

TYPES OF BICYCLE ACCOMMODATIONS

DEDICATED BICYCLE LANES designate exclusive space for bicyclists and get bicyclists going in the right direction. Bicycle lanes can be typically be considered on any street that has a minimum Average Daily Traffic (ADT) of 3,000 vehicles per day and meets the minimum dimensional requirements.



Bike Lane Adjacent to Curb in Boston, MA¹



Bike Lane Adjacent to Parking in San Francisco, CA²

In general, bicycle lanes are typically 4' to 6' wide. Bicycle lanes wider than 6' are not recommended, as motorists may confuse them with parking lanes or travel lanes. The cross-sectional requirements vary based upon the adjacent uses:

- **ADJACENT TO THE EDGE OF ROADWAY (NO PARKING ALLOWED)**
On streets that do not have curbing the minimum width of a bicycle lane is 4'. However, in areas that have vertical curbing, where storm drains covers are not flush with the pavement, where the pavement is in poor condition, or where a longitudinal seam in the pavement exists, the minimum width of bicycle lanes is 5'.
- **ADJACENT TO PARKING**
Bicycles lanes that are marked adjacent to on-street parking are required to be at least 5' wide. In many areas where the parking lane is narrow, where parking turnover is frequent, where adjacent vehicle speeds are higher, and/or along a fixed bus route, it may be desirable to increase the bicycle lane width up to 6'.

It is important that bicycle lanes adjacent to parking areas are properly designed to avoid opening car doors. Referred to as the "door zone," the first 3' of the bicycle lane adjacent to the parking lane could become an unexpected and dangerous obstruction to a passing cyclist. In

¹ <http://brighton-community.blogspot.com/>

² http://imgs.sfgate.com/blogs/images/sfgate/bicycle/2010/09/09/IMG_0507624x468.JPG

New York City, 31% of all bicycle fatalities between 1996 and 2005 were due to crashes within the door zone³. A diagram depicting the door zone can be found below.



Potential Door Zone⁴

BUFFERED BICYCLE LANES may be used on streets with available space. Typically they are used in areas where there is a significant difference in speeds between cyclists and passing motor vehicles, often adjacent to an uphill lane in hilly or rolling terrain, or on streets adjacent to parking where additional protection from the door zone can be provided. The buffered area is typically 2' to 5' wide, and is marked with white hatching.



Buffered Bike Lane in Seattle, WA⁵

COLORED PAVEMENT, typically a green high-friction surface, may be applied within a bike lane in areas where a significant number of motor vehicles may be crossing over the bike lane or in other areas where special attention needs to be drawn to the presence of the lane for a specific

³ <http://www.nyc.gov/html/dot/downloads/pdf/bicyclevfatalities.pdf>

⁴ <http://bostonbiker.org/files/2009/10/truckwithdooropen.jpg>

⁵ <http://sdblog.seattle.gov/wp-content/uploads/2011/12/DexterInUse1.jpg>

safety reason. This treatment is typically applied at unsignalized intersections with large numbers of turning vehicles or along a transition to an auxiliary right-turn lane.



Bike Lane with Green Pavement in Seattle, WA⁶

SHARE THE ROAD BICYCLE ROUTES, identified by shared lane pavement markings known as “sharrows” can typically be considered on any streets that have a minimum ADT of 3,000 vehicles per day. Sharrow markings assist bicyclists with lateral positioning in a travel lane, encourage safe passing of bicycles by motorists, and reduce the likelihood of wrong-way bicycling.

Sharrows can be used as a “bridge,” spanning a narrow section of road between two other sections that have bike lanes or other bicycle facilities. They may not be appropriate on roads that have vehicular 85th percentile speeds that exceed 35 miles per hour, or in other areas where roadway geometry makes it likely that there will be a significant difference in motor vehicle and bicycle speeds.



Sharrow Adjacent to Parking Lane in New York, NY⁷



Sharrow Centered in Travel Lane in Los Angeles, CA⁸

⁶ <http://thecityfix.com/files/2010/03/Seattle-bike-lane.jpg>

Sharrows should be installed only after examination of traffic data and geometric conditions. Motorists can typically pass a bicycle without changing lanes in a lane is at least 14' wide. For travel lanes 14' or wider, the sharrow should be placed approximately 11' off the face of curb or edge of pavement if parallel parking is allowed to avoid the door zone, or 4' from the face of curb or edge of pavement if parking is prohibited. In areas where travel lanes are 15' or wider, the installation of bicycle lanes should be considered instead.

If the travel lane is less than 14', sharrows should be centered in the travel lane and accompanied by "Bicycles May Use Full Lane" (or similar) signage. Ideally, sharrows in the center of a travel lane should be used on short sections of roads where a bicycle lane needs to be dropped temporarily for the purposes of adding a turn lane or on designated bicycle routes where the road is untypically narrow.

