arterial	3.05 = C	4.69 = E	Worst Bike Q/LOS
Minor Arterial	2.32 = B	4.38 = D	Worst Bike Q/LOS
Collector	2.39 = B	3.89 = D	Tied for worst Bike Q/LOS w/ Scenario A

Advantages:

- Similar to many of the Capital Region's existing non-motorized facilities.
- Do not have to modify existing roadways.
- Facilities separate from busy roads appeal to novice users and those with slower reflexes.

Disadvantages:

- Off-road facilities such as sidewalks and pathways are statistically the most dangerous places to bike due to conflicts with motor vehicles at intersections and driveways.
- Increased number of conflicts between bicyclists and pedestrians on pathways.
- Some bicyclists will still choose the roadway rather than a Shared-use Path.
- Few of the region's existing shared-use paths meet current AASHTO guidelines.
- Off-road facilities will need to be cleared of snow and have a higher maintenance standard than is currently in place to be considered a transportation facility.
- Transition between Shared-use Paths and Bike Lanes are awkward.

Scenario Observations

After reviewing the Quality/Level of Service (Q/LOS) analysis and testing alternative inputs for the alternative scenarios, a number of observations were made. These include:

- AASHTO minimum guidelines in many cases do not result in a Q/LOS grade of "C" or better.
- The Sidewalk and Bike Lane scenarios were the only scenarios that consistently achieved a Q/LOS of C or better for bicyclists and pedestrians. The other scenarios consistently had at least one mode rated a Q/LOS of D or worse.
- An 8' wide Bike Lane would be required to achieve a Bicycle Q/LOS higher than C on a typical Principal Arterial due to the traffic volumes and speeds. At that width, the Bike Lane may be misinterpreted as a travel lane and would be difficult to fit in most road ROW's.
- A 21' wide buffer would be required to achieve a Pedestrian Q/LOS higher than C on a typical Principal Arterial due to the traffic volumes and speeds. This would be difficult to accommodate in most road ROW's.
- The non-motorized zone does not vary in width much and all of the scenarios can be accommodated in standard ROW widths.
- While Bike Lanes provide additional buffer space between the vehicular travel way and the sidewalks, the difference in the Q/LOS is not significant.
- The Average Daily Traffic Volume for a 2 Lane Urban Collector would have to be below 3,500 to achieve a Bicycle Q/LOS of C.
- A Bike Lane provides an additional 4 to 5' of lateral separation between fixed objects such as trees and street lights and the motorized travel lanes increasing motorized safety.
- A Bike Lane provides a benefit to trees planted in the buffer by providing an additional 4' to 5' between the canopy of the tree and trucks that may hit the lower branches.

Conclusion

Based on these observations **Scenario B – Sidewalk and Bike Lane** is the preferred alternative for all road classifications under most circumstances. Scenario A – Sidewalks and Shared Roadway may be appropriate for lower volume (<3,500 ADT) and lower speed (<= 30 MPH) Collectors. Scenario C – Shared-use Path may be appropriate for Parkway situations where intersecting roadways and driveways are widely spaced (typically father apart than 1/2 mile). In addition, there should be little need to get to destinations on the other side of the road between intersecting roadways and marked mid-block crosswalks.

While Scenario B – Sidewalk and Bike Lane, is the preferred alternative, the region should not restrict bicycling on most sidewalks. Bicyclists will choose to ride in the road or on a sidewalk based on their individual skills and comfort riding in traffic and current conditions. Thus an individual who may typically ride in the road may choose to ride on a sidewalk if the road is wet. Also, some individuals may be comfortable riding in bike lanes on some roads but not others. It is not the MPO's place to dictate where a bicyclist should ride but rather provide new facilities in accordance with current best practices and retrofit existing facilities as best as possible.

The region though needs to underscore that when bicyclists ride on sidewalks they need to always yield to pedestrians. Six to eight foot wide sidewalks can accommodate moderate slower paced bicycle traffic in suburban settings. Thus Scenario B – Sidewalk and Bike Lane provides that option for both on-road and off-road bicycling in many situations. Given that some bicyclists will choose to ride on the sidewalks, the sidewalks should be designed and maintained such to accommodate these users. This is not to say

that they need to meet AASHTO Guidelines for shared-use pathways, but that sightlines at intersecting driveways and roadways should be open so that motorists and bicyclist can see each other. Sidewalk and ramp alignments should take into consideration bicycle travel. Obstructions within and immediately adjacent to the sidewalk should be avoided. Also, the sidewalk surfaces and adjacent overhanging vegetation need to be maintained with bicycle travel in mind.

There will be places in the downtown or other high density mixed use areas where the combination of high pedestrian volumes and limited sidewalk widths will dictate that bicyclists should walk their bikes when on the sidewalk. There may also be places where sidewalk bicycling may be hazardous and likewise require that bicyclists walk their bicycle. Whenever bicycles are restricted from riding on the sidewalk every effort should be made to improve bicyclists accommodations within the roadway.

Notes on the Application of the Conclusions

It should be noted that traffic volumes and speed, rather than road classifications, should determine whether to use a 4' or 5' wide bike lane. As a general rule, where volumes are expected to be over 25,000 trips per day and/or speeds are posted at 40 MPH or above, a 5' bike lane is preferred. 5' bike lanes are also preferable in situations where the vertical and horizontal curves limit sight lines.

Multi-Modal Corridor Width Requirements

While primary roads are classified as Principal Arterials, Minor Arterials, and Collectors, there is not in practice a direct relationship between a road's classification and the number of lanes or lane width. Factors such as the available right-of-way, existing infrastructure and context have a significant influence in a road's design.

Multi-Modal Roadway Widths

There are various configurations of overall road widths depending on individual lane widths. For instance, a road may have anywhere from ten to twelve foot travel lanes and three-&-one-half to five-&-one-half foot bicycle lanes. Variation in any or all of these widths has an impact on overall road width.

Also affecting roadway widths are:

- Parking--adds approximately seven feet to each side of the road and increases roadway width requirements.
- Speed – wider motor vehicle lanes generally encourage increased speed of motor vehicles. Wider bicycle lanes are desirable with faster motor vehicle speeds to increase the distance between motor vehicles and bicycles.

Multi-modal ROW Widths

In addition to the road, the ROW contains sidewalks or shared-use paths, the buffer area between the sidewalk and the road and space for a median if any. There is tremendous variation within some variables such as the buffer and the median distance. Also a small portion of a road's ROW may be used for actual road improvements.

It is not always preferable to go to the maximum allowable ROW width. The best width will depend on contextual circumstances in a given a situation. Special circumstances, however, may make it necessary to make maximum use of the ROW.

Other issues that have a bearing on ROW widths include:

- Parking – parallel on-street parking adds approximately seven feet to each side of the road and may increase ROW requirements, though in some circumstances the space would be obtained from the buffer.
- Speed – as noted under Multi-Modal Roadway Widths, higher speeds generally increase the width of a road. Higher speeds also make a wider buffer more desirable.

Multi-modal Roadway Design Guidelines

The following pages provide guidance on typically required road width, ROW width and cross section elements for the following typical roadway types:

- Urban Two-lane
- Urban Three-lane
- Urban Four-lane
- Urban Five-lane
- Urban Four-lane Parkway

Fig 2.3E Urban Two-lane Multi-Modal Roadway Design Guidelines

Typical Roadway Width Range:
27' – Minimum 29' – Minimum Desirable 35' – Upper Range

Typical Right-of-Way Width Range:
51' – Minimum 54' – Minimum Desirable 74' – Upper Range

Sidewalk, Buffer and Bike Lane Width Guidelines:

	Sidewalk Width	Buffer Width	Bike Lane Width
Collectors	5' AASHTO Minimum 6' Preferred Minimum	2' AASHTO Minimum 6' Preferred Minimum	3.5' AASHTO Minimum 4' Preferred Minimum
Arterials	5' AASHTO Minimum 8' Preferred Minimum	5' AASHTO Minimum 9' Preferred Minimum	3.5' AASHTO Minimum 5' Preferred Minimum

Notes:

- AASHTO guidelines indicate that 4' wide sidewalks may be used if 5' wide passing spaces for wheelchair users are provided at reasonable intervals.
- AASHTO guidelines indicate that curb-attached sidewalks should be a minimum of 6' wide on Collectors and 8 to 10' wide along busy Arterials.
- Bike Lane widths noted are based on the bike lane being adjacent to the City's standard 1.5' wide gutter. AASHTO minimum width Bike Lanes are 5' from face of curb to the bike lane stripe. The gutter must be flush with the adjacent roadway to be able to count the width of the gutter in the overall width of the bike lane.
- Bike Lanes over 5.5' may encourage illegal use as parking lanes.

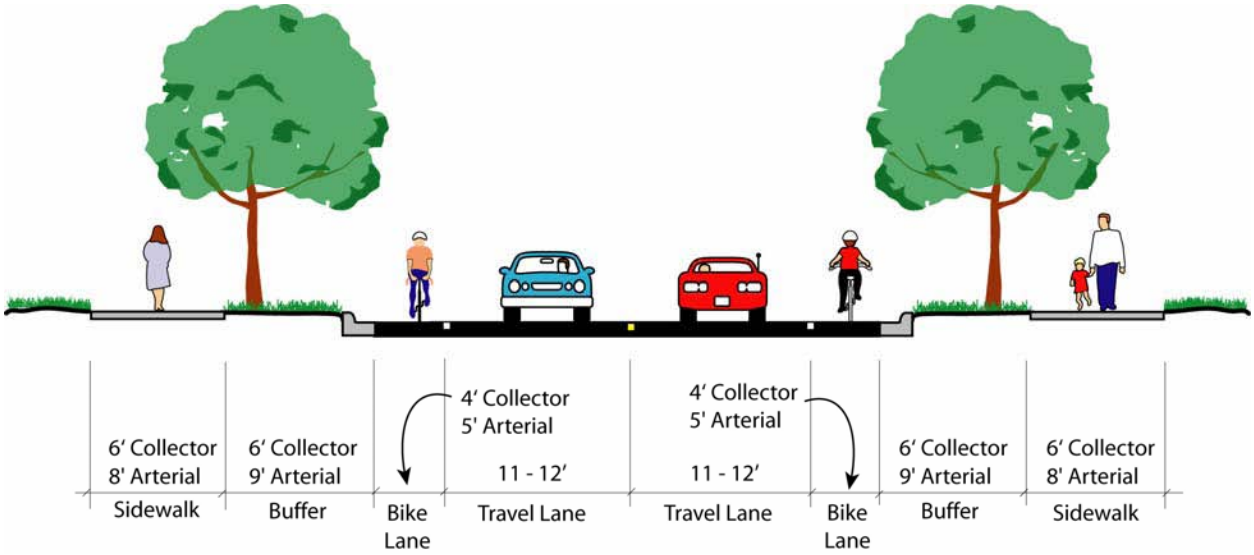
Typical Roadway Cross-Section Guidelines:[1]

Road Width[2]	27'	28'	29'	30'	31'	32'	33'	34'	35'
Bike Lane	3.5'	3.5'	3.5'	4'	4.5'	5'	5.5'	5.5'	5.5'
Travel Lane	10'	10.5'	11'	11'	11'	11'	11'	11.5'	12'
Travel Lane	10'	10.5'	11'	11'	11'	11'	11'	11.5'	12'
Bike Lane	3.5'	3.5'	3.5'	4'	4.5'	5'	5.5'	5.5'	5.5'

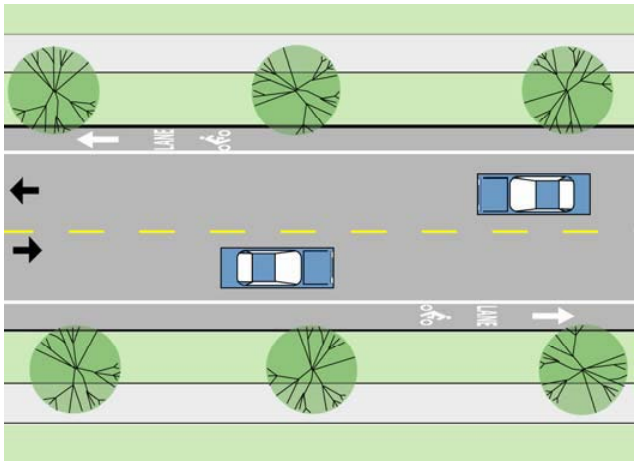
Highlighted cross sections should only be used in specific locations that meet certain conditions for which sub-11' travel lanes are appropriate.

1: For retrofitting existing streets as well as new street construction or street reconstruction projects.
2: The distance is from edge-of-metal to edge-of-metal and assumes a standard 18" gutter.

Urban Two-lane Multi-modal Roadway Typical Cross Section



Two-lane Road Typical Plan View



Bike Lanes

On roads with lower speed limits, bicycle lanes may be reduced to the 3.5' minimum (5' total from face of curb). In rural cross sections, the paved shoulder should be a minimum of 4' wide. Bike Lanes over 5.5' may encourage illegal use a parking lanes.

Trees

Tree spacing should be approximately 30' on center. Trees should be placed a minimum 5' back from the face of curb on Arterials and a minimum of 2' back from the face of curb on Collectors. The trees should also be placed a minimum of 2' back from the edge of sidewalk. Tree spacing/alignment should be varied as necessary to permit good visibility at crosswalks and intersections.

Fig 2.3F Urban Three-lane Multi-modal Roadway Design Guidelines

Typical Roadway Width Range:
37' – Minimum 39' – Minimum Desirable 47' – Upper Range

Typical Right-of-Way Width Range:
53' – Minimum 63' – Minimum Desirable 95' – Upper Range

Sidewalk, Buffer and Bike Lane Width Guidelines:

	Sidewalk Width	Buffer Width	Bike Lane Width
Collectors	5' AASHTO Minimum 6' Preferred Minimum	2' AASHTO Minimum 6' Preferred Minimum	3.5' AASHTO Minimum 4' Preferred Minimum
Arterials	5' AASHTO Minimum 8' Preferred Minimum	5' AASHTO Minimum 9' Preferred Minimum	3.5' AASHTO Minimum 5' Preferred Minimum

Notes:

- AASHTO guidelines indicate that 4' wide sidewalks may be used if 5' wide passing spaces for wheelchair users are provided at reasonable intervals.
- AASHTO guidelines indicate that curb-attached sidewalks should be a minimum of 6' wide on Collectors and 8 to 10' wide along busy Arterials.
- Bike Lane widths noted are based on the bike lane being adjacent to the City's standard 1.5' wide gutter. AASHTO minimum width Bike Lanes are 5' from face of curb to the bike lane stripe. The gutter must be flush with the adjacent roadway to be able to count the width of the gutter in the overall width of the bike lane.

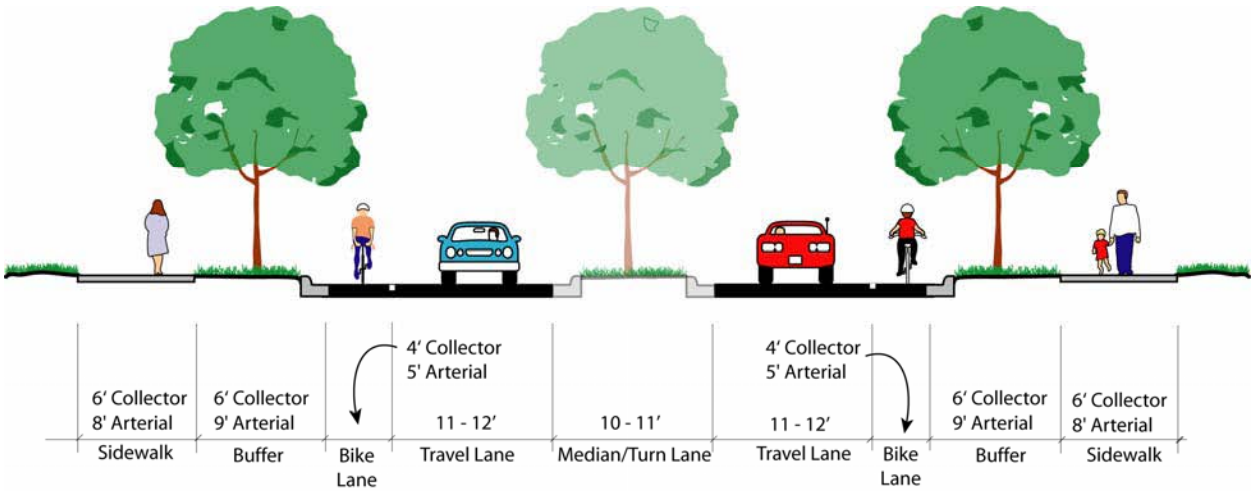
Typical Roadway Cross-Section Guidelines:[1]

Road Width[2]	37'	38'	39'	40'	41'	42'	43'	44'	45'	46'	47'
Bike Lane	3.5'	3.5'	3.5'	4'	4'	4.5'	5'	5.5'	5.5'	5.5'	5.5'
Travel Lane	10'	10.5'	11'	11'	11'	11'	11'	11'	11.5'	12'	12'
Center Left Turn Lane	10'	10'	10'	10'	11'	11'	11'	11'	11'	11'	12'
Travel Lane	10'	10.5'	11'	11'	11'	11'	11'	11'	11.5'	12'	12'
Bike Lane	3.5'	3.5'	3.5'	4'	4'	4.5'	5'	5.5'	5.5'	5.5'	5.5'

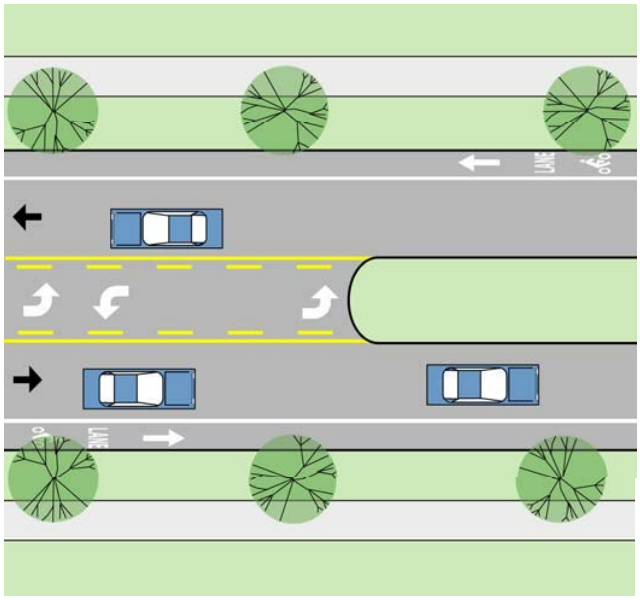
Highlighted cross sections should only be used in specific locations that meet certain conditions for which sub-11' travel lanes are appropriate.

1: For retrofitting existing streets as well as new street construction or street reconstruction projects.
2: The distance is from edge-of-metal to edge-of-metal and assumes a standard 18" gutter.

Urban Three-lane Multi-Modal Roadway Typical Cross Section



Urban Three-lane Multi-Modal Roadway Typical Plan View



Median

A planted median should be considered whenever there is no need for a turn lane. The planted median improves the aesthetics of the roadway, reduces the impervious surfaces and can act as an informal crossing island for dispersed mid-block crossings. Medians have also been shown to be less expensive to construct and maintain than paving in the long run. The crossing island may also be constructed in a manner that will mitigate storm water run-off.

Bike Lanes

On roads with lower speed limits, bicycle lanes may be reduced to the 3.5' minimum (5' total from face of curb). In rural cross sections the paved shoulder should be a minimum of 4' wide. Bike Lanes over 5.5' may encourage illegal use a parking lanes.

Trees

Tree spacing should be approximately 30' on center. Trees should be placed a minimum 5' back from the face of curb on Arterials and a minimum of 2' back from the face of curb on Collectors. The trees should also be placed a minimum of 2' back from the edge of sidewalk. Tree spacing/alignment should be varied as necessary to permit good visibility at crosswalks and intersections.

Fig 2.3G Urban Four-lane Multi-modal Roadway Design Guidelines

Typical Roadway Width Range:
47' – Minimum 51' – Minimum Desirable 59' – Upper Range

Typical Right-of-Way Width Range:
63' – Minimum 75' – Minimum Desirable 107' – Upper Range

Sidewalk, Buffer and Bike Lane Width Guidelines:

	Sidewalk Width	Buffer Width	Bike Lane Width
Collectors	5' AASHTO Minimum 6' Preferred Minimum	2' AASHTO Minimum 6' Preferred Minimum	3.5' AASHTO Minimum 4' Preferred Minimum
Arterials	5' AASHTO Minimum 8' Preferred Minimum	5' AASHTO Minimum 9' Preferred Minimum	3.5' AASHTO Minimum 5' Preferred Minimum

Notes:

- AASHTO guidelines indicate that 4' wide sidewalks may be used if 5' wide passing spaces for wheelchair users are provided at reasonable intervals.
- AASHTO guidelines indicate that curb-attached sidewalks should be a minimum of 6' wide on Collectors and 8 to 10' wide along busy Arterials.
    - Bike Lane widths noted are based on the bike lane being adjacent to the City's standard 1.5' wide gutter. AASHTO minimum width Bike Lanes are 5' from face of curb to the bike lane stripe. The gutter must be flush with the adjacent roadway to be able to count the width of the gutter in the overall width of the bike lane.
- Bike Lanes over 5.5' may encourage illegal use as parking lanes.

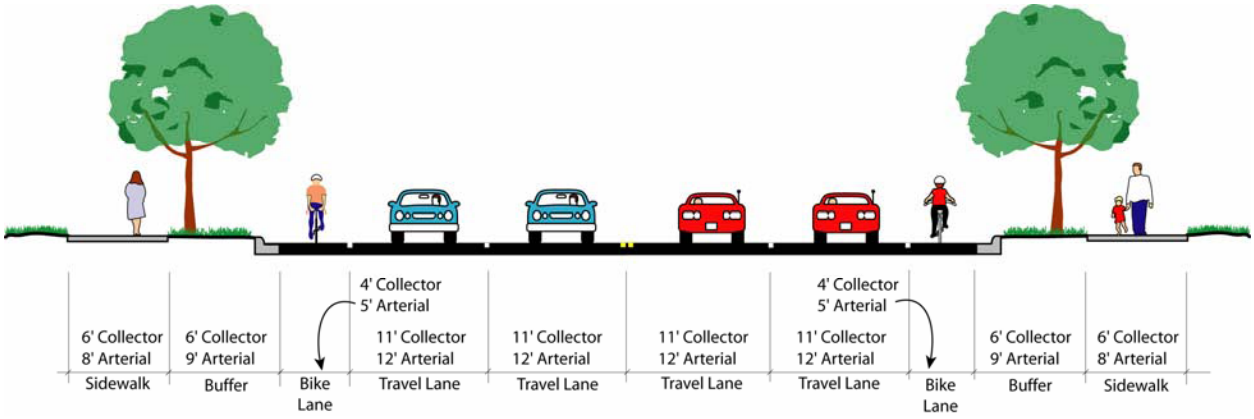
Typical Roadway Cross-Section Guidelines:[1]

Road Width[2]	47'	48'	49'	50'	51'	52'	53'	54'	55'	56'	57'	58'	59'
Bike Lane	3.5'	3.5'	3.5'	3.5'	3.5'	4'	4.5'	5'	5.5'	5.5'	5.5'	5.5'	5.5'
Travel Lane	10'	10'	10.5'	10.5'	11'	11'	11'	11'	11'	11.5'	12'	12'	12'
Travel Lane	10'	10.5'	10.5'	11'	11'	11'	11'	11'	11'	11'	11'	11.5'	12'
Travel Lane	10'	10.5'	10.5'	11'	11'	11'	11'	11'	11'	11'	11'	11.5'	12'
Travel Lane	10'	10'	10.5'	10.5'	11'	11'	11'	11'	11'	11.5'	12'	12'	12'
Bike Lane	3.5'	3.5'	3.5'	3.5'	3.5'	4'	4.5'	5'	5.5'	5.5'	5.5'	5.5'	5.5'

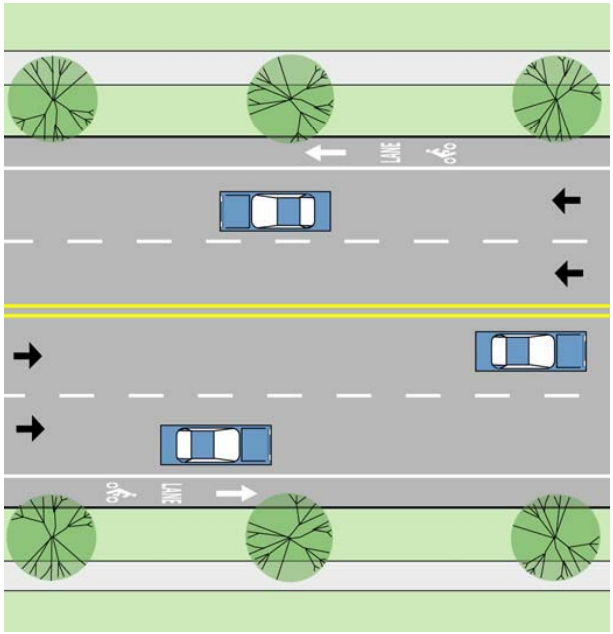
Highlighted cross sections should only be used in specific locations that meet certain conditions for which sub-11' travel lanes are appropriate.

1 For retrofitting existing streets as well as new street construction or street reconstruction projects.
2 The distance is from edge-of-metal to edge-of-metal and assumes a standard 18" gutter.

Urban Four-lane Multi-modal Roadway Typical Cross Section



Urban Four-lane Multi-modal Roadway Typical Plan View



Bike Lanes

On roads with lower speed limits, bicycle lanes may be reduced to the 3.5’ minimum (5’ total from face of curb). In rural cross sections the paved shoulder should be a minimum of 4’ wide. Bike Lanes over 5.5’ may encourage illegal use a parking lanes.

Trees

Tree spacing should be approximately 30’ on center. Trees should be placed a minimum 5’ back from the face of curb on Arterials and a minimum of 2’ back from the face of curb on Collectors. The trees should also be placed a minimum of 2’ back from the edge of sidewalk. Tree spacing/alignment should be varied as necessary to permit good visibility at crosswalks and intersections.

Fig 2.3H Urban Five-lane Multi-modal Roadway Design Guidelines

Typical Roadway Width Range:
57' – Minimum 61' – Minimum Desirable 71' – Upper Range

Typical Right-of-Way Width Range:
73' – Minimum 85' – Minimum Desirable 119' – Upper Range

Sidewalk, Buffer and Bike Lane Width Guidelines:

	Sidewalk Width	Buffer Width	Bike Lane Width
Collectors	5' AASHTO Minimum 6' Preferred Minimum	2' AASHTO Minimum 6' Preferred Minimum	3.5' AASHTO Minimum 4' Preferred Minimum
Arterials	5' AASHTO Minimum 8' Preferred Minimum	5' AASHTO Minimum 9' Preferred Minimum	3.5' AASHTO Minimum 5' Preferred Minimum

Notes:

- AASHTO guidelines indicate that 4' wide sidewalks may be used if 5' wide passing spaces for wheelchair users are provided at reasonable intervals.
- AASHTO guidelines indicate that curb-attached walks should be a minimum of 6' wide on Collectors and 8 to 10' wide along busy Arterials.
- Bike Lane widths noted are based on the bike lane being adjacent to the City's standard 1.5' wide gutter. AASHTO minimum width Bike Lanes are 5' from face of curb to the bike lane stripe. The gutter must be flush with the adjacent roadway to be able to count the width of the gutter in the overall width of the bike lane.

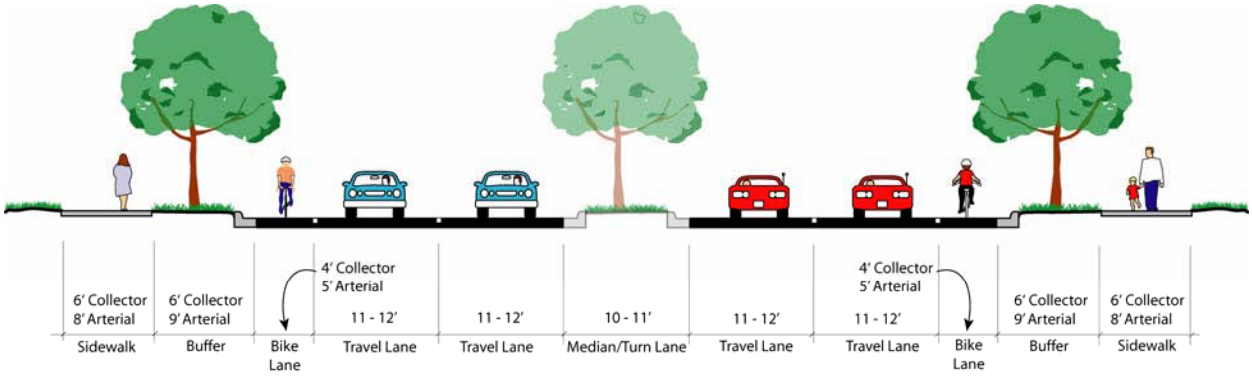
Five-Lane Road with Bike Lane Cross-Section Guidelines:[1]

Road Width[2]	57'	58'	59'	60'	61'	62'	63'	64'	65'	66'	67'	68'	69'	70'
Bike Lane	3.5'	3.5'	3.5'	3.5'	3.5'	4'	4'	4.5'	5'	5.5'	5.5'	5.5'	5.5'	5.5'
Travel Lane	10'	10'	10.5'	10.5'	11'	11'	11'	11'	11'	11'	11.5'	11.5'	12'	12'
Travel Lane	10'	10.5'	10.5'	11'	11'	11'	11'	11'	11'	11'	11'	11.5'	12'	12'
Center Lane	10'	10'	10'	10'	10'	10'	11'	11'	11'	11'	11'	11'	11'	12'
Travel Lane	10'	10.5'	10.5'	11'	11'	11'	11'	11'	11'	11'	11'	11.5'	12'	12'
Travel Lane	10'	10'	10.5'	10.5'	11'	11'	11'	11'	11'	11'	11.5'	11.5'	12'	12'
Bike Lane	3.5'	3.5'	3.5'	3.5'	3.5'	4'	4'	4.5'	5'	5.5'	5.5'	5.5'	5.5'	5.5'

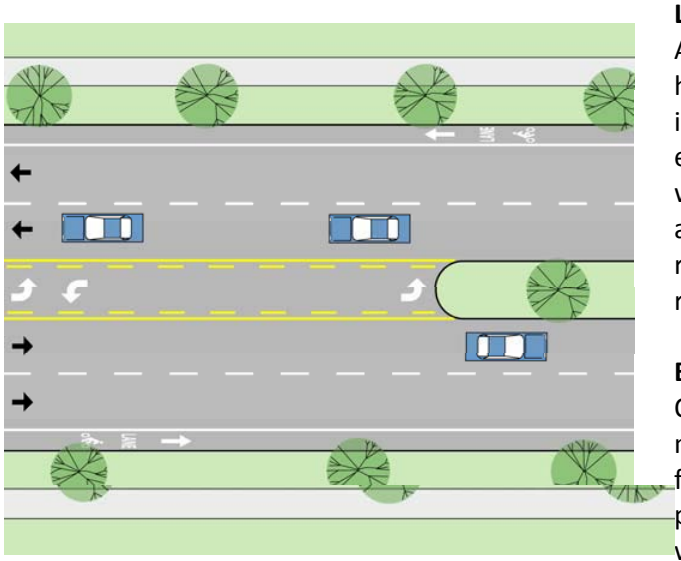
Highlighted cross sections should only be used in specific locations that meet certain conditions for which sub-11' travel lanes are appropriate.

