CITY OF ASHLAND

Transportation System Plan

BICYCLE AND PEDESTRIAN FACILITY DESIGN TOOLKIT

KITTELSON & ASSOCIATES, INC.
TRANSPORTATION PLANNING / TRAFFIC ENGINEERING
alta PLANNING + DESIGN
CITY OF ASHLAND

The City of Ashland is committed to providing a quality pedestrian and bikeway network that will encourage healthy and active lifestyles. The following Bicycle and Pedestrian Facility Design Toolkit provides a menu of options to improve facilities for bicyclists and pedestrians—facilities that increase user comfort and make active transportation more attractive. The Toolkit offers comprehensive design guidance based on information compiled by Alta Planning + Design and Kittelson & Associates and the following reference materials:

- Association of State Highway and Transportation Officials (AASHTO) Guide for the Development of Bicycle Facilities
- Manual of Uniform Traffic Control Devices (MUTCD) 2009 Chapter 9: Traffic Controls for Bicycle Facilities
- National Association of City Transportation Officials (NACTO) Urban Bikeway Design Guide
- Americans with Disabilities Act (ADA) Standards for Accessible Design

The Toolkit provides a brief description of each individual treatment along with technical information, typical application, peer commuities that are actively using the treatment and documents that can provide additional guidance. Facility costs can vary significantly by jurisdiction due to differences in materials and labor costs, among other contributing factors. As a result, the cost estimates in this Toolkit have been separated into three categories: HIGH, MEDIUM and LOW. These designations are meant only to illustrate the relative cost of individual facilities in relation to the other treatments included in the Toolkit.

DESIGN SUMMARY ≫

Shared lane markings (SLM's), also known as "sharrows", are often used on streets where dedicated bike lanes are desirable but not possible due to physical or other constraints. Such markings delineate where bicyclists should operate within a shared vehicle/bicycle travel lane. SLM's are not a substitute for conventional bike lanes and should not be used as such. Benefits of SLM's include:

- Correctly position bicyclists in the travel lane and away from parked cars (if any)
- Encourage bicyclists to ride in a straight line so that their movement is predictable to motorists
- Alert motorists to expect the prescence of bicyclists

DIMENSIONS:

- See MUTCD Section 9C.07
- Must be positioned 4' min. from curb or 11' min. from curb if on-street parallel parking is present

TYPICAL APPLICATION:

- Streets with traffic volumes < 3,000 AADT
- Streets with posted travel speeds < 35 mph

COST:

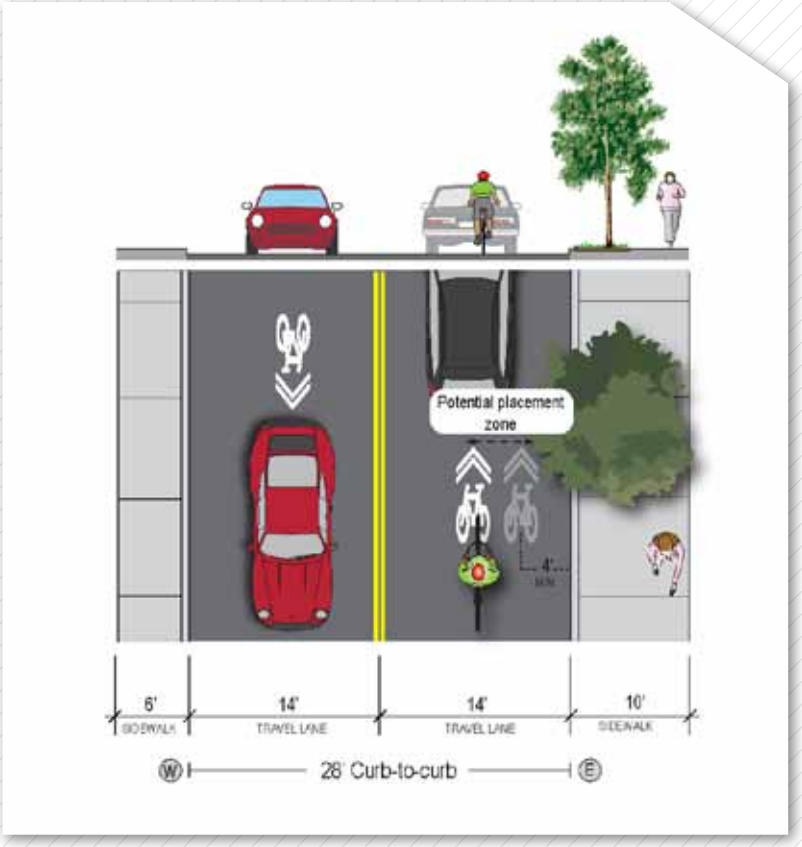
- Low

PEER COMMUNITIES:

- SLM's are widely adopted throughout the US

ADDITIONAL GUIDANCE:

- Manual on Uniform Traffic Control Devices (MUTCD) Chapter 9: Traffic Control for Bicycle Facilities, National Association of City Transportation Officials (NACTO) Urban Bikeway Design Guide



Shared Lane Markings being used on a local street with no on-street parking

Shared Lane Markings adjacent to parking encourage bicyclists to ride outside the "door zone"

DESIGN SUMMARY

Traditional bike lanes can be uncomfortable for cyclists on high-volume or high-speed roadways, as automobiles pass or are parked too close to bicyclists. Buffered bike lanes are designed to increase the space between the bike lanes and the travel lane or parked cars. Advantages of buffered bike lanes include:

- Providing motorists greater separation between cyclists and motor vehicles
- Providing additional space for cyclists to avoid door openings
- Providing space for cyclists to pass one another without encroaching into the travel lane

DIMENSIONS:

- Same as a Conventional Bike Lane (5' to 6') with the addition of a 2' to 3' painted buffer on either or both the travel lane and/or parking side of the bike lane

TYPICAL APPLICATION:

- Any location where traditional bike lanes do not provide sufficient comfort for cyclists
- Streets with posted travel speeds > 25 mph

COST:

