



# NACTO



## Urban Bikeway Design Guide

April 2011 Edition

## IN THIS SECTION:

- Conventional Bike Lanes
- Buffered Bike Lanes
- Contra-Flow Bike Lanes
- Left-Side Bike Lanes

# BIKE LANES

A Bike Lane is defined as a portion of the roadway that has been designated by striping, signage, and pavement markings for the preferential or exclusive use of bicyclists.

Bike lanes enable bicyclists to ride at their preferred speed without interference from prevailing traffic conditions and facilitate predictable behavior and movements between bicyclists and motorists. A bike lane is distinguished from a cycle track in that it has no physical barrier (bollards, medians, raised curbs, etc.) that restricts the encroachment of motorized traffic. Conventional bike lanes run curbside when no parking is present, adjacent to parked cars on the right-hand side of the street or on the left-hand side of the street in specific situations. Bike lanes typically run in the same direction of traffic, though they may be configured in the contra-flow direction on low-traffic corridors necessary for the connectivity of a particular bicycle route.

The configuration of a bike lane requires a thorough consideration of existing traffic levels and behaviors, adequate safety buffers to protect bicyclists from parked and moving vehicles, and enforcement to prohibit motorized vehicle encroachment and double-parking. Bike Lanes may be distinguished using color, lane markings, signage, and intersection treatments.

# Conventional Bike Lanes

## Description

Bike lanes designate an exclusive space for bicyclists through the use of pavement markings and signage.

The bike lane is located adjacent to motor vehicle travel lanes and flows in the same direction as motor vehicle traffic. Bike lanes are typically on the right side of the street, between the adjacent travel lane and curb, road edge, or parking lane. This facility type may be located on the left side when installed on one-way streets, or may be buffered if space permits. See contra-flow bike lanes for a discussion of alternate direction flow.

Bike lanes enable bicyclists to ride at their preferred speed without interference from prevailing traffic conditions. Bike lanes also facilitate predictable behavior and movements between bicyclists and motorists. Bicyclists may leave the bike lane to pass other bicyclists, make left turns, avoid obstacles or debris, and avoid other conflicts with other users of the street.



## Conventional Bike Lane Benefits

Increases bicyclist comfort and confidence on busy streets.

Creates separation between bicyclists and automobiles.

Increases predictability of bicyclist and motorist positioning and interaction.

Increases total capacities of streets carrying mixed bicycle and motor vehicle traffic.

Visually reminds motorists of bicyclists' right to the street.

## Typical Applications

Bike lanes are most helpful on streets with  $\geq 3,000$  motor vehicle average daily traffic.

Bike lanes are most helpful on streets with a posted speed  $\geq 25$  mph.

On streets with high transit vehicle volume.

On streets with high traffic volume, regular truck traffic, high parking turnover, or speed limit  $> 35$  mph, consider treatments that provide greater separation between bicycles and motor traffic such as:

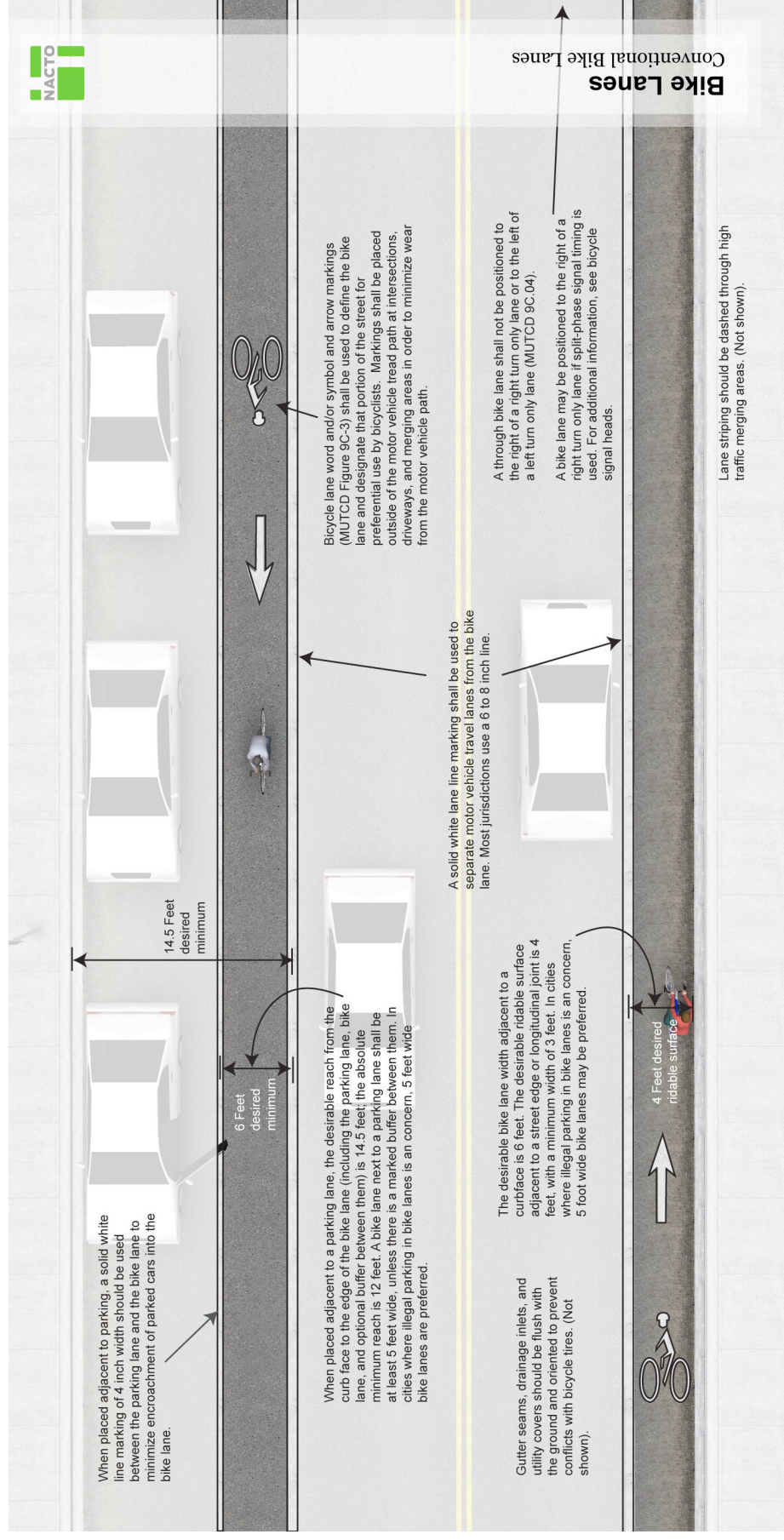
Left-sided bike lanes

Buffered bike lanes

Cycle tracks



# Design Guidance



View a high resolution image here: <http://nacto.org/wp-content/uploads/2010/08/Conventional-Bike-lanes-Annotation.jpg>

## REQUIRED



The desirable bike lane width adjacent to a curbface is 6 feet. The desirable rideable surface adjacent to a street edge or longitudinal joint is 4 feet, with a minimum width of 3 feet. In cities where illegal parking in bike lanes is an concern, 5 foot wide bike lanes may be preferred.

*The recommended width of a bike lane is 1.5m(5 feet) from the face of a curb or guardrail to the bike lane stripe.*

*If the [longitudinal] joint is not smooth, 1.2m(4 feet) of rideable surface should be provided.*

AASHTO. (1999). Guide for the Development of Bicycle Facilities.



When placed adjacent to a parking lane, the desirable reach from the curb face to the edge of the bike lane (including the parking lane, bike lane, and optional buffer between them) is 14.5 feet; the absolute minimum reach is 12 feet. A bike lane next to a parking lane shall be at least 5 feet wide, unless there is a marked buffer between them. In cities where illegal parking in bike lanes is an concern, 5 feet wide bike lanes are preferred.

*If parking is permitted, ... the bike lane should be placed between the parking area and the travel lane and have a minimum width of 1.5 m (5 feet).*

*Where parking is permitted but a parking stripe or stalls are not utilized, the shared area should be a minimum 3.6 m (12 feet) adjacent to a curb face ... If the parking volume is substantial or turnover is high, an additional 0.3 to 0.6 m (1 to 2 feet) of width is desirable.*

AASHTO. (1999). Guide for the Development of Bicycle Facilities.



The desirable bike lane width adjacent to a guardrail or other physical barrier is 2 feet wider than otherwise in order to provide a minimum shy distance from the barrier.

*On new structures [with railings], the minimum clear width should be the same as the approach paved shared use path, plus the minimum 0.6-m (2-foot) wide clear areas.*

AASHTO. (1999). Guide for the Development of Bicycle Facilities.

## REQUIRED (CONTINUED)



Bicycle lane word and/or symbol and arrow markings (MUTCD Figure 9C-3) shall be used to define the bike lane and designate that portion of the street for preferential use by bicyclists.

*Markings shall be placed:*

*At the beginning of bike lane*

*At the far side of all bike path crossings*

*At approaches and at far side of all arterial crossings*

*At major changes in direction*

*At intervals not to exceed ½ mile*

*At beginning and end of bike lane pockets at approach to intersection*

Los Angeles Bicycle Plan Update(2010). Chapter 5— Technical Design Handbook-DRAFT.