1 For retrofitting existing streets as well as new street construction or street reconstruction projects.
2 The distance is from edge-of-metal to edge-of-metal and assumes a standard 18" gutter.

Urban Five-lane Multi-modal Roadway Typical Cross Section



Five-lane Multi-modal Roadway Typical Plan View



Lane Width

As 5-lane roads are typically higher volume and higher speed facilities, the minimum width indicated should only be considered in extenuating circumstances. Such situations would include areas with numerous driveway and roadway intersections. Where a 5-lane road is a lower speed facility, 57' minimum road width may be considered.

Bike Lanes

On roads with lower speed limits, bicycle lanes may be reduced to the 3.5' minimum (5' total from face of curb). In rural cross sections the paved shoulder should be a minimum of 4' wide. Bike Lanes over 5.5' may encourage illegal use a parking lanes.

Trees

Tree spacing should be approximately 30' on center. Trees should be placed a minimum 5' back from the face of curb on Arterials and a minimum of 2' back from the face of curb on Collectors. The trees should also be placed a minimum of 2' back from the edge of sidewalk. Tree species/spacing/alignment should be varied as necessary to permit good visibility at crosswalks and intersections.

Median

A planted median should be considered whenever the there is no need for a turn lane. The planted median improves the aesthetics of the roadway, reduces the impervious surfaces and can act as an informal crossing island for dispersed mid-block crossings. Medians have also been shown to be less expensive to construct and maintain than paving in the long run. The crossing island may also be constructed in a manner that will mitigate storm water run-off.

Fig 2.3I Urban Four-lane Parkway Multi-modal Design Guidelines

Typical Roadway Width Range:
47' – Minimum 51' – Minimum Desirable 59' – Upper Range

Typical Right-of-Way Width Range:
63' – Minimum 75' – Minimum Desirable 107' – Upper Range

Sidewalk, Buffer and Bike Lane Width Guidelines:

	Sidewalk Width	Buffer Width	Bike Lane Width
Collectors	5' AASHTO Minimum 6' Preferred Minimum	2' AASHTO Minimum 6' Preferred Minimum	3.5' AASHTO Minimum 4' Preferred Minimum
Arterials	5' AASHTO Minimum 8' Preferred Minimum	5' AASHTO Minimum 9' Preferred Minimum	3.5' AASHTO Minimum 5' Preferred Minimum

Notes:

- AASHTO guidelines indicate that 4' wide sidewalks may be used if 5' wide passing spaces for wheelchair users are provided at reasonable intervals.
- AASHTO guidelines indicate that curb-attached sidewalks should be a minimum of 6' wide on Collectors and 8 to 10' wide along busy Arterials.
- Bike Lane widths noted are based on the bike lane being adjacent to the City's standard 1.5' wide gutter. AASHTO minimum width Bike Lanes are 5' from face of curb to the bike lane stripe. The gutter must be flush with the adjacent roadway to be able to count the width of the gutter in the overall width of the bike lane.
- Bike Lanes over 5.5' may encourage illegal use as parking lanes.

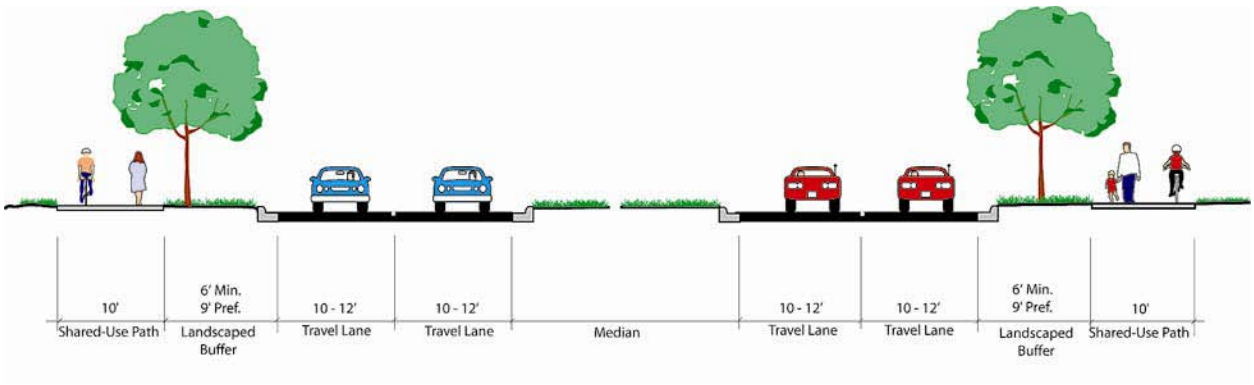
Typical Roadway Cross-Section Guidelines:[1]

Road Width[2]	47'	48'	49'	50'	51'	52'	53'	54'	55'	56'	57'	58'	59'
Bike Lane	3.5'	3.5'	3.5'	3.5'	3.5'	4'	4.5'	5'	5.5'	5.5'	5.5'	5.5'	5.5'
Travel Lane	10'	10'	10.5'	10.5'	11'	11'	11'	11'	11'	11.5'	12'	12'	12'
Travel Lane	10'	10.5'	10.5'	11'	11'	11'	11'	11'	11'	11'	11'	11.5'	12'
Travel Lane	10'	10.5'	10.5'	11'	11'	11'	11'	11'	11'	11'	11'	11.5'	12'
Travel Lane	10'	10'	10.5'	10.5'	11'	11'	11'	11'	11'	11.5'	12'	12'	12'
Bike Lane	3.5'	3.5'	3.5'	3.5'	3.5'	4'	4.5'	5'	5.5'	5.5'	5.5'	5.5'	5.5'

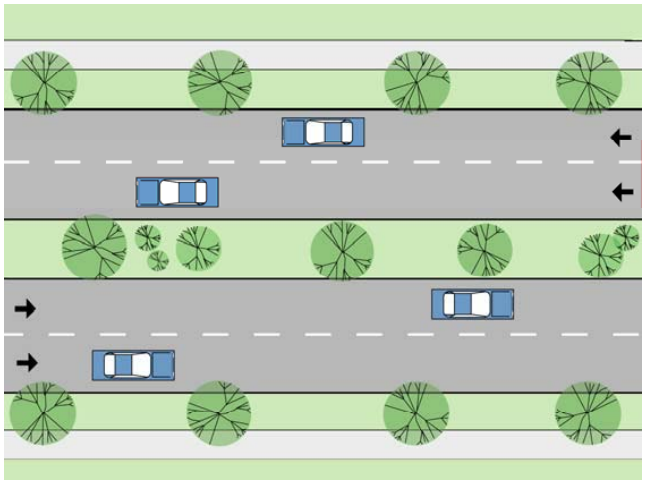
Highlighted cross sections should only be used in specific locations that meet certain conditions for which sub-11' travel lanes are appropriate.

1 For retrofitting existing streets as well as new street construction or street reconstruction projects.
2 The distance is from edge-of-metal to edge-of-metal and assumes a standard 18" gutter.

Urban Four-lane Parkway Multi-modal Typical Cross Section



Urban Four-lane Multi-modal Roadway Typical Plan View



Shared-use Paths

This cross-section may be appropriate for Parkway situations where intersecting roadways and driveways are widely spaced (typically father apart than ½ mile) and there is little need to get to destinations on the other side of the road between intersecting roadways and marked mid-block crosswalks.

Care should be taken not to excessively meander the path. Even when on a recreational trip, few bicyclists will travel far out-of-direction unless there is a compelling reason.

The grade of the Shared-use Path should match as close as possible the grade of the road. Excessively steep grades on pathways discourage bicycle travel and may present safety issues. The AASHTO Guide for the Development of Bicycle Facilities provides guidelines on the geometric design of Shared-use Paths.

Trees

Tree spacing should be approximately 30’ on center. Trees should be placed a minimum 5’ back from the face of curb on Arterials and a minimum of 2’ back from the face of curb on Collectors. The trees should also be placed a minimum of 2’ back from the edge of sidewalk. Tree spacing/alignment should be varied as necessary to permit good visibility at crosswalks and intersections.

Median

The planted median improves the aesthetics of the roadway, reduces the impervious surfaces and can act as an informal crossing island for dispersed mid-block crossings. Medians have also been shown to be less expensive to construct and maintain than paving in the long run. The median may also be constructed in a manner that will mitigate storm water run-off.

On-Street Parking Guidelines

When adding parking the parking lane should be set at 5.5' (7' total including gutter) and the bike lane width should be a minimum of 5' wide. Additional width for bike lanes is desirable due to opening doors of parked cars infringing on the bike lane width. Bike Lanes wider than 5' should have the door zone cross-hatched to encourage bicyclists to ride a safe distance away from the parked cars.

A 4" stripe should mark the edge of the parking lane to encourage parking as close to the curb as possible. The parking lane should always remain at 5.5'. Any additional room should be allocated toward the Bike Lane first, then to the travel lane adjacent to the bike lane.

Multi-modal One-Way Road Design Guidelines

Bike Lanes may be located on either side of a one-way road. For consistency sake, the right hand side should be the default choice. If, however there are numerous bus stops with frequent bus service the left hand side of the road may be preferable. If there is on-street parking on one side of the road, the bicycle lane should generally be located on the opposite side of the road than the on-street parking.

Fig 2.3J. Signed Bike Route Design Guidelines

Purpose

Bike Route signs are guide signs, rather than indicating that a particular facility exists. Bicycle Routes are intended to mark routes that may not be obvious to users unfamiliar with the area. They are typically used on local streets and may utilize incorporate pathway connections that link local streets. They are likely to be used by cyclists who are uncomfortable bicycling on the main roads, students bicycling to school or by recreational cyclists.

Directional Signage

The key aspect of a bicycle route is the destination sign that should call out points of interest along the route such as schools, shopping centers or parks (e.g. "To Downtown").

Route Characteristics

Routes signed as a Bike Route should be roads that have a relatively high Quality/Level of Service for bicyclists. The route should not have any known hazards to bicyclists and should be maintained in a manner that is appropriate for bicycle use. While many local roads may meet these criteria, the key is that the road is part of a specific route to a particular place. Obvious routes need not be marked. Bike Routes should be used judiciously to identify obscure routes to key destinations that avoid travel along major roadways.

Where a bicycle route on a local road intersects a busy multi-lane primary road and continues on the other side of the road, a traffic signal or appropriately design mid-block crossing should be provided. Bike Routes generally do not include specific bicycle improvements such as Bike Lanes. Bike Lane pavement markings and signs already indicate that a road segment is designed to specifically accommodate bicycles. Bike Route signs are to be used where no obvious bicycle facility exists yet the route is advantageous to bicyclists. Thus road segments with Bike Lanes should generally not be marked as a Bike Route.

Frequency of Sign Placement
The signs should be placed at every turn, signalized intersection and approximately every ¼ mile along the route.

Transitions between Sidewalk Bikeways and Bike Lanes Design Guidelines
The recommended approach to accommodating bicycles along arterials and collectors is with a bicycle lane. However, there will be places, especially in the near-term, where that may not be possible. This presents a situation where some bicyclists will prefer to continue bicycling in the roadway and others will prefer to leave the roadway and use a sidewalk bikeway. Given the significant variances in bicyclist's abilities, trip purposes, and cycling speeds, forcing all cyclists into a single solution is inappropriate. The solution then is to accommodate both preferences.

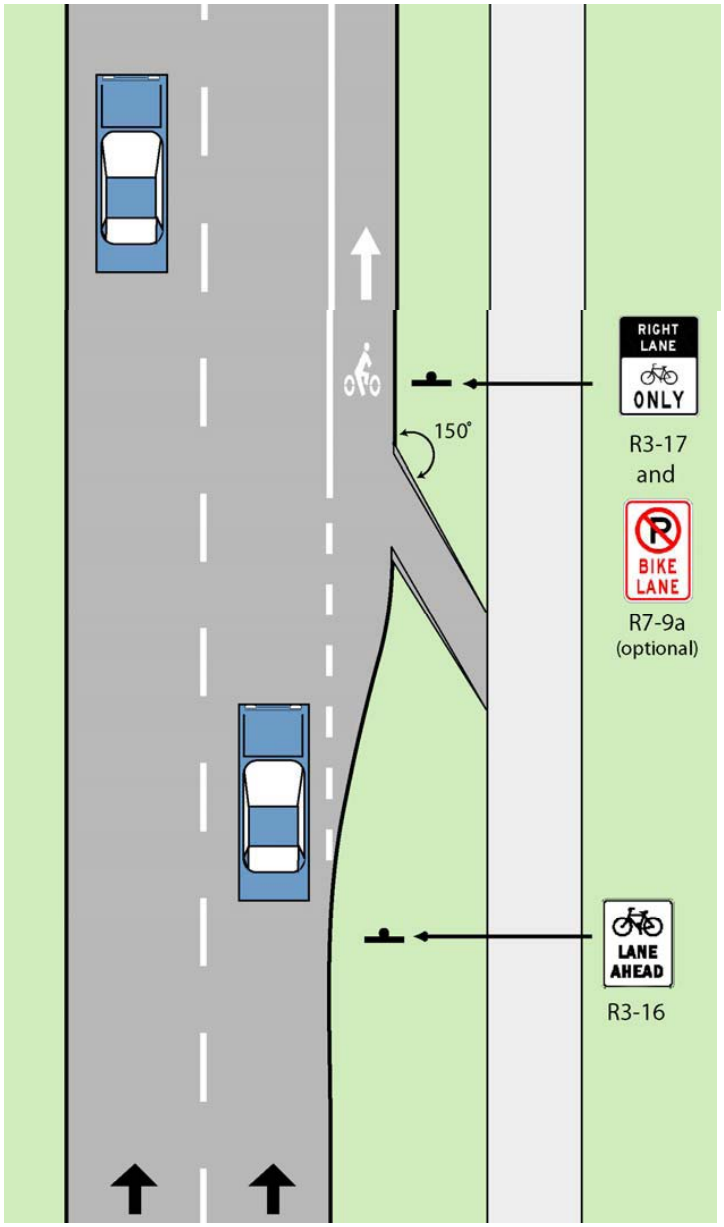
The transition points between sidewalk bikeways and bike lanes, presents a number of challenges. This underscores the importance of making the non-motorized system as consistent as possible. When bringing bicyclists into the roadway as shown in Fig 2.3K (next page), the entrance point needs to be protected. Unlike merging points between motor vehicles, the speed differential between bicyclists and motor vehicles may be significant with the potential for hit-from-behind crashes if the merging area is not protected.

When bringing bicycles onto a pathway, there is the potential for conflicts with pedestrians and bicyclists already on the pathway. Trying to segregate bicycles and pedestrians on a single 8' – 10' wide path is not feasible. Each direction for bicycle use requires 4'. Some busy shared-use paths have a dashed yellow line down the center to separate path users by direction of travel. While these tend to work to a degree in busier off-road pathways they are rarely used in sidewalk bikeway situations.

The solution does not differentiate between the sidewalk bikeways that are adjacent to a bike lane from a typical sidewalk. A sign along the pathway can instruct bicyclists to yield to pedestrians per City code. The approach is based on the assumption that the fastest bicyclists will remain in the roadway and share the lane with the motor vehicles rather than leave the roadway and have their travel impeded by pedestrians and driveway crossings.

A ramp that eases the transition from a Bike Lane to a Shared-use Path is provided where the Bike Lane ends.

Fig. 2.3K. Bicycle Entrance Ramp from Sidewalk Bikeway to Bike Lane Design Guideline:



Applications

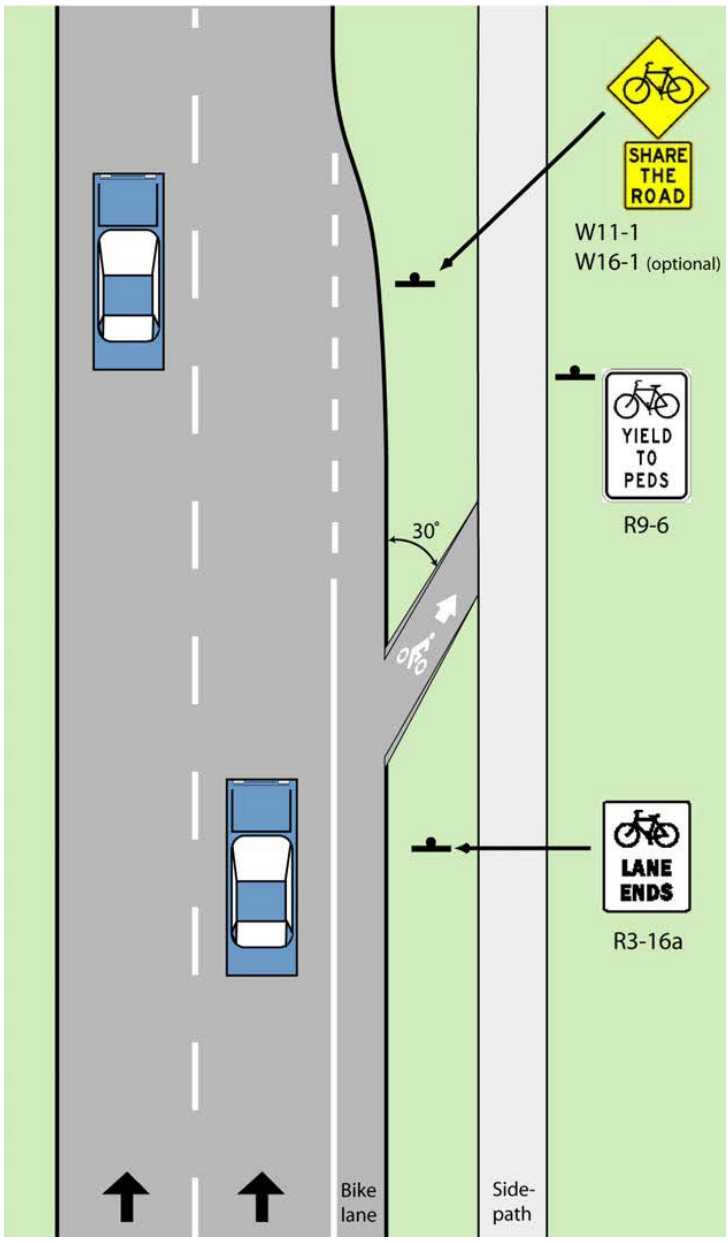
The bike entrance ramp is used to provide easy transition from a sidewalk bikeway to a bike lane or to allow a bicyclist to enter the roadway to make a turn as a vehicle.

The ramp may be used where a bike lane begins or periodically along a sidewalk bikeway that parallels a bike lane.

Key Elements:

1. Bicyclists have an option to bike either in the bike lane or along the sidewalk bikeway.
2. The ramp should resemble a curb ramp with flared sides and a flush edge with the road grade.
3. The mouth of the ramp (not including the flared sides) should be 5’ wide or sized to fit maintenance vehicles designed for sweeping.
4. When used at the beginning of a bike lane, the road should be widened to accommodate the bike lane and protect bikers entering roadway from the sidewalk bikeway given the sharp angle of entry. As the road is flared, dashed pavement markings should be used indicate the beginning of the bike lane and an area where bikers in the roadway can merge into the bike lane.

Fig. 2.3L. Bicycle Exit Ramp from Bike Lane to Sidewalk Bikeway Design Guideline



Applications

The bike exit ramp is used to provide easy transition from a bike lane to a sidewalk bikeway.

The ramp may be used where a bike lane ends or periodically along a sidewalk bikeway that parallels a bike lane.

Key Elements:

1. Bicyclists have the option of bicycling in the roadway or on a sidewalk bikeway.
2. The exit ramp should resemble a curb ramp with flared sides and a flush edge with the road grade.
3. The mouth of the ramp (not including the flared sides) should be 5’ wide or sized to fit maintenance vehicles designed for sweeping and snow removal.
4. Where a bike lane ends, dashed pavement markings indicate the end of the bike lane and an area where bikers are merging back into the roadway. Dashed lines should begin well in advance of the end of the bike lane to ensure adequate warning and a large transition zone.
5. A bike symbol and arrow on the ramp to discourage bicyclists on the sidewalk bikeway to enter the roadway going the wrong way.

Modifying Existing Facilities to Incorporate Bicycle Lanes

The Capital Region's existing road infrastructure must be considered when looking at how bicycle lanes may be added. Waiting for a complete road reconstruction at which time the "ideal" scenario may be applied would result in unnecessary delay in implementing a bicycle lane system. Also, in many cases, existing development, historic districts and natural features dictate that the roadway width will change little if at
all even in the long run. Hence, approaches to modifying facilities that work within existing curb lines and with existing storm sewer systems need to be employed.

In some cases, existing travel lanes may need to be narrowed to accommodate bicycle lanes. In other cases there may be excess road capacity that permits eliminating a lane in order to accommodate bicycle lanes. There may be cases where an alternative road configuration that includes bicycle lanes will work equally as well if not better than the existing conditions for motorists, such as a four to three lane conversion. In most cases though, incorporating bicycle lanes is a compromise between the ideal motorized transportation facility and the ideal bicycle facility in order to establish a true multi-model facility within existing infrastructure limitations. The following guidelines illustrate various techniques for modifying existing facilities in order to incorporate bicycle lanes.

Adding Bike Lanes to High Speed Four and Five-Lane Roads

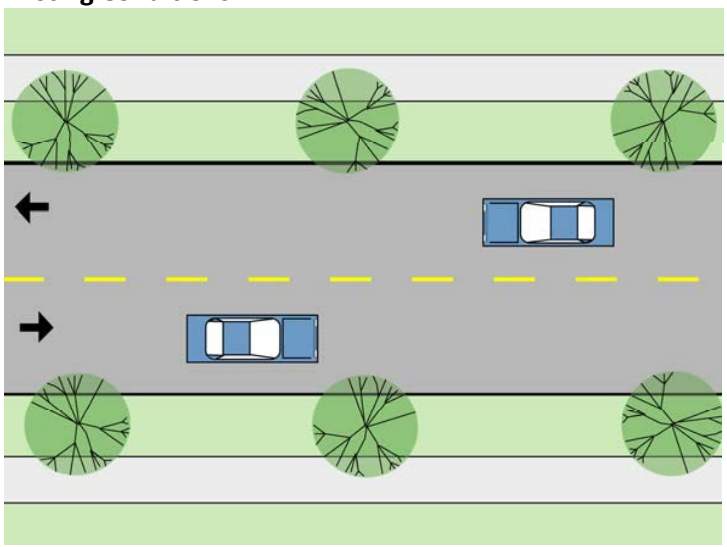
The narrowing of high speed four and five-lane roads to accommodate bike lanes has some specific conversion issues. Given the higher volumes of traffic, higher speeds and higher number of heavy vehicles on many of these roadways, it is desirable to keep the motor vehicle lane widths as close to an 11' minimum as possible. On some of The Capital Region's four and five-lane roads, this may mean that it is not
possible to accommodate a bike lane on both sides of the roadway.

As an interim measure for roads less than 60' wide, a bike lane on one side may be considered in conjunction with a shared lane/side path option on the other side. The bike lane should be located on the side with the most driveways and intersecting roads. The other option to consider if there are numerous intersecting roads and driveways on both sides to lower the speed of the roadway so that sub-11' lanes are more appropriate. This is best accomplished with changes to the physical roadway with such things as planted medians and/or crossing islands. These in combination with the narrow lanes will naturally slow traffic.

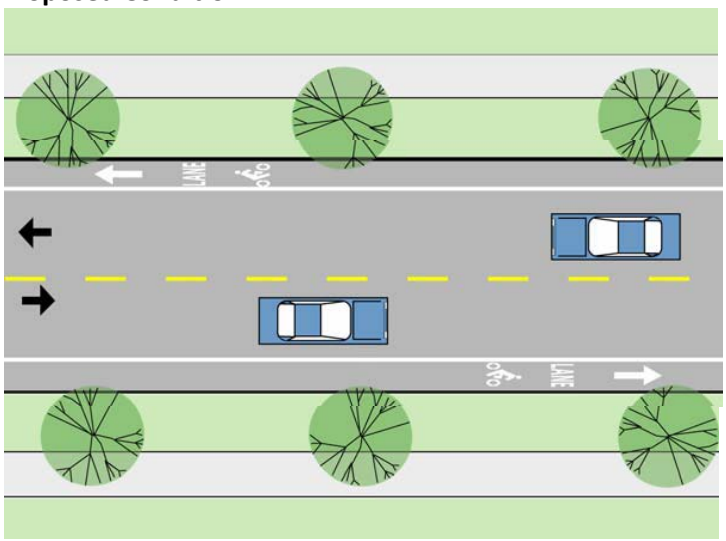
When there is not a bike lane in the road, the bicyclist should be provided the option to use a sidewalk bikeway or to bike in the road. Exit and entrance ramps should be used to ease the transition between on road and off-road facilities.

Fig. 2.3M. Providing Bicycle Lanes Through Lane Narrowing Design Guidelines

Existing Conditions



Proposed Condition



Description

The travel lanes are narrowed allowing room for the inclusion of a bike lane. The bicycle lane has the additional advantage of providing a buffer between the travel lane and the curb.

AASHTO guidelines specifically discuss narrowing travel lanes in order to accommodate bicycle travel, although there are some situations where narrowing lanes may not be appropriate.

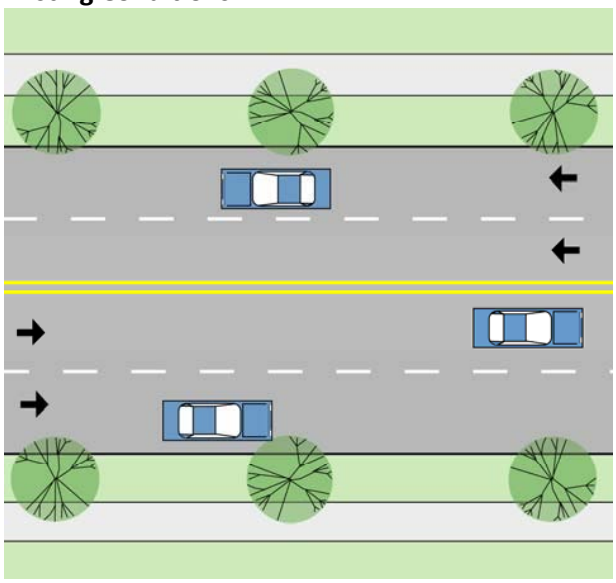
Application

In general, lane narrowing to provide for bicycle lanes may be considered in the following situations:

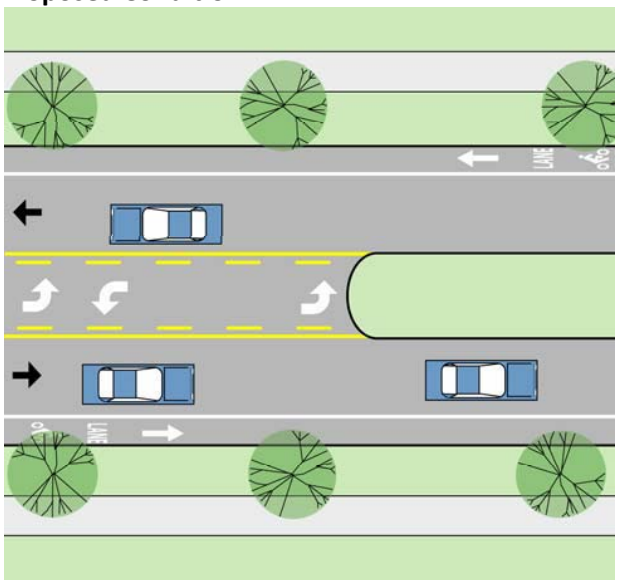
- 27’ or wider, 2 lane road
- 37’ or wider, 3 lane road (2 lane road with a center turn lane)
- 41’ or wider, 2 lane road with parking on both sides
- 47’ or wider, 4 lane road
- 52’ or wider, 3 lane road with parking on both sides
- 57’ or wider, 5 lane road

Fig. 2.3N. Four-Lane to Three-Lane Road Conversions Design Guidelines

Existing Conditions



Proposed Condition



Application statistics are referenced from:

Guidelines for the Conversion of Urban Four-lane Undivided Roadways to Three-lane Two-way Left-turn Lane Facilities, April 2001, Sponsored by the Office of Traffic and Safety of the Iowa Department of Transportation, CTRE Management Project 99-54

Description

Four-lane roads present several operational difficulties to motorists. Traffic is often weaving from lane to lane to avoid vehicles that are stopped in the left lane while waiting for a gap in oncoming traffic to make a left turn, or those slowing down in the right lane to make a right turn. The presence of a bicycle in the curb lane also adds to the weaving of traffic if there is not sufficient lane width to pass the bicycle while staying within the lane.

This constant weaving of traffic also makes judging when to enter the road from a driveway or side street difficult as lane positions are changing frequently. This is especially the case for left turns. To address the operational difficulties of 4-lane roadway, the roadway is reconfigured to two through lanes, a center shared left turn lane and/or median and two bike lanes.