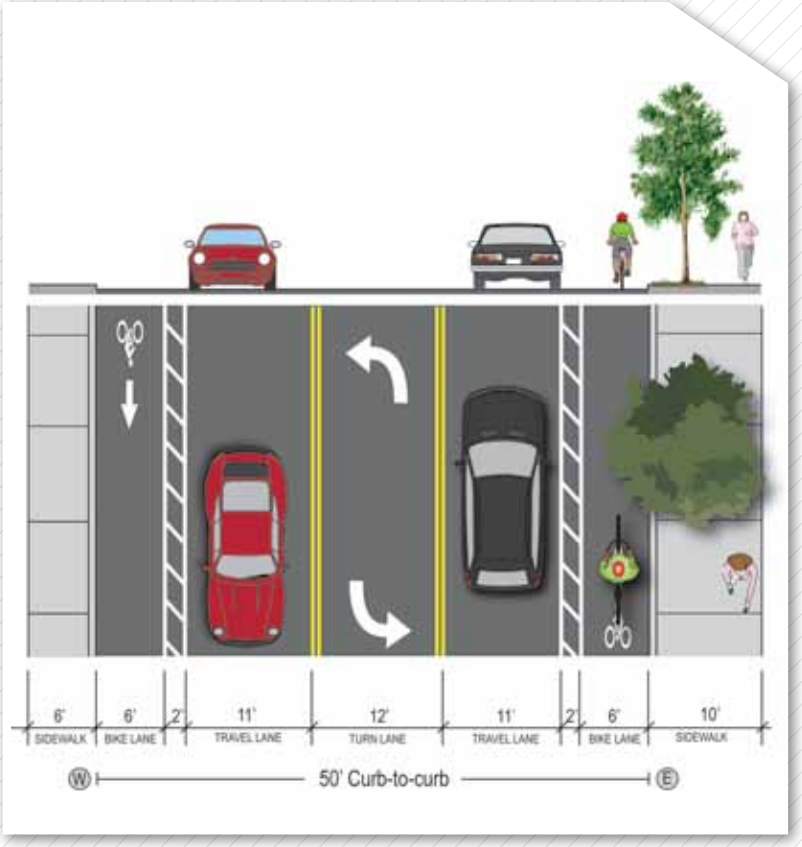
- Medium

PEER COMMUNITIES:

- Marin County, California; Portland, Oregon; Seattle, Washington

ADDITIONAL GUIDANCE:

- NACTO Urban Bikeway Design Guide, CROW Design Manual, London Bicycle Design Standards



Buffered bike lanes increase the shy distance between passing motorists and bicyclists

A bike commuter in an urban setting rides comfortably in the buffered bike lane

DESIGN SUMMARY ≫

Bicyclists are especially vulnerable at locations where there is ambiguity between the rights-of-way of motor vehicle and bicycle traffic. Some jurisdictions use colored bike lanes to guide cyclists through major vehicle/bicycle conflict points (FHWA requires green colored pavement). These conflict areas include at intersections or merge areas. Colored bike lanes typically extend through the entire bicycle/vehicle conflict zone (e.g., through the entire intersection, or through the transition zone where motorists cross a bike lane to enter a dedicated right turn lane). Use these treatments to:

- Draw attention to conflict areas
- Increase motorist yielding behavior
- Emphasize expectation of bicyclists on the road

DIMENSIONS:

- Width is the same as a conventional bike lane with addition of colored thermoplastic and dashed lines

TYPICAL APPLICATION:

- Streets with traffic volumes > 3,000 AADT
- Streets with posted travel speeds > 25 mph

COST:

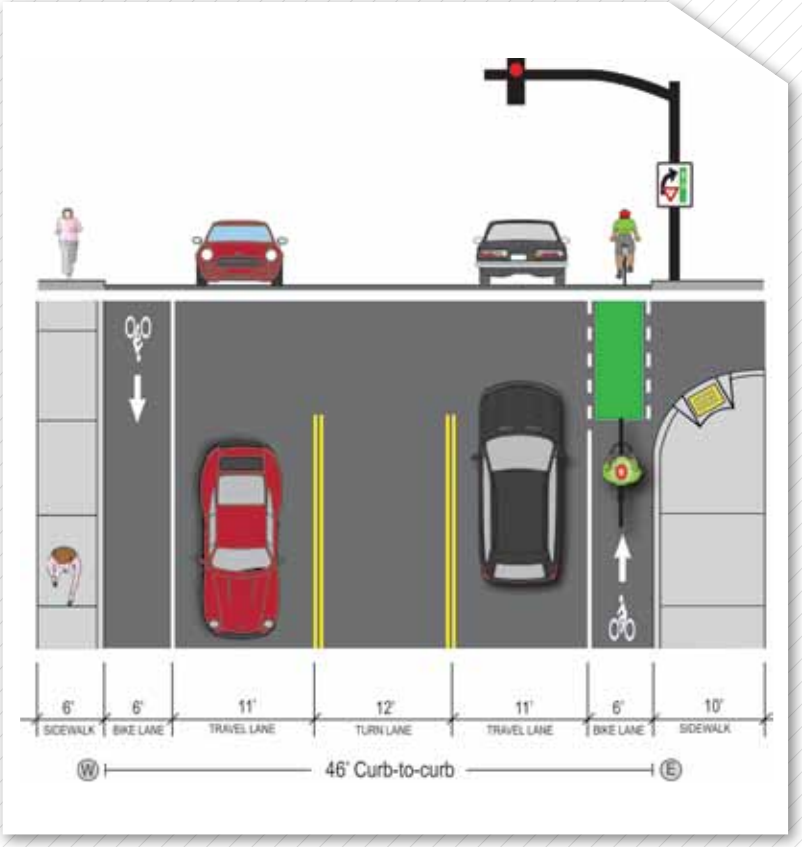
- High

PEER COMMUNITIES:

- Los Angeles County, California; Detroit, Michigan

ADDITIONAL GUIDANCE:

- MUTCD (interim approval; see Section 3G.01), NACTO Urban Bikeway Design Guide



Colored bike lanes increase visibility of bicyclists in a transition zone

On this rural highway in Central Oregon colored pavement is added to heighten visibility

DESIGN SUMMARY ≫

Protected cycle tracks are at-grade bikeway facilities that utilize existing on-street parking and a painted buffer to separate bicyclists from motor vehicle traffic. Cycle tracks provide many of the comforts of a shared use path within the road right-of-way. Benefits of protected cycle tracks include:

- Dedicates and protects space for bicyclists and improves comfort
- Reduces risk of 'dooring' compared to a bike lane, and eliminates the risk of a doored cyclist being struck by a motor vehicle
- Low implementation cost through use of existing pavement using parking lane as a barrier

DIMENSIONS:

- 5' to 7' plus 3' buffer separating on-street parking from bike lane
- By moving cyclists behind parked vehicles bicyclists are less visible at intersections. As a result, greater design emphasis is required to provide sufficient sight lines at intersections and for the treatment of pedestrian crossings of the cycle track

TYPICAL APPLICATION:

- Streets with multiple lanes and high traffic volumes
- Streets with high travel speeds (≧ 30 mph)
- Streets with high parking turnover (ensures the cycle track is sufficiently protected throughout the day)
- Street segments with few intersecting driveways or cross-streets

COST:

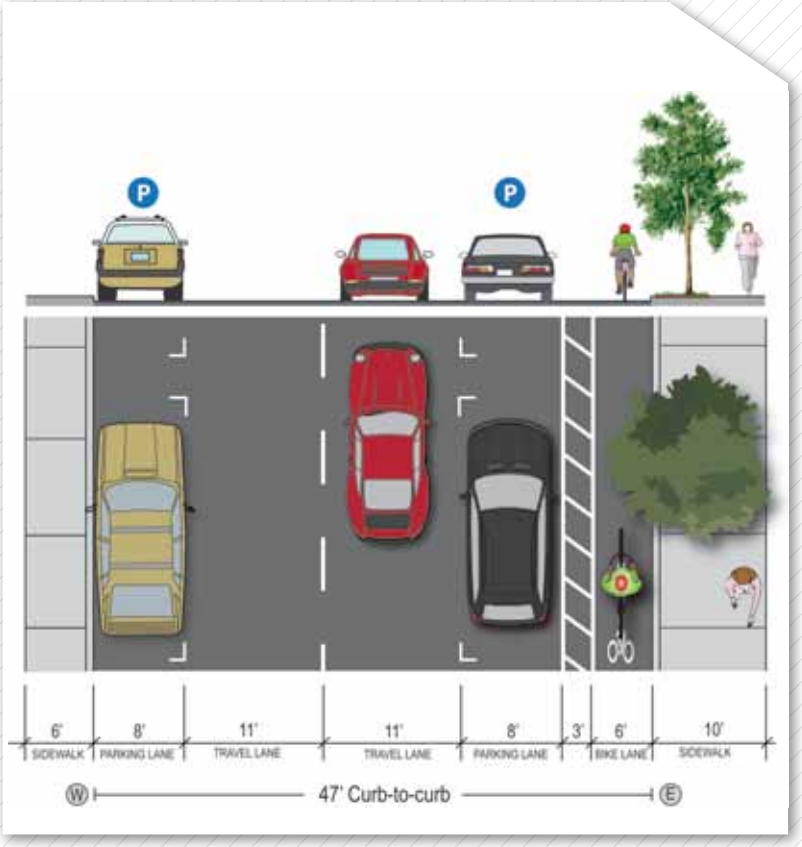
- Low

PEER COMMUNITIES:

- Portland, Oregon; Missoula, Montana; New York City, New York City, New York

ADDITIONAL GUIDANCE:

- NACTO Urban Bikeway Design Guide, Portland Bicycle Plan for 2030 (Appendix D)



A protected cycle track near Portland State University allows students, faculty and staff to more easily bicycle to campus

The 9th Street cycle track in NYC is located on the left side of the street to reduce conflicts between turning motorists

DESIGN SUMMARY ≫

At some intersections bicyclists require additional assistance in making certain movements, (e.g. bicycle only movements separate to traffic movements and where there are turning conflicts with motorists, transit, or pedestrians). In these areas, bicycle signal heads can be used to provide additional guidance to bicyclists and other roadway users. Bicycle signals are used in combination with conventional traffic signals and use the standard green, yellow, red lenses with the addition of a bicycle stencil. These treatments:

- Prioritize bicycle movements and separates them from conflicting vehicle traffic movements
- Improves comfort for bicyclists
- Are preferable to instructing bicyclists to use pedestrian signals

DIMENSIONS:

- Signal head should be clearly visible to oncoming bicycles
- Bicycle phase should provide adequate clearance time and actuation/ detection (if not pretimed)

TYPICAL APPLICATION:

- Intersections with bicycle only movements or conflicts with other roadway users
- Multi-use path crossings and other high bicycle volume locations

COST:

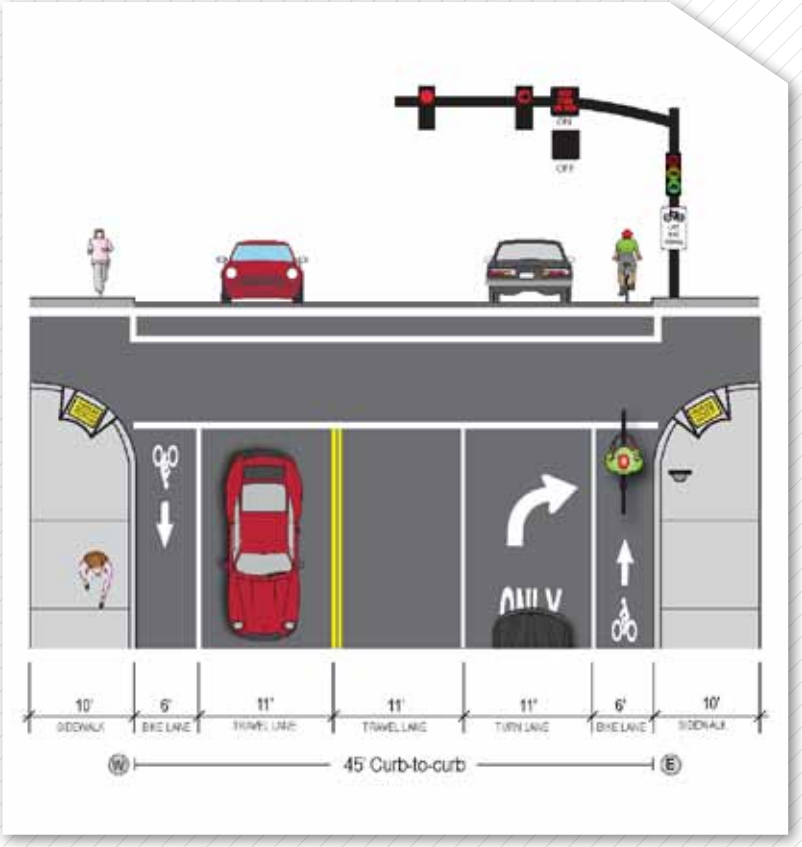
- High

PEER COMMUNITIES:

- Portland, OR; Davis, CA; Washington, DC; Alexandria, VA

ADDITIONAL GUIDANCE:

- Currently there are no standards for determining bicycle clearance times. Design and operation should consider general MUTCD guidance, local conditions, and engineering judgment



A bicycle signal in use in San Luis Obispo keeps motorists and bicyclists separated in time

A bicycle signal with accompanying signage alerting bicyclists to obey the signal

DESIGN SUMMARY ≫

Left-turns are often difficult for bicyclists, especially when cyclists must make their turn from a bike facility on the right side of the street by crossing vehicle traffic lanes. Two-stage turn boxes (sometimes referred to as Copenhagen lefts, hook turns, or box turns) provide an option for bicyclists to safely make left turns in two stages. In a two-stage left turn, cyclists proceed straight through the intersection with the green signal and wait in a queue box in front of vehicle traffic on the cross street to proceed through the intersection when the cross street gets a green signal. These treatments:

- Increase bicyclist comfort making left turns
- Reduce conflicts between bicyclists, turning motorists, and pedestrians in the crosswalk
- Are preferable to instructing bicyclists to use pedestrian signals
- Disadvantage: Increases signal delay for bicyclists

DIMENSIONS:

- Up to 9' long and 3' wide with bicycle stencil and turn arrow pavement markings. Green thermoplastic background is recommended
- Located in a protected area between bike lane and parking lane or setback crosswalk on streets with no parking lane
- Located between cycle track and motor vehicle travel lane on streets with cycle tracks to the right of on-street parking

TYPICAL APPLICATION:

- Signalized intersections
- Streets with high traffic volumes and/or speeds
- Streets with a significant number of bicyclists making left-turns

COST:

- Low (without thermoplastic) Medium (with green background)

PEER COMMUNITIES:

- Portland, OR; New York City, NY

ADDITIONAL GUIDANCE:

- CROW, Portland Bikeway Facility Design Guide

Source: NACTO

A two-stage left turn box in use near Portland State University allows bicyclist to safely wait for traffic to clear before crossing

In Vancouver, BC bicyclists are directed to use the left-turn queue box via colored directional pavement markings

DESIGN SUMMARY

Bike boxes move back the stop bar for vehicles at signalized intersections in order to create a designated area for bicyclists to wait during the red signal phase. Bike boxes create a more comfortable and safe environment for cyclists by increasing their visibility to motorists and providing them a way to get ahead of queued traffic.