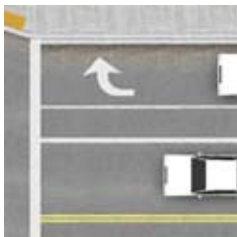
Bike lane word, symbol, and/or arrow markings (MUTCD Figure 9C-3) shall be placed outside of the motor vehicle tread path at intersections, drive-ways, and merging areas in order to minimize wear from the motor vehicle path.



A solid white lane line marking shall be used to separate motor vehicle travel lanes from the bike lane. Most jurisdictions use a 6 to 8 inch line.

*A bike lane should be delineated from the motor vehicle travel lanes with a 150-mm (6-inch) solid white line. Some jurisdictions have used a 200-mm (8-inch) line for added distinction.*

AASHTO. (1999). Guide for the Development of Bicycle Facilities.

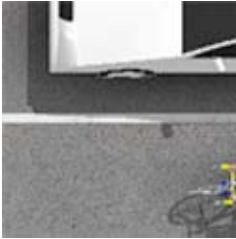


A through bike lane shall not be positioned to the right of a right turn only lane or to the left of a left turn only lane (MUTCD 9C.04). A bike lane may be positioned to the right of a right turn only lane if split-phase signal timing is used. For additional information, see bicycle signal heads. For additional strategies for managing bikeways and right turn lanes, see through bike lanes in this guide.

## RECOMMENDED



Bike lanes should be made wider than minimum widths wherever possible to provide space for bicyclists to ride side-by-side and in comfort. Reduce bike lane width only after other street elements (e.g., travel lanes, medians, median offsets) have been reduced to their minimum dimensions. If sufficient space exists to exceed desirable widths, see buffered bike lanes. Very wide bike lanes may encourage illegal parking or motor vehicle use of the bike lane.



When placed adjacent to parking, a solid white line marking of 4 inch width should be used between the parking lane and the bike lane to minimize encroachment of parked cars into the bike lane.

*An additional 100-mm (4-inch) solid white line can be placed between the parking lane and the bike lane. This second line will encourage parking closer to the curb, providing added separation from motor vehicles, and where parking is light it can discourage motorists from using the bike lane as a through travel lane.*

AASHTO. (1999). Guide for the Development of Bicycle Facilities.

*In a case study looking at the influence of pavement markings and bicyclist positioning, researchers found that, "the bicycle lane [with an edge line demarcating the parking lane] was the most effective at keeping cars parked closer to the curb and encouraging cyclists to ride in a consistent position at intersections.*

Pedestrian and Bicycle Information Center. (2006). BIKESAFE: Bicycle Countermeasure Selection System. Publication No. FHWA-SA-05-006, Federal Highway Administration, Washington, DC.

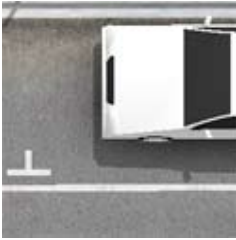


Gutter seams, drainage inlets, and utility covers should be flush with the ground and oriented to prevent conflicts with bicycle tires.

*Since bicyclists usually tend to ride a distance of 0.8-1.0 m (32-40 inches) from a curb face, it is very important that the pavement surface in this zone be smooth and free of structures. Drain inlets and utility covers that extend into this area may cause bicyclists to swerve, and have the effect of reducing the usable width of the lane. Where these structures exist, the bike lane width may need to be adjusted accordingly.*

AASHTO. (1999). Guide for the Development of Bicycle Facilities.

## RECOMMENDED (CONTINUED)



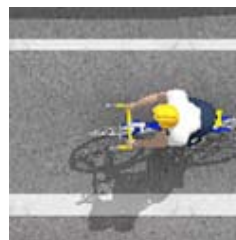
If sufficient space exists, separation should be provided between bike lane striping and parking boundary markings to reduce door zone conflicts. Providing a wide parking lane may offer similar benefits. Refer to buffered bike lanes for additional strategies.



If sufficient space exists and increased separation from motor vehicle travel is desired, a travel side buffer should be used. Refer to buffered bike lanes for additional details.



Lane striping should be dashed through high traffic merging areas. See through bike lanes for more information.



The desirable dimensions should be used unless other street elements (e.g., travel lanes, medians, median offsets) have been reduced to their minimum dimensions.



In cities where local vehicle codes require motor vehicles to merge into the bike lane in advance of a turn movement, lane striping should be dashed from 50 to 200 feet in advance of intersections to the intersection. Different states have varying requirements.