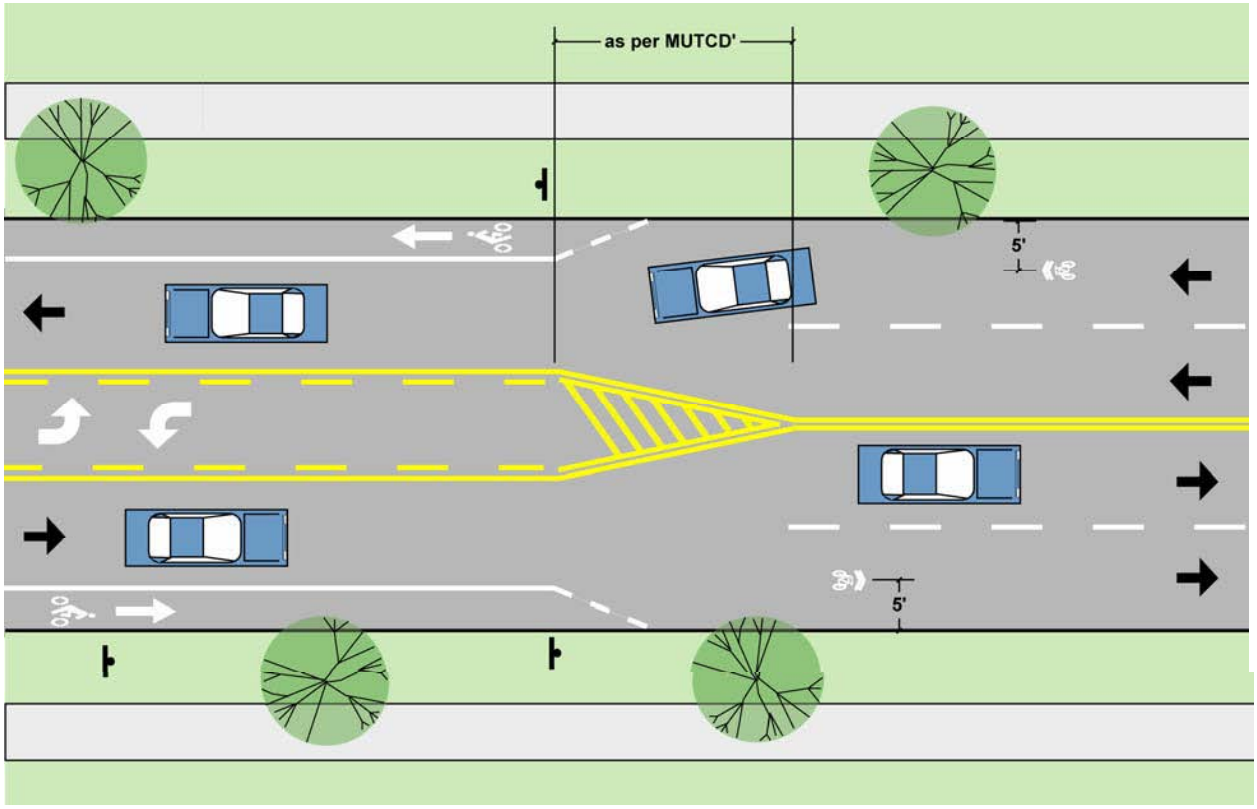
Application

This type of conversion has been used on roadways with up to 24,000 vehicles per day (VPD). Modeling research has shown that there is no loss in Vehicular Level of Service until about 1,750 vehicles per hour (approximately 17,500 VPD) compared to a four-lane configuration. In addition to a significant improvement in the Bicycle Level of Service, these conversions have been also shown to provide a:

- Reduction of the 85% speed by about 5 MPH
- Dramatic reduction in excessive speeding (60-70%) of vehicles going greater than 5 MPH over the posted speed limit.
- Dramatic reduction in the total number of crashes (17-62%).

Conversions though must be evaluated on a caseby-case basis as numerous factors influence the appropriateness of 4 to 3 lane conversion.

Fig. 2.3O. Near-term Opportunities – Transition From Three Lanes to Four Lanes at Signals



Description

Where two motor vehicle lanes are needed to accommodate motor vehicle stacking at signalized intersections the bicycle lane may be dropped and replaced with the Shared-Use Arrow.

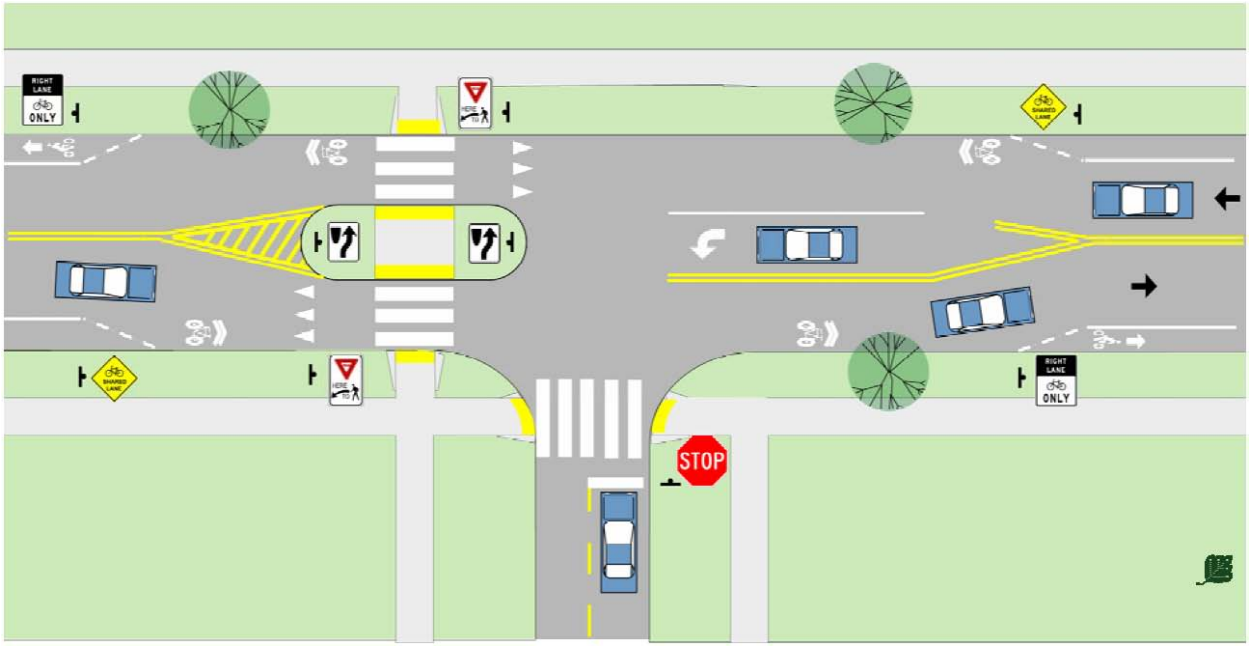
Application

This is an interim approach to accommodating vehicle stacking needs to be used where a bike lane is interrupted in the vicinity of a signal. The long-term solution would expand the intersection to accommodate bicycle lanes. The length of the four-lane segment should be minimized.

Three to Two-Lane Road Conversions

There are cases where a three-lane cross section is used consistently when the need for turn lanes is only intermittent. In these cases a bike lane may be added in places where the turn lane is not warranted. The bike lane then may be dropped when the turn lane is introduced.

Fig. 2.3P. Near-term Opportunities – Accommodation of Turn Lanes and Crossing islands



Description

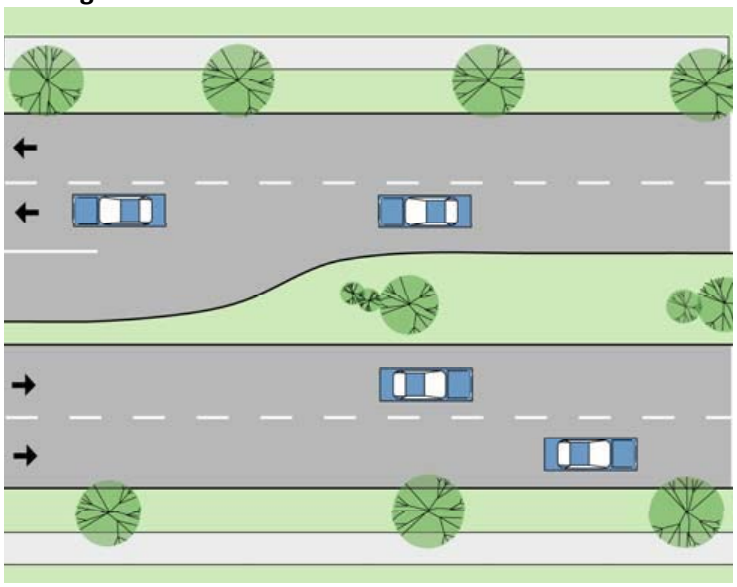
Where a designated left-turn lane is warranted and/or a pedestrian crossing island is appropriate, the bicycle lane may be dropped and replaced with the Shared-Use Arrow.

Application

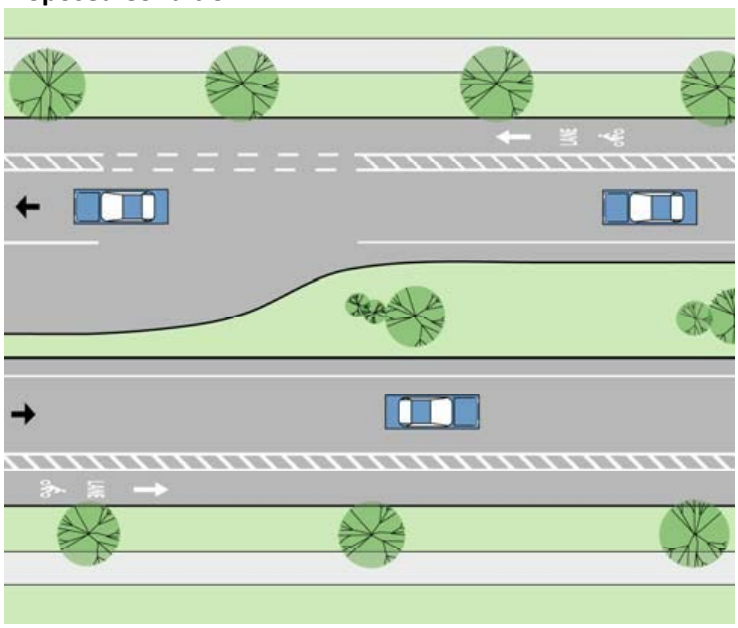
This is an interim approach to accommodating the turn lane and the crossing island. The long-term solution would expand the intersection to accommodate bicycle lanes. The length of the left-turn lane should only be as long as it needs to be to accommodate the conditions of each specific site.

Fig. 2.3Q. Four to Two-Lane Boulevard Conversions Design Guidelines

Existing Conditions



Proposed Condition



Description

The existing condition is a four-lane boulevard with designated turn lanes. These roads have tremendous traffic volume capacity. There are some situations where this road design exceeds the needs of the roadway.

In the proposed condition, two lanes of through traffic are eliminated and bicycle lanes are added. As bicycle lanes are considerably more narrow than travel lanes, a striped buffer is added between the vehicular travel lane and the bike lane and an edge line is placed a few feet from the inside curb. This allows emergency vehicles to pass.

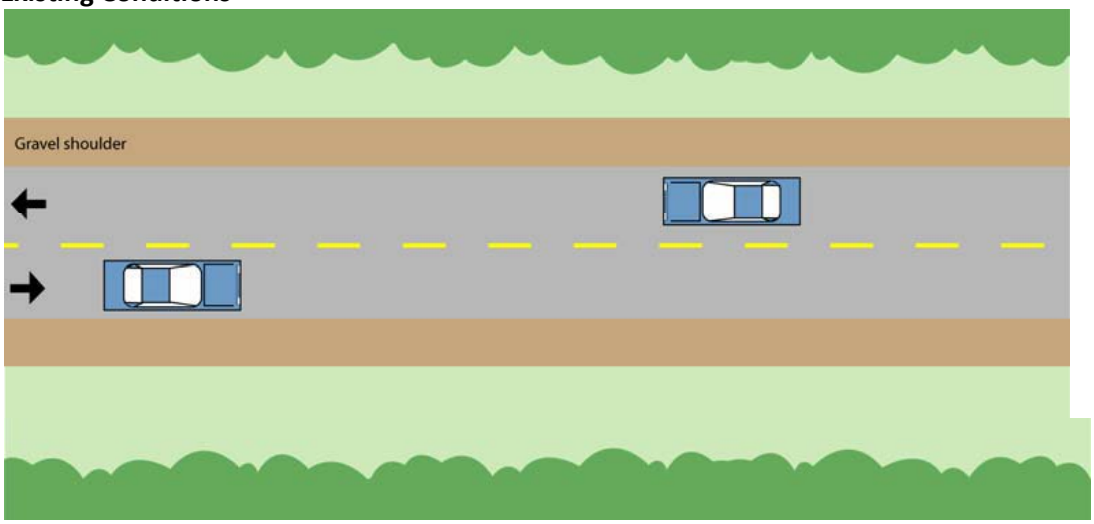
This striped buffer is replaced with a dashed line where bicycle-merging movements are expected.

Application

Where the existing and expected traffic volumes do not warrant four lanes of traffic with extended designated turn lanes.

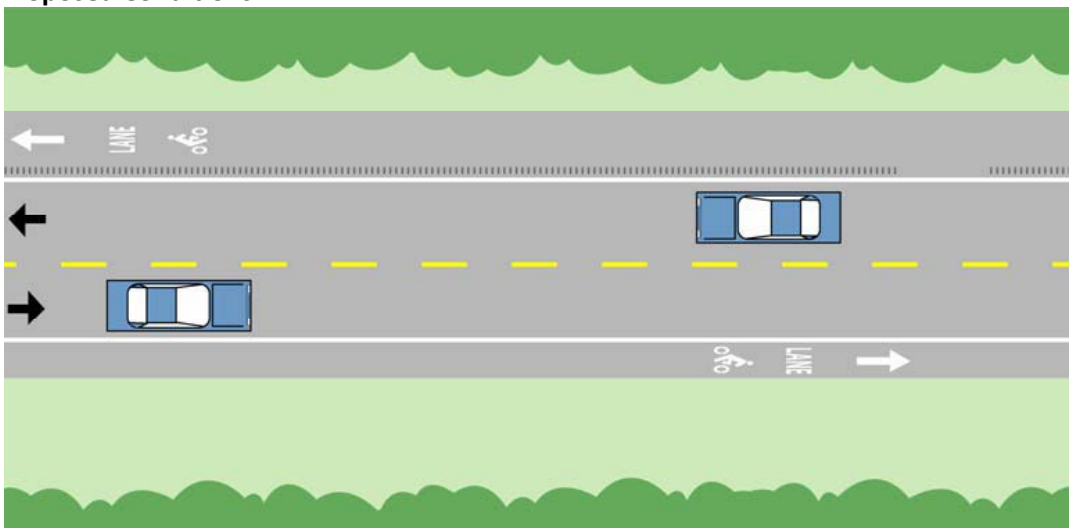
Fig. 2.3R. Paving Shoulders

Existing Conditions



A rural cross-section (no curbs) with gravel or grass shoulder. The existing roadway travel lanes are not of a sufficient width to accommodate bicycle lanes by lane narrowing.

Proposed Conditions



Description

Paving the shoulder provides a separate bicycle facility and improves roadway conditions from a motor vehicle and maintenance standpoint. The use of rumble strips is discouraged as they may cause a bicyclist to lose control when they leave the bicycle lane to make a turn or to avoid an obstacle. If extenuating circumstances call for the use of rumble strips, breaks should be provided where appropriate to allow for a bicycle to safely leave the bike lane.

Application

Paved shoulders should be provided on all rural cross section roadways within the region. Where appropriate, bicycle lane pavement markings may be applied.

Sub-standard Bicycle Lanes and Edge Striping
There will be places where it will be impossible to reconfigure a roadway to accommodate even the minimum width of bicycle lane as described in AASHTO. In such cases it may be desirable to place a bike lane of a slightly narrower width in order to provide continuity of on-road facilities. At an absolute minimum, a bicycle lane next to a standard curb and gutter should have 3' of ridable surface (measured to the centerline of the lane stripe). In a case where that is not possible, a standard 4" edge stripe may be considered without the standard bicycle lane markings and signs.

Designation of Sidewalks or Sidewalk Bikeways as Bicycle Facilities
Since numerous studies have shown sidewalk bikeways to be a more dangerous place to bicycle than in the roadway, the City should not designate any new sidewalk bikeways as a designated bicycle facility. Rather, the choice of riding on a sidewalk or in the street should be up to the cyclist based on their experience, comfort level and current conditions. The sidewalk/sidewalk bikeway should be considered first and foremost for pedestrians. Bicyclists who choose to bicycle on a sidewalk/sidewalk bikeway (when permitted by law) must yield to pedestrians. Routes currently signed as sidewalk bicycle routes should be reviewed on a case-by-case basis and should be removed as soon as practical. The sidewalk bicycle routes are non-standard signs that do not comply with LADOTD standards. Also, none of the sidewalk bicycle routes that were evaluated meet AASHTO guidelines for designating sidewalks as signed bikeways. The sidewalk bicycle routes falsely indicate to motorists that bicyclists should not be expected in the roadway.

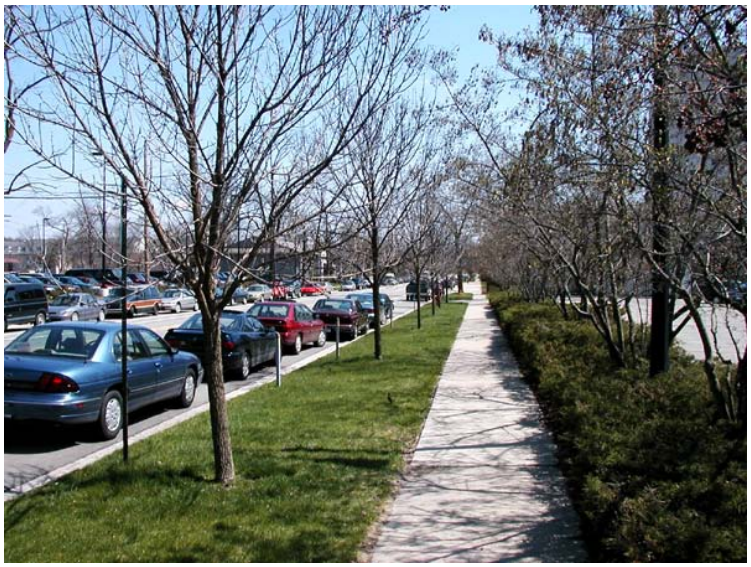
Completing and Repairing the Sidewalk System
Sidewalks should exist along both sides of all transit routes whenever feasible. The sidewalks should be constructed with concrete and should be a minimum of 6' wide along primary roads. While this plan focuses on the primary road system, the neighborhood sidewalk system is key to the region's non-motorized system. Commuters with disabilities, parents with strollers, seniors and small children need safe pedestrian routes within neighborhoods. In most neighborhoods there are gaps in the sidewalk system. Some neighborhoods are intentionally without sidewalks. Others have minor. Also, in some of the region's oldest neighborhoods the infrastructure has deteriorated to such a point where many of the sidewalks are not passable to individuals with even minor mobility impairments.

Concrete sidewalks, a minimum of 5' wide and compliant with ADA standards, should be provided on both sides of all public and private streets in existing and proposed residential neighborhoods. Sidewalks are particularly important near schools, parks and other public venues. There may be cases though where sidewalks on both sides may not be feasible and/or desirable due to physical and/or natural feature constraints.

For neighborhoods or streets currently without sidewalks, a uniform approach should be developed that considers not only the sentiment of the majority of residents along the street, but also the importance of the sidewalk in a broader context. Given that sidewalks provide access beyond the households immediately adjacent to them, a cost share program should be explored to determine the most equitable way to fund projects that have significance beyond the immediate residences.

Improving the Landscape Buffer Zone
Many sidewalks are buffered from the roadway with trees which is a key factor in determining the quality of the pedestrian experience. Other sidewalks have no trees at all or in some cases are paved up to the back of the curb. The Region should prioritize the planting of street trees. Streets with high

traffic volumes should receive extra consideration as the street trees will help improve the pedestrian environment the most. The trees should be planted 30’ on center along the roadway.



The presence of on-street parking, street trees and a landscape buffer improve the pedestrian experience.

Providing Seating

Providing benches and other seating options along collectors and arterials help make longer trips manageable for some pedestrians. The seating should be located in as pleasant a place as possible and shaded from the summer sun. Businesses and residents should be encouraged to provide and maintain benches for use by the general public.

2.4 Travel Across Road Corridors

Despite the dangers or inconveniences that exist, at some point in a pedestrian's or bicyclist's journey they will be required to cross a road. Crossing roadways pose challenges to safe navigation for pedestrians and bicyclists on their journeys. Ways to get across a road (including railroads) include intersections, mid-block crosswalks, bridges and tunnels. All pose unique challenges to pedestrians and bicyclists.

Bicyclists and pedestrians in many cases, cross the road in very different fashions. Bicyclists in the roadway most likely will make left turns just like a vehicle, merging across lanes as necessary. Their restrictions to crossing the road are primarily based on their comfort level of riding with traffic and the volumes, speed and gaps that exist. Some bicyclists, depending on the traffic conditions, choose to make left turns as pedestrians. They leave the roadway and cross the road at a crosswalk.

For pedestrians, and bicyclists who choose to cross the road as a pedestrian, crossing a road can be an intimidating experience. There are often limited safe and legal crossing options. Pedestrians are directed to cross roads at either intersections or at mid-block crosswalks. Each of those options has their own set of issues.

Intersection Issues

While generally, intersections are the safest place for pedestrians and bicyclists to cross the road, there are a number of issues to consider. Intersections are the most common places of conflict for automobiles, bikes and pedestrians. Even at a simple four way stop, there can be up to twelve different possible movements from the cars alone. Add in more lanes of traffic, and it can quickly get overwhelming; however, if designed correctly, intersections can facilitate convenient and safe interactions for all users.

Signalized intersections are the hubs of activity on the roadway. It is a place with conflicting demands from many different users. For the most part, a roadway's vehicular capacity is determined at signalized intersections. From a pedestrian's standpoint, they often face a sea of left turning vehicles, right turning vehicles, and through traffic from four directions. When crosswalk signals require activation by a push button, pedestrians often ignore them because of their inconvenience. Even when pedestrians push the button, in most cases there is no feedback to the pedestrian that they have indeed activated the signal. Often when the signal phases are long, they will assume that the button is broken and cross the road at an inappropriate time.

Vehicles turning right-on-red also pose dangers to pedestrians. The driver of a vehicle is focused on the traffic to the left, looking for a gap. Frequently drivers do not look right for pedestrians beginning to cross the street before beginning their turn. Another problem occurs in situations where the view of the oncoming traffic is obstructed if the vehicle is behind the stop bar. Often times the driver of the vehicle will advance over the crosswalk to improve their sightline. If they are unable to proceed they completely block the crosswalk with their vehicle. This is a common occurrence especially in the downtown area where right-on-red is permitted even when clear sight lines do not exist from behind the stop bar.

Vehicles turning left at busy intersections with few gaps in traffic can also be problematic to pedestrians. The driver of a left turning vehicle in such cases is often focused primarily on finding a suitable gap in oncoming traffic and may commit to turning left before noticing a pedestrian in the crosswalk.

The Capital Region also has many intersections where the roads meet at odd angles. This results in wider than typical intersections. When the pedestrian "Walk" phase is triggered concurrent with a red light signal for the cross traffic, motorized vehicles are often moving through the far crosswalk at the same time the pedestrian "walk" phase begins.

From a bicyclist standpoint, one of the most frustrating circumstances is not being able to trigger a traffic signal. Many traffic signals in t he Capital Region are activated by detector loops placed in the pavement that sense a change in the magnetic field. Depending on how the detectors are adjusted, the position of the bicycle and the nature of the bicycle's frame and wheel, a bicycle may not be able to trigger a signal. As a result, a bicyclist must either leave the turn lane and cross as a pedestrian, ignore the signal, or position themselves forward of the detector into the intersection and wait for a vehicle behind them to trigger the signal.

Unsignalized intersections are also key points where pedestrians and bicyclists want to cross the road corridor. When the crosswalks are left unmarked, pedestrian travel is often discouraged.

The aforementioned issues are addressed throughout the following guidelines and in *Section 3 – Proposed Policies and Programs*. In addition, special attention has been paid to addressing crossings at points other than signalized intersections.

General Crosswalk Design

Marking a crosswalk serves two purposes: (1) it clarifies that a legal crosswalk exists at that location and (2) it tells the pedestrian the best place to cross .1 Several issues should be considered when designing safe crosswalks, including visibility, communicating the pedestrian's intent, minimizing crossing distance, and accommodating persons with special needs.

Visibility

Increasing the visibility of all users crossing the road is a key issue for pedestrian safety. The ability of pedestrians to see motorists is equally as important as their own visibility in the roadway. Marked crosswalks should be included only where sight distance is adequate for both pedestrians and motorists. Obstructions in sight lines should be minimized. Visibility can be improved with the following design treatments:

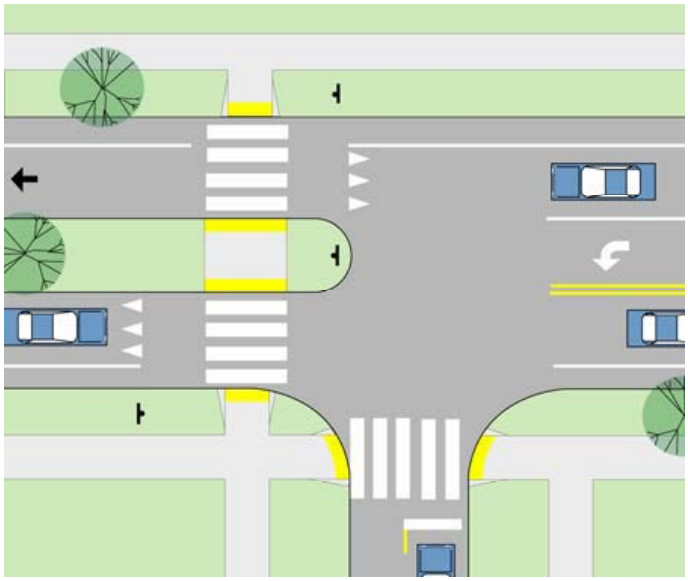
- Wide white ladder crosswalks.
- Stop lines or yield lines that are set back from the crosswalk a sufficient distance to increase visibility from all lanes of traffic.
- Signage directing motorists to yield to the pedestrians.
- Placement of signage that does not obstruct the visibility of the pedestrians.
- Curb extensions (bulb outs), extending the curb out at intersections, also minimize pedestrian crossing distance.
- Removal of low hanging branches and minimal planting between the oncoming vehicles and the sidewalk approaches to the crosswalk such that sight distances are in accordance with AASHTO guidelines.
- Lighting of the crosswalk and the sidewalk approaches.

Understanding the Pedestrian's Intent

Road users should be able to discern if a pedestrian is planning to cross the road so that they may take appropriate measures. If a crosswalk is located where a sidewalk directly abuts the roadway, the road users cannot tell if someone is simply going to walk by the crosswalk or abruptly turn and attempt to cross the street. Also, places where pedestrians may typically congregate, such as bus stops, may cause road users to needlessly stop. To help clarify the pedestrian's intent to cross the road, intersections should incorporate the following features:

- A short stretch of sidewalk perpendicular to the roadway where only pedestrians planning to cross the street would typically stand.
- Placing bus stops past the crosswalk to avoid blocking the crosswalk.
- Distancing the crosswalk from places where pedestrians may congregate adjacent to the roadway without the intent to cross the road.
- Installing curb extensions to reduce the crossing distance for pedestrians and to slow traffic, (see Fig. 2.4B)

Figure 2.4A. Pedestrian Crossing island



Crossing islands

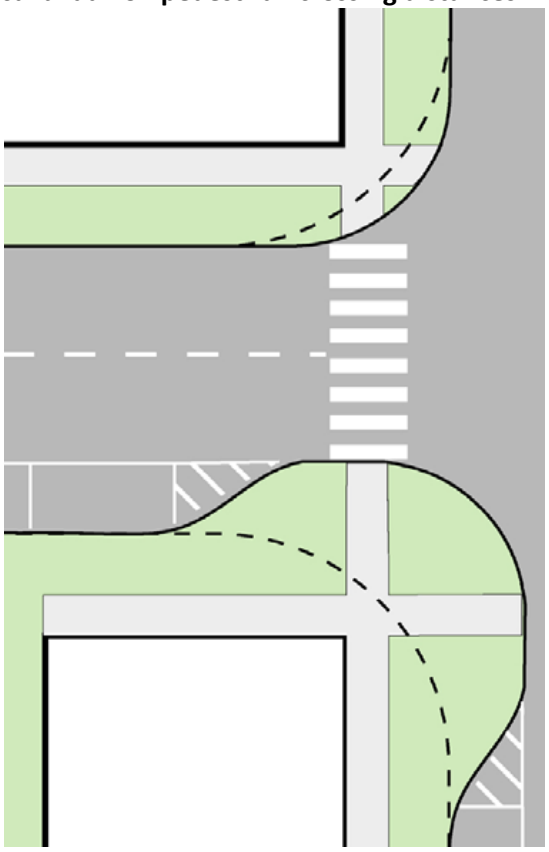
Crossing islands are raised areas that separate lanes of opposing traffic and eliminating the need for pedestrians to cross more than one direction of traffic at a time (see the figure to the left).

Crossing islands allow the pedestrian to undertake the crossing in two separate stages. This increases their comfort level and opens up many more opportunities to safely cross the road.

Crossing islands increase the visibility of the crosswalk to motorists and reduce pedestrian crossing distances.

Crossing islands should be considered for all un-signalized marked crosswalks that traverse three or more lanes.

Fig. 2.4B. Effect of curb extensions and smaller curb radii on pedestrian crossing distances



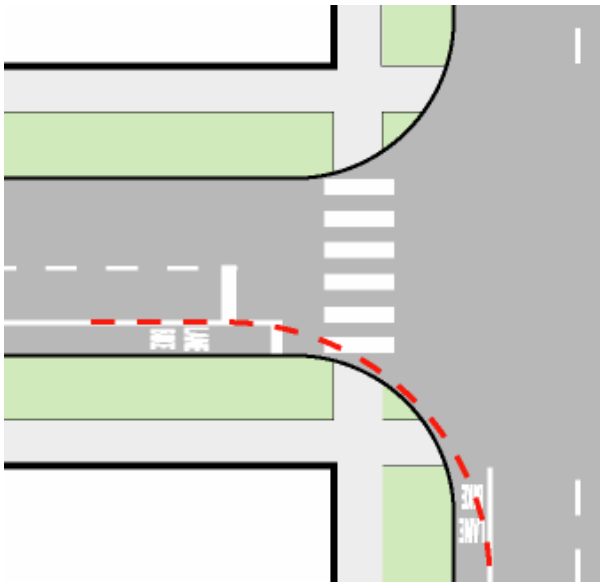
Minimizing Crossing Distances

Minimizing the distance that pedestrians need to cross the street is another critical safety issue. As crossing distances increase, the comfort and safety of a pedestrian decreases. Simple design solutions such as reducing curb radii, and adding curb extensions, shorten crosswalk distances. As well they reduce the potential for pedestrian-vehicle conflict. Larger corner radii promote higher turning speeds and increase pedestrian crossing distances. See the figure to the left.

In addition to increasing visibility and shortening crossing distances for pedestrians, curb extensions increase the space available for directional curb ramps and prevent parked cars from encroaching on the crosswalk. Curb extensions also serve to make a pedestrian's intent to cross the road known to motorists before they have to step into the roadway.

For signalized intersections, shorter crosswalks mean more time for the pedestrian "Walk" phase and a shorter clearance interval "Flashing Don't Walk" phase.

Fig 2.4C. Effect of Bike Lanes on Turning Radius



Minimizing Turning Radius When Bike Lanes are Present

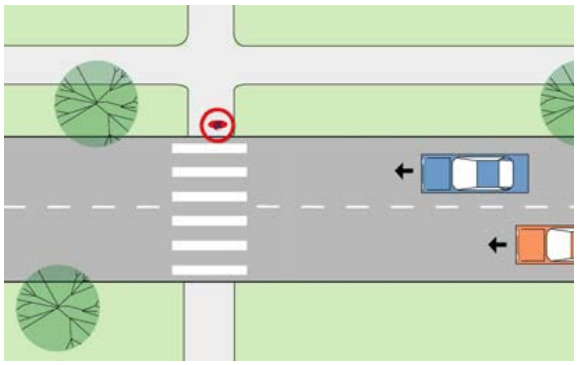
Bicycle lanes provide an added advantage of effectively increasing the turning radius for motor vehicles. This is especially the case where both intersecting roads have bike lanes as shown in the figure to the left.