- Increases visibility and safety of cyclists
- Helps prevent "right-hook" conflicts between cyclists and vehicles
- Facilitates cyclist left turns and transitions from right to left side bike lanes (if box extends across entire intersection)

DIMENSIONS:

- Transverse lines shall be used to create a bike box 10' to 16' deep and indicate where motor vehicles are required to stop (MUTCD 3B.16)
- A Bike Symbol or Helmeted Bicyclist Symbol (MUTCD 9C-3A or 9C-3B) shall be centered between the crosswalk line and stop line
- Bike boxes may be combined with a green colored thermoplastic background

TYPICAL APPLICATION:

- Signalized intersections on streets with bike lanes or cycle tracks
- Intersections with high volumes of motorists and bicyclists
- intersections with frequent motorist right-turns and/or bicyclist left-turn

COST:

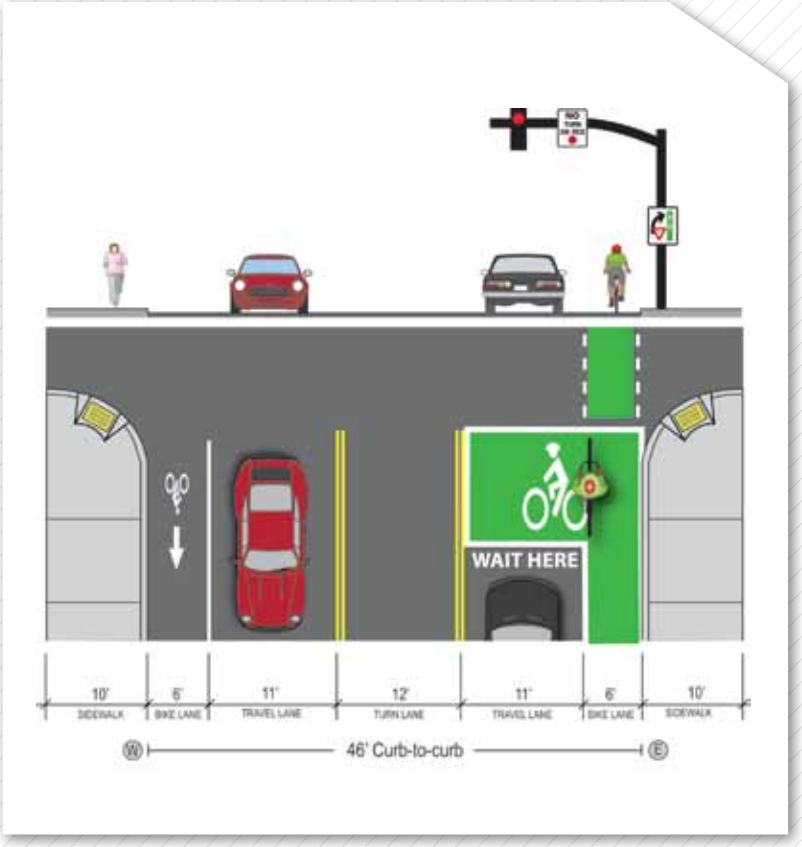
- Medium (without thermoplastic base) High (with green background)

PEER COMMUNITIES:

- Portland, Oregon; New York City, New York; Copenhagen, Denmark

ADDITIONAL GUIDANCE:

- NACTO Urban Bikeway Design Guide, MUTCD



A blue bike box in Vancouver, BC alerts motorists to remain behind bicyclists waiting for a signal

One of Portland's first green bike boxes located at SW 14th Ave and Burnside Street

DESIGN SUMMARY ≫

Wayfinding signs are typically placed at key locations leading to and along bike routes, including where multiple routes intersect and at key bicyclist "decision points." Wayfinding signs displaying destinations, distances and "riding time" can dispel common misperceptions about time and distance while increasing users' comfort and accessibility to key destinations.

- A cost-effective yet highly-visible treatment that can improve the riding environment
- Visually cue motorists that they are driving along a bicycle route and should correspondingly use caution
- May be combined with on-street pavement markings

DIMENSIONS:

- Note that too many signs tend to clutter the right-of-way, and it is recommended that these signs be posted at a level most visible to bicyclists and pedestrians, rather than per vehicle signage standards.

TYPICAL APPLICATION:

- Designated bicycle routes
- Bicycle Boulevards

COST:

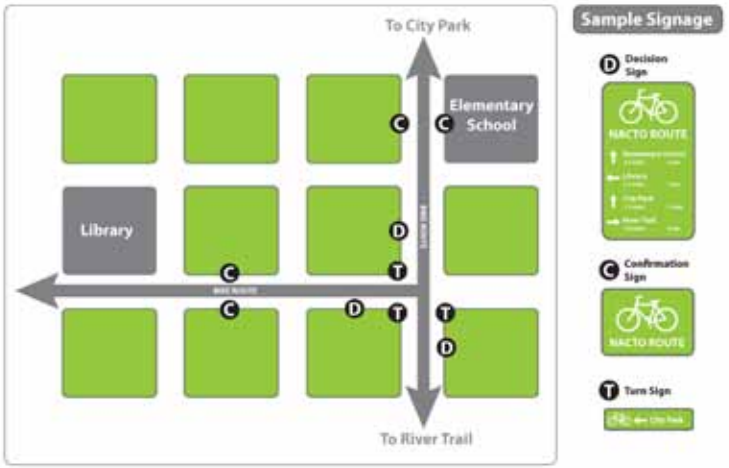
- Low

PEER COMMUNITIES:

- Wayfinding signage is standard in many communities in the US

ADDITIONAL GUIDANCE:

- MUTCD, NACTO Urban Bikeway Design Guide, Bicycle Boulevard Planning and Design Handbook, www.ibpi.usp.pdx.edu/guidebook.php



Source: NACTO

An example of some generic bike route wayfinding signage commonly found in communities across the US

Wayfinding signage in Eugene, Oregon provides bicyclists with direction, distance and average ride time to key destinations

DESIGN SUMMARY ≫

Bike-only entrances, also known as "choker entrances" are intersection curb extensions or raised islands allowing full bicycle passage while restricting vehicle access. When motorists approach a bike-only entrance at a cross-street they must turn onto the cross-street while bicyclists may continue through the intersection. These devices can also be designed to permit some vehicle turning movements from a cross-street onto the through street while restricting other movements.