## OPTIONAL



“Bike lane” signs (MUTCD R3-17) may be located prior to the beginning of a marked bike lane to designate that portion of the street for preferential use by bicyclists. The 2009 MUTCD lists bike lane signs as optional; however, some states still require their use.

*If the word, symbol, and/or arrow pavement markings shown in Figure 9C-3 are used, Bike Lane signs (see Section 9B.04) may also be used, but to avoid overuse of the signs not necessarily adjacent to every set of pavement markings.*

Federal Highway Administration. (2009). Manual on Uniform Traffic Control Devices.



On bike lanes adjacent to a curb, “No Parking” signs (MUTCD R8-3) may be used to discourage parking within the bike lane.



Color may be used to enhance visibility of a bike lane.

## South Huntington Avenue Bike Lanes

Boston, MA

The South Huntington Avenue Bike Lanes, installed by the city of Boston in 2010, create a safe, designated route for cyclists along a problematic traffic corridor and a main bicycle route leading to and from the Jamaica Plain neighborhood of Boston. Before construction of the bike lane, the roadway had been difficult for cyclists to navigate for a number of reasons, including a set of trolley tracks in the middle of the street and a troublesome intersection where Heath St. meets South Huntington Ave. The bike lane was designed 6' wide and rests between a 12' travel lane and 8' and 9' parking lanes. At the intersection of Heath St. and South Huntington Ave., 20-30 parking spaces were removed and additional pavement markings added to channel cars into the proper area and avoid collisions. Where the bike lane crosses the trolley track, it has been painted green to ensure a safe, right-angle crossing of the tracks, and as a sign for cars to yield. Green paint has also been employed at several other points along the bike lane to create greater distinction from motorists. Further along Huntington Ave., a bus stop had to be relocated, parking removed, and an asphalt ramp created for bicyclists to wait safely on the curb to cross the tracks. In this area, the bike lane is indicated by sharrows in the right travel lane. As part of the city of Boston's bike network, the bike lane establishes connectivity between Hyde Square in Jamaica Plain, another bike route leading south towards the Arborway, and the Southwest Corridor off road path.



## Maintenance

Lane lines and stencil markings should be maintained to clear and legible standards.

Bike lanes should be plowed clear of snow by crews.

Bike lanes should be maintained to be free of potholes, broken glass, and other debris.

Utility cuts should be back-filled to the same degree of smoothness as the original surface. Take care not to leave ridges or other surface irregularities in the area where bicyclists ride.

If chip sealing, consider providing new surfacing only to the edge of the bike lane. This results in a smoother surface for bicyclists with less debris. Sweep bike lanes clear of loose chip in the weeks following chip sealing.

If trenching is to be done in the bike lane, the entire bike lane should be trenched so that there is not an uneven surface or longitudinal joints.

## Treatment Adoption and Professional Consensus

Bicycle lanes are the most common bicycle facility in use in the US, and most jurisdictions are familiar with their design and application as described in the MUTCD and AASHTO Guide for the Development of Bicycle Facilities. To offer increased levels of comfort and security to bicyclists, some cities have exceeded the minimum dimensions required in these guides.

### Bike Lane and Sharrows on 27th Avenue SE

Minneapolis, MN

The 27th Ave SE bike lane in Southeast Minneapolis provides a key north-south connection between two major bicycle trails: East River Road and the University of Minnesota Transitway. The lane serves as a major corridor for bicyclists leading through several densely populated neighborhoods and affordable housing areas in SE Minneapolis. Before installation of the bike lanes, 27th Ave. SE, a truck route and County State Aid Highway, was a four lane roadway with a 30 mph speed limit and 3,600 vehicles per day. The road also crosses a railroad track at a 45-degree angle dangerous for cyclists. To create a safer roadway for cyclists, the city added bike lanes and/or sharrows at all points along the route and reduced 27th Ave. SE from four lanes to two at certain points. A gutter pan at the roadside curb was paved to create a smooth surface for cyclists. Extra pavement was also added to the railroad track area to ensure a right angle crossing for cyclists and avoid the risk of catching a tire in the tracks. The lanes were created using permanent tape striping with a layer of seal coating in most places, though portions of the lane were milled and overlaid to create a single-surface bike lane. Bicycle route and way-finding signage, as well as bicycle racks and intersection treatments, were included as part of the project.

The 27th Ave. SE bike lane and sharrows project was funded by a \$100,000 federal grant from the Non-motorized Transportation Pilot Program (Bike Walk Twin Cities). The project was completed in August 2010.

# Renderings

The following images are 3D concepts of conventional bike lanes.