This also applies to driveways. When a sidewalk is close to the road, the curb radius of an intersecting driveway is typically quite small. In these cases, a bicycle lane can significantly improve the ease of entering and exiting the driveway. For example a 5' curb radius adjacent to a 3.5' bike lane has an effective turning radius of 10' (including the gutter).

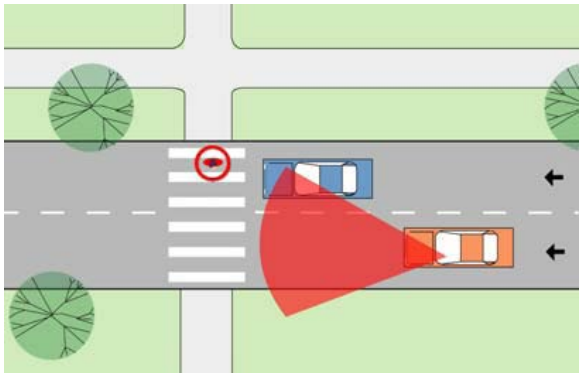
The increased effective turning radius means that motorists are less likely to encroach on adjacent motor vehicle lanes during the turning movements.

Fig. 2.4D. Multiple Threat Crashes Issues

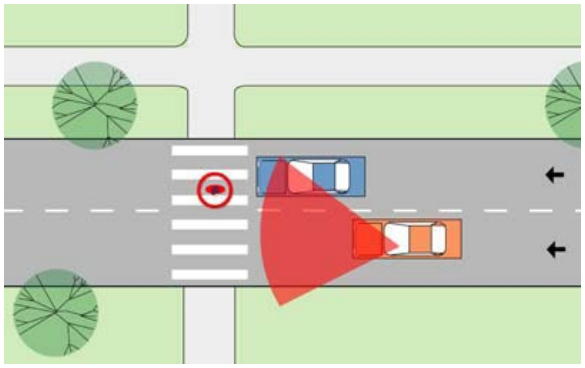
Whenever a crosswalk traverses multiple lanes of traffic traveling in the same direction, there is a potential for what is known as a multiple-threat crash. The crash unfolds as follows:



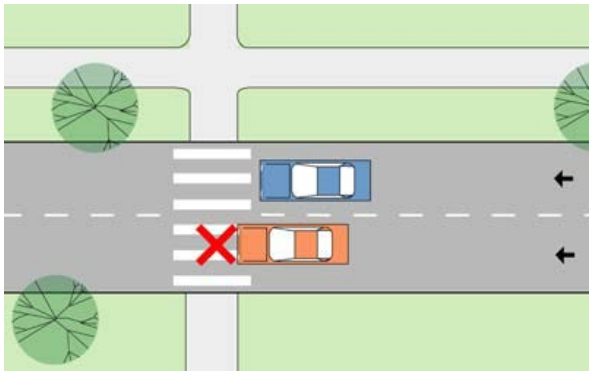
1. The driver in the lane closest to the pedestrian sees the pedestrian approaching the ramp or just entering the roadway and begins to slow down.



2. The driver closest to the pedestrian lane stops, yielding the right-of-way to the pedestrian. The car is stopped immediately adjacent to the crosswalk, therefore blocking the sightlines between the pedestrian and the driver of the other car.



3. The driver of the other car fails to see the pedestrian and continues towards the crosswalks without slowing down.



4. The driver of the second car does not see the pedestrian until it is too late to come to a complete stop and hits the pedestrian.

A combination of high visibility crosswalks, yield lines set back from the crosswalk, and crosswalk signage on both sides of the street can help provide better visibility of pedestrians in the crosswalk.

Accessibility

Providing accessible options for all users crossing the street is required by law. Keeping up-to-date on changing accessibility guidelines is critical to the safety and success of all new intersection and mid-block crosswalk construction. Crosswalk locations that are only identifiable by sight, have blocked sight lines, have short signal timings or signals without accessible information, act as barriers of information and barriers to movement for people with visual or mobility impairments. Several treatments of the crosswalk can increase accessibility for impaired users and many of them are required by ADA and are LADOTD standards:

- Audible pedestrian signals indicate when the pedestrian signal has changed and the traffic has come to a stop. This prevents a person with a visual impairment from having to discern traffic flow solely through the traffic sounds, which can be difficult at busy intersections and not always reliable.
- Pedestrian activated locator-tone signal buttons placed in a consistent location at every intersection will aid the visually impaired. Even more helpful, passive pedestrian detection technology eliminates the need for pushbuttons, yet maintains the traffic optimizing advantages of pedestrian activated signals.
- Directional curb ramps guide people with visual impairments to the crosswalk.
- Detectable warning strips at the ends of the crosswalk warn the visually impaired when they are leaving the sidewalk and entering the roadway.
- Median crossing islands should also include detectable warning strips, curb ramps with a level landing or full cut-throughs at road grade for accessibility.
- Pedestrian triggered mid-block control signals aid those with mobility impairments, as well as anyone trying to judge the safest time to cross between gaps in traffic.

Including the options listed above in new crosswalk design makes the pedestrian environment safer for all users. Consistent design treatment of crosswalks will help users of all abilities feel more comfortable and more able to navigate road crossings. Continuity in design will not only allow pedestrians to feel more at ease, but motorists too, will know what to expect and where to look for it.

Tactile and contrasting color detectable warning strips provide pedestrians with vision impairments and important queue that they are leaving the sidewalk and entering a street.

Fig. 2.4E. Blue Bike Lanes – Experimental Marking

Description
These are used to increase the visibility of bike lanes at potential conflict points such as where a vehicle would have to cross over a bicycle lane to access a right turn lane.
Application
This is an experimental marking. The region should evaluate existing installations around the country and apply to FHWA to test the marking in an appropriate location in the area.

Fig. 2.4F. Countdown Signals


"Walk" Phase

Clearance Interval


"Don't Walk" Phase

Description
These operate in the same manner as typical pedestrian signals, with one addition. At the onset of the Clearance Interval (flashing "Don't walk" or red hand), the signal counts down the remaining time until the "Don't Walk" phase (solid "Don't Walk" or red hand).

Pedestrians find these very intuitive to use and they can help clear up many misunderstandings as to the purpose of the Clearance Interval. Studies have shown that fewer pedestrians remain in the street at the end of the Clearance Interval with countdown signals than with standard pedestrian signals. These signals have been very well received by pedestrians and have reduced complaints in some communities regarding pedestrian signal timing.

Application
The region should consider using the pedestrian signals with an integrated countdown clock for all new and replacement pedestrian signals. The area should consider adding countdown clocks to existing signals at high pedestrian volume signalized crosswalks and locations where the crosswalk is longer than 50'.

Fig. 2.4G. Portable Speed and Traffic Detectors

Description

These portable detectors have the ability to perform traffic counts, speed studies and indicate a driver's speed on a LED display. Some models have a strobe light that may be activated when the speed limit is exceeded. They have been shown to reduce speed in before and after studies.

Application

These may be moved into an area where speeding is of concern to residents. The device may be used without displaying the speed to get a baseline speed study and traffic count in an unobtrusive manner.

It may then be set to display the speed. Numerous inexpensive mounting plates may be put in place around the region and the detector can be easily and economically moved from place to place. These would be ideal for school zones where speed is a concern.

Fig. 2.4H. Active Crosswalk Warning Systems

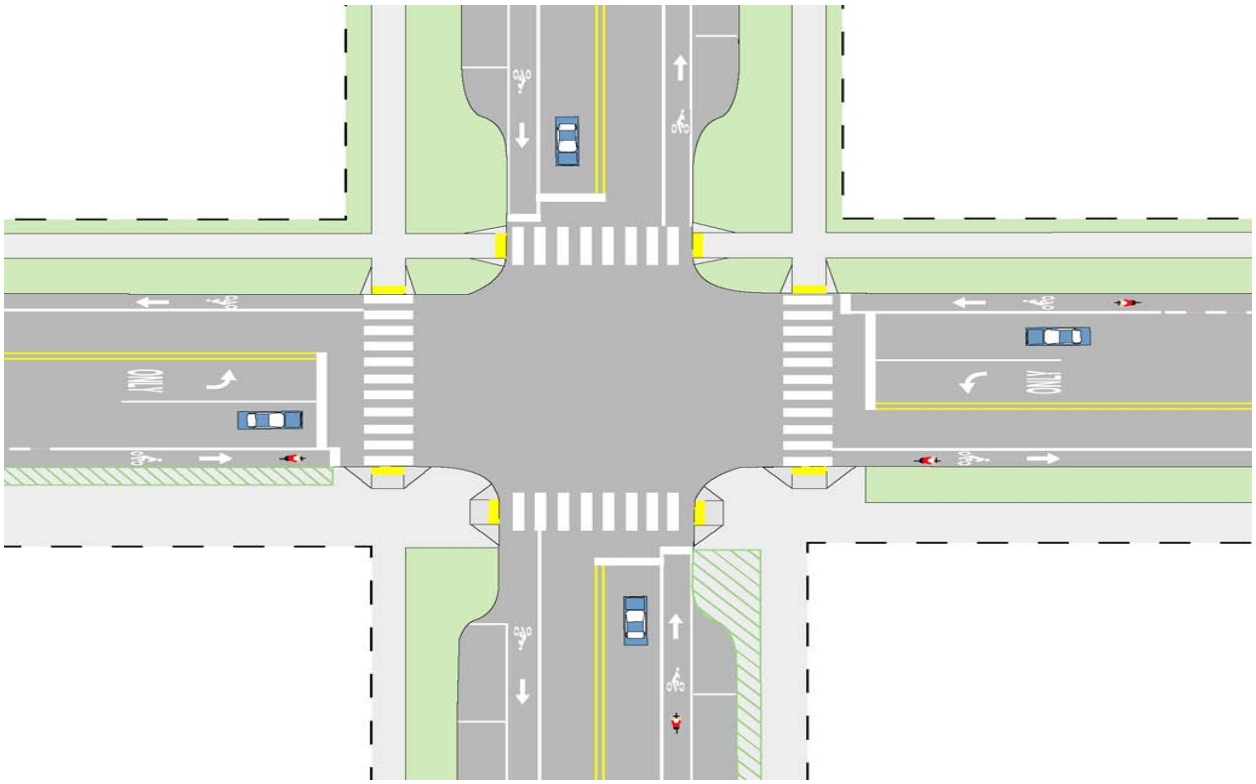
Description

A flashing beacon and/or in-pavement flashing LED's are activated when a pedestrian is present. The signals may be passively activated through a number of methods or activated via a standard push button. The pedestrian approach can also be set to flash a red light with a sign indicating to cross after traffic clears. Various manufacturers have solar powered models with radio controls to activate flashers on advance warning signs and on signs on the opposite side of the street. This significantly reduces the cost of installation and operation.

Application

These systems are best located at pathway and major road intersections, or mid-block crosswalks on major roadways where pedestrian traffic is sporadic. Passive activation works best when there is a long pedestrian approach such as pathway.

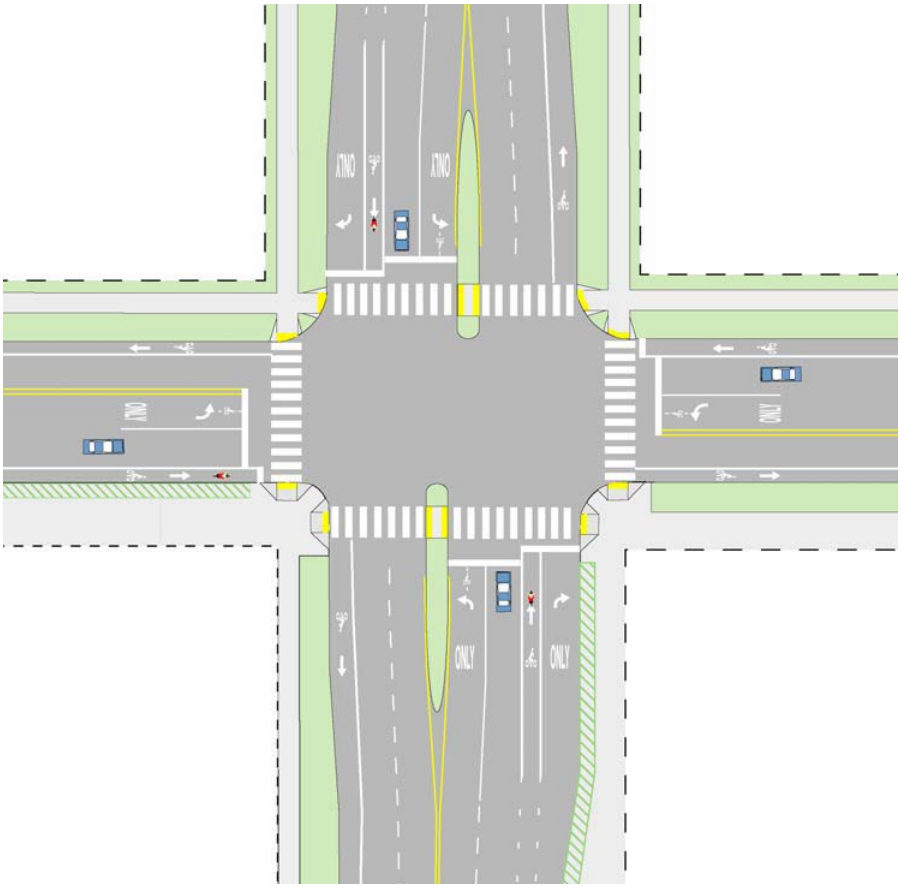
Fig. 2.4I. Urban Intersection Design Guidelines



Key Elements

- Bike lane striping should stop at the pedestrian crosswalks and resume on the far side of the intersection. Unusual alignments may be aided by extending dashed guidelines through the intersection.
- Bike lane striping is dashed at the intersection approach to indicate that bikers may be merging with traffic to make a turn.
- Striping between the parking lane and bike lane encourages motorists to park closer to the curb and discourages motorists from using the bike lane in combination with an unused parking bay as a travel lane.
- Curb extensions reduce the crossing distance of pedestrians and improve sight distance for both motorists and pedestrians. Curb extensions should be used wherever there is on-street parking.
- In urban areas, a furniture and street tree zone provides a buffer from the street and improves the pedestrian level of service rating. A sufficiently wide travel way should be clear of any obstructions.

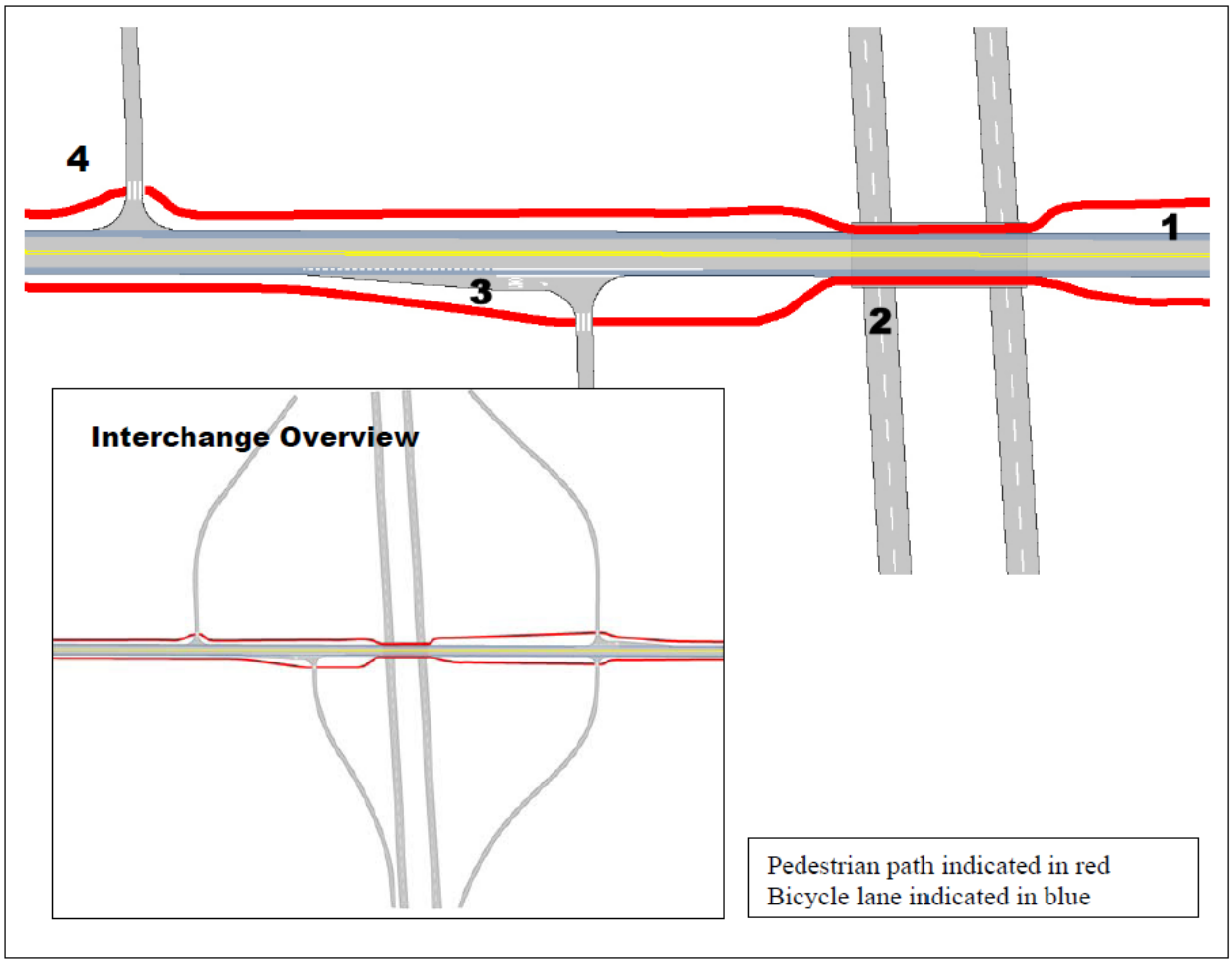
Fig. 2.4J. Multi-lane Urban Intersection Design Guidelines



Key Elements

- Pedestrian crossing islands should be installed at wide, multi-lane streets with high traffic volumes. Curbs, signs, and street hazard markings should delineate the islands.
- Crosswalks should be a minimum of 10’ wide and clearly marked with a white ladder design to increase visibility and resist tire wear.
- Bike stop bar is advanced several feet ahead of vehicle stop bar to minimize conflicts of right turning cars with through bike traffic.
- A small curb radius shortens the pedestrian’s crossing distance and controls traffic speed around corners. Bike lanes provide a significantly larger effective turning radius than the actual curb radius and should be considered in turning radius calculations.
- Perpendicular ramps should be built 90 degrees to the curb face and should include a detectable warning strip for visually impaired people.
- Traffic detectors in left turn lanes should be designed to detect bicycles. Detectors should include pavement markings that indicate where bikes can best be detected.
- Timing of the traffic signal should allow adequate all red phases to provide sufficient clearance time for bikes to clear an intersection.
- Other intersection features may include Right-On-Red turning restrictions, leading pedestrian interval signal phases, and audible signals for visually impaired users where appropriate.

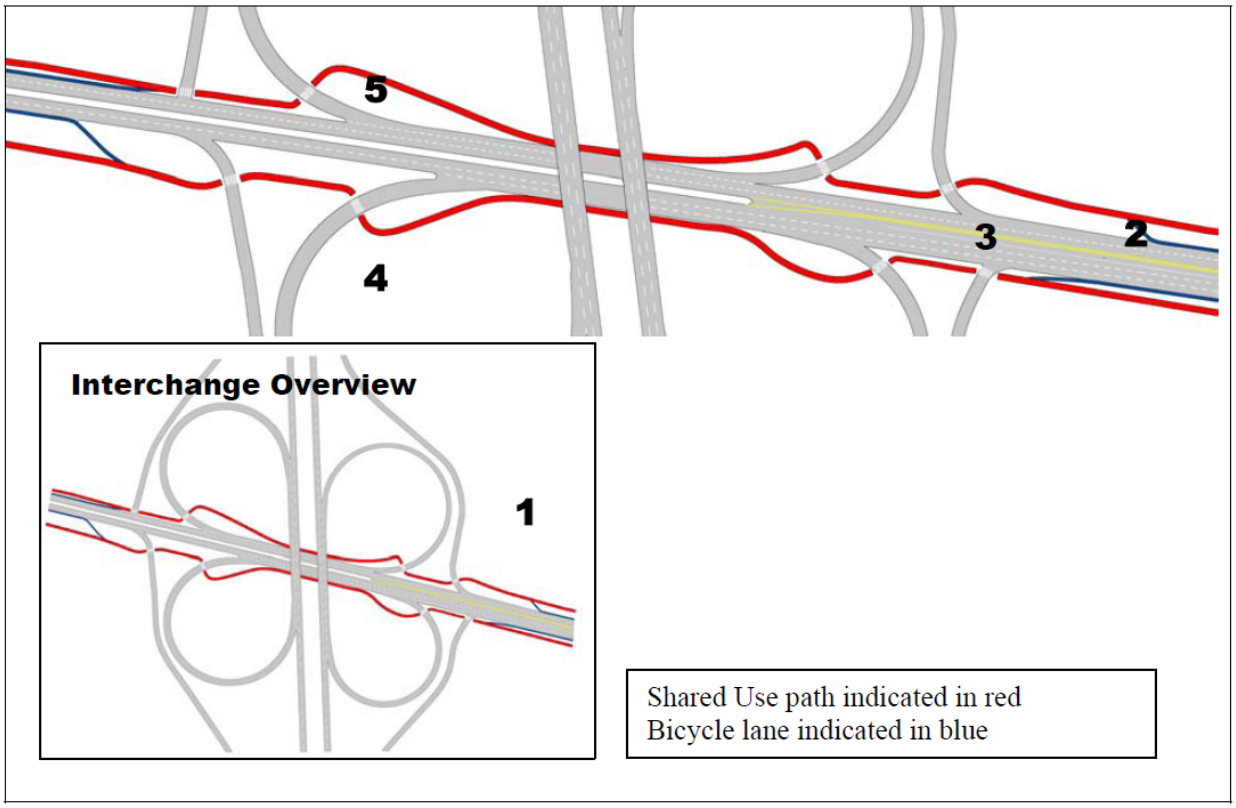
Fig. 2.4K. Urban Overpass Interchange Retro-fit Design Guidelines



Key Elements

1. Bike lanes must be on both sides of the road to allow cyclists to ride with traffic.
2. Sidewalks with barriers between the sidewalk and the roadway should be provided at the bridge.
3. The through bike lane should be to the left of the right turn lane onto the approach ramp.
4. Curb radii of ramps are tightened to narrow pedestrian crossing distances and crosswalks are clearly marked.

Fig. 2.4L. Urban Free-flow Underpass Interchange Retro-fit Design Guidelines



Description

Free-flow ramps pose many dangers to bicyclists and pedestrians. Motor vehicle speeds are high and a lot of merging movements occur in different lanes. When interchanges are reconstructed, all ramps should be brought perpendicular to the roadway to reduce speeds at crosswalk locations.

Key Elements

1. A Shared-use Path circumnavigating the interchange reduces the conflicts between non-motorized traffic and merging vehicles.
2. Approaching the intersection, bike lanes leave the roadway and merge with the sidewalk to form a Shared Use Path.
3. On-ramp radii are tightened to slow right-turning traffic.
4. Shared-use Path meets all roadways at right angles. The distance that pedestrians and bicyclists must cross at the ramps is minimized. Path crosses ramps in a location with good visibility, where speeds are low, and where the driver is not entirely focused on merging with traffic.
5. Shared-use Path should be at least 10’ wide.

Signal Timing and Turn Restrictions

The length of pedestrian signals are generally determined primarily by the motor vehicle flow with the exception of a few cases where the motor vehicle phase is lengthened to accommodate a long pedestrian clearance interval. Where there is heavy pedestrian flow, such as in the campus area, the flow of pedestrians should be given the same consideration as motor vehicles in setting signal timing.

Where intersection geometry is such that the intersection is wider than typical, motor vehicle clearances should be evaluated to make sure that the pedestrian Walk phase is not started when motor vehicles would be moving through the crosswalk. Also, the motor vehicle clearance time should be set to account for bicycle traffic.

Motorists are prohibited from blocking crosswalks by law. The region should evaluate restricting right turns where a vehicle cannot see cross street traffic without entering a crosswalk. Where there is significant pedestrian traffic in a crosswalk that conflicts with motor vehicles making right turns, the MPO should evaluate the feasibility of using a leading pedestrian interval of approximately 5 seconds. A leading pedestrian interval providing pedestrians with the "Walk" phase prior to motor vehicles given the green light has been shown to help prevent right turning vehicles from cutting off pedestrians trying to leave the curb.

Leading pedestrian intervals and restrictions on right turn on red may be used to minimize conflicts between motorists and pedestrians in crosswalks.

Unsignalized Mid-block Crosswalks

The majority of pedestrian trips are ¼ mile or less, or a five to ten minute walk at a comfortable pace. Any small forced detour in a pedestrian's path has the potential to cause significant time delays if not shift the trip to another mode (most likely motorized). Pedestrians will seek the most direct route possible and are not willing to go far out of their way. Thus, they will often cross the road whether there are crosswalks or not. This results in the increased likelihood of pedestrians unexpectedly dashing out midblock. This is the second most common type of pedestrian/vehicle collision after intersection related crashes.

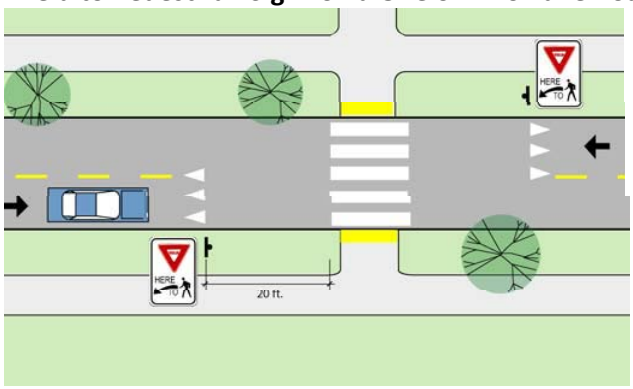
A concern with any mid-block crosswalk is providing the pedestrian with a false sense of security. This concern must be weighed against accommodating and encouraging pedestrian travel. If we are to encourage safe and legal pedestrian travel, well designed, high visibility mid-block crosswalks should be provided at appropriate locations. The use of a sign oriented toward pedestrians that states "Cross Road When Traffic Clears" has been used in other communities to underscore the pedestrian's responsibilities at unsignalized crosswalks.

Understanding pedestrian routes and common pedestrian destinations will guide the placement of midblock crosswalks at needed locations. According to AASHTO's *Guide for the Planning, Design, and Operation of Pedestrian Facilities*, there are numerous attributes to consider when determining whether placement of a mid-block crosswalk is appropriate. These include:

- The location is already a source of a substantial number of mid-block crossings.
- Where a new development is anticipated to generate mid-block crossings.
- The land use is such that pedestrians are highly unlikely to cross the street at the next intersection.
- The safety and capacity of adjacent intersections or large turning volumes create a situation where it is difficult to cross the street at the intersection.
- Spacing between adjacent intersections exceeds 200 m (660 ft or an 1/8 of a mile).
- The vehicular capacity of the roadway may not be substantially reduced by the midblock crossing.
- Adequate sight distance is available for both pedestrians and motorists.

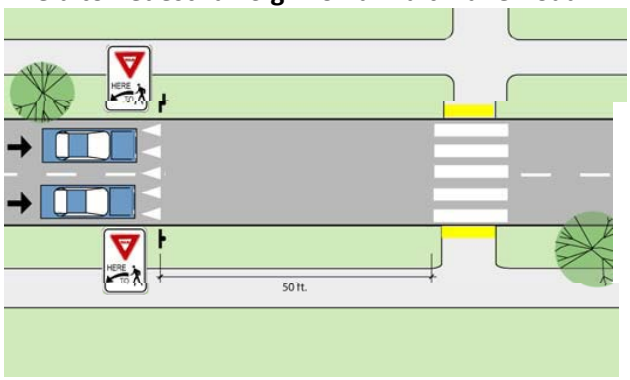
Fig. 2.4R. Crosswalk Sign and Yield Line Placement

"Yield to Pedestrian Sign" on a One or Two-Lane Road



"Yield Here to Pedestrians" signs and yield line pavement markings should be placed a minimum of 20 ft. in advance of a crosswalk to encourage drivers to stop a greater distance from the crosswalk.

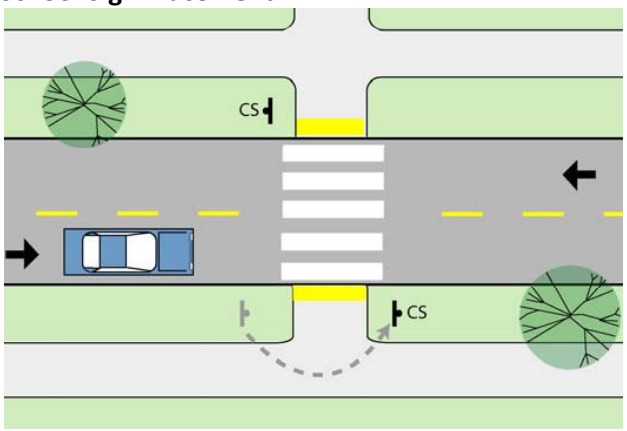
"Yield to Pedestrian Sign" on a Multi-Lane Road



"Yield Here to Pedestrians" signs and yield line pavement markings should be placed further in advance of a crosswalk on multi-lane roads to minimize the risk of a multiple-threat crash (see illustration in this section) and provide improved visibility for motorists in adjacent lanes.

"Yield Here to Pedestrians" signs should be placed on either side of the road to ensure visibility for motorists in both lanes.

School Sign Placement

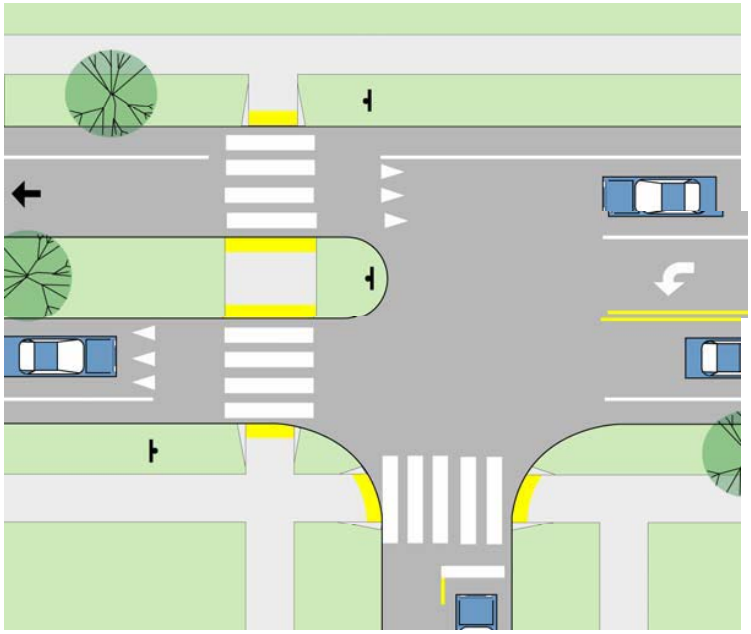


When the W11-1 crossing signs and accompanying plaques are used in place of the "Yield to Pedestrian Here" signs, they should be placed behind the crosswalk to improve visibility of crossing pedestrians rather than in front of the crosswalk where the large signs may obstruct motorists' views.