On two-lane roads, placing sharrows in the center of the travel lane over long distances is discouraged, but it is acceptable on multi-lane roads that provide motorists the opportunity to safely change lanes to pass a bicyclist. Caution should also be used placing sharrows in the center of the travel lane on two-lane roads that have poor stopping sight distance and/or hilly or rolling terrain that may cause a significant difference in traveling speeds between bicyclists and motorists.

PRIORITY SHARED LANES may be considered on multi-lane roads with an outside travel lane of less than 14'. Priority Shared Lanes may be desirable on streets where removing one or more travel lanes is not desired due to high peak hour traffic volumes, but where non-peak hour volumes can be reduced to a single lane in each direction. Priority Shared Lanes would require an approved waiver from the Federal Highway Administration prior to installation.



Priority Shared Lane in Salt Lake City, UT⁹

⁷ <http://streetswiki.wikispaces.com/file/view/sharrow-bikelane.jpg/128158169/sharrow-bikelane.jpg>

⁸ http://laist.com/attachments/la_zach/sharrows-la-pilot.jpg

⁹ <http://www.coe.neu.edu/transportation/images/saltlakecity.jpg>

Priority Shared Lanes are intended to encourage motor vehicles to travel in the inside lane during non-peak hours, giving the entire outside lane to cyclists. During peak traffic hours, it is expected that motor vehicles will continue to use all travel lanes, sharing the outside lane with cyclists.

A Priority Shared Lane typically consists of a sharrow centered in the outside travel lane, overlaid upon a 5'-wide green high friction surface. Sharrows are placed at standard intervals, and "Bikes May Use Full Lane" and "Change Lanes To Pass" signs are placed at the beginning of each block.

CYCLE TRACKS incorporate many of the design elements of a bicycle lane, but significantly increase safety by providing a space intended primarily for cyclists that is physically separated from passing motor vehicles. They come in many different forms, ranging from at street level and separated from traffic by a median, to sidewalk level on a path separated from the sidewalk. Cycle tracks can be designed as one-way or two-way facilities.

The biggest challenges in implementing cycle tracks are the spatial requirements. The bike path portion of a one-way cycle track is typically 5' to 7' wide; 7' is recommended to allow for one cyclist to safely pass another. The recommended width of the bicycle path portion of a two-way cycle track is 12'. When installed adjacent to a parking lane, a cycle track requires an additional 3' buffer for the door zone to allow for safe passenger loading and unloading from a parked car. If parking is not allowed and the cycle track is at street level and separated from passing motor vehicles by a median width, the median width is typically 4' or larger.

Other factors must be considered during the design of cycle tracks. Modifications to crosswalks, curb extensions, and wheelchair ramps may be necessary in order to retain safe, compliant pedestrian facilities. At intersections with traffic signals, separate signal indications for bicyclists may be required. Maintenance of cycle tracks separated by a median, including street sweeping, snow removal, and catch basin cleaning, must be considered to ensure that maintenance vehicles will fit within the cycle track. The Washington Street corridor could be improved with this type of treatment.

STREET-LEVEL CYCLE TRACKS typically consist of a bike path that is marked with the same white bicycle markings found in bike lanes and will either have a buffer zone, if it is adjacent to a parking lane, or a raised median to separate it from passing motor vehicles. The bike path portion of a cycle track may be marked with a green high-friction surface to enhance its visibility.



One-way Street Level Cycle Track, Adjacent to Parking in Portland, OR¹⁰



Two-way Street Level Cycle Track, Separated by a Median in Montreal, PQ¹¹

SIDEWALK-LEVEL CYCLE TRACKS have similar design features as street-level cycle tracks, but instead of being constructed at the same elevation as the road surface, they are constructed at the same elevation as the adjacent sidewalk or at an intermediate level between the two. These facilities can be one-way or two-way. Additional design features that must be taken into consideration include the placement of street furniture, street trees, signage, and utility poles. It may be necessary to reconstruct driveway curb cuts so that the cycle track maintains the same elevation, to add a green high-friction surface across driveways and minor intersections, or to use a surface that will contrast with the sidewalk material along the rest of the cycle track to discourage use by pedestrians.



One-way Street Sidewalk Level Cycle Track in Cambridge, MA¹²



Two-way Sidewalk Level Cycle Track in Portland, OR¹³

¹⁰ http://bikeportland.org/wp-content/uploads/2009/08/cycletrack_big.jpg

¹¹ <http://www.flickr.com/photos/rllayman/4770592213/>

¹² http://denverurbanism.com/wp-content/uploads/2011/01/2011-01-01_cycle_track.jpg

SHARED SHOULDERS are streets with a striped shoulder that may be used for bicycle travel. These streets typically include a yellow diamond bicycle warning sign with a “Share the Road” plaque to alert drivers to the presence of cyclists. Shared shoulders may be used as a first step towards adding bicycle accommodations onto a roadway segment until future road construction can be completed. They may be considered on streets that allow parking, where occupancy rates are low, or do not allow parking, or where the width of the shoulder does not meet the minimum requirements for a marked bicycle lane. On streets where the shoulder suddenly narrows due to constraints such as curb extensions, sharrows within the motor vehicle travel lane should be considered until the typical shoulder resumes.