# Image Gallery



BALDWIN PARK, CA



WASHINGTON, DC



OLYMPIA, WA



KANSAS CITY, KS



SAN MARCOS, TX



MADISON, WI



CHAPEL HILL, NC



AUSTIN, TX



AUSTIN, TX



DEL MAR, CA



AUSTIN, TX

# Buffered Bike Lanes

## Description

Buffered bike lanes are conventional bicycle lanes paired with a designated buffer space separating the bicycle lane from the adjacent motor vehicle travel lane and/or parking lane. A buffered bike lane is allowed as per MUTCD guidelines for buffered preferential lanes (section 3D-01).



## Buffered Bike Lane Benefits

Provides greater shy distance between motor vehicles and bicyclists.

Provides space for bicyclists to pass another bicyclist without encroaching into the adjacent motor vehicle travel lane.

Encourages bicyclists to ride outside of the door zone when buffer is between parked cars and bike lane.

Provides a greater space for bicycling without making the bike lane appear so wide that it might be mistaken for a travel lane or a parking lane.

Appeals to a wider cross-section of bicycle users.

Encourages bicycling by contributing to the perception of safety among users of the bicycle network.

*Cyclists indicated they feel lower risk of being 'doored' in the buffered bike lanes and nearly nine in 10 cyclists preferred a buffered bike lane to a standard lane. Seven in 10 cyclists indicated they would go out of their way to ride on a buffered bike lane over a standard bike lane...*

Portland State University, Center for Transportation Studies. (2011). Evaluation of Innovative Bicycle Facilities: SW Broadway Cycle Track & SW Stark/Oak Street Buffered Bike Lanes FINAL REPORT. Portland Bureau of Transportation, Portland, OR.

## Typical Applications

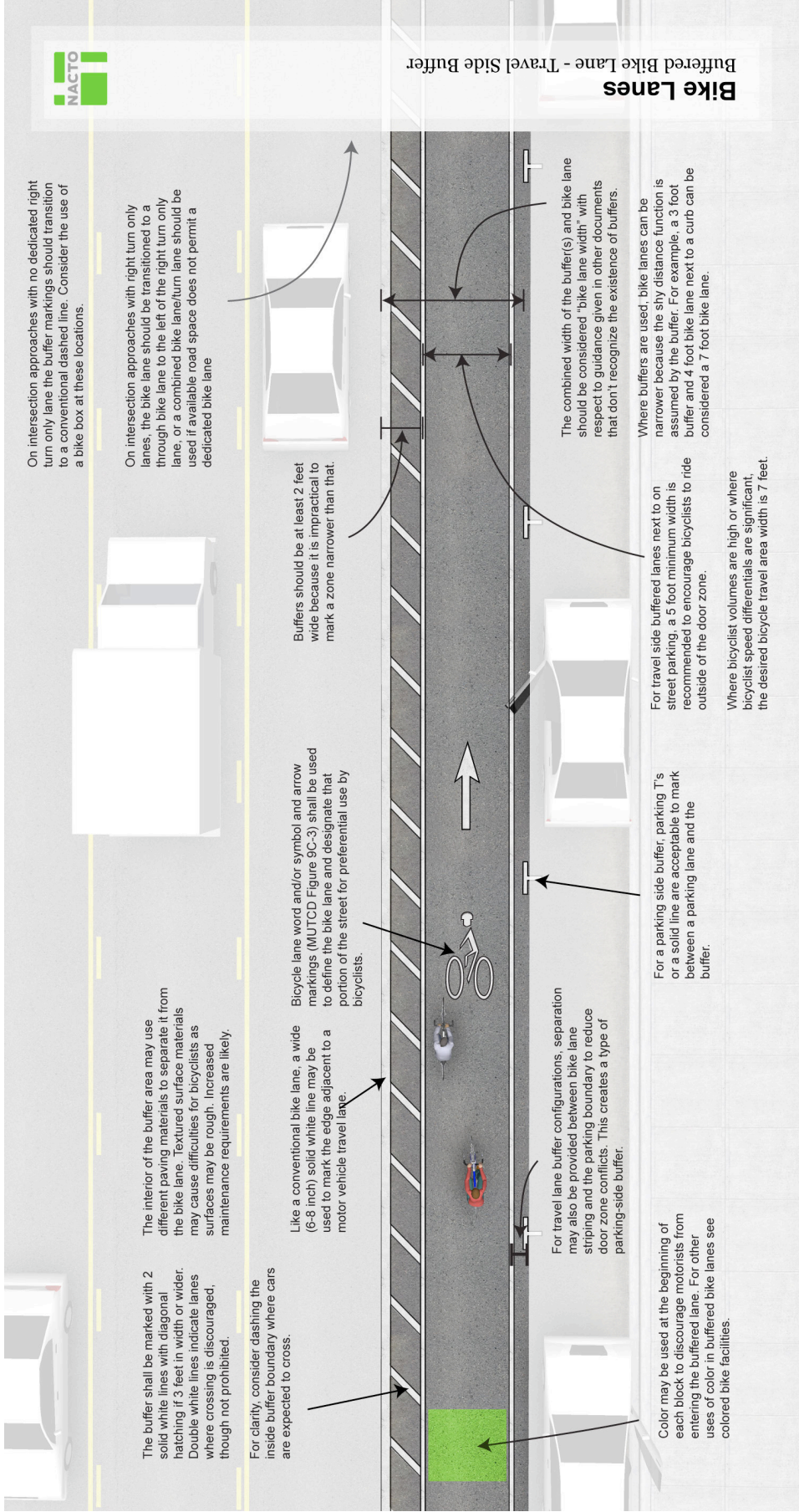
Anywhere a standard bike lane is being considered.