Selected Placement of Crosswalks at Tee intersections Design Guidelines

On some roads it may be desirable to mark only one of the crosswalks at a Tee intersection in order to channel pedestrians to a safer crossing point and to maximize the effectiveness of the crosswalk by not overusing high visibility crosswalks.

Fig. 2.4S. Unsignalized Tee Intersection with Turn Lane Guidelines



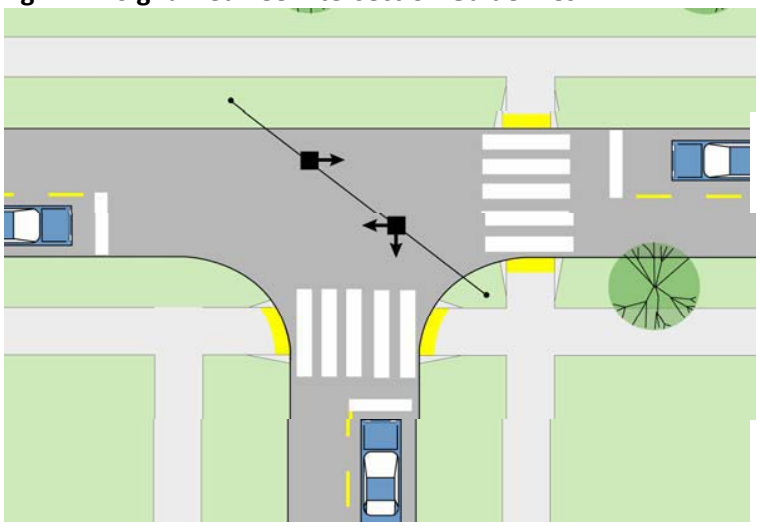
Description

At un-signalized Tee intersections with center turn lanes the marked crosswalk is located to the left of the intersecting street and the turn lane is converted to a pedestrian crossing island. The crossing island should be located such that it requires left turns from the intersecting street to have a fairly tight turning radius, therefore reducing their travel speed.

Curb ramps should be provided at all legal crosswalks, regardless of whether the crosswalk is marked. Driveways should be prohibited in the vicinity of the intersection.

The treatments shown should be used in conjunction with advance warning signs (not shown).

Fig. 2.4T. Signalized Tee Intersection Guidelines

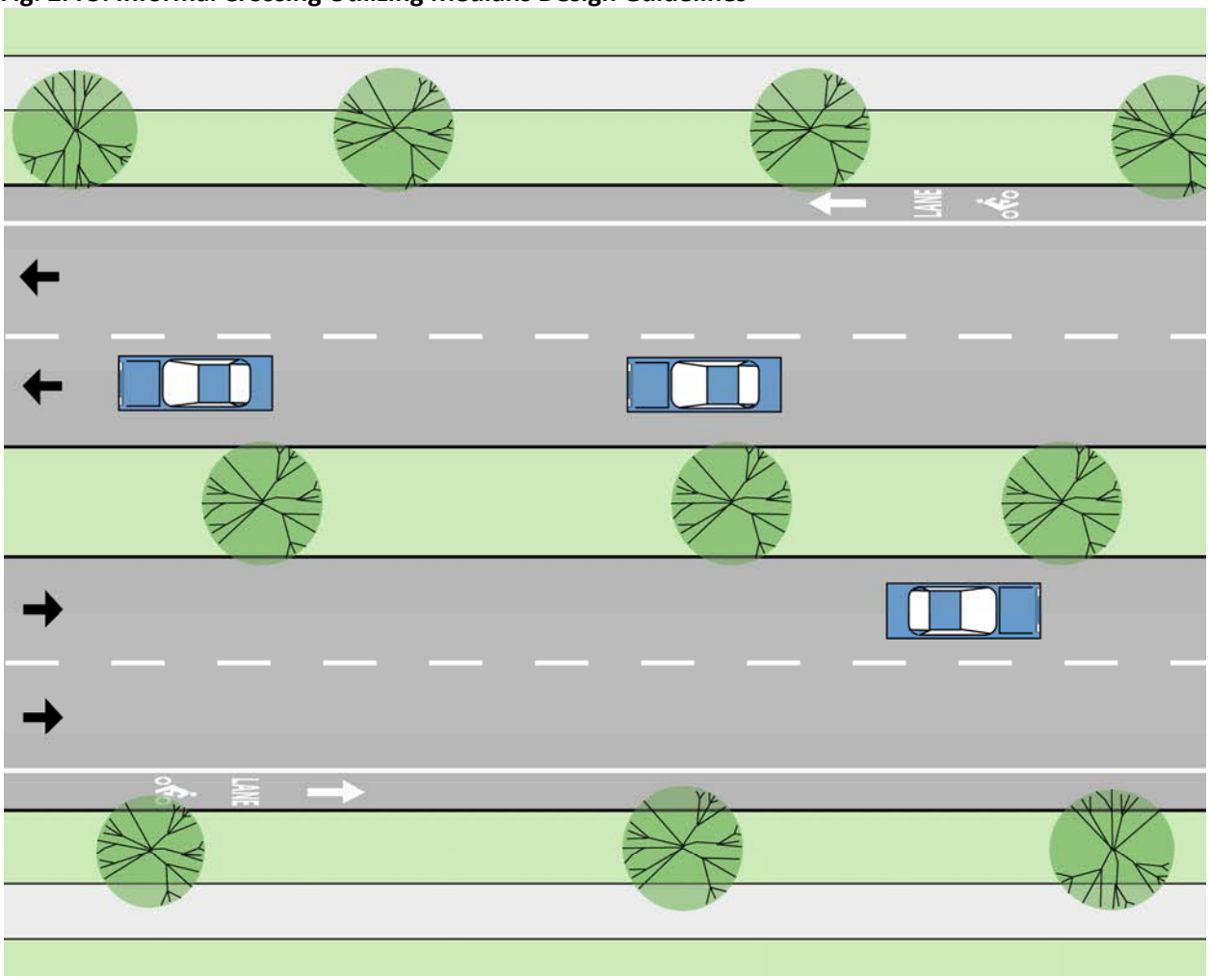


Description

At signalized Tee intersections, the crosswalk to the right of the intersecting street is marked. Left turns at signalized intersections are the most dangerous for pedestrians due to the wider turning radius, the resulting increased travel speed, and the increased distance of the crosswalk from the beginning point of the left turning movement.

There may be individual cases where it is appropriate to have the crosswalk located on the opposite side of the intersection.

Fig. 2.4U. Informal Crossing Utilizing Medians Design Guidelines



Description

Raised medians may somewhat accommodate dispersed informal crossings by able-bodied adults during periods of low snowfall.

Key Elements

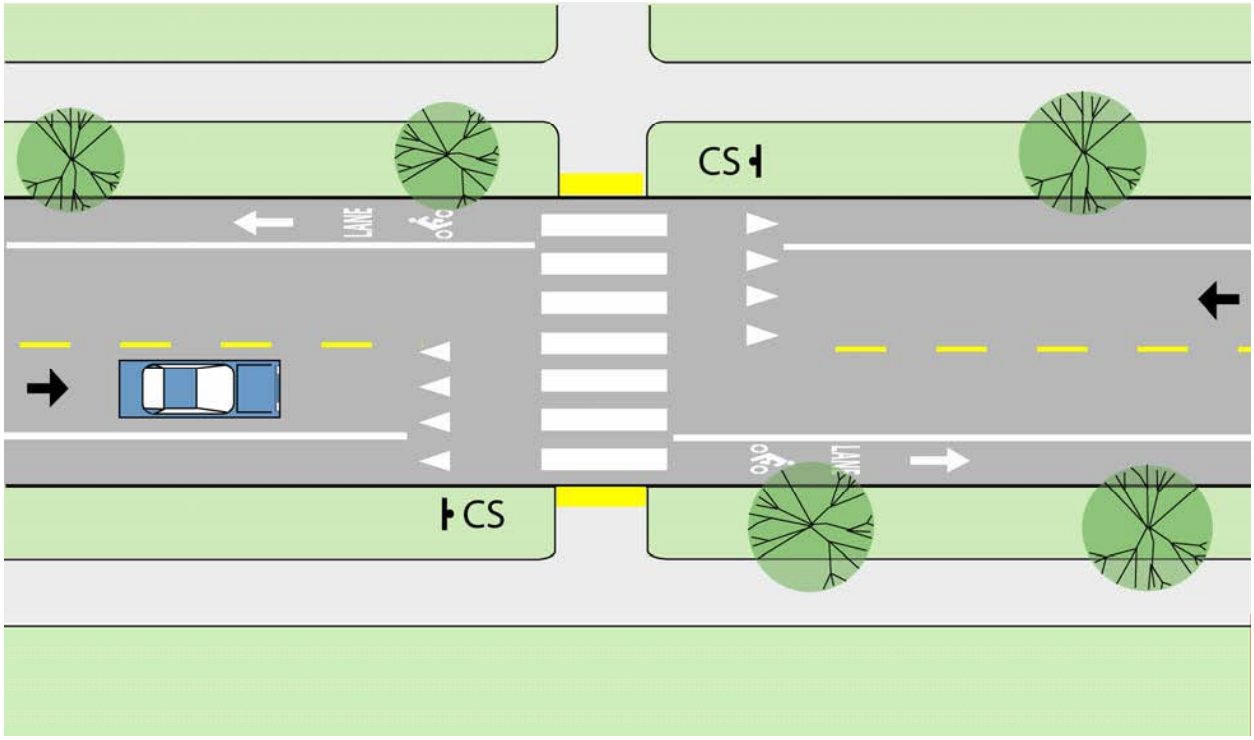
A median with plantings that permits traversing by foot and allows good visibility between the driver and the pedestrian.

Applications

On roads of four or more lanes where dispersed crossings are anticipated, where center left-turn lanes are unused, where minimum pavement is desired, and where traffic calming is desired. They may be used where a marked crosswalk is being considered as a Near-term Opportunities measure.

Example

Fig. 2.4V. Unsignalized Basic Mid-block Crosswalk Design Guidelines



Description

A mid-block crosswalk for a two-lane road at an un-signalized location without parking. The treatments shown should be used in conjunction with advance warning signs (not shown).

Key Elements:

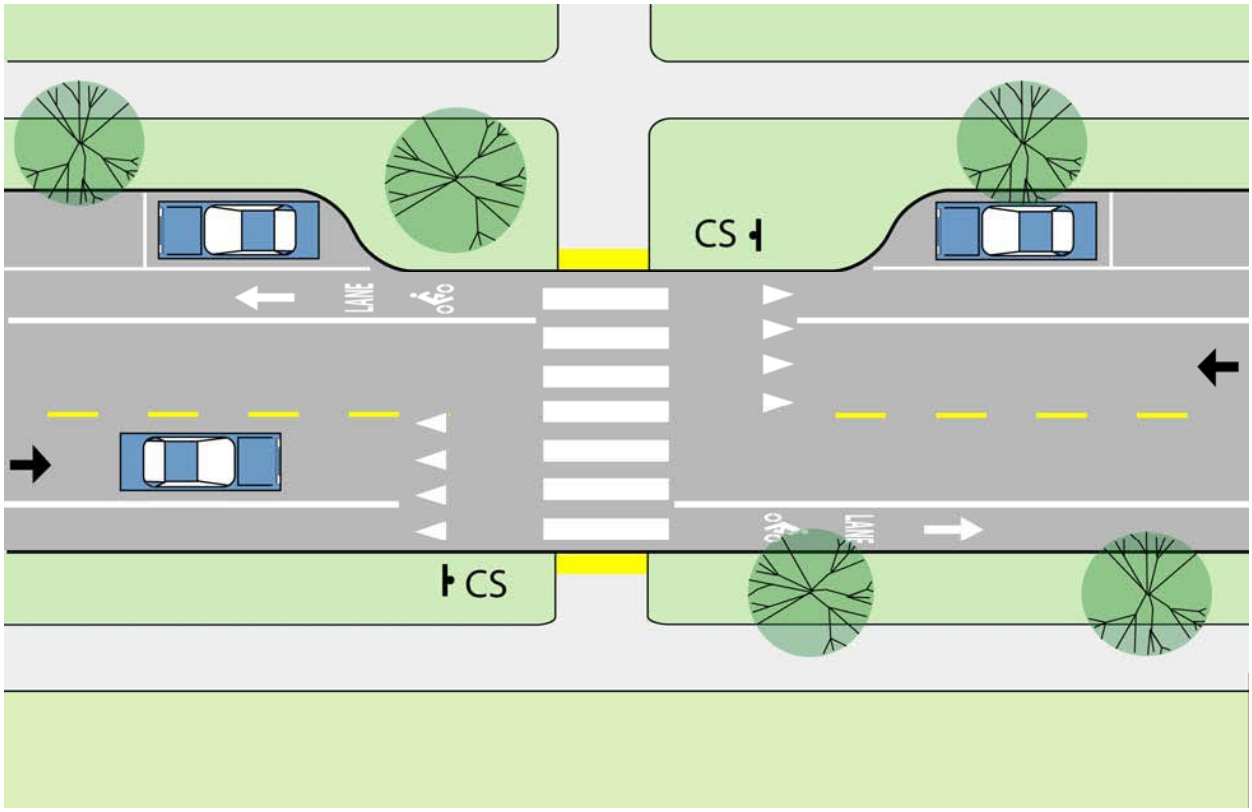
1. The yield markings are set back from the ladder crosswalk to minimize the potential for a multiple threat crash.
2. Where crossing signs other than the R1-5/ R1-5a "Yield Here to Pedestrians" are used, yield lines should be omitted.
3. Sightlines are kept clear of vegetation.
4. A 2' wide detectable warning strip is used at the base of the ramps.

Applications

Generally used on relatively low volume, low speed roads where sufficient gaps in the motorized traffic exist. This crosswalk design should not be used in any situations where there are greater than two travel lanes or when there is on street parking.

Example

Fig. 2.4W. Unsignalized Mid-block Crosswalk With Parking Guidelines



Description

A mid-block crosswalk for a two-lane road at an un-signalized location with parking. The treatments shown should be used in conjunction with advance warning signs (not shown).

Key Elements:

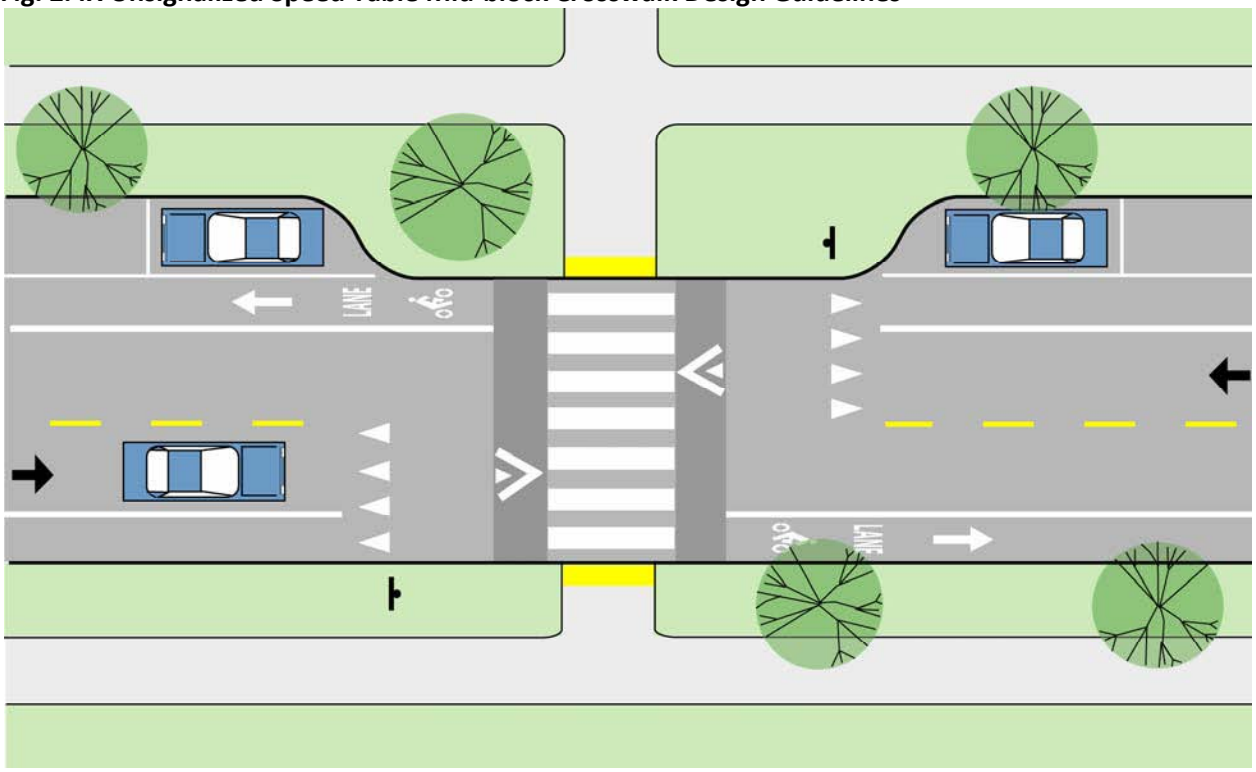
1. See elements listed under Un-signalized Basic Mid-block Crosswalk.
2. A bulb-out extends the pedestrian ramp into the sightlines of oncoming vehicles, reducing the potential for a "dart-out" type crash.

Applications

Generally used on relatively low volume, low speed roads where sufficient gaps in the motorized traffic exist. This crosswalk design should not be used in any situations where there are greater than two travel lanes.

Example

Fig. 2.4X Unsignalized Speed Table Mid-block Crosswalk Design Guidelines



Description

A mid-block crosswalk for a two-lane road at an un-signalized location with parking. The treatments shown should be used in conjunction with advance warning signs (not shown).

Key Elements:

1. See elements listed under Un-signalized Basic Mid-block Crosswalk and Un-signalized Mid-block Crosswalk with Parking.

2. A speed table with 6’ long approach ramps and a 4” high table is placed under the crosswalk to bring travel speeds to approximately 25 MPH.

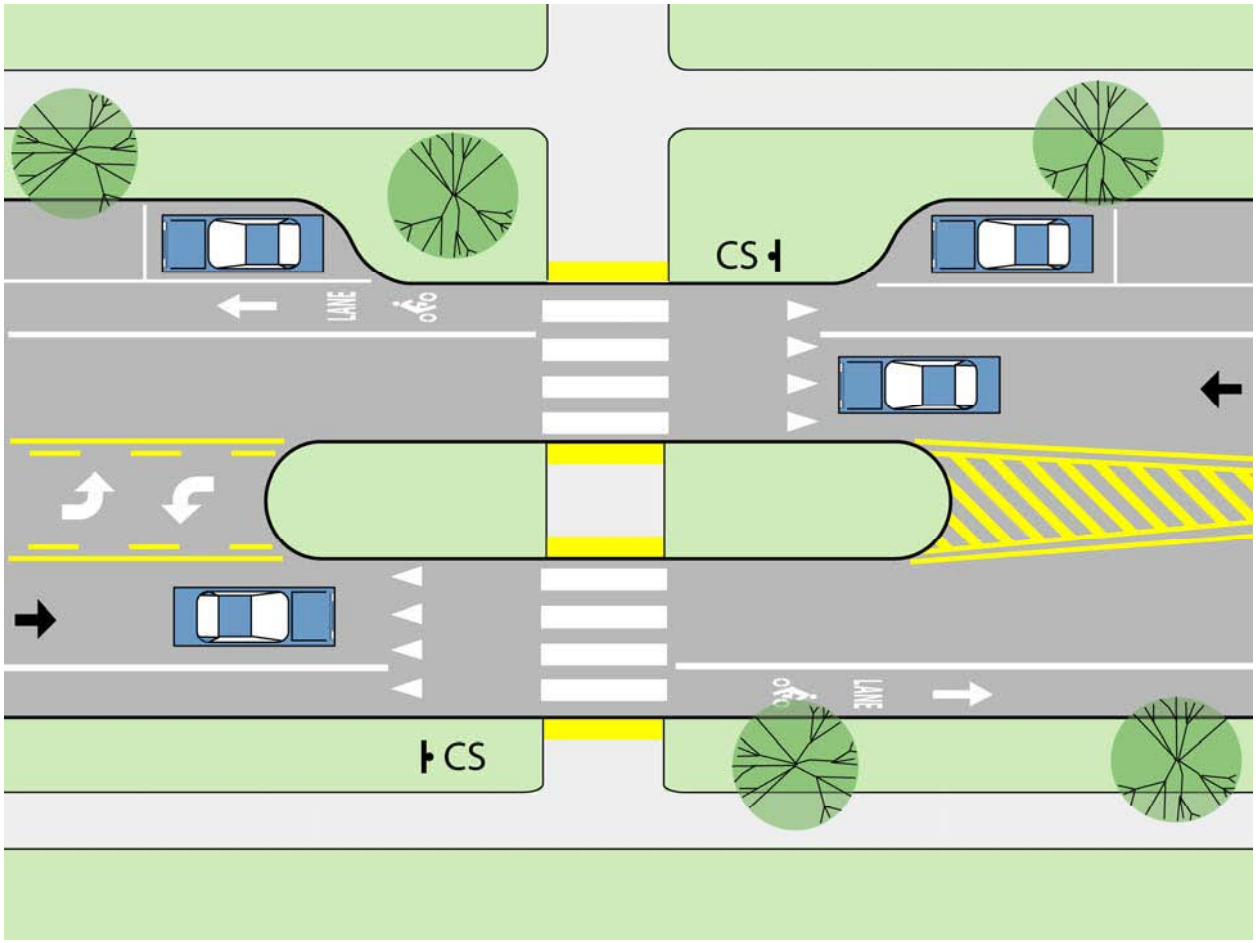
3. When retrofitting existing roadways, maintaining drainage along the curb may present challenges in meeting ADA ramp requirements.

Applications

Generally used on relatively low volume, low speed roads where sufficient gaps in the motorized traffic exist. This crosswalk design should be used in areas where traffic speeds typically exceed posted speeds. May only be used as a part of a traffic calming program.

Example

Fig. 2.4Y. Mid-block Crosswalk with Crossing island Guidelines



Description

A mid-block crosswalk for a two-lane or three-lane road at an un-signalized location with or without parking. The treatments shown should be used in conjunction with advance warning signs (not shown).

Key Elements:

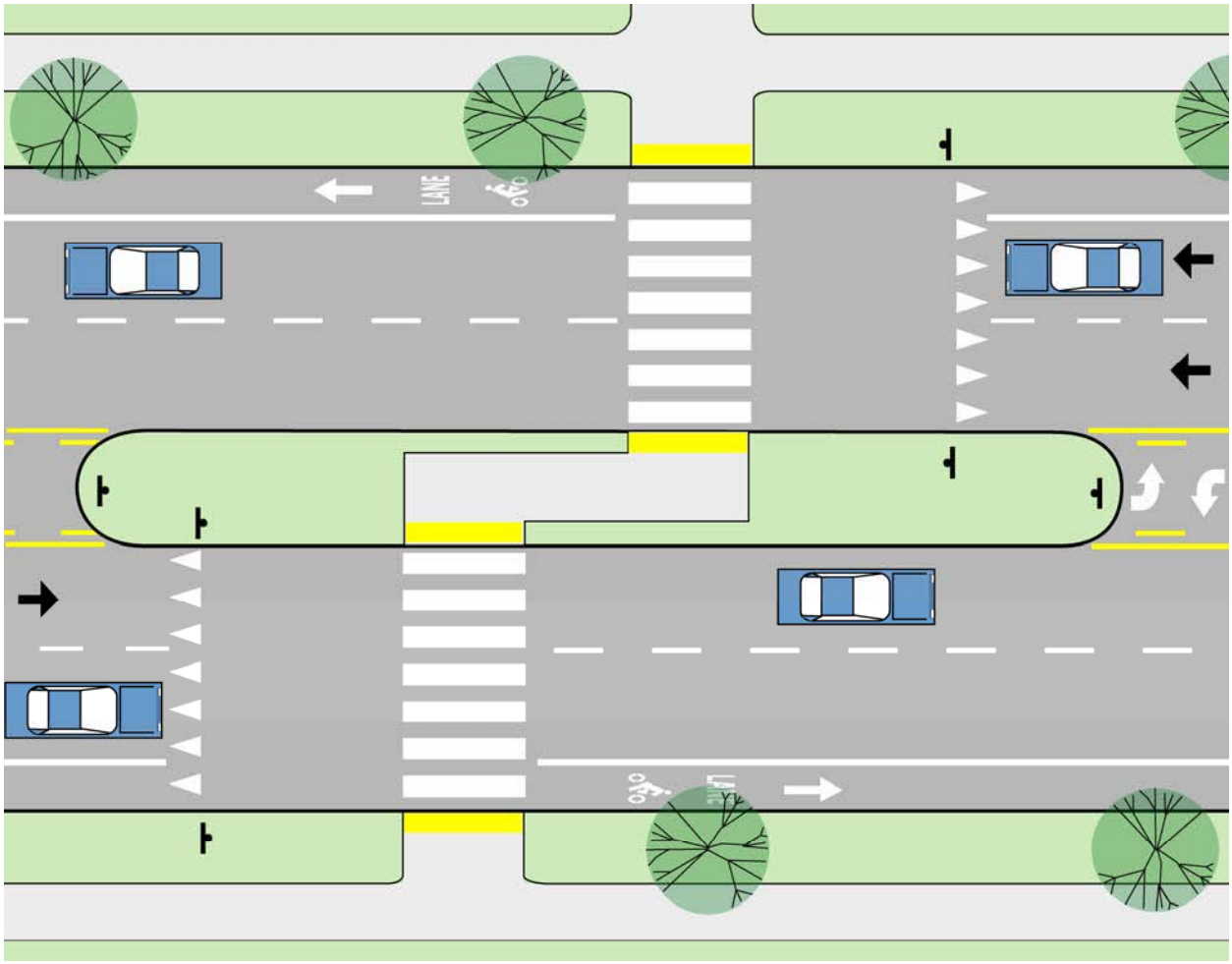
1. See elements listed under Un-signalized Basic Mid-block Crosswalk and Un-signalized Mid-block Crosswalk with Parking.
2. A crossing island is provided to break the crossing into two separate legs. The island has a minimum width of 6’ with 11’ or wider preferred.
3. Planting on crossing islands should be kept low so as not to obstruct visibility.

Applications

Generally used on a higher volume and higher speed road where suitable gaps to cross both directions of traffic in one movement are infrequent.

Example

Fig. 2.4Z. Unsignalized Mid-block Zigzag Crosswalk Design Guidelines



Description
A mid-block crosswalk for a four or more lane road at an un-signalized location without parking.

Key Elements:
1. See elements listed under Un-signalized Basic Mid-block Crosswalk and Un-signalized Mid-block Crosswalk with Crossing island.
2. The crosswalks are staggered to direct the pedestrian view towards oncoming traffic.
3. Yield markings are set further back to improve pedestrian visibility from both lanes and minimize multiple-threat crashes.
4. Median signs are placed higher than typical so as not to impede sightlines.

Applications
Generally used on high volume / high-speed multi-lane roads.

Example

Lighting of Crosswalks

All marked crosswalks should be well lighted with overhead lighting. The combination of overhead lighting and crosswalk signs used by the City is a good system that should continue to be employed. The lighting should also extend to light the extent of any crossing island for the motorists safety. The area should consider adding either a passive or active pedestrian activation system to the overhead crosswalk signs that cause the signs either to blink or become brighter when a pedestrian is present.

Marking of Crossing Islands

Crossing islands can present an obstruction in the roadway for motorists. The presence of this obstacle is key to the visibility of the crosswalk even more so than the signage or pavement markings and flush crossing islands have not been shown to have the same safety benefits as raised crossing islands. When the crosswalk is located in a left-turn lane it is located outside of the typically traveled roadway and is a minimum obstruction. When the road flairs around a crossing island it is more of an obstruction for a motorist. To draw attention to the obstruction, typical pavement markings as called for in LADOTD should be utilized. In addition, reflective material may be added to the sign posts, and reflective flexible bollards may be placed on the ends of the islands to increase the island's visibility at night and during inclement weather.

Roundabouts

In many situations, roundabouts have several advantages over typical intersection design: vehicles move at slower speeds, traffic flows more smoothly, and reduced pavement enhances aesthetics and offers the opportunity for landscaping in the central and splitter islands. There are however, serious drawbacks to roundabouts for those with vision impairments, and two-lane roundabouts are problematic for bicycles in particular. Roundabouts, especially larger ones, can present significant out-of-direction travel for pedestrians. Depending on the nature of the surrounding land uses and the design of the roundabouts, pedestrians may attempt to walk directly across the center of the roundabout.

Because there are no traffic control signals to provide a pedestrian "walk" signal, pedestrians wait for an appropriate gap in traffic and cross. The splitter or diversion islands provides a crossing island the pedestrian, breaking the road crossing into two stages so that they are only dealing with one direction of traffic at a time. This system works quite well for pedestrians without vision difficulties. Studies have shown a reduction in pedestrian crashes for single lane roundabouts and about the same number for multiple lane roundabouts as compared to a traditional signalized intersection. Pedestrians with vision impairments often find roundabouts very intimidating as the audible queues are sometimes insufficient to judge a suitable gap in traffic. Research is currently underway to determine the most appropriate way to accommodate blind and vision impaired pedestrians in roundabouts.