Street with White Edge Lines in Newton, MA¹⁴



“Share The Road” signage¹⁵

SHARED-USE PATHS or **GREENWAYS** are off-street bicycle facilities. They may run parallel to a roadway or may be a part of a park system. These facilities typically attract recreational riders, and are often shared with pedestrians. Shared-use paths are typically at least 10’ wide, with a preferable width of 12’ to 14’, and may have a paved or stone dust surface.



¹³ http://farm5.static.flickr.com/4110/5067028870_1d30b43235.jpg

¹⁴ Photo courtesy of City of Newton Department of Public Works

¹⁵ http://asymptotia.com/wp-images/2007/01/share_the_road.jpg

OTHER DESIGN CONSIDERATIONS

ROAD DIETS may be considered on existing multi-lane roads that currently do not provide adequate space for bicycle accommodations, where traffic volumes do not justify the number of travel lanes. Reducing 4-lane roads to 3-lane, or even 2-lane, may decrease collisions for all roadway users by 19 - 47%¹⁸ while providing the opportunity to add bicycle accommodations. Relevant research published by the Federal Highway Administration and other agencies should be examined when planning a road diet.

LANE DIETS refer to reducing lane widths from standard or larger than standard size in order to introduce a traffic calming measure and add bicycle accommodations. Under certain conditions, the width of vehicle travel lanes may be reduced to 10' without impacting safety. The Federal Highway Administration and the National Cooperative Highway Research Program have additional information from ongoing research on good applications for reducing lane widths. Before and after safety and speed studies should be done as a part of any lane diet project.

As new bicycle facilities are added, changes to operations at **TRAFFIC SIGNALS** will be necessary. The addition of components that will detect approaching bicycles and will call or extend the green light are necessary for the safety for all road users. Adjustments to signal timing may also be needed. At intersections with cycle tracks or off-road paths, separate bicycle signals may also be required.

BIKE BOXES may be considered at signalized intersections on approaches that have bike lanes. They can decrease the likelihood of crashes involving cyclists and cars starting from a stop at a red light by providing:

- A clear, delineated space for a cyclists to move ahead of a stopped car, particularly if cars at the beginning of the queue are intending to turn right;
- A safe area for a cyclist to move to the left in order to make a left turn;
- An area to transition between right-side to left-side bicycle lanes on a one-way street.

Bike boxes are identified by a green high-friction surface that is applied between the motor vehicle stop line and the crosswalk and along the last 50' of the bike lane leading up to the crosswalk. In addition, the stop line is typically offset 10' to 15' back from the crosswalk to

¹⁶ Photo courtesy of City of Newton Department of Public Works

¹⁷ http://asymptotia.com/wp-images/2007/01/share_the_road.jpg

¹⁸ "Evaluation of Lane Reduction 'Road Diet' Measures on Crashes," FHWA: Highway Safety Information Systems.

provide ample space for stopped cyclists. Bike boxes have not been adopted by the current edition of the MUTCD, and would require a waiver from the Federal Highway Administration prior to installation.



Bike Box in Portland, OR¹⁹

CONTRAFLOW LANES are bike lanes designed to allow cyclists to travel legally in the opposite direction on a one-way street. The contraflow lane should be delineated from the opposing motor vehicle lane with yellow striping. Contraflow lanes must be carefully designed to avoid conflicts between cyclists and pedestrians, parked cars and passing motor vehicles.



Contraflow Lane in Seattle, WA²⁰

HYBRID TREATMENTS may be considered on some streets that do not have the necessary width to accommodate the same treatment in both directions. For example:

¹⁹ http://farm3.static.flickr.com/2060/2445062658_9547c7e413.jpg

²⁰ http://www.seattle.gov/transportation/images/bs_counterflow.jpg

- On streets that have a steep incline, sharrows may be used for the downhill portion and a standard or buffered bicycle lane may be considered on the opposite side for cyclists climbing uphill.
- On streets that typically have low occupancy rates but are required to retain some parking capacity, parking may be removed from one side of the street in favor of a bike lane and cyclists traveling in the opposite direction would be expected to ride in a shared shoulder accommodation.
- **WAYFINDING** signage is an essential component of a good bike network. As new bicycle facilities are added, it is important to direct bicyclists who may be unfamiliar with the area to village centers, schools, parks, and other parts of the network. Wayfinding signs are sized appropriately for cyclists, typically feature white lettering on a green background, and may include travel distances, direction arrows, and facility names. They should complement and not compete with other City wayfinding signs, so as to be most effective.



➤ Wayfinding Signs in Boston, MA²¹

²¹ Photo courtesy of Toole Design Group