On streets with high travel speeds, high travel volumes, and/or high amounts of truck traffic.

On streets with extra lanes or extra lane width.

Special consideration should be given at transit stops to manage bicycle and pedestrian interactions.

# Design Guidance



The diagram illustrates a cross-section of a road with a buffered bike lane. On the left, a car is shown in a travel lane. The bike lane is separated from the travel lane by a buffer zone. The buffer zone is marked with a solid white line and a dashed white line. The bike lane itself is marked with a solid white line and a dashed white line. The diagram shows various design elements such as buffer width, lane width, and lane markings. Callouts provide specific design guidance for each element.

**On intersection approaches with no dedicated right turn only lane the buffer markings should transition to a conventional dashed line. Consider the use of a bike box at these locations.**

**On intersection approaches with right turn only lanes, the bike lane should be transitioned to a through bike lane to the left of the right turn only lane, or a combined bike lane/turn lane should be used if available road space does not permit a dedicated bike lane**

**The interior of the buffer area may use different paving materials to separate it from the bike lane. Textured surface materials may cause difficulties for bicyclists as surfaces may be rough. Increased maintenance requirements are likely.**

**The buffer shall be marked with 2 solid white lines with diagonal hatching if 3 feet in width or wider. Double white lines indicate lanes where crossing is discouraged, though not prohibited.**

**For clarity, consider dashing the inside buffer boundary where cars are expected to cross.**

**Like a conventional bike lane, a wide (6-8 inch) solid white line may be used to mark the edge adjacent to a motor vehicle travel lane.**

**Bicycle lane word and/or symbol and arrow markings (MUTCD Figure 9C-3) shall be used to define the bike lane and designate that portion of the street for preferential use by bicyclists.**

**Buffers should be at least 2 feet wide because it is impractical to mark a zone narrower than that.**

**The combined width of the buffer(s) and bike lane should be considered "bike lane width" with respect to guidance given in other documents that don't recognize the existence of buffers.**

**Where buffers are used, bike lanes can be narrower because the shy distance function is assumed by the buffer. For example, a 3 foot buffer and 4 foot bike lane next to a curb can be considered a 7 foot bike lane.**

**For travel side buffer, parking T's or a solid line are acceptable to mark between a parking lane and the buffer.**

**For travel lane buffer configurations, separation may also be provided between bike lane striping and the parking boundary to reduce door zone conflicts. This creates a type of parking-side buffer.**

**Color may be used at the beginning of each block to discourage motorists from entering the buffered lane. For other uses of color in buffered bike lanes see colored bike facilities.**

**Where bicyclist volumes are high or where bicyclist speed differentials are significant, the desired bicycle travel area width is 7 feet.**

**For travel side buffered lanes next to on street parking, a 5 foot minimum width is recommended to encourage bicyclists to ride outside of the door zone.**

**Where bicyclist volumes are high or where bicyclist speed differentials are significant, the desired bicycle travel area width is 7 feet.**

**Buffered Bike Lane - Travel Side Buffer**

View a high resolution image here: [http://nacto.org/wp-content/uploads/2010/08/Buffered-Bike-Lane\\_Annotation1.jpg](http://nacto.org/wp-content/uploads/2010/08/Buffered-Bike-Lane_Annotation1.jpg)

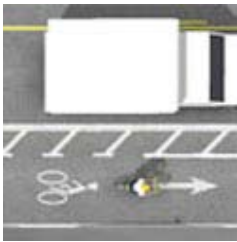
## REQUIRED



Bicycle lane word and/or symbol and arrow markings (MUTCD Figure 9C-3) shall be used to define the bike lane and designate that portion of the street for preferential use by bicyclists.

*Bicycle lane—the preferential lane-use marking for a bicycle lane shall consist of a bicycle symbol or the word marking BIKE LANE.*

Federal Highway Administration. (2009). Manual on Uniform Traffic Control Devices. Section 3D.01.