- Maintain through bicycle travel on a street while physically restricting through vehicle traffic
- Direct through vehicle traffic onto parallel higher-order streets
- Most effective when higher-order streets can sufficiently accommodate the diverted traffic

TYPICAL APPLICATION:

- Bicycle Boulevards or other low-traffic streets where motor vehicle cut-through traffic is not desired

COST:

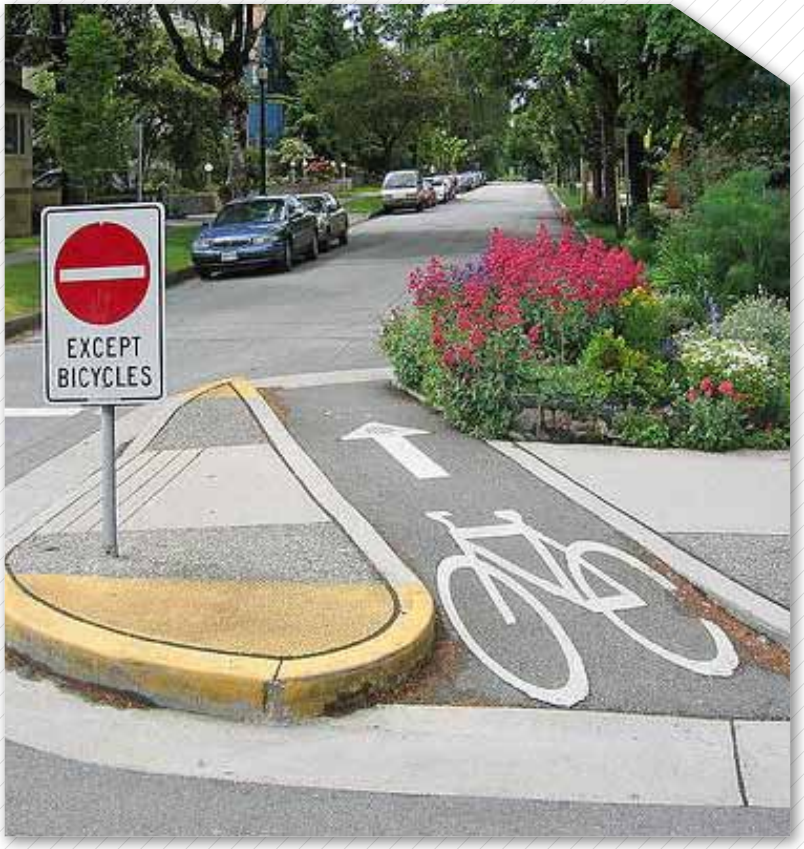
- Low

PEER COMMUNITIES:

- Portland, Oregon; Vancouver, British Columbia

ADDITIONAL GUIDANCE:

- Alta Planning + Design and IBPI, Bicycle Boulevard Planning and Design Handbook, www.ibpi.usp.pdx.edu/guidebook.php, ODOT Bicycle and Pedestrian Plan



A choker entrance used on a Bicycle Boulevard in Portland, OR

DESIGN SUMMARY ≫

Where the placement of racks on sidewalks is not possible (due to narrow sidewalk width, sidewalk obstructions, street trees, etc.), bicycle parking can be provided in the street where on-street vehicle parking is allowed. Racks can be clustered in a parking space, or they can be located on sidewalk curb extensions where adequate sight distance exists. The conversion of a parking stall into a bike corral increases overall parking capacity on the street by providing space for 12 bicycles.

DIMENSIONS:

- Varies by jurisdiction, but generally consisting of 6-12 "staple" racks lined diagonal or perpendicular to the roadway. The corral is the width of a parking space
- Hi-visibility striping and/or flexible bollards may also be used to demarcate the bike corral area

TYPICAL APPLICATION:

- Streets with a high density of retail, commercial and restaurant establishments
- Streets with a high demand for bicycle parking

COST:

- Low

PEER COMMUNITIES:

- Portland, Oregon; Ashland, Oregon; Boulder, Colorado

ADDITIONAL GUIDANCE:

- City of Portland Bureau of Transportation, http://www.portlandonline.com/transportation/

Ashland's first bike corral located adjacent to Standing Stone Brewery

A standard bike corral in use in Downtown Portland, OR

DESIGN SUMMARY

Bike sharing is a form of public transportation that is gaining momentum globally to help cities become greener, quieter and healthier places to live. It is a unique opportunity to convert non-bicyclists to cycling and to increase the visibility of bicycling.

The key to successful bike sharing systems is density. Stations should be located reasonably close together so as to always be convenient, and there should be more bicycle docks located at major transportation hubs, employment centers, entertainment areas and large institutions. Bike sharing programs can help travelers complete the "last mile" of a transit trip and provide an inexpensive and convenient mobility option for short trips.

DIMENSIONS:

- System size and type varies by jurisdiction

COST:

- High: Funding is required for capital and ongoing operating costs. Options include public funds, private sponsors and advertising

PEER COMMUNITIES:

- Washington DC; Boston, Massachusetts; Montreal, Quebec; Denver, Colorado; Madison, Wisconsin

ADDITIONAL GUIDANCE:

- Alta Bike Share Resources http://www.altabicycleshare.com/resources; The Bike-sharing Blog http://bike-sharing.blogspot.com

The popular blue bikes of the Melbourne, Australia system

DESIGN SUMMARY ≫

Automatic counters like the those used in Copenhagen (top right) provide a public display of the number of bicyclists that pass a particular location each day. This technology provides valuable data for future planning and evaluation, but perhaps more importantly, highlights the success of well-used infrastructure, encourages bicycling, and serves to legitimize bicycling as a key component of the transportation system. Other popular automatic counters (bottom right and left) record bicyclist movements similar to how motor vehicle traffic counts are taken. Though not highly visibble, these types of counters can help illustrate existing capacity/demand for a given bicycle facility.

TYPICAL APPLICATION:

- On facilities with high numbers of bicyclists
- At locations that serve as main entrances/exits to the central business district or other defined area
- Before and after the installation of a bikeway facility

COST:

- Medium

PEER COMMUNITIES

- Copenhagen, Denmark; Portland, Oregon; San Diego, California

ADDITIONAL GUIDANCE:

- The National Bicycle and Pedestrian Documentation Project

Hose counters installed on several Portland Bridges collect annual travel data for bicyclists

Infrared Counter at Rose Canyon Bicycle Path in San Diego, CA

DESIGN SUMMARY ≫

Sidewalks are the most fundamental element of the walking network, as they provide an area for pedestrian travel that is separated from vehicle traffic. Sidewalks are typically constructed out of concrete and are separated from the roadway by a curb or gutter, landscaping, and on-street parking. Sidewalks are a common application in urban and suburban environments.

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: the Curb Zone, the Furnishings Zone, the Through Pedestrian Zone, and the Frontage Zone.

- **Curb Zone:** defines the pedestrian space from the roadway and prevents water in the street gutters from entering the pedestrian space
- **Furnishings Zone:** buffers pedestrians from the adjacent roadway, and is also the area where elements such as street trees, signal poles, utility poles, street lights, etc are located
- **Through Pedestrian Zone:** the area intended for pedestrian travel. This zone should be entirely free of permanent and temporary objects
- **Frontage Zone:** allows pedestrians a comfortable "shy" distance from the building fronts

DIMENSIONS:

- Sidewalks should be at least 6' wide, exclusive of the curb and other obstructions
- Must enable two pedestrians (including wheelchair users) to walk side-by-side, or to pass each other comfortably

COST:

- High

PEER COMMUNITIES:

- Most jurisdictions have guidelines for sidewalk construction

ADDITIONAL GUIDANCE:

- ADA Standards for Accessible Design

Cafe seating in the Furnishings Zone adds vibrancy but maintains an unobstructed walkway

This flower shop displays its wares, but also takes care to keep the Pedestrian Through Zone clear of obstructions

DESIGN SUMMARY

Curb ramps allow users to make an easy transition from the street to the sidewalk. There are a number of factors to be considered in the design and placement of curb ramps at corners. Properly designed curb ramps ensure that the sidewalk is accessible from the roadway. A sidewalk without a curb ramp can be useless to someone in a wheelchair, forcing them back to a driveway and out into the street for access.