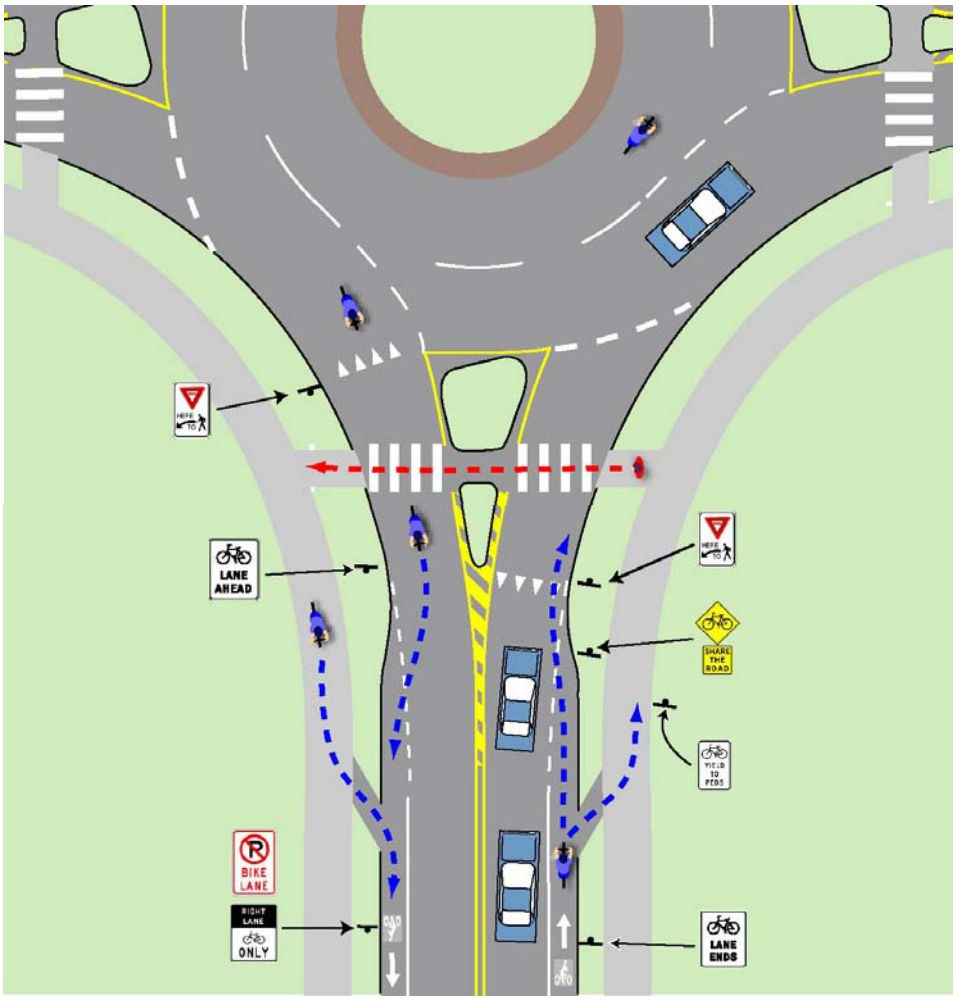
Multi-lane roundabouts are especially problematic for bicyclists. Studies have shown that while single lane roundabouts have about the same number of crashes when compared to traditional signalized intersections, multi-lane roundabouts have significantly more. Because of this, design guidelines recommend allowing bicyclists who are traveling in the roadway approaching the roundabout to exit the roadway prior to the roundabout and navigate the roundabout as a pedestrian would. More confidant bicyclists may remain in the roadway and merge with the motor vehicles.

Design Guidelines:

- Roundabout approaches should include bicycle entrance and exit ramps to give bicyclists the option of biking on a sidewalk bikeway as well as the roadway.

- Roundabouts should include pedestrian crossing islands on all entering roadways.
- The use of roundabouts should be accompanied by an education campaign regarding the issues with blind pedestrians and a motorist responsibly when they see a pedestrian using a white cane.
- The bicycle and pedestrian safety issues should be carefully evaluated for any multiple lane roundabouts.
- The latest research on accommodating blind and vision impaired pedestrians in roundabouts should be consulted before designing and constructing a roundabout.
- Bicycle and pedestrian pavement markings and signs should be regularly evaluated for every roundabout.

Fig. 2.4AA. Non-motorized Design Considerations for Roundabouts



Signalized Mid-block Crossings
Sometimes signalization is needed at a mid-block crosswalk location to ensure safe crossing. Areas that have many elderly, disabled, or young children crossing between signals are places that warrant special consideration. Signals can also help pedestrians cross at mid-block locations where there are insufficient gaps in traffic to cross safely.

Standard Mid-Block Signalized Pedestrian Crossings
The Manual on Uniform Traffic Control Devices (MUTCD) has warrants for installing signalized crosswalks based on pedestrian demand. These include considerations given to the type of pedestrians the signal will serve (young, elderly, and/or persons with physical or visual disabilities). They also recognize that current pedestrian mid-block crossings may be inhibited by the road conditions in combination with the type of pedestrians who would like to cross the road.

With standard mid-block pedestrian signals, when a pedestrian activates the crossing button, a yellow then steady red light is displayed to motorists and then a walk signal is displayed to pedestrians. During the pedestrian clearance interval (flashing don't walk or red hand), the steady red light remains displayed to motorists. After the clearance interval is complete the signal for motor vehicles returns to green and the pedestrian signal returns to a steady don't walk signal. These signalized pedestrian crossings may be coordinated with other signals to minimize the impact the signal has on motorized traffic flow.

Other Options
There are also several other types of mid-block signalized crossings that are currently being used on an experimental basis. The following signals, while not meeting current MUTCD standards, strive to address shortcomings in the standard mid-block signalized pedestrian crossing. Prior to evaluating similar devices in the City, careful analysis would be required. The following are a few of the experimental signals being used around the country:

Mid-Block Signal-Controlled Crossings with Flashing Red
Typically, the signal rests with a green light for motor vehicles. When a pedestrian activates the crossing button, a yellow then steady red light is displayed to motorists and then a walk signal is displayed to pedestrians. During the pedestrian clearance interval (flashing don't walk or red hand), a flashing red light is displayed to motorists who may proceed if the crosswalk is clear. At the conclusion of the pedestrian clearance interval, a steady green signal is displayed to motor vehicles. The advantage of this signal is that drivers have to stop for pedestrians crossing the road, but may resume travel through the crosswalk as soon as light turns to flashing red and the pedestrian is out of the roadway, rather than waiting for the entire light cycle.

Pelican Crossings (Pedestrian light controlled)
Originally developed in Great Britain, there are a few variations that have been implemented in the United States. Tucson, Arizona has implemented a number of these crossings with the following characteristics. The pedestrian crosses the street in two stages, using a crossing island. For each stage a standard traffic signal rests with a green light for motor vehicles. When a pedestrian activates the signal button, a yellow then steady red light is displayed to motorists approaching the crosswalk and then a walk signal is displayed to ped-

estrians displayed to pedestrians. After the clearance interval is complete the signal for motor vehicles returns to green and the pedestrian signal returns to a steady don't walk signal. By splitting the crossing into two stages the signal may be synchronized with signals in either direction along the roadway.

Other variations display a flashing yellow signal to motorists during all or a portion of the pedestrian clearance interval. A PUFFIN CROSSING is a variation that uses passive detectors to adjust the pedestrian crossing times.

Toucan Crossing

Toucan Crossings are used at intersections where it is desirable to provide a signalized crossing for bicycles and pedestrians but not for motor vehicles. A typical situation would be where a residential road intersect a primary road and the residents wish to reduce through traffic. The Toucan Crossing uses a standard signal for motor vehicles. Bicyclists and pedestrians who wish to cross the primary road are directed to the center of the minor road where passive sensors trigger the signal. The length of the pedestrian clearance interval is determined by sensors that can detect pedestrians in the crosswalk, thus cutting down on unnecessary delay to motor vehicles when used by bicyclists. Motor vehicles are typically restricted to a right-only turn from the residential roadway onto the primary road.

Hawk Crossing (High-intensity Activated Crosswalk)

The Hawk signal is similar to an emergency beacon in that the signal's purpose is clearly signed adjacent to the signal. The signal is kept dark at its resting state. When a pedestrian activates the crossing button, a flashing yellow signal is displayed to motorists. This is followed by a steady yellow then a solid red at which time the pedestrian is displayed a walk signal. During the clearance interval, the motorists are displayed an alternating flashing red signal. The disadvantage of this signal is that a dark signal indicator for vehicles can often be confusing, and in many states, drivers are required to stop at a darkened signal. Drivers at this signal often remain stopped after it is okay to proceed through the flashing red light.

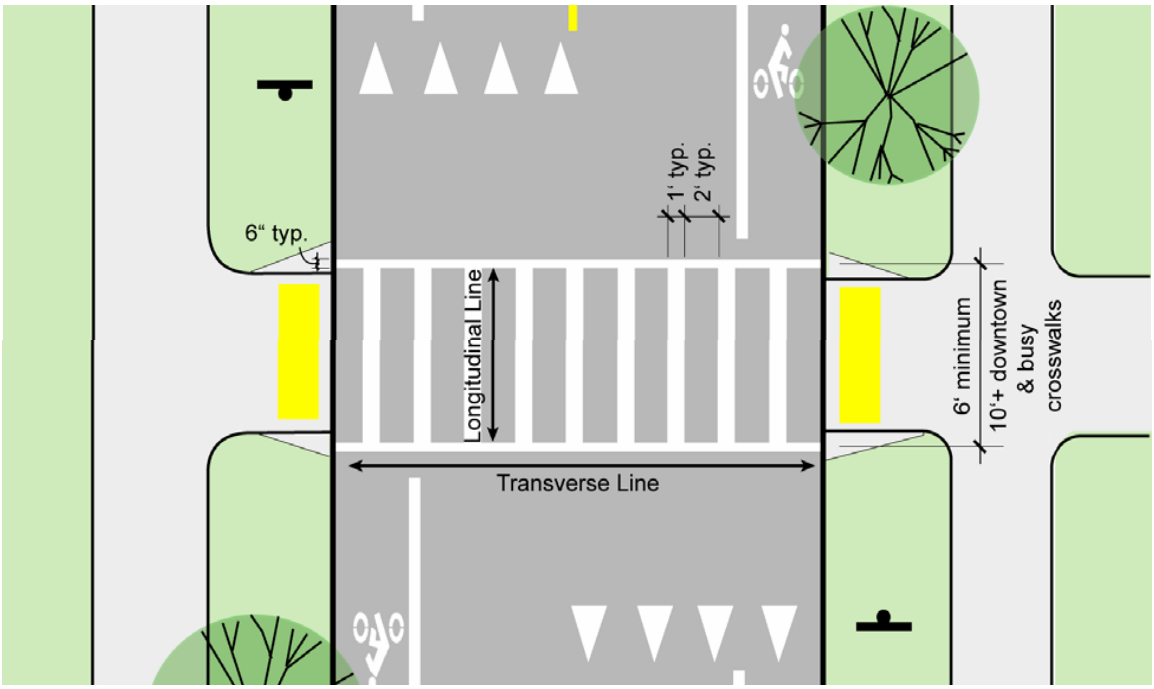
Other Options and Considerations for Experimental Mid-block Signalized Crosswalks

For further information on the types of mid-block signals being used around the country, refer to following report: *Alternative Treatments for At-Grade Pedestrian Crossings*, by Nazir Lalani and the ITE Pedestrian and Bicycle Task Force, Washington, D.C: Institute of Transportation Engineers, 2001.

As is apparent from the descriptions above, numerous features are available for use in a mid-block crosswalk, however none of these have an ideal combination of features. The ideal mid-block signal should incorporate the following:

- **A "hot response" system that immediately activates the signal when the button is pushed.** Often, the delay time for activated signals is so great that many pedestrians assume that the signal is broken and cross prematurely. A "hot response", with its quick activation of signal change, minimizes this problem. At a minimum, the pedestrian should receive some feedback in the form of a light and/or tone that they have successfully triggered the signal. Many of the newer pedestrian activated buttons have this feature.
- **Automated detection of pedestrians in the crosswalk.** Increasingly, signals are incorporating sensors that use infrared or microwave technology to detect pedestrians in the crosswalk. This technology allows the signals to more accurately reflect when pedestrians leave the crosswalk or ignoring false calls, reducing vehicle delay and minimizing driver frustration. This is an excellent feature where the speed in which typical users cross the road varies dramatically, such as a bicyclist and an elderly pedestrian.
- **Pedestrian yield phase**. As mentioned above, many people crossing at a mid-block signalized crosswalk are likely to feel comfortable enough to cross without activating the signal button. The disadvantage of all of the signals mentioned above is that the pedestrian indicators do not accommodate these types of crosswalk users. The signals either indicate that the pedestrian has the right to cross while the vehicle indicator is red, or that the pedestrian should not cross. What is needed is an indicator that informs people that is ok to cross without activating the button, but that they must simply yield to passing cars. As the pedestrian yield phase is not a LADOTD standard the use of such would require a design exception and should be accompanied by a study to determine its effectiveness.

Fig. 2.4AB. Ladder Style Crosswalk Design Guidelines



Description

A combination of Transverse and Longitudinal style crosswalks to improve visibility for motorists and usability for pedestrians with sight impairments.

Key Elements:

1. All crosswalk markings are highly skid-resistant and strongly contrast pavement.
2. Longitudinal lines are no more than 1' wide to minimize areas of thermoplastic markings.
3. Spacing of the longitudinal lines is no more than 2' to improve the visibility of the crosswalk to motorists.
4. Transverse lines are used to aid pedestrians with sight impairments in finding the edge of the crosswalks (this can be difficult with longitudinal lines alone, especially when spaced far apart).
5. The width of the crosswalk is set such that it can easily accommodate all pedestrians crossing the road.

Application

For all marked mid-block crosswalks across Arterial and Collector streets and signalized crosswalks downtown. Also, on local streets where there is a high potential for conflict between motorists and pedestrians such as crosswalks that serve schools. Locations where pedestrian crossing is sporadic require high visibility as the motorist's expectation for the presence of pedestrians is low.

Example

2.5 Non-motorized Travel on Independent Pathways

There are many types of Shared-Use pathways, each with unique issues. One type of Shared-Use pathway is the independent pathway that is separate from the road system. Independent pathways include rail-to-trail corridors, paths through parks and other trail systems. Independent pathways can be important and beneficial links to the non-motorized transportation system provided they have direct connections to the existing network of bike lanes and sidewalks. If designed and maintained properly, they can be the "jewels" of a City's non-motorized transportation system.

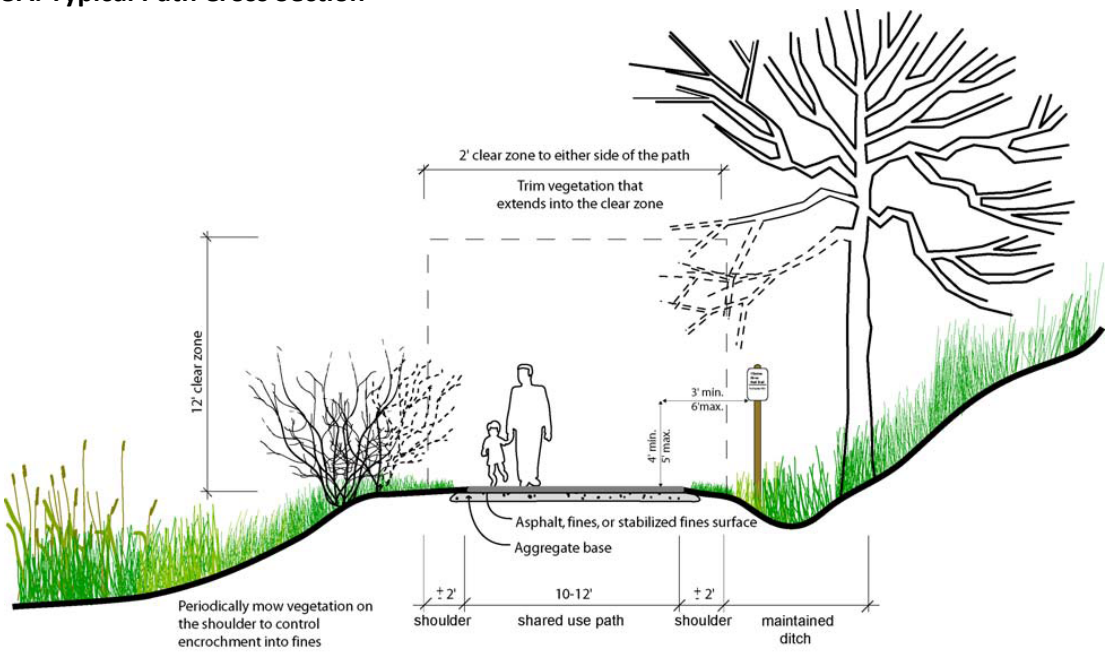
Independent pathways should be designed to accommodate shared uses including cyclists, walkers, strollers, in-line skaters, and people in wheelchairs. For the safety of all users, the pathway should be built wide enough to accommodate these shared uses. AASHTO guidelines indicate that 10' wide path is the minimum width for a Shared-Use path. The preferred minimum width is 12' in most cases in urban areas with 14' to 16' being common widths.

Studies done by the Rails-to-Trails Conservancy have shown that off-road pathways in general are quite safe from a personal safety standpoint. But in urban areas it is important that pathways follow the principles of Crime Prevention Through Environmental Design (CPTED).

Trail Cross Section Design Guidelines

Figure 2.5A below illustrates several key points about the design and maintenance of Shared-Use paths: Whether the surface of the path is asphalt, fines or other material, it should have a solid base and positive drainage as the path may have maintenance vehicles on it at all times of the year. The vegetation along the trail should be regularly trimmed and mowed to maintain a clear zone around the trail.

Fig. 2.5A. Typical Path Cross Section

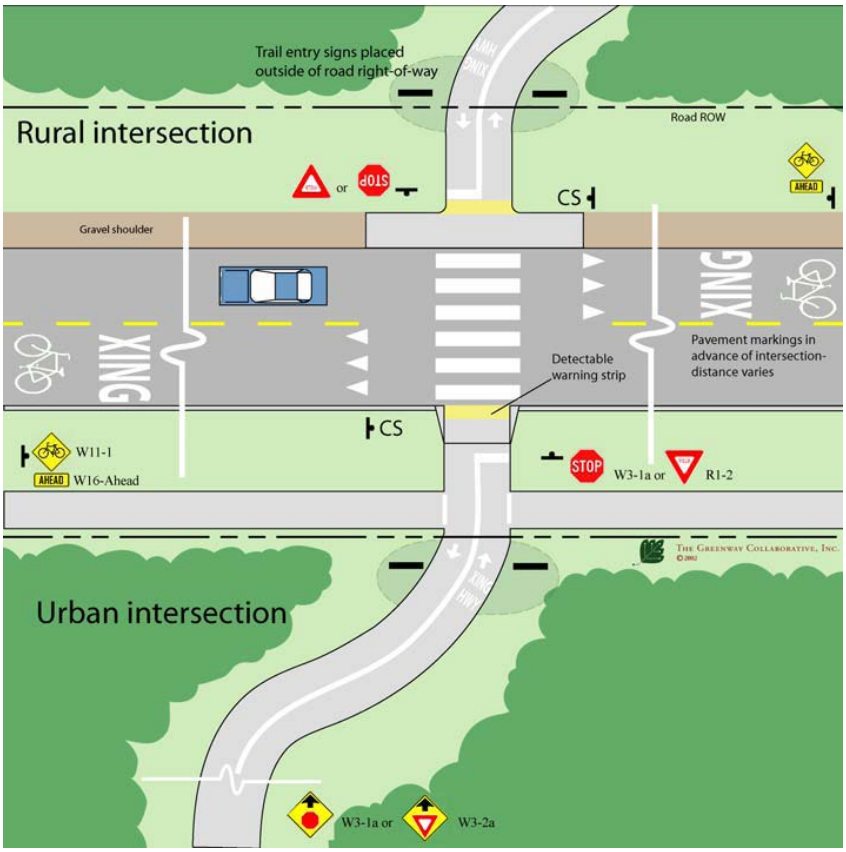


Independent Pathway / Road Intersection Design Guidelines

Independent pathways often intersect roadways at unsignalized mid-block crossings. Many of the design guidelines for a typical mid-block crosswalk apply (See Section 2, Facility Guidelines: Non-Motorized Travel Across Road Corridors) but because of the unique nature of independent pathways, several additional safety points must be considered. The following plan illustrates the key points needed for a safe design of the intersection of an independent pathway with a roadway:

- Clear signage that identifies user rights-of-way and notifies both the users of the pathway and the motorists that an intersection is approaching.
- Pavement markings at the beginning of the trail intersection notify users of direction of travel and rights-of-way. Pavement markings further along the trail should be minimized to avoid visual clutter.
- The pathway should meet the roadway at as close to a 90-degree angle as possible for maximum visibility of users.
- Trail signage is often set back outside the road right-of-way.
- Regardless of the surfacing material of the trail, asphalt should be used for the portion of the trail that intersects the road. The asphalt increases traction for bicycle users and cuts down on debris from the shoulder of the road accumulating in the pathway. The change in materials can also help to notify users of the upcoming intersection. At rural intersections, gravel shoulders should also be paved adjacent to the trail to minimize debris in the stopping zone.

Fig. 2.5B. Typical Pathway/Roadway Intersection



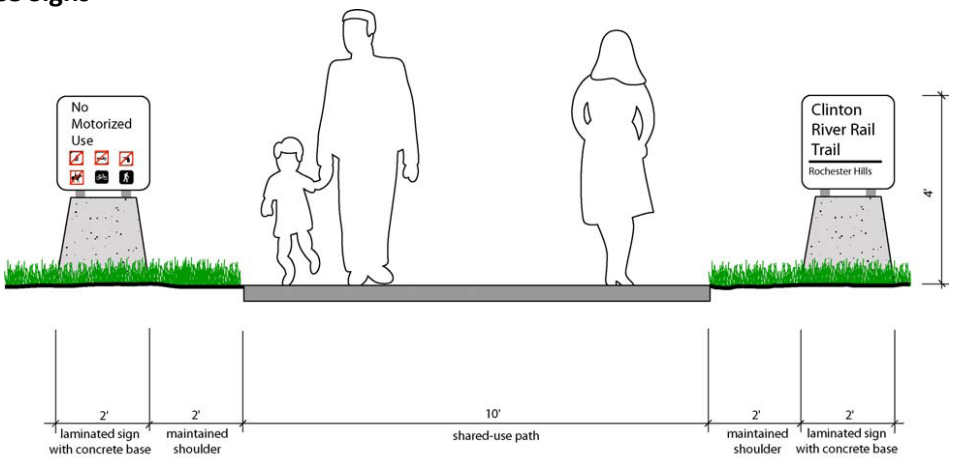
Trail Entrance / Exit Signage Design Guidelines

If designed correctly, trail signage can serve as a pleasing amenity to the trail while providing valuable safety and orientation information to the users of the trail. Key considerations for the design of trail signage include:

- Signs should be placed at the beginning of trail intersections with the roadway to orient the user to his or her location along the trail, the distance to the next intersection crossing, and the rules and regulations of the trail.
- Signs should be a sufficient distance from the shoulder of the trail to prevent obstruction or collisions.
- Signs should be placed to allow access for maintenance vehicles to the trail.

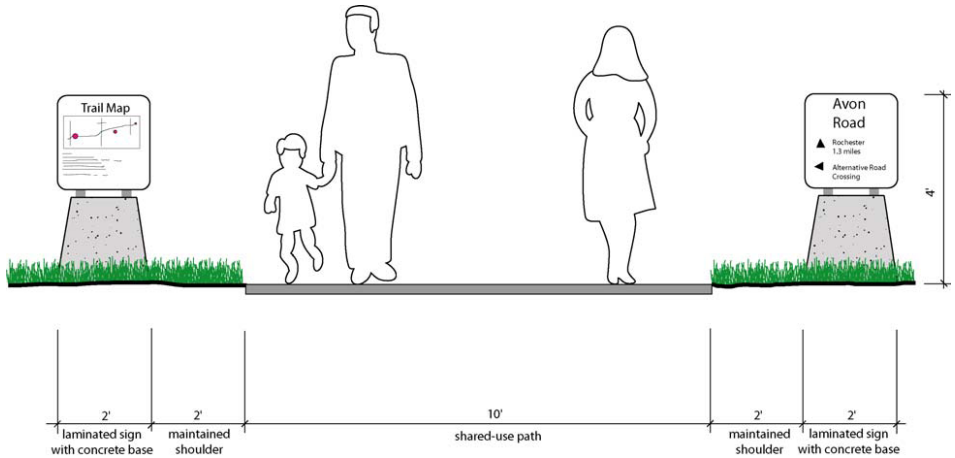
The signs shown below should be considered illustrative only, depicting the type of information to be presented and appropriate locations. They are not intended as specific design recommendations.

Fig. 2.5C.
Trail Entrance Signs



Trail Entrance Elevation-Alternative A

Fig. 2.5D. Trail
Exit Signs



Trail Exit Elevation-Alternative A

2.6 Travel Within Neighborhoods

While the focus of this report is on the primary road system of Collectors and Arterials, local roadways that serve residential and mixed use areas are critical to the success of the region's non-motorized system. Local roads that serve neighborhoods are typically attractive non-motorized links due to the lower vehicle volumes and speeds.

Bicycle Travel in Neighborhoods

Bicycles typically do not need any special accommodations on local residential streets as they can comfortable share the road with the limited motor vehicle traffic. Some local residential streets, by themselves or in combination with off-road paths, provide excellent and attractive alternatives to the primary road system. In some cases, it may be desirable to sign bicycle routes that provide access to destinations such as schools and parks where the route may not be obvious to a cyclist unfamiliar with the area. See Fig. 2.3J, Signed Bike Route Design Guidelines for more information on Bike Routes and Section 5, Proposed Facilities for proposed Bike Route locations.

Public vs. Private Roads

It is as important to provide safe and comfortable pedestrian facilities on private streets as on public streets. However, private street standards are currently interpreted as only requiring a 4' wide sidewalk on one side of the street with no buffer needed between the sidewalk and street. Consequently, many development projects get built with less than adequate pedestrian facilities that detract from the area's overall ability to accommodate non-motorized travel. Regardless of ownership, neighborhood roads should include concrete sidewalks a minimum of 5' wide and compliant with ADA standards, on both sides of the street with a landscaped buffer between the sidewalk and the road.

An issue with private roads is the perception that they may not be open for use by the general public. For this reason public roads should always be the preference for new developments. In crafting development agreements that incorporate private roads it should be clear that the roads are open to all pedestrians and bicyclists and that there should be no signage of physical structures that imply that non-motorized access is limited to the residents of that neighborhood.

Both public and private neighborhood streets should be designed to incorporate many of the same pedestrian safety enhancing measures as those previously noted for primary public roadways. These include reduced curb radii, narrower street widths, curb extensions, and traffic calming measures such as speed tables.

Connectivity Between Neighborhoods and to the Primary Road System

If a new development has limited road access to surrounding arterial streets, special access points for pedestrians and bikes should be incorporated between property lines or along utility rights-of-way. Non-motorized connectivity between adjacent residential, commercial and institutional developments should be provided. Local governments can regulate the form and shape of new neighborhoods to support and promote pedestrian and bike mobility both by modifying master plans and development standards. Careful site design encourages walking by making non-motorized travel more direct than motorized transportation modes.

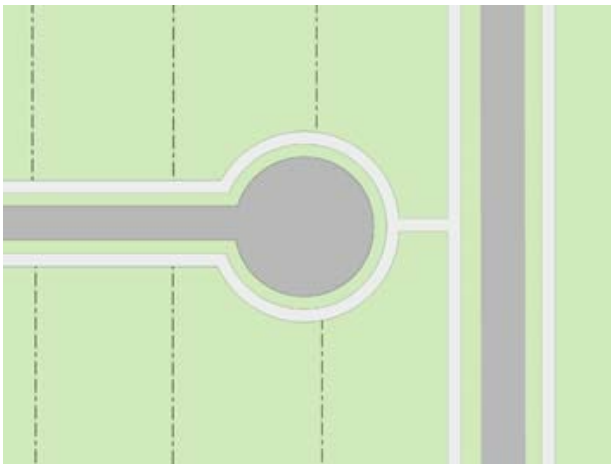
Neighborhood Roadways Design

Public and private street standards should clearly require sidewalks on both sides of the street, subject to City review. Neighborhood streets should have the following amendments to encourage pedestrian access with in neighborhoods:

- Slow vehicular speeds.
- Small block sizes.
- Interconnected streets.
- Sidewalks on both sides of the streets.
- Landscaped buffer between the street and the sidewalk with street trees that will provide shade.
- Connections to adjoining neighborhoods.
- Direct walkway connections between residential areas and commercial and institutional areas when not afforded by the street system

Fig. 2.6A. Cul-de-sac connector

Grid patterned streets with sidewalks and small block sizes are preferred for pedestrian use. They allow pedestrians to have multiple options in route choices and follow the most direct route possible. It is desirable for street networks and pedestrian facilities to correspond wherever possible. However, even if grid streets are not desired or feasible, pedestrian and bike links should still be provided even where the road does not connect. If cul-de-sacs and dead end streets are used, pedestrian and bike cut-throughs meeting AASHTO guidelines should be created to link to adjacent streets (Figure 2.6A).



2.7 Travel Within Non-Residential and Mixed Use Developments

Many new commercial, office, institutional and mixed use developments being built today are designed for easy access by motor vehicles and do not take into adequate consideration the patrons arriving by other means of travel. Aspects of site design can discourage non-motorized traffic when designed solely for automobile use. New developments today often have poorly placed bike-parking facilities, large setbacks with parking lots that lack direct access for pedestrians or bicyclists and face large arterial roadways with little or no direct access to neighborhoods and residential areas that may be surrounding them. These problems can be remedied by improving site design and enhancing connections to the external transportation system.

Circulation with the Site
Buildings with frontages along the street create a streetscape that is comfortable and accommodating to pedestrians, and help keep traffic moving at slower speeds. Parking to the side or the rear of the building keeps the streetscape intact, allows easy access for pedestrians from adjacent sidewalks and minimizes automobile and pedestrian conflicts. As the building frontages are moved back from the streetscape to accommodate parking, the pedestrian's sense of exposure to traffic, the distance they must walk to access the store, and their resulting discomfort substantially increases.

Setback of the building frontages from adjacent intersections also complicates pedestrian travel across the roadways. Typical development patterns are "L" shaped with the majority of buildings set back from the intersection and one or two isolated buildings near the intersection. This pattern places the majority of the buildings away from the primary pedestrian crossing point and puts a large expanse of parking between the isolated buildings on the corner and the majority of the buildings. Depending on the development across the street, "L" shaped development can set up strong pedestrian desire lines across mid-block locations. Because of the large scale of most of these developments, the distance between the desire lines and the signal is significant.

If orienting proposed development projects to improve non-motorized uses is not a feasible option in designing the layout of the buildings, then providing clear, direct and safe pedestrian access at mid-block locations is necessary to minimize out of direction travel through or around the parking lot by pedestrians. Parking lots can be dangerous areas for pedestrians and present many challenges for safe navigation. Older adult pedestrians have a high incidence of accidents involving vehicles backing up, a common maneuver in parking lots. Site plans should be required to include the following design measures:

- Reduce building setbacks as much as possible and provide walkways to the entrances that are clearly marked, accessible and is buffered from the surrounding parking lot.
- Use raised crosswalks and striping to clearly define the walkways from driveways. Speed tables and raised crosswalks can calm traffic and increase visibility.