The buffer shall be marked with 2 solid white lines with diagonal hatching if 3 feet in width or wider. Double white lines indicate lanes where crossing is discouraged, though not prohibited. For clarity, consider dashing the inside buffer boundary where cars are expected to cross.

*Standard guidance for Buffer-separated right-hand side preferential lane buffer configurations (MUTCD 3D.02 03-D):*

1. A wide solid double white line along both edges of the buffer space where crossing the buffer space is prohibited.
2. A wide solid single white line along both edges of the buffer space where crossing of the buffer space is discouraged.

Federal Highway Administration. (2009). Manual on Uniform Traffic Control Devices. Section 3D.02.

## Division Street Buffered Bike Lane San Francisco, CA



with Townsend Street, a street with a bike lane used by many cyclists to reach the Caltrain (commuter rail) station. Prior to implementation of the buffered bike lane, this stretch of Division Street had shared roadway markings, or “sharrows.”

In November of 2010, the SFMTA striped a buffered bicycle lane and added channelizers, or “safe-hit

posts,” on Division Street between 9th Street and 11th Street. The physical separation from vehicular traffic fills an important gap in the route to and from the Caltrain (commuter rail) station.

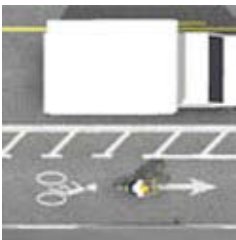
This stretch of Division Street, partially covered by Highway 101, had on-street parking and several driveways to commuter parking lots or industrial facilities. Removal of parking elicited some opposition. Additionally, while the driveways along Division Street receive relatively infrequent use, access must be maintained. Maintaining access to these driveways created some difficulties for barrier placement and staff will monitor potential vehicle/bicycle conflicts in the future.

## RECOMMENDED

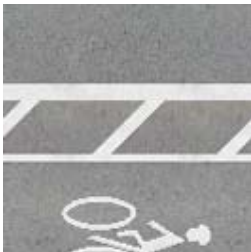


The combined width of the buffer(s) and bike lane should be considered “bike lane width” with respect to guidance given in other documents that don’t recognize the existence of buffers. Where buffers are used, bike lanes can be narrower because the shy distance function is assumed by the buffer. For example, a 3 foot buffer and 4 foot bike lane next to a curb can be considered a 7 foot bike lane.

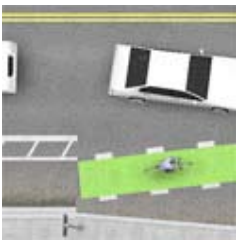
For travel side buffered lanes next to on street parking, a 5 foot minimum width is recommended to encourage bicyclists to ride outside of the door zone.



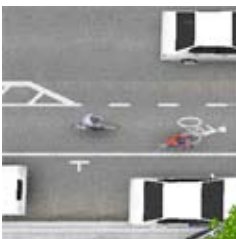
Where bicyclist volumes are high or where bicyclist speed differentials are significant, the desired bicycle travel area width is 7 feet.



Buffers should be at least 2 feet wide because it is impractical to mark a zone narrower than that.

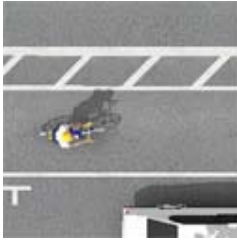


On intersection approaches with right turn only lanes, the bike lane should be transitioned to a through bike lane to the left of the right turn only lane, or a combined bike lane/turn lane should be used if available road space does not permit a dedicated bike lane.

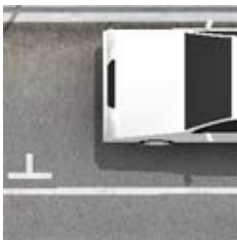


On intersection approaches with no dedicated right turn only lane the buffer markings should transition to a conventional dashed line. Consider the use of a bike box at these locations.

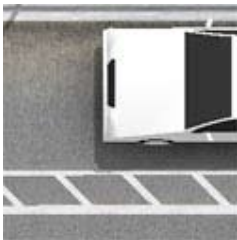
## OPTIONAL



Like a conventional bike lane, a wide (6-8 inch) solid white line may be used to mark the edge adjacent to a motor vehicle travel lane. For a parking side buffer, parking T's or a solid line are acceptable to mark between a parking lane and the buffer.



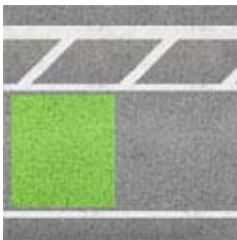
For travel lane buffer configurations, separation may also be provided between bike lane striping and the parking boundary to reduce door zone conflicts. This creates a type of parking-side buffer.