Visual-tactile warning strips provide contrast with the sidewalk and alert people with visual impairments to changes in the pedestrian environment. These devices are most effective adjacent to smooth pavement so the difference is easily detected. They are used at:

- The edge of depressed corners
- The border of raised crosswalks and intersections
- The edge of transit platforms where railroad tracks cross the sidewalk

DIMENSIONS:

- The landing at the top of a ramp should be at least 4'-0" long and at least the same width as the ramp itself
- The slope should no more than 1:50 (2.0%) in any direction

TYPICAL APPLICATION:

- Any street with sidewalks

COST:

- Medium

PEER COMMUNITIES:

- ADA-compliant curb ramps are required

ADDITIONAL GUIDANCE:

- ADA Standards for Accessible Design

Three different applications of visual-tactile strips on curb ramps

DESIGN SUMMARY

Curb extensions minimize pedestrian exposure during crossing by shortening crossing distance and give pedestrians a better chance to see and be seen before committing to crossing. They are appropriate for any crosswalk where it is desirable to shorten the crossing distance and there is a parking lane adjacent to the curb. (Note that if there is no parking lane, the extensions may be a problem for bicycle travel and truck or bus turning movements.)

DIMENSIONS:

- In most cases, the curb extensions should be designed to transition between the extended curb and the running curb in the shortest practicable distance.
- For purposes of efficient street sweeping, the minimum radius for the reverse curves of the transition is 10 ft (3 m) and the two radii should be balanced to be nearly equal

TYPICAL APPLICATION:

- On streets with high incidence of pedestrian-vehicle conflict
- Where decreasing the crossing distance significantly improves the pedestrian experience
- Environment/streets with higher pedestrian volumes

COST:

- Medium

PEER COMMUNITIES:

- Curb extensions are widely adopted throughout the US

ADDITIONAL GUIDANCE:

- AASHTO Guide for the Planning, Design and Operation of Pedestrian Facilities DRAFT

A curb extension in Santa Monica, CA helps to improve crossing a busy intersection

DESIGN SUMMARY

Enhanced crossings include colored, textured, and/or raised crosswalks. These facilities are designed to heighten driver awareness of pedestrian crossings and assign priority to pedestrians by providing an additional visual cue beyond traditional crosswalk markings. Where there is poor motorist awareness of an existing crossing or at high-use locations, high-visibility crosswalks can increase safety for pedestrians and bicyclists. An enhanced crosswalk may also add visual interest to the streetscape in locations such as an historic main street or commercial district--areas with high pedestrian activity.

DIMENSIONS:

- Common materials for textured crosswalks include brick, stone, and decorative concrete
- For raised crosswalks the approach to the crosswalk (ramp angle) must consider the needs of emergency vehicles

TYPICAL APPLICATION:

- Where a special emphasis on pedestrians and pedestrian priority is desired
- On traffic calmed streets
- Along routes to school to improve visibility of school children

COST:

- Medium

PEER COMMUNITIES

- Portland, Oregon; Seattle, Washington; Charlotte, North Carolina

ADDITIONAL GUIDANCE:

- Institute of Transportation Engineers (ITE), Pedestrian and Bicycle Information Center

This red crosswalk in London heightens the visibility of pedestrians crossing the street

The traditional brick pavers used for this crossing contrast with the standard asphalt roadway

DESIGN SUMMARY

Median refuge islands help improve safety by providing a crossing refuge for pedestrians and slowing motor vehicle traffic. Refuge islands at intersections should have a median "nose" that gives protection to the crossing pedestrian.

- Minimize pedestrian exposure during crossing by shortening crossing distance and increasing the number of available gaps for crossing.
- Allow pedestrians to gauge safe crossing of "one direction" of traffic at a time

DIMENSIONS:

- The refuge island must be accessible, preferably with an at-grade passage through the island rather than ramps and landings.
- The island should be at least 6' wide between travel lanes and at least 20' long
- The refuge area should be wide enough (> 6') to accommodate bikes with trailers and wheelchair users
- On streets with speeds higher than 25 mph there should also be double centerline marking, reflectors, and "KEEP RIGHT" signage
- If a refuge island is landscaped, the landscaping should not compromise the visibility of pedestrians crossing in the crosswalk.

TYPICAL APPLICATION:

- Where the roadway to be crossed is greater than 50 ft (15.2 m) wide or more than four travel lanes
- At signalized or unsignalized crosswalks

COST:

- Medium

PEER COMMUNITIES:

- Median refuge islands are popular with many jurisdictions throughout the US

ADDITIONAL GUIDANCE:

A hi-visibility median refuge island in Portland, OR significantly improves crossnig a busy arterial

DESIGN SUMMARY ≫

Rectangular Rapid Flash Beacons (RRFB's) are a type of active warning beacon that is designed to alert motorists to the presence of a pedestrian entering the crosswalk. RRFB's are activated by a pedestrian via a push button mounted on a pole in advance of the crosswalk. The amber lights in an RRFB are high-intensity, similar to those used on emergency vehicles and the flashing pattern is irregular to better attract motorist's attention.

DIMENSIONS:

- Locate RRFB adjacent to crosswalk facility
- Rectangular amber LED's should be 2" x 5" and installed directly below crossing sign
- See MUTCD Interim Report for flash rate and sequence specifications

TYPICAL APPLICATION:

- At uncontrolled intersections with high pedestrian volumes to supplement pedestrian crossing/warning sign
- At uncontrolled intersections where motorist compliance with existing crosswalk facility is low

LAND USE CONTEXT:

- Urban and suburban

COST:

- Low

PEER COMMUNITIES:

- Portland, Oregon; Astoria, Oregon

ADDITIONAL GUIDANCE:

- MUTCD MUTCD – Interim Approval for Optional Use of Rectangular Rapid Flashing Beacons (IA-11), NACTO Urban Bikeway Design Guide

An RRFB in Berkely, CA located adjacent to a commuter transit center improves pedestrian access

This recently introduced RRFB in Astoria, OR helps pedestrians cross busy Hwy 30

DESIGN SUMMARY

In some cases a demand-responsive pedestrian or bicycle signal is needed to assist in crossing high traffic volume streets. For the demand-responsive signal, a push button or imbedded loop detector is provided to actuate the pedestrian/bicycle phase. A Pedestrian Hybrid Beacon is a combination of a beacon flasher and traffic control signaling technique for marked crossings. The beacon signal consists of a traffic signal head with a red-yellow-red lens. The unit is off until activated, then the phasing of the signal is:

- The signal flashes yellow to warn approaching drivers
- A solid yellow advises drivers to prepare to stop
- The signal changes to a solid red, and a WALK indicator is shown
- The beacon signal converts to an alternating flashing red, allowing the drivers to proceed after stopping at the crosswalk, while the bicyclist or pedestrian is shown the flashing DON'T WALK signal