Fig. 2.7A. Typical Commercial Center at Intersection of Main Roads

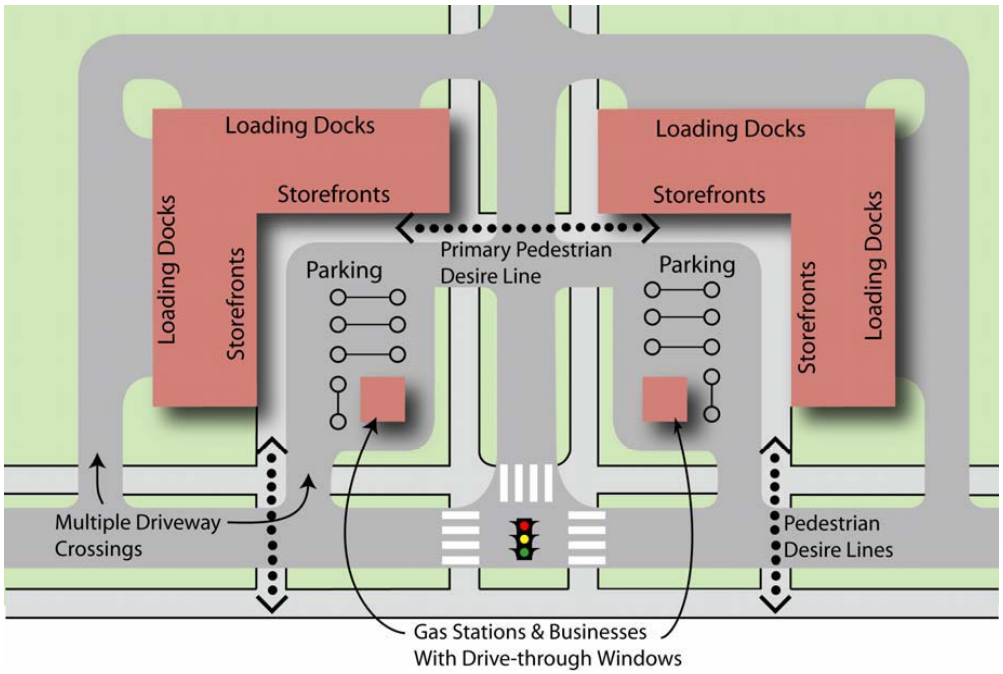
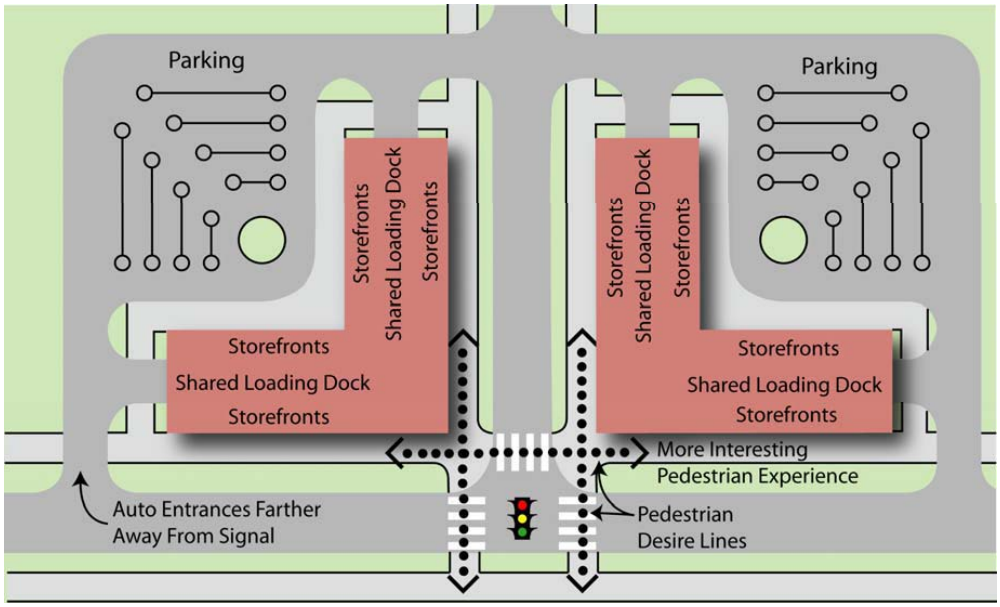


Fig. 2.7B. Pedestrian Friendly Commercial Center Alternative



- Provide trees and other plantings to buffer pedestrians from parking areas, enhance parking lot aesthetics, and minimize the pedestrian's exposure to the elements while crossing the vast expanse of pavement.
- Walkways should have direct and clear access to building entrances and be designed to safely go through the parking lot, or circumnavigate it if necessary.
- Walkways along the buildings should be wide enough to accommodate several people abreast and have frequent curb cuts and ramps for accessibility, as well as tactile and audible pedestrian information.

Just as pedestrians need direct and clear access through the parking lots to the buildings, bikes should also be safely directed through the parking lot. Bike parking should be provided in a visible and convenient location. Many cyclists are reluctant to lock their bikes in an area that is out of the way and unfrequented because of the greater likelihood of theft. This leads to situations where bikes are locked to anything available such as signposts or railings. These bikes can cause hazards for pedestrians and obstacles to accessibility. Providing bike parking facilities in convenient and well-lit locations will minimize these problems.

The site plan review process will allow the local government to ensure that these design measures are followed. Local planning commissions should require that developers include these specific pedestrian and bike accommodations early in the site planning.

Connections to the External System

The site must have convenient and safe access to pedestrian, bicycle and transit facilities outside the development. Frequently, large new developments are located on the edge of town along major arterials with limited non-motorized facilities. New developments should always connect to an existing non-motorized transportation network. Commercial developments should include specific plans for connecting to existing facilities and neighborhoods in surrounding areas.

Motor vehicle access to commercial development should be constructed as a conventional driveway with small turning radii and a ramp up to the sidewalk level, rather than a typical public intersection where the roadbed continues at the same level and there are curbs on either side. Use of driveway entrances rather than typical intersections enhance pedestrian safety and comfort because motorists must drive slowly when entering and exiting the development. When a typical intersection-style entrance is used, the sidewalk should continue across the entrance, preferably at sidewalk height, so the right-of-way is clearly established and motorists understand they are entering a pedestrian area. Supplemental signage and crosswalk pavement markings should be used to indicate a crosswalk and the pedestrian right-of-way.

Plantings should be pulled back away from the entrance crossings to allow maximum visibility for both pedestrians crossing the entrance and the cars entering the commercial development. The radius of the intersection curb should be kept as small as possible, and the width of the driveway should be the minimum needed. Just as roads are updated to accommodate vehicular access at new developments with turning lanes or signals, so should non-motorized facilities be updated with new crosswalks, signage and pedestrian signals.

New roadway designs often favor access control for businesses along the road. In this scenario, several

businesses share access through one driveway instead of each business having its own entrance and exit onto the main street. In addition to the advantages for vehicles, this is an advantage for the lateral movement of pedestrians along the street because they do not have to cross as many driveways.

However, more direct pedestrian access points from the sidewalk to the individual building entrances should be incorporated. The spacing of crosswalks along the primary road to developments across the road should also be considered.

The design and placement of the buildings should allow direct and clear access from surrounding neighborhoods and residential areas. Too often, what could be a short walk to a nearby store from a residential street becomes dangerous and un-navigable because the store does not have public access on the side facing the residential streets. Both pedestrian and bicycle access should be unimpeded from these areas. During site plan evaluation, development access and travel distances from surrounding residential areas should be a prime consideration.

Encouraging Mixed Use

While tying commercial developments to surrounding residential areas is a good practice, a better practice is to eliminate the segregation of commercial and housing areas. Incorporating higher density housing into commercial developments can dramatically alter the character of commercial development making the project more similar in feel to a small downtown rather than a strip development. For more information see the Land Use Considerations in the next section. Mixed land uses can significantly increase the number of non-motorized trips.

Site Design Checklist

A site design checklist or similar tool should be provided to developers and used by the City in their review of site plans to make sure that bicycle and pedestrian issues are being adequately addressed. The following checklist was adapted with minor modifications from *The Canadian Guide to Promoting Sustainable Transportation through Site Design* by the Canadian Institute of Traffic Engineers. It is a part of a larger publication that looks at site design issues more fully.

Land Use & Urban Form Checklist:

- Densities are sufficient to support transit (3 to 7 households an acre / 4 to 7 jobs an acre)
- Highest density land uses are located close to activity nodes such as transit corridors and intersections.
- Proposed use provides or adds to a diversity of land uses in the surrounding area and does not result in large tracts of similar uses.
- Proposed use is compatible with adjacent land uses and with long term land use plans for the area.
- Adjacent street network provides for connectivity of transit, cycling and pedestrian routes.
- Mixed uses help support non-motorized transportation.

Safety & Security Checklist:

- Overall site design attempts to minimize conflict points between vehicles, pedestrians and cyclists.
- Sight distances have been considered in overall site design and in the placement of entry signs and landscaping.
- Consideration has been given to personal security for pedestrians, cyclists and transit users.
- Buildings are located close to the street, but provide adequate clearance for pedestrian activities along street frontage.
- Where appropriate, retail, restaurants and other pedestrian oriented uses animate the street frontage.

Building Entrances Checklist:

- Building entrances are located close to the street, with direct pedestrian access.
- Potential conflict points between users arriving by different modes are minimized.

Internal Transportation Network Checklist:

- Roads and paths match up with surrounding networks and ensure direct connections through the site for cyclists and pedestrians.
- Block lengths are limited and mid-block crosswalks are provided where appropriate.
- Traffic-calming principles are applied, where appropriate (proper site design should avoid the need to apply extensive traffic calming).
- Appropriate measures have been taken to ensure easy progress of transit through the site.

Desired Pedestrian & Cyclist Routes Checklist:

- ☐ Safe, continuous and clearly defined routes for pedestrians and cyclists are provided along desire lines including links to surrounding residential areas.
- ☐ Weather protection and amenities such as trees are provided.
- ☐ Intersections are designated to facilitate pedestrian and cyclist crossings.

Transit Stops Checklist:

- ☐ Walking distances to stops do not exceed 1300 feet, and pathways to stops are safe and direct.
- ☐ Waiting areas are well lit and attractive.

Site Grading Checklist:

- ☐ Terrain along pathways is kept reasonably level, and ramps are also provided wherever stairs are necessary.
- ☐ Slopes along pathways are designed to avoid the ponding of slush and water.

Motor Vehicle Parking Configuration & Treatment Checklist:

- ☐ Off-street parking is located away from the street, preferably behind buildings or underground.
- ☐ Vehicle access is separate from pedestrian access, and access and egress controls are designed so vehicles do not block pedestrian ways.
- ☐ Parking lots are kept small and designed to prevent speeding.
- ☐ Pedestrians have protected walkways through the lots.

Motor Vehicle Parking Supply & Management Checklist:

- ☐ Off-street parking should be provided, where necessary, at the sides and rear of buildings.

Bicycle Parking Checklist:

- ☐ Bicycle parking is located near entrance for short term users in a high visibility location.
- ☐ Weather protected bicycle parking for longer term users is provided in a secure area. Storage possibilities for gear are considered.
- ☐ Showers, changing rooms and lockers are provided within employment centers.

Passenger Pick-up & Drop-off Areas Checklist:

- ☐ Passenger pick-up and drop-off areas are located to the side or rear of buildings, downstream from the entrance, but no more than 100 feet away from it.

Loading Areas Checklist:

- ☐ Loading areas are located off the street, and are screened from public view.

- ☐ Loading area access is designed so that pedestrian, cyclist, and transit routes are never severed.

Internal Road Design Checklist:

- ☐ Appropriate traffic signals and compact geometry of intersections control speeds and allow for safe passage of cyclists. Roads are designed to cross at right angles. Sight lines are respected.
- ☐ Lanes are designed to accommodate motor vehicles and cyclists, and remind respective users of the other networks on the site.
- ☐ Facilities for cyclists and sustainable modes are provided and continued across the site.

Pedestrian Facilities Checklist:

- ☐ Sidewalks are provided along all roads, and follow pedestrian desire lines where possible.
- ☐ Properly signed crossings are provided wherever a path or sidewalk crosses a road.
- ☐ Pathways are clearly defined, delineated, and are of a sufficient unobstructed width. Appropriate amenities such as lighting and weather protection are provided and safety along path is addressed.

Transit Facilities Checklist:

- ☐ Stops are located close to the main entrances of activity generators. Crosswalks are provided at all stops.
- ☐ Stops and waiting areas are properly illuminated, visible from a distance, and have warranted amenities such as shelters and benches.
- ☐ Spacing between stops is minimized.
- ☐ Shelters and rest areas are provided at transit stops and locations where there is a high number of users, the elderly or the disabled.
- ☐ Shelters and rest areas are identifiable, accessible, places appropriately, and are comfortable.

Wayfinding Checklist:

- ☐ Appropriate signage and physical features are provided for users of all networks to determine their location, identify their destination, and progress towards it.

Street Furniture & Amenities Checklist:

- ☐ Amenities are provided to create a comfortable and appealing environment, pre-empting litter and responding to user needs.

Landscaping Checklist:

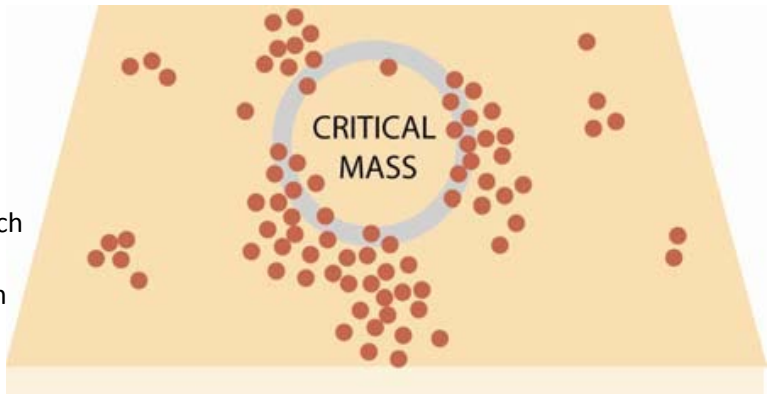
- ☐ Landscaping does not compromise user security and safety.

2.8 Land Use Planning Considerations

Land use patterns greatly affect the viability of non-motorized transportation. There is a general consensus based on a significant body of research that three key issues determine how supportive an environment is to walking, bicycling and transit.

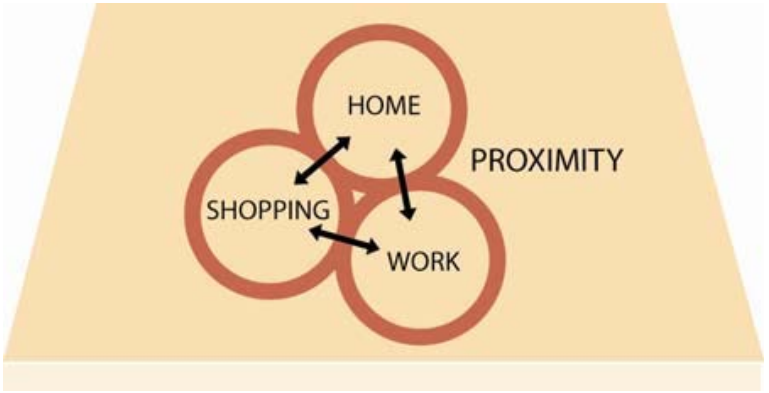
Density

The density of the residential population determines if an area is capable of supporting a transit system, both economically and efficiently. Higher density encourages retail services needed to maintain a healthy urban environment. Increased population density introduces a critical mass of pedestrians who provide comfort and security to each other with their combined presence. Higher density uses support a non-motorized transportation system more than low density land uses. It has been noted that the key indicator of the vitality of a place is the presence of pedestrians.



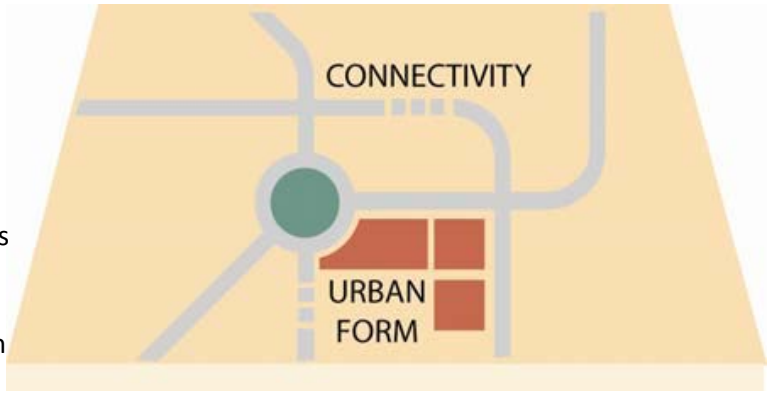
Diversity

The diversity of land uses refers to the proximity of trip origins and destinations. If the distances are comfortable for bicyclists and/or pedestrians they will be more likely to use non-motorized means, thus reducing the number of motor vehicle trips. A diversity of services at key public transportation stops allows transit users to minimize their travel and combine many errands at one place.



Design

The design of the non-motorized system and the support facilities determine if a pedestrian or bicyclist trip will be safe, comfortable and convenient. The design is also key in determining how accessible transit stops are and how large an area each transit stop draws from. Design is important on both on a macro and micro scale. On a macro scale the directness and interconnectedness of the network is critical for permitting quick access to adjacent diverse land uses. On a micro scale an environment that rewards non-motorized users with safe and pleasant surroundings encourages use.



Density, diversity and design must all work in concert to make an environment that supports alternative transportation. The absence of one element has the ability to reduce the positive impact of the presence of the other two. Municipal planning can guide land use plans and zoning plans to encourage dense, mixeduse development and design considerations that support a variety of transportation choices. Ordinances may be used to permit mixed-use developments with higher densities, as well as promote increased densities around major destination points and transit lines.

A community's transit, bicycle and pedestrian friendliness has as much to do with a community's population density, land-use diversity and the layout of the street network as it does with providing specific facilities for bicyclists and pedestrians.

2.9 Pedestrian Travel Downtown

The design of the downtown pedestrian environment has a direct effect on the degree to which people enjoy the walking experience. If designed appropriately, the walking environment serves not only the people who currently walk but also entices those who don't. When considering the appropriate design of a certain location, designers should consider not only existing pedestrian use, but how the design will influence and increase walking in the future.

Additionally, designers must consider the various levels of walking abilities and local, state, and federal accessibility requirements. Although these types of requirements were specifically developed for people with walking challenges, their use will result in pedestrian facilities that benefit all people.

In the downtown area, defined by the boundary of the Downtown Development District (DDD), pedestrian accommodation takes on a special importance. Though the following guidelines are intended for the downtown area, many have applicability in other areas of town.

Zones in the Sidewalk Corridor
The Sidewalk Corridor is typically located within the public right-of-way between the curb or roadway edge and the property line. The Sidewalk Corridor contains four distinct zones:

- Curb Zone
- Furnishings Zone
- Through Pedestrian Zone
- Frontage Zone

Curb Zone **Furnishings Zone** **Through Pedestrian** **Frontage**

The Curb Zone

The Curb Zone defines the pedestrian area, providing a buffer between the sidewalk and street. This zone usually consists of the width of the curb and may contain space for unloading passengers or freight.

- Curb Zone width should be 18 inches where pedestrian or freight loading is expected and may conflict with obstacles, such as planters, in the Furnishings Zone.
- Curb Zone width along all other streets should be a minimum of six inches.

Curbs prevent water in the street gutters from entering the pedestrian space, discourage vehicles from driving over the pedestrian area, and make it easy to sweep the streets. In addition, the curb helps to define the pedestrian environment within the streetscape, although other designs can be effective for this purpose. At the corner, the curb is an important tactile element for pedestrians who are finding their way with the use of a cane.

On-Street Parking

As noted in Section 2.3 – Travel Along Road Corridors, the presence of on-street parking has a favorable impact on the quality of pedestrian environment. On-street parking increases the lateral separation between pedestrians and moving traffic as well as presenting a substantial buffer between the sidewalk and the street. On-Street Parking also has a traffic calming effect with motorists generally being more cautious looking for opening doors and cars pulling in and out.

Where the buffer zone is limited, on-street parking can compensate for lowered comfort level. Thus, if on-street parking is only allowed on on-side of the street due to road width constraints, the parking should be located on the side with the least buffer, all other factors being equal.

The Furnishings Zone

The Furnishings Zone lies between the Through Pedestrian Zone and Curb Zone. All fixtures and street furniture should be contained in the Furnishings Zone to keep the Through Pedestrian Zone free for walking. This is also the area where people alight from parked cars along the roadway.

Separating pedestrians from travel lanes greatly increases their comfort as they use the Sidewalk Corridor. This buffer function of the Furnishings Zone is especially important on streets where traffic is heavy, yet along many of these streets the existing Sidewalk Corridor is narrow. Where possible, additional width should be given to this zone on streets with traffic speeds over 35 mph.

The furnishing zone is also the area where elements such as signal poles, utility poles, controller boxes, hydrants, signs, parking meters, driveway aprons, grates, and hatch covers are located. Wherever it is wide enough, the Furnishings Zone should include street trees and be paved with tree wells and planting pockets for trees, flowers, and shrubs.

Furnishings Zone Elements

- Trees, planters & landscaping
- Trash & recycling receptacles
- Bicycle racks
- Street lights
- Benches
- Consolidated news racks (advertising racks should be discouraged)
- Clocks
- Public art
- Banners & flags
- Information kiosks

• Fountains
• Wayfinding/signage
• Street Vendors

Planting

Street trees are a highly desirable part of the pedestrian environment, especially large-canopied shade trees. Every effort should be made to provide enough room in the Sidewalk Corridor to accommodate trees in addition to pedestrian travel.

Tree limbs and branches should be trimmed to leave 7' – 6" clear above the level of the sidewalk. Permanent planters usually are not permitted in the right-of-way. Moveable planters may be permitted in the Frontage Zone with a permit from the City.

Street Furnishings

Street furnishings can enliven and provide variety to outdoor public spaces. They serve an aesthetic as well as utilitarian function. Proper design and placement of street furnishings will reinforce the downtown design theme throughout The Capital Region. The amount and types of furnishings provided will vary
depending on the uses along the street and amount of pedestrian activity.

- On sidewalks of ten feet or greater, the Furnishings Zone width should be a minimum of four feet. A wider zone should be provided in areas with large planters and/or seating areas.
- Street furnishing should create a unified look. The color and appearance of street furnishings should be selected in concert with other design elements (such as special paving), surrounding furnishings, and the area as a whole.
- Street furnishings should be securely anchored to the sidewalk and protected with a graffiti resistant coating to ensure a long-term quality appearance.
- The design and selection of street furniture should include consideration for the security, safety, comfort, and convenience of the user.
- Street furniture should be grouped together to conserve sidewalk space, provide complementary functions, and maintain a clear width sufficient to accommodate pedestrian flow. A greater number and type of furnishings should be located in high-use pedestrian traffic areas.
- The design and siting of furnishings should accommodate the physically challenged. This includes provision of space adjacent to walkways for wheelchairs and/or strollers.
- Textured paving may be used in the Furnishings Zone for decorative purposes.
- To reduce street clutter, consolidate signage on light poles, and other permanent fixtures, wherever possible.
- Dual-level lighting fixtures, which illuminate the street and sidewalk areas, are recommended on downtown commercial streets.

Street Vendors

Street vendors contribute to the life of downtown and provide inexpensive food to many downtown employees and visitors. When permits are granted to vendors the location should be carefully defined so carts and canopies not interfere with the through pedestrian zone. The use of generators should be strictly regulated or banned as the sound of generators severely degrades the pedestrian experience downtown.

The Through Pedestrian Zone

The Through Pedestrian Zone serves as the sidewalk area dedicated to walking and is located between the Frontage Zone and Furnishings Zone. This zone should be entirely free of permanent and temporary objects.

Width

As a general rule, the zone should be at least 6 feet wide in downtown, with 8-10 feet recommended. A minimum of five feet should be reserved to allow for two people to walk comfortably side by side and meet ADA requirements. The volumes of pedestrian traffic should be evaluated prior to granting sidewalk occupancy permits to make sure there is adequate sidewalk width to accommodate typical pedestrian volumes. An acceptable width would result in a pedestrian having to make only minor adjustments in speed and direction to avoid conflicts with other pedestrians and obstacles.

Alignment

The through pedestrian zone should keep in a straight line for an entire block. Zigzagging alignments to accommodate café tables alternately located against buildings and in the furniture zone reduces the capacity of sidewalk and makes it difficult to transverse for persons with sight and mobility impairments.

Intruding Elements

Driveway aprons should not intrude into the Through Pedestrian Zone. This Zone should be kept clear of any fixtures and/or obstructions. Clearance should be provided in a generally straight path for the convenience of all pedestrians, but especially for the sight-impaired. The Sidewalk surface must be stable, firm, smooth, and slip-resistant, per the ADA.

Constraints in the Sidewalk Corridor

Most of Baton Rouge's downtown grid has already been built, and in many cases the existing Sidewalk Corridor is too narrow to accommodate the recommended zone widths. Competing needs for space in a constrained Sidewalk Corridor can be resolved in either of two ways: by compromising on the minimum

required clearance for some or all of the zone or by increasing the dimensions of the Sidewalk Corridor. The resolution of such conflicts in any given case must be based on considerations of balancing the conflicting uses and adjusting the magnitude of the solution to fit the magnitude of the project.

Widening the Sidewalk Corridor

In some cases, it is possible to increase the dimensions of the Sidewalk Corridor, either through acquisition of right-of-way or public walkway easements, or by reallocation of the overall right-of-way (such as by narrowing travel lanes or reducing the number of lanes). As part of a roadway reconstruction project on a street with a narrow Sidewalk Corridor, the project planners should first analyze the impact of reclaiming a portion of the existing right-of-way. If this proves impractical, the feasibility of acquiring additional right-of-way should be examined. Acquisition should be considered where its cost is reasonable in proportion to the overall project cost.

In the case of infill development, the dedication of public right-of-way or the granting of a public walkway easement to widen the Sidewalk Corridor may be included as a requirement for obtaining a building permit or land use approval.

Grates

All grates within the sidewalk shall be flush with the level of the surrounding sidewalk surface, and shall be located outside the Through Pedestrian Zone. Ventilation grates and tree well grates shall have openings no greater than 13 mm (1/2 in) in width.

Hatch Covers

Hatch covers should be located within the Furnishings Zone. Hatch covers must have a surface texture that is rough, with a slightly raised pattern. The surface should be slip-resistant even when wet. The cover should be flush with the surrounding sidewalk surface.

Surfaces

Walking surfaces shall be firm and stable, resistant to slipping, and allow for ease of passage by people using canes, wheelchairs, or other devices to assist mobility. Brick or concrete unit pavers may also be used particularly in the Furnishings Zone or around mature trees where sidewalk lifting is a problem.

Frontage Zone

The Frontage Zone is the area between the Through Pedestrian Zone and the property line. This zone allows pedestrians a comfortable "shy" distance from the building fronts, in areas where buildings are at the lot line, or from elements such as fences and hedges on private property.

Where no Furnishings Zone exists, elements that would normally be sited in that zone, such as transit shelters and benches, telephone kiosks, signal and street lighting poles and controller boxes, traffic and parking signs, and utility poles, may occupy the Frontage Zone. In some cases, easements or additional right-of-way may be required to allow for these items. For residential and mixed-use buildings built to the right-of-way line, these elements should not be sited in the Frontage Zone, as they could block access to an existing or future building. Private temporary uses such as sidewalk cafes may occupy the Frontage Zone, so long as the Through Pedestrian Zone is maintained.

Encroachments

Fences and walls, when permitted, must be at least 1 foot behind the back of the sidewalk (or the future sidewalk, if none exists). Encroachments into the right-of-way should not be permitted where the existing sidewalk corridor is less than the recommended width.

Care should be exercised if elements such as standpipe systems for fire safety project into the Frontage Zone from a building face. Standpipes systems should only project a maximum of 1 foot but not more than four inches if they project in the area between 2 feet, 3 in and 6 feet 8 inches above the sidewalk, per the ADA.

Adjacent Parking Lots

Where there is no landscaping between parked vehicles and the right-of-way, wheel stops or other means such as walls or fences should be used to prevent parked vehicles from overhanging into the Frontage Zone.

Appendix: G

Proposed Policies and Programs

These policies and programs provide the institutional support for the non-motorized system. They provide the necessary support systems for the proposed physical system. They also provide a framework within which new issues related to non-motorized transportation may be addressed.

The first two policies, Accommodating Bicycle and Pedestrian Travel and ADA Compliance Issues are general in nature but outline the Region's approach to addressing non-motorized transportation. Some of the proposed policies are ones that the MPO itself cannot implement by itself but must work with the local governments to implement. The other policies deal with specific design issues, engaging the community, educating the people responsible for implementing and enforcing the system, and approaches to maintaining the system.

Topics:
3.1 – General Policies on Accommodating Bicycle and Pedestrian Travel
3.2 – ADA Compliance Issues
3.3 – Community Involvement and Encouragement Programs
3.4 – Maintenance of Non-motorized Facilities

3.1 Accommodating Bicycle and Pedestrian Travel

In 1999, the United States Department of Transportation issued a policy statement on integrating bicycling and walking into transportation infrastructure entitled *Design Guidance, Accommodating Bicycle and Pedestrian Travel: A Recommended Approach*. This document indicates the federal government's interpretation on how best to address the non-motorized transportation requirements of the Transportation Equity Act for the 21st Century. It serves as the best national policy model for accommodating bicycle and pedestrian travel.

Recommended General Policy Statement
The following draft policy statement is drawn from the United State Department of Transportation's policy statement with minor edits. The entire document may be found in the Appendix.

1. Bicycle and pedestrian ways shall be established in new construction and reconstruction projects on both sides of a street in all urbanized areas unless one or more of two conditions are met:

a) bicyclists and pedestrians are prohibited by law from using the roadway. In this instance, a greater effort may be necessary to accommodate bicyclists and pedestrians elsewhere within the right of way or within the same transportation corridor.

b) the cost of establishing bikeways or walkways would be excessively disproportionate to the need or probable use. Excessively disproportionate is defined as exceeding twenty five percent of the cost of the larger transportation project.

2. Where uncurbed road sections are used, paved shoulders should be included in all new construction and reconstruction projects on roadways used by more than 1,000 vehicles per day. Paved shoulders have safety and operational advantages for all road users in addition to providing a place for bicyclists and pedestrians to operate.

a) Rumble strips are not recommended where shoulders are used by bicyclists unless there is a minimum clear path of four feet in which a bicycle may safely operate.

3. Sidewalks, shared use paths, street crossings (including over and undercrossings), pedestrian signals, signs, street furniture, transit stops and facilities, and all connecting pathways shall be designed, constructed, operated and maintained so that all pedestrians, including people with disabilities, can travel safely and independently.

4. The design and development of the transportation infrastructure shall improve conditions for bicycling and walking through the following additional steps:

a) Planning projects for the long-term. Transportation facilities are long-term investments that remain in place for many years. The design and construction of new facilities that meet the criteria in item 1 above should anticipate likely future demand for bicycling and walking facilities and not preclude the provision of future improvements. For example, a bridge that is likely to remain in place for 50 years, might be built with sufficient width for safe bicycle and pedestrian use in anticipation that facilities will be available at either end of the bridge even if that is not currently the case.

b) Addressing the need for bicyclists and pedestrians to cross corridors as well as travel along them. Even here, bicyclists and pedestrians may not commonly travel along a particular corridor that is being improved or constructed, but they will likely need to be able to cross that corridor safely and conveniently. Therefore, the design of intersections and interchanges shall accommodate bicyclists and pedestrians in a manner that is safe, accessible and convenient.

c) Getting exceptions approved at an administrator level. Exceptions for the non-inclusion of bikeways and walkways shall be approved by an administrator and be documented with supporting data that indicates the basis for the decision.

d) Designing facilities to the best currently available standards and guidelines. The design of facilities for bicyclists and pedestrians should follow design guidelines and standards that are commonly used, such as the AASHTO Guide for the Development of Bicycle Facilities, AASHTO's Guide for the Planning, Design, and Operation of Pedestrian Facilities, AASHTO's A Policy on Geometric Design of Highways and Streets, and the ITE Recommended Practice "Design and Safety of Pedestrian Facilities". The design of the facilities for bicyclists and pedestrians should also follow the plans and design guidelines set forth in this plan as interpreted on a case-by-case basis.