On wide one-way streets with buffered bike lanes, consider adding a buffer to the opposite side parking lane if the roadway appears too wide. This will further narrow the motor vehicle lanes and encourage drivers to maintain lower speeds.



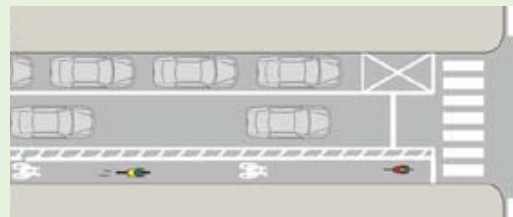
The interior of the buffer area may use different paving materials to separate it from the bike lane. Textured surface materials may cause difficulties for bicyclists as surfaces may be rough. Increased maintenance requirements are likely.



Color may be used at the beginning of each block to discourage motorists from entering the buffered lane. For other uses of color in buffered bike lanes see colored bike facilities.

## Pine and Spruce Streets Philadelphia, PA

In 2009, the Mayor's Office of Transportation in Philadelphia undertook a pilot project to evaluate the impact of a buffered crosstown bike lane on Spruce and Pine Streets running through the center city of Philadelphia. The project creates a buffer protected east-west bike route and provides a direct connection between paths on the Schuylkill and Delaware Rivers. The buffered bike lane is 6' with a 2' buffer at most points along the route. The bike lane required the removal of a single traffic lane on both streets, which had low-traffic levels, and the retiming of a traffic signal at Broad Street. The pilot projects measured a 65-100% increase in bicycle traffic along the route and an 11% decrease in motor vehicle traffic. Following the pilot, the bike lane will be made permanent in coordination with a planned street resurfacing.



## N 130th Street Buffered Bike Lanes

Seattle, WA

The N 130th Street Buffered Bike Lane in Seattle, completed in June 2010, runs along a 0.32 mile segment from Linden Ave. N to Greenwood Ave. N. The project grew out of a pedestrian project to improve a mid-block, uncontrolled marked crosswalk at North Park Avenue N. Before the reconfiguration, N 130th Street was a three-plus lane arterial street with a history of speeding. N 130th Street had an Average Daily Traffic (ADT) of 11,353 and a posted speed limit of 30 MPH. 85th percentile speeds along the corridor were 38 – 39 MPH before the re-channelization. The city wanted to reduce the number of lanes for pedestrians to cross at this location, which serves a Community Center and park on the north side of the street and apartments and single family homes on the south side. The neighborhood also has a high senior citizen population.

The reconfiguration of N 130th St. initially called only for the installation of a raised median midway through the pedestrian crossing. In coordination with these improvements and the Bicycle Master Plan, the city decided to implement buffered bike lanes as part of the re-design. The city first looked into creating

one bike lane in each direction, but a center left turn lane did not leave enough room for installation. Left turn movements along the corridor were minimal since there are no intersecting streets on the north side of N 130th Street and all the intersecting streets on the south side are non-arterial. The city decided to reduce the number of travel lanes to one in each direction and to create a buffer that reduces the width of the vehicle travel lane to discourage speeding.

As part of the N 130th Street buffered bike lane project, video detection was installed for the west-bound approach at Greenwood Ave N and N 130 St. After shifting the existing lane markings to add the bike lanes, existing detection loops on this approach were no longer in the correct locations. Video detection was chosen because it was cost-effective and cheaper to install than cutting loops for three vehicles lanes and one bike lane. The pavement was also in subpar condition for cutting new loop detectors. The other three sections of the intersection continue to function using loop detection.



## Maintenance

Buffer striping may require additional maintenance when compared to a conventional bicycle lane.

Buffered bike lanes should be maintained free of potholes, broken glass, and other debris.

If trenching is to be done in the bicycle lane, the entire bicycle lane should be trenched so that there is not an uneven surface or longitudinal joints.

See conventional bicycle lanes for additional maintenance issues that may apply.

## Treatment Adoption and Professional Consensus

Buffered bike lanes are used in the following US cities and counties:

Austin, TX  
Brooklyn, NY  
Cape Coral, FL  
Marin County, CA  
New York, NY  
Portland, OR  
San Francisco, CA  
Seattle, WA  
Tucson, AZ

# Renderings

The following images are 3D concepts of conventional bike lanes. The configuration shown is based on Brooklyn, NY, and Portland, OR, examples.







# Image Gallery



# Image Gallery



NEW YORK, NY



AUSTIN, TX



NEW YORK, NY



AUSTIN, TX



AUSTIN, TX



CAPE CORAL, FL