TYPICAL APPLICATION:

- Streets along a designated bicycle or pedestrian route where a fixed signal phase would cause undue delay to motor vehicle operations. The MUTCD provides warrants for the use of hybrid beacons based on motor vehicle speed, crossing length, motor vehicle volumes, and pedestrian volumes.
- Locations where heightened visibility of crossing is desired
- Where bicycle or pedestrian facilities intersect major streets without existing signalized crossings

COST:

- High

PEER COMMUNITIES:

- Portland, Oregon; Phoenix, Arizona; Tucson, Arizona

ADDITIONAL GUIDANCE:

- MUTCD

A Pedestrian Hybrid Beacon stops traffic on Hawthorne Blvd in Portland, OR

DESIGN SUMMARY ≫

Enhanced pedestrian signals include features designed to make crossing easier. These include pedestrian countdown signals that display the amount of time remaining to cross the street, or a Leading Pedestrian Interval (LPI), where pedestrians are given a "walk" designation a few seconds before the vehicle green phase begins. These are most appropriate is helpful at intersections with frequent conflicts between turning vehicles and pedestrians.

Audible pedestrian signals provide crossing assistance to pedestrians with vision impairment at signalized intersections. To be considered for audible signals, the location must first meet the following basic criteria:

- The intersection must already be signalized
- The location must be suitable to the installation of audible signals, noise level, and neighborhood acceptance
- There must be a demonstrated need for an audible signal device. The need is demonstrated through a user request
- The location must have a unique intersection configuration and characteristics
- Audible signals should be activated by a pedestrian signal push button with at least a one second-delay to activate the sound

COST:

- Medium

PEER COMMUNITIES:

- Portland, Oregon; Seattle, Washington

ADDITIONAL GUIDANCE:

- ADA Standards for Accessible Design

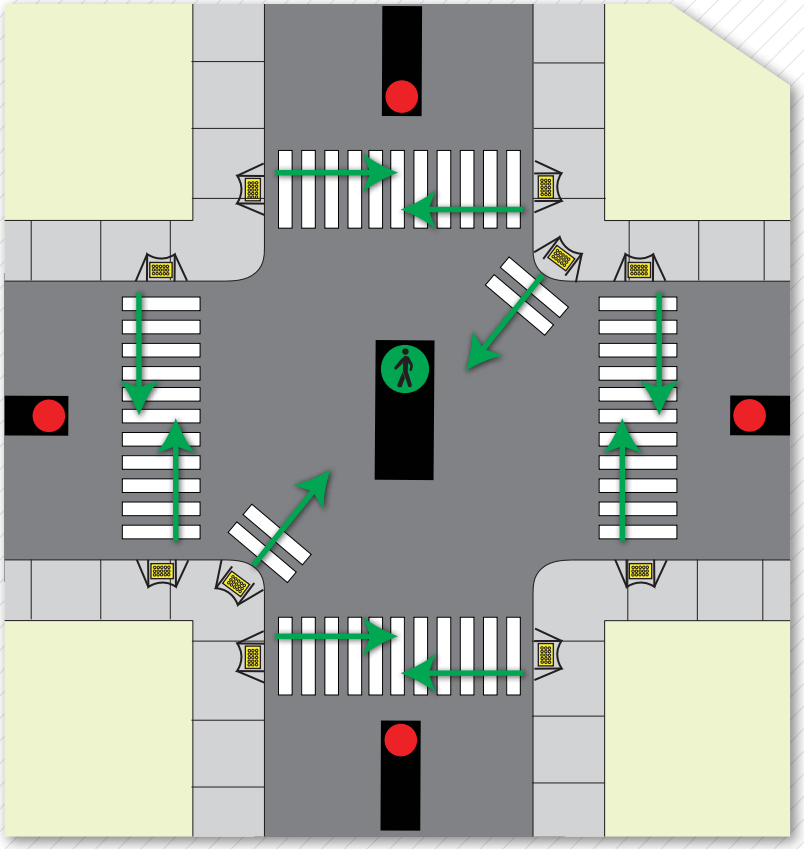
Speaker on pedestrian traffic signal.

Countdown signals help pedestrians make better decisions about when to cross the street

DESIGN SUMMARY

In areas with very heavy pedestrian traffic, an all-pedestrian signal phase gives pedestrians free passage in the intersection when all motor vehicle traffic movements are stopped. By stopping all motor vehicle approaches, pedestrians can cross straight or diagonally through the intersection.

Pedestrian scramble phases are only recommend where pedestrian volumes are very high and should be used sparingly, given that the additional phase increases wait times for all modes (including pedestrians) and longer wait times can lead to greater non-compliance.



DIMENSIONS:

- This non-standard treatment requires explicit signage and pavement markings that explain the facility

TYPICAL APPLICATION:

- Where pedestrian volumes are very high
- Dense commercial/shopping areas
- Locations with frequent motor vehicle/pedestrian conflicts

COST:

- Medium

PEER COMMUNITIES:

- Oakland, California; Toronto, Canada

ADDITIONAL GUIDANCE:

- ITS Berkeley technology Transfer Program Newsletter (Spring 2003) http://techtransfer.berkeley.edu/newsletter/03-2/scramble.php

A Pedestrian Scramble Signal in use in Oakland, CA

DESIGN SUMMARY ≫

Pedestrian friendly design encourages transit use. In order to be successful, transit service must be frequent, reliable, convenient, comfortable and affordable. A hard flat surface is required for safe boarding, alighting, waiting and accessibility.

The following amenities make the transit experience more attractive and may encourage increased patronage:

- Bus stop markers/signs that are oriented to the pedestrian, rather than to passing vehicles,
- Bus schedules and route maps displayed at transit stops
- Seating for transit passengers, placed so that the waiting passengers are visible to the bus driver
- A shelter to protect passengers from the weather
- Pedestrian scale lighting to increase security and visibility for riders and transit operators
- A trash container

DIMENSIONS:

- All bus stops should have a hard flat boarding surface
- All stops must meet ADA requirements

COST:

- High

PEER COMMUNITIES:

- These types of pedestrian amenities can be found at transit stops throughout the US

ADDITIONAL GUIDANCE:

- TCRP report 46: Amenities for Transit, ADA Standards for Accessible Design

A bus shelter in Seattle incorporates public art on its surface to increase visual interest

DESIGN SUMMARY

Grade-separated crossings allow bicyclists and pedestrians to overcome major barriers like freeways, major highways, railway lines, and waterways. Grade-separated facilities should be carefully considered - studies have demonstrated that if the at-grade crossing, though less safe, can provide competitive time savings, a grade separated facility may be ineffective.