5. The design of residential, commercial and mixed-use site developments should be in accordance with the best currently available guidelines. The design should incorporate the principals outlined in *The Canadian Guide to Promoting Sustainable Transportation Through Site Design* by the Canadian Institute of Traffic Engineers and other nationally accepted guidelines. Sites should be developed to provide direct pedestrian links between adjacent developments as well as provide for future connections.

3.2 ADA Compliance Issues

Title II of the Americans with Disabilities Act of 1990 (ADA) requires local governments to make their activities, programs and services accessible to persons with disabilities. In the area of non-motorized transportation, the City is required to use accessible design standards for newly constructed and reconstructed sidewalks and shared use paths and to the maximum extent feasible, make altered facilities readily accessible. In addition, the City is required to bring non-compliant curb ramps into compliance throughout the City as part of a transition plan.

The City's Americans with Disabilities Act Transition Plan, updated in 1999, states that the highest priority for curb ramp replacement should be in the downtown area. In addition, the Plan recommends that first priority for new sidewalk construction should be eliminating gaps in sidewalk and path systems that provide access to and from bus stops.

Three recent publications address accessibility of non-motorized facilities. They are:

1. Designing Sidewalks and Trails for Access Part 2 – Best Practices Design Guide (FHWA,Publication # FHWA-EP-01-027)

2. Building a True Community – Final Report of the Public Rights-of-Way Access Advisory Committee

3. Draft Guidelines for Accessible Rights-of-Way, November 23, 2005 (FHWA, Pub. # FHWA-SA-03-019, based in part on the preceding publication)

Together these documents define current best practices for accommodating pedestrians with disabilities for sidewalks and shared-use paths, intersections, crosswalks, and signalization. Until public rights-of-way standars are adopted by the Department of Justice and the U.S. Department of Transportation, the area must follow the ADA Accessibility Guidelines (ADAAG) standards. Once new standards are adopted, the MPO should provide focused training sessions for local government staff and private design and construction professionals to ensure that new transportation facilities are constructed properly.

3.3 Community Involvement and Encouragement Programs

Promoting non-motorized transportation through community involvement and encouragement is a critical component to the success of a non-motorized transportation plan. There are many creative approaches being used to involve and educate communities around the country about the importance of non-motorized transportation. Listed in the following paragraphs are a few. For further information on the subject, please consult the references below:

Rails-to-Trails Conservancy and the Association for Bike and Pedestrian Professionals. "Improving Conditions for Biking and Walking: A Best Practices Report." January 1998.

National Highway Traffic Safety Administration. *Pedestrian Safety Toolkit Resource Catalog.* January 1999.

Ride/Walk/Bus to Work

Communities around the country are using the Ride-to-Work Day as a means to educate and involve the public in non-motorized issues. Coordinating days or weeks that specifically promote bicycle commuting is a proven method of increasing number of people who commute by bike. The California Bike Commute Day has had amazing success on a very tiny budget. For the statewide event, transit agencies donated posters and registration cards, and the sale of event tee-shirts helped cover administration costs and limited advertising.

3.4 Maintenance of Non-motorized Facilities

The success of the region's non-motorized transportation system ultimately depends on thorough and timely maintenance of all its facilities. Typical problems that can occur on pedestrian and bike facilities include cracked pavement, standing water, obstructions in the clear zone such as sidewalk furniture, evergrown trees and shrubs, construction equipment and signs, and road debris. Without proper maintenance and removal of these problems, people are not encouraged or able to use non-motorized modes of transportation.

General Maintenance of Sidewalks
Regular and consistent maintenance of sidewalks, particularly along arterials and collectors, is important for non-motorized modes of travel. Conditions such as cracks, heaving from tree roots and surface spalling create trip hazards for pedestrians. Inadequate maintenance of sidewalks is not only dangerous, but can complicate any travel by pedestrians who are elderly or have mobility impairments.

In addition to the sidewalk condition inspections program, a proactive approach to sidewalk maintenance is necessary to support non-motorized travel. This approach should include an annual asphalt path maintenance program for shared use paths and trails in area parks; easily accessible web-based complaint forms; and systematic tree and brush trimming along sidewalks and shared use paths adjacent to major streets and in area parks. In addition, research should be done to determine how to minimize the impacts of street tree root damage to sidewalks.

Crosswalks
While motorists can tolerate bumpy roads, uneven pavement surfaces at intersection crosswalks can be hazardous for pedestrians. Additional criteria should be considered to identify those pedestrian crossings that are in need of resurfacing. In addition to a smooth pavement surface, crosswalks need markings that provide good contrast for motorists and a non-slip surface for pedestrians.

Bicycle Lane Striping and Sweeping
Motor vehicles tend to sweep debris into bicycle lanes filling them with debris quicker than the motor vehicle lanes. If debris is left in place it becomes a hazard for cyclists and some cyclists will no longer ride in the bicycle lanes. To avoid this problem, bicycle lanes should receive more frequent sweeping. This has the added benefit of reducing the amount of sediment washed into the storm sewer system and some communities have increased the frequency of street cleaning solely for that purpose.

Maintaining visibility and reflectivity of bicycle lane pavement markings and symbols are important to nighttime cycling safety, especially when raining. Materials used for bicycle markings should be non-slip.

The MPO should also undertake a public awareness campaign on the value of keeping bicycle lanes and curbs in general free of debris to promote bicycle safety and water quality. Citizens should be encouraged to sweep bicycle lanes and curb areas to supplement scheduled maintenance.

Problem Identification and Prioritization

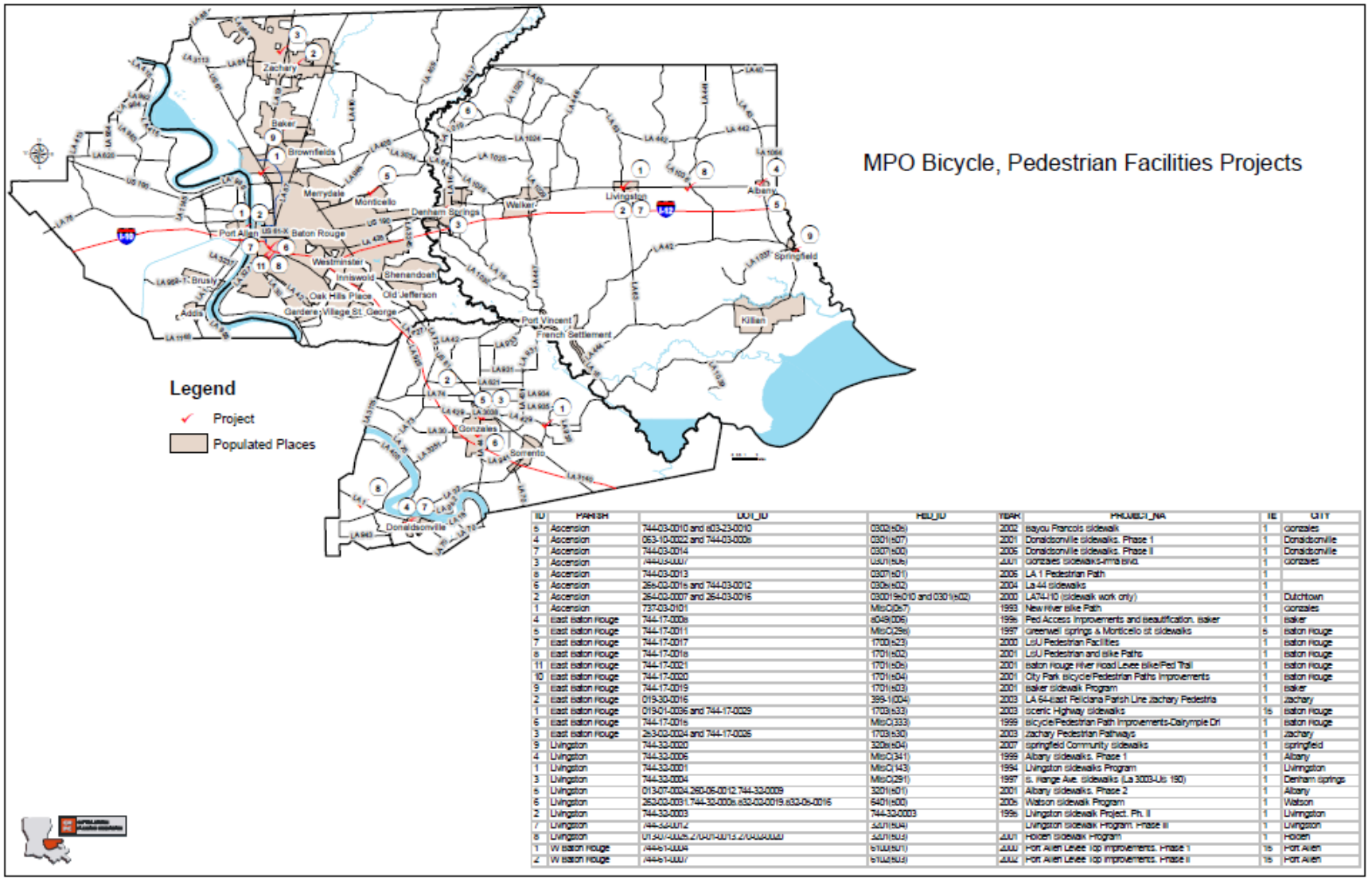
Encouraging the community to identify non-motorized facility problems and maintenance issues can save local government staff both time and resources. Public participation also allows citizens to feel that its local government is responding to their needs and concerns. The City of Portland, Oregon uses a phone hotline, web pages and postcard/comment cards to aid citizens in reporting maintenance issues. Problems may include malfunctioning pedestrian signals, gaps in the sidewalk system, maintenance of crosswalk or bicycle lane markings, or debris in bicycle lanes. In addition to providing comment cards at locations such as bicycle stores and public buildings, the local governments should set up web-based forms that allow tracking of service requests and direct the request to the appropriate person.

One area that demands particular attention is pedestrian-activated crosswalk signals that are not functioning properly. By the time pedestrians have completed their trip, they may not remember or do not know how to report the problem. Posting a phone number on the post, along with the fixture number, could allow those with cell phones to call in a report.

MAPS

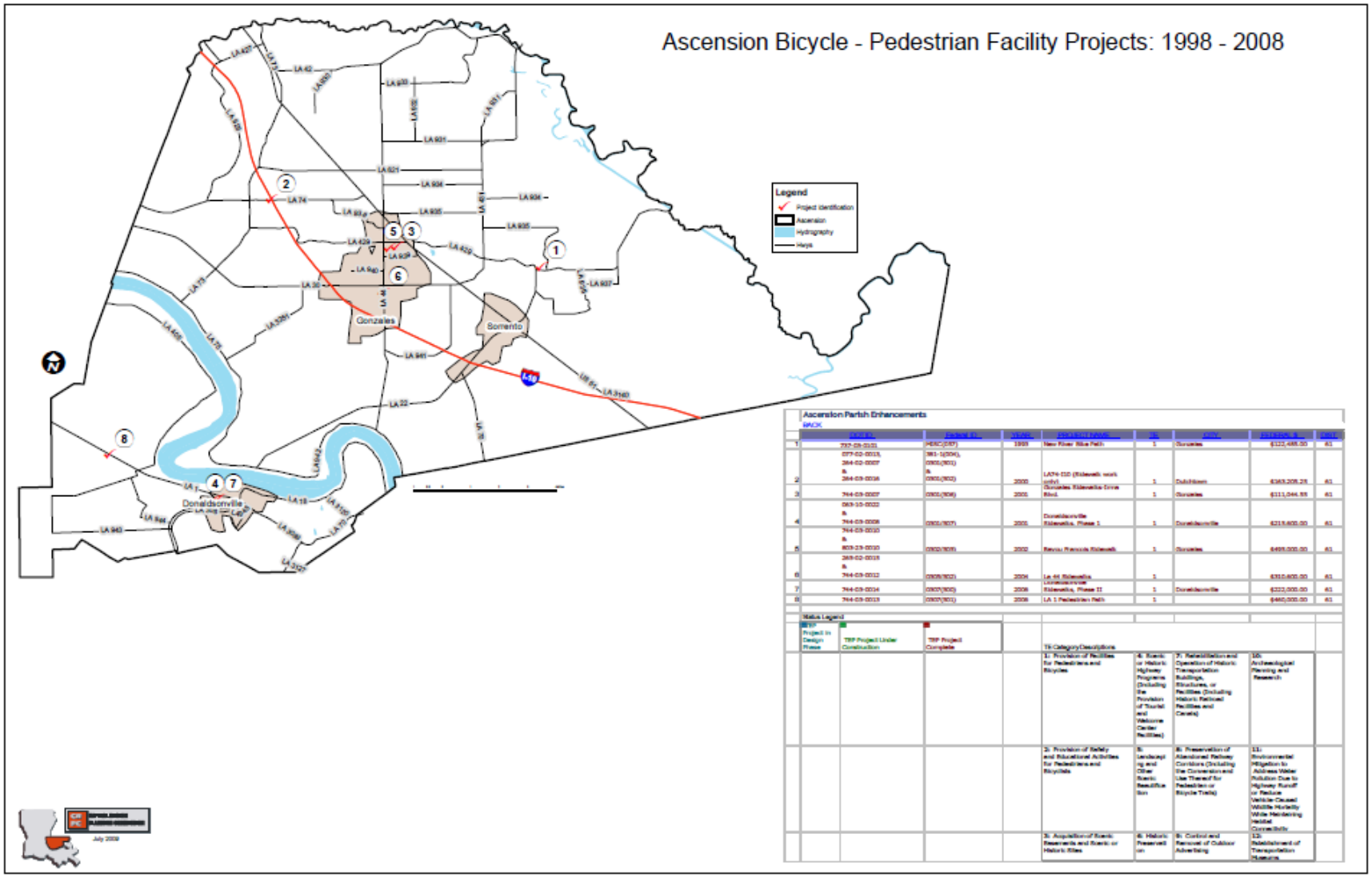
Map A—Current Non-Motorized Projects in MPO Region
Map B—Current Non-Motorized Projects in Ascension Parish
Map C—Current Non-Motorized Projects in East Baton Rouge Parish
Map D—Current Non-Motorized Projects in Livingston Parish
Map E—Current Non-Motorized Projects in West Baton Rouge Parish

Map A



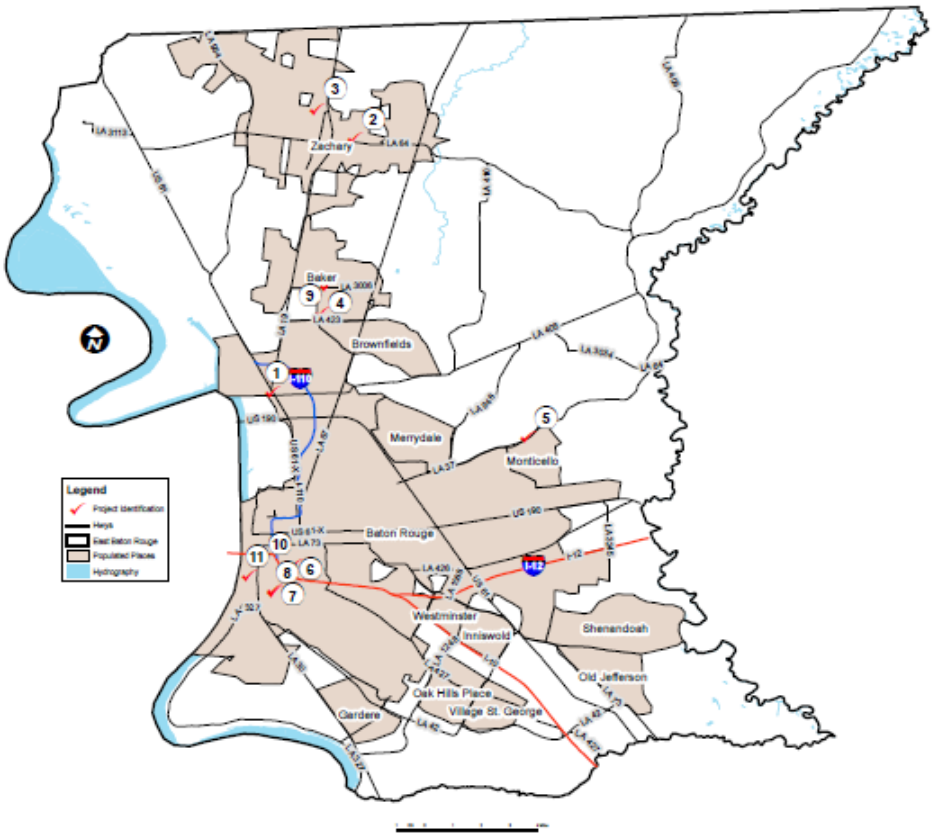
ID	PARISH	DOT_ID	FED_ID	YEAR	PROJECT_NA	TE	CITY
5	Ascension	744-03-0010 and 803-23-0010	0302(s05)	2002	bayou Francois sidewalk	1	gonzales
4	Ascension	063-10-0022 and 744-03-0006	0301(s07)	2001	Donaldsonville sidewalks, Phase 1	1	Donaldsonville
7	Ascension	744-03-0014	0307(s00)	2005	Donaldsonville sidewalks, Phase II	1	Donaldsonville
3	Ascension	744-03-0007	0301(s06)	2001	gonzales sidewalks-irma blvd.	1	gonzales
8	Ascension	744-03-0013	0307(s01)	2005	LA 1 Pedestrian Path	1	
6	Ascension	264-02-0015 and 744-03-0012	0306(s02)	2004	La 44 sidewalks	1	
2	Ascension	264-02-0007 and 264-03-0015	0300(19s010 and 0301(s02)	2000	LA74-10 (sidewalk work only)	1	Dutchtown
1	Ascension	737-03-0101	MiscO(b7)	1993	New river bike Path	1	gonzales
4	east baton rouge	744-17-0006	s048(006)	1998	Ped Access Improvements and beautification, baker	1	baker
5	east baton rouge	744-17-0011	MiscO(29s)	1997	greenwell springs & Monticello st sidewalks	5	baton Rouge
7	east baton rouge	744-17-0017	1700(s23)	2000	LsU Pedestrian Facilities	1	baton Rouge
8	east baton rouge	744-17-0018	1701(s02)	2001	LsU Pedestrian and bike Paths	1	baton Rouge
11	east baton rouge	744-17-0021	1701(s05)	2001	baton rouge river road Levee bike/Ped Trail	1	baton Rouge
10	east baton rouge	744-17-0020	1701(s04)	2001	City Park bicycle/Pedestrian Paths Improvements	1	baton Rouge
9	east baton rouge	744-17-0019	1701(s03)	2001	baker sidewalk Program	1	baker
2	east baton rouge	019-30-0016	399-1(004)	2003	LA 64-east Feliciana Parish Line zachary Pedestria	1	zachary
1	east baton rouge	019-01-0036 and 744-17-0029	1703(s33)	2003	scenic Highway sidewalks	1s	baton Rouge
6	east baton rouge	744-17-0016	MiscO(333)	1999	bicycle/Pedestrian Path Improvements-Dalrymple Dr	1	baton Rouge
3	east baton rouge	263-02-0004 and 744-17-0025	1703(s30)	2003	zachary Pedestrian Pathways	1	zachary
9	Livingston	744-33-0020	3208(s04)	2007	springfield Community sidewalks	1	springfield
4	Livingston	744-33-0005	MiscO(341)	1999	Albany sidewalks, Phase 1	1	Albany
1	Livingston	744-33-0001	MiscO(143)	1994	Livingston sidewalks Program	1	Livingston
3	Livingston	744-33-0004	MiscO(291)	1997	s. Range Ave. sidewalks (La 3003-Uti 190)	1	Denham springs
5	Livingston	013-07-0004,260-05-0012,744-33-0009	3201(s01)	2001	Albany sidewalks, Phase 2	1	Albany
6	Livingston	252-03-0031,744-33-0006,s33-03-0019,s33-0s-0016	6401(s00)	2005	Watson sidewalk Program	1	Watson
2	Livingston	744-33-0003	744-33-0003	1998	Livingston sidewalk Project, Ph. II	1	Livingston
7	Livingston	744-33-0012	3201(s04)		Livingston sidewalk Program, Phase III	1	Livingston
8	Livingston	013-07-0025,260-05-0015,744-33-0030	3201(s03)	2001	Holden sidewalk Program	1	Holden
1	W baton Rouge	744-61-0004	s101(s01)	2001	Port Allen Levee top improvements, Phase I	1s	Port Allen
2	W baton Rouge	744-61-0007	s101(s03)	2002	Port Allen Levee top improvements, Phase II	1s	Port Allen

Map B


Ascension Bicycle - Pedestrian Facility Projects: 1998 - 2008
Legend
Project Identification
Ascension
Hydrography
Hwys
Gonzales
Sorrento
Donaldsonville
Ascension Parish Enhancements
BACK

Map C

East Baton Rouge Bicycle - Pedestrian Facility Projects: 1998 - 2008



E Baton Rouge Parish Enhancements

BACK

	DOTD ID	Federal ID	YEAR	PROJECT NAME	TE	CITY	FEDERAL $	DIST
1	019-01-0035 & 744-17-0029	1703(533)	2003	Scenic Highway Sidewalks	1,5	Baton Rouge	$227,910.0	61
2	019-30-0016	999-1(504)	2003	LA 64-East Feliciana Parish Line Zachary Pedestrian/Bike Path	1	Zachary	$250,000.0	61
3	253-02-0024 & 744-17-0026	1703(530)	2003	Zachary Pedestrian Pathways	1	Zachary	$190,000.0	61
4	744-17-0008	8049(506)	1995	Ped Access Improvements and Beautification, Baker	1	Baker	$96,000.0	61
5	744-17-0011	MISC(298)	1997	Greenway Springs & Monticello st sidewalks	1	Baton Rouge	$355,000.0	61
6	744-17-0015	MISC(333)	1999	Bicycle/Pedestrian Path Improvements-Dalrymple Drive	1	Baton Rouge	$628,600.0	61
7	744-17-0017	1705(523)	2000	LSU Pedestrian Facilities	1	Baton Rouge	$45,993.0	61
8	744-17-0018	1701(502)	2001	LSU Pedestrian and Bike Paths	1	Baton Rouge	$600,000.0	61
9	744-17-0019	1701(503)	2001	Baker Sidewalk Program	1	Baker	$117,602.7	61
10	744-17-0020	1701(504)	2001	City Park Bicycle/Pedestrian Path Improvements	1	Baton Rouge	$190,000.0	61
11	744-17-0021	1701(505)	2001	Mississippi River Road Levee Bike/Ped Trail	1	Baton Rouge	$1,000,550.0	61

Status Legend

BP Project in Design Phase	BP Project Under Construction	BP Project Complete

TE Category Descriptions

1: Provision of Facilities for Pedestrians and Bicycles	4: Scenic or Historic Highway Programs (including the Provision of Tourist and Welcome Center Facilities)	7: Rehabilitation and Operation of Historic Transportation Buildings, Structures, or Facilities (including Historic Railroad Facilities and Canals)	10: Archaeological Planning and Research
2: Provision of Safety and Educational Activities for Pedestrians and Bicyclists	5: Landscaping and Other Scenic Beautification	8: Preservation of Abandoned Railway Corridors (including the Conversion and Use Thereof for Pedestrian or Bicycle Trails)	11: Environmental Mitigation to Address Water Pollution Due to Highway Runoff or Reduce Vehicle-Caused Wildlife Mortality While Maintaining Habitat Connectivity
3: Acquisition of Scenic Easements and Scenic or Historic Sites	6: Historic Preservation	9: Control and Removal of Outdoor Advertising	12: Establishment of Transportation Museums

Map D

Livingston Bicycle - Pedestrian Facility Projects: 1998 - 2008

Livingston Parish Enhancements

BACK

	DOTD ID	Federal ID	YEAR	PROJECT NAME	TE	CITY	FEDERAL $	DIST
1	744-32-0001	HSIC(143)	1994	Livingston Sidewalks Program	1	Livingston	$118,346.00	62
2	744-32-0003	HSIC(241)	1995	Livingston Sidewalk Project, Ph. II	1	Livingston	$134,289.00	62
3	744-32-0004	HSIC(291)	1997	S. Range Ave. Sidewalk (La 3003-US 190)	1	Denham Springs	$232,000.00	62
4	744-32-0006	HSIC(341)	1999	Albany Sidewalks, Phase I	1	Albany	$58,444.00	62
5	013-07-0024, 260-06-0012, & 744-32-0009	3201(501)	2001	Albany Sidewalks, Phas	1	Albany	$138,035.0	62
6	262-02-0031, 744-32-0008, 832-02-0019, 832-05-0016 & 832-40-0001	6401(500)	2001	Watson Sidewalk Progr	1	Watson	$208,000.0	62
7	744-32-0012	3201(504)	2001	Livingston Sidewalk Program, Phase III	1	Livingston	$285,000.00	62
8	013-07-0025, 270-01-0013, 270-02-0020 & 744-32-0011	3201(503)	2001	Holden Sidewalk Progra	1	Holden	$224,000.0	62
9	744-32-0020	3200(504)	2007	Springfield Community Sidewalks	1	Springfield	$114,000.00	62

Status Legend

TEP Project in Design Phase | TEP Project Under Construction | TEP Project Complete

TE Category Descriptions

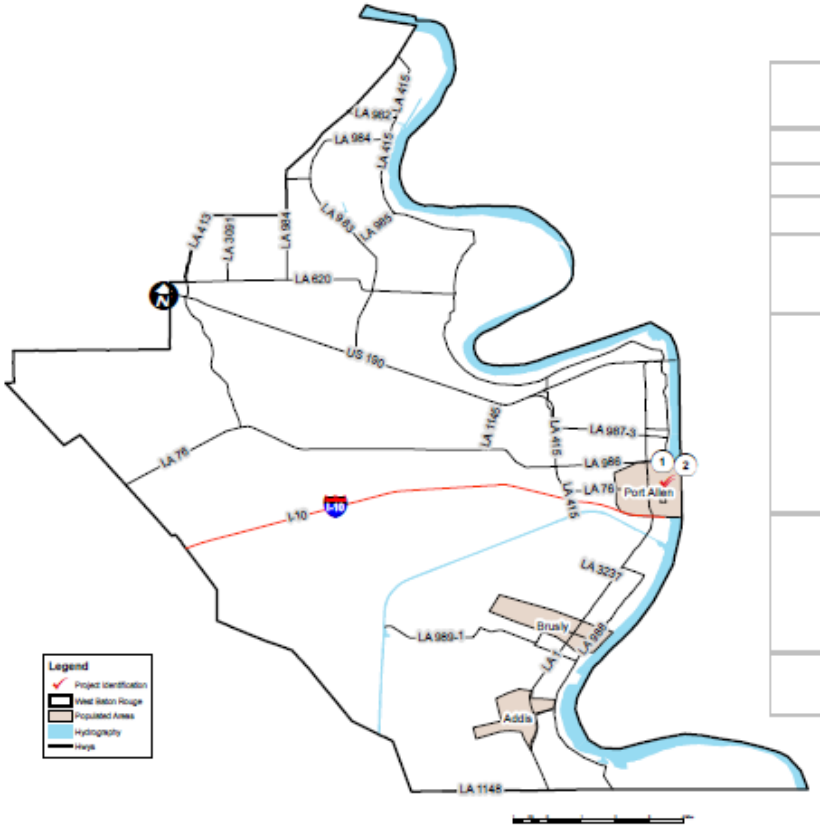
1 Provision of Facilities for Pedestrians and Bicycles | 4 Scenic or Historic Highway Program (Including the Provision of Tourist and Welcome Center Facilities) | 7 Rehabilitation and Operation of Historic Transportation Buildings, Structures or Facilities (Including Historic Railroad Facilities and Canals) | 10 Archaeological Planning and Research

2 Provision of Safety and Educational Activities for Pedestrians and Bicyclists | 5 Landscaping and Other Scenic Beautification | 8 Preservation of Abandoned Railway Corridors (Including the Conversion and Use Thereof for Pedestrian or Bicycle Trails) | 11 Environmental Mitigation to Address Water Pollution Due to Highway Runoff or Reduce Vehicle-Caused Wildlife Mortality While Maintaining Habitat Connectivity

3 Acquisition of Scenic Easements and Scenic or Historic Sites | 6 Historic Preservation | 9 Control and Removal of Outdoor Advertising | 12 Establishment of Transportation Museum

Map E

West Baton Rouge Bicycle - Pedestrian Facility Projects: 1998 - 2008



W Baton Rouge Parish Enhancements

BACK

	DOT ID	Federal ID	YEAR	PROJECT NAME	TE	CITY	FEDERAL $	DIST
1	744-61-0004	6100(501)	2000	Port Allen Levee Top Improvements, Phase 1	1,5	Port Allen	$759,000.0	61
2	744-61-0007	6102(503)	2002	Port Allen Levee-Top Improvements, Phase II	1,5	Port Allen	$280,000.0	61

Status Legend

TEP Project in Design Phase | TEP Project Under Construction | TEP Project Complete

TE Category Descriptions

					1: Provision of Facilities for Pedestrians and Bicycles	4: Scenic or Historic Highway Programs (Including the Provision of Tourist and Welcome Center Facilities)	7: Rehabilitation and Operation of Historic Transportation Buildings, Structures, or Facilities (Including Historic Railroad Facilities and Canals)	10: Archaeological Planning and Research
					2: Provision of Safety and Educational Activities for Pedestrians and Bicyclists	5: Landscaping and Other Scenic Beautification	8: Preservation of Abandoned Railway Corridors (Including the Conversion and Use Thereof for Pedestrian or Bicycle Trails)	11: Environmental Mitigation to Address Water Pollution Due to Highway Runoff or Reduce Vehicle-Cause Wildlife Mortality While Maintaining Habitat Connectivity
					3: Acquisition of Scenic Easements and Scenic or Historic Sites	6: Historic Preservation	9: Control and Removal of Outdoor Advertising	12: Establishment of Transportation Museums

REFERENCES

2008 Baton Rouge MPO Transportation Plan Update

American Association of State Highway & Transportation Officials (AASHTO)

Louisiana Statewide Bicycle and Pedestrian Master Plan

Bicycle Pedestrian Plan for East Baton Rouge Parish

Victoria Transport Institute

Pierce County Non-Motorized Transportation Plan

City of Ann Arbor Non-Motorized Transportation Plan