DIMENSIONS:

- The crossing must be ADA accessible
- Grade changes should be minimized to the greatest extent possible
- Shared bicycle/pedestrian facilities should have a clear passage width of at least 12'

TYPICAL APPLICATION:

- Where at-grade crossings are not possible
- Where ADT exceeds 25,000 vehicles
- Where 85th-percentile speeds exceed 45mph

COST:

- High

PEER COMMUNITIES:

- Minneapolis, Minnesota; Portland, Oregon; Eugene, Oregon

ADDITIONAL GUIDANCE:

- FHWA Designing Sidewalks and Trails for Access, Oregon Bicycle and Pedestrian Plan (2007 DRAFT)

The Putach Creek Undercrossing in Davis, CA provides passage underneath I-80

The Diamond Back Bridge in Tucson, AZ allows for safe crossing of a 6-lane arterial below

DESIGN SUMMARY

Frequent driveway access increases the total number of conflict points between motorists, pedestrians and/or bicyclists. Access management seeks to minimize conflicts through use of raised median islands and driveway consolidation. Driveway consolidation restricts the number of locations that motorists may use to access destinations by funneling all ingress/egress movements to a single controlled intersection. Raised medians restrict motor vehicle turn movements on and off the main travelway.

TYPICAL APPLICATION:

- Designated pedestrian and bicycle corridors
- Streets with multiple mid-block access points
- Streets with a high number of crashes

COST:

- Medium to High depending on the level of treatment required

PEER COMMUNITIES:

- Access management strategies are standard practice in many US transportation engineering departments

ADDITIONAL GUIDANCE:

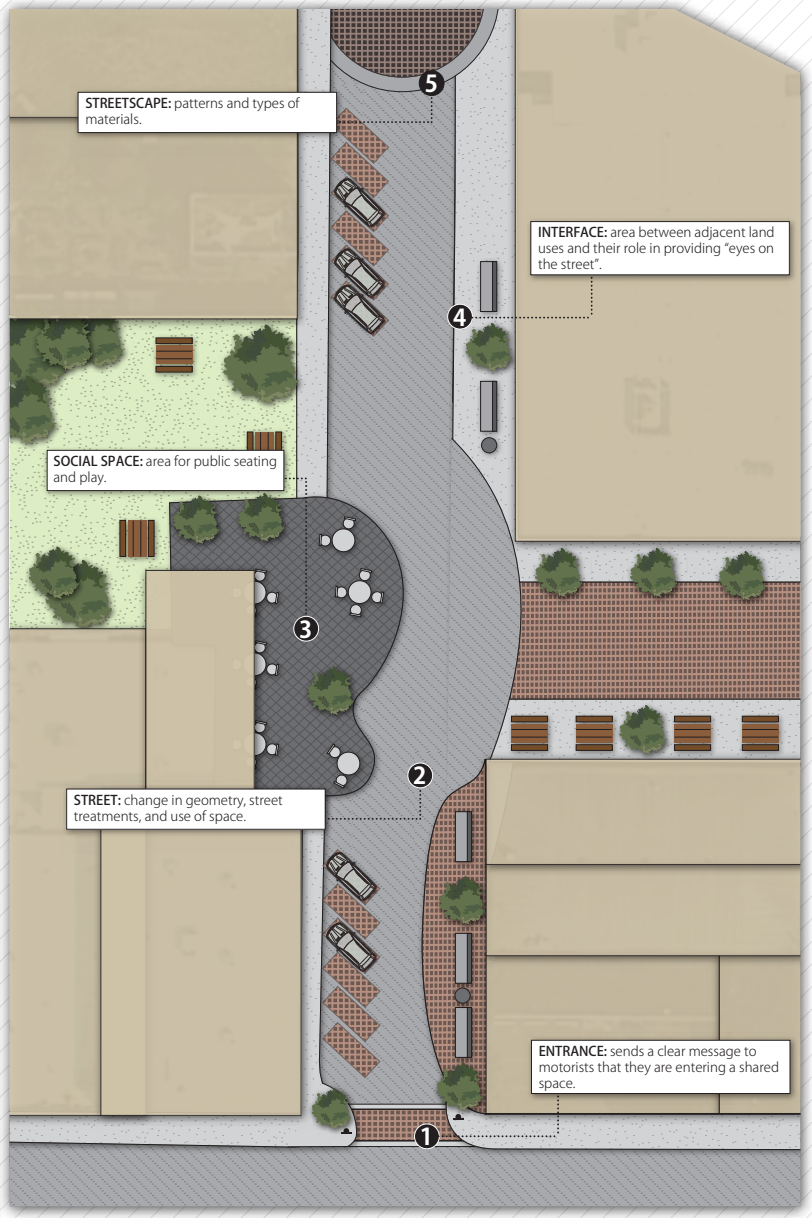
- Pedestrian and Bicycle Information Center, Transportation Research Board (TRB) Access Management Manual

Updated in 2007, Naito Parkway in Portland, Oregon uses a planted raised median to restrict turn movements at any location that is not a signalized intersection

DESIGN SUMMARY

Shared Streets, Woonerf's and British 'Home Zones' aim to provide a better balance of the needs of all road users to improve safety, comfort, and livability. This balance is accomplished through the integration, rather than segregation, of roadway users. By eschewing many of the traditional roadway treatments such as curbs, signs, and pavement markings, the distinction between modes is blurred. This introduces a level of "uncertainty" amongst street users that heightens their sense of awareness and requires caution and interaction with one another. These factors help to create an environment that is more comfortable for everyone, and particularly for vulnerable road users who benefit from slower motor vehicle travel speeds and more attentive motorists. Shared Streets are composed of five distinct elements:

- **Entrance:** sends a clear signal that users are entering a space where different behavior is expected. The entrance should significantly contrast with its immediate surroundings. Through the use of bright signage, narrowing the roadway at the street entrance, using different paving materials, or a combination of these elements.
- **Street:** is designed to promote slow motor vehicle speeds – ideally near walking pace and no greater than 20 mph. This is accomplished by shortening sight lines, narrowing the roadway and changing road geometry
- **Social Space:** are created outside of the travel-way and often dedicated through the placement of tables, benches, etc.
- **Interface:** describes the area between the street and the adjacent land uses (typically homes or commercial establishments). It is important that street activities are not hidden or obscured from view
- **Streetscape:** should not resemble that of a typical street and should make abundant use of different paving materials, street furniture, and landscaping.



BENEFITS:

- Improved bicycle/pedestrian safety.
- Reduced motor vehicle travel speeds and volumes.
- Increased bicycle/pedestrian activity.
- Improved attractiveness of street.
- Reduced crime.
- Increased social activity amongst neighbors and children.

DESIGN SUMMARY

LEGAL ISSUES:

- One of the greatest challenges facing the adoption of Shared Streets in the US is litigious. Many jurisdictions will not consider adopting a Shared Street due to risk of a lawsuit in the event of a collision between a motorist and pedestrian or bicyclist. There is less definition of right-of-way and many of the design features go against traditional traffic engineering guidance (e.g., reducing sight lines).
- Must be positioned 4' min. from curb or 11' min. from curb if on-street parking is present

TYPICAL APPLICATION:

- On residential or commercial streets in urban or suburban environments.

COST:

- High

PEER COMMUNITIES:

- Cambridge, Massachusetts; Risjswijk, Netherlands; Bristol, UK

ADDITIONAL GUIDANCE:

- UK Department for Transport, Home Zones - Planning and Design, Pedestrian and Bicycle Information Center

Pavement materials clearly delineate parking spaces in a British Home Zone

Altered road geometry in a Woonerf in Risjswijk, Netherlands.