APPENDIX A

FACILITY AND DESIGN GUIDANCE

A regional network of bicycle and pedestrian facilities is dependent on the quality of the segments that each municipality contributes. A good network can be described as consistent, continuous, recognizable and safe. Because each member government may define these differently, confusion may occur while traveling the regional network. To overcome this challenge, ACOG has adopted design guidelines that will apply to all segments of the regional bike and pedestrian network that are funded by ACOG through the Surface Transportation Build Grant (STBG), the Transportation Alternatives Program (TAP), and the Air Quality Small Grants Program.

ACOG's design guidelines seek to address two questions: what sort of facility is suitable for a given road condition; and what engineering specifications should be followed. The guidance below calls reference to several national organizations' published guidelines. These include the Federal Highway Administration (FHWA), the National Association of City Transportation Officials (NACTO), the American Association of State Highway Transportation Officials (AASHTO), and the Manual on Uniform Traffic Control Devices (MUTCD).

BICYCLE FACILITIES

ACOG recommends using the NACTO Urban Bikeway Design Guide, AASHTO Guide for Development of Bicycle Facilities, and the FHWA Bikeway Selection Guide when selecting, designing and constructing bicycle facilities in the region. For intersections, it is recommended local communities use the NACTO guide Don't Give Up at the Intersections. These guides are based on the experience of the top cycling cities in the world. The designs below are examples of common roadway treatments that promote safety and usability for cyclists. While these designs have proven effective in many cities around the world, it is important for local officials to tailor the treatment to fit each individual situation.

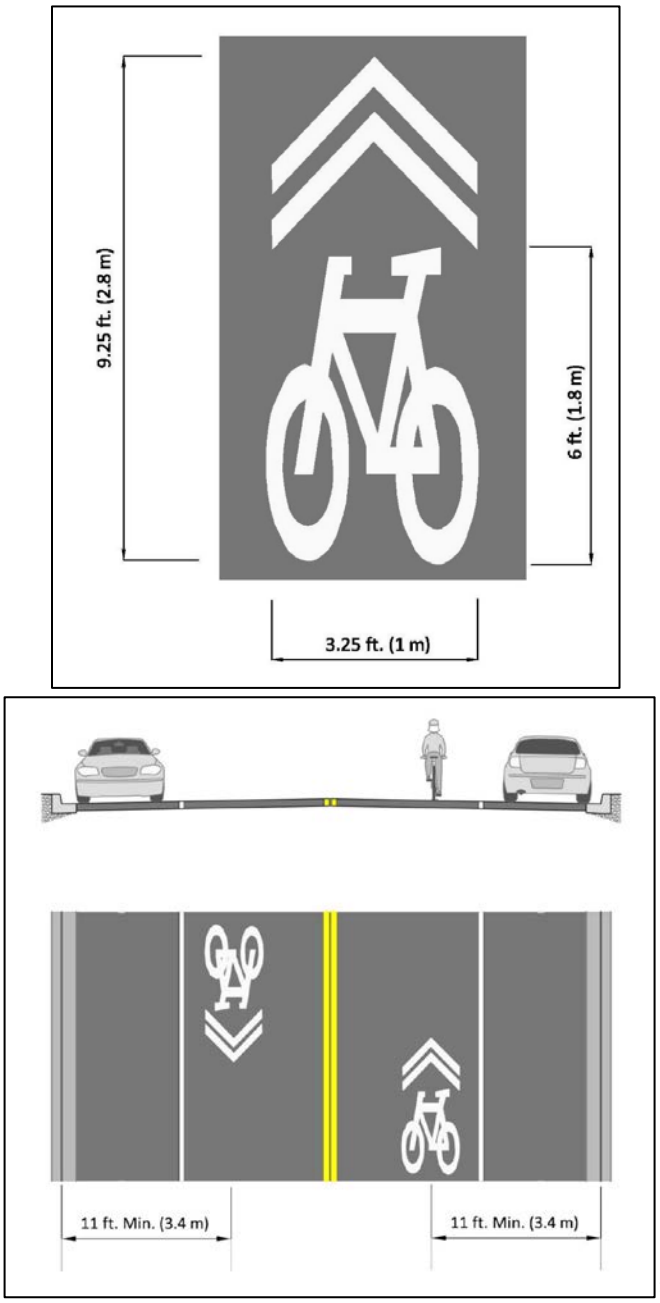
TREATMENT	RECOMMENDED GUIDANCE
Signs	NACTO
Sharrows	AASHTO
Paved Shoulders	AASHTO
Bike Lanes	NACTO
Buffered Bike Lanes	NACTO
Protected Bike Lane/Cycle Track	NACTO
Share Use Path	AASHTO
Bicycle Boulevard	NACTO
Intersections	NACTO

SHARED LANE MARKINGS

Bikeway Signage and Markings encompasses any treatment or piece of infrastructure whose primary purpose is either to indicate the presence of a bicycle facility or to distinguish that the facility is designed for bicyclists, motorists, or pedestrians. Bicycle signage includes several sub-categories. These include wayfinding and route signage, regulatory signage, and warning signage. Some bicycle specific signage exists to provide motorized traffic with information and instruction.

Shared Lane Markings (SLMs), or "sharrows," are road markings used to indicate a shared lane environment for bicycles and automobiles. Among other benefits shared lane markings reinforce the legitimacy of bicycle traffic on the street, recommend proper bicyclist positioning, and may be constructed to offer directional and

wayfinding guidance. The shared lane marking is a pavement marking with a variety of uses to support a complete bicycle network, though it is not a true bicycle facility and should not be considered a substitute for bike lanes, cycle tracks, or other separation treatments where these types of facilities are otherwise warranted or space permits. ACOG suggests this treatment be used on roads with lower traffic counts and speeds of less than 25 mph. The MUTCD outlines guidance for shared lane markings in section 9C.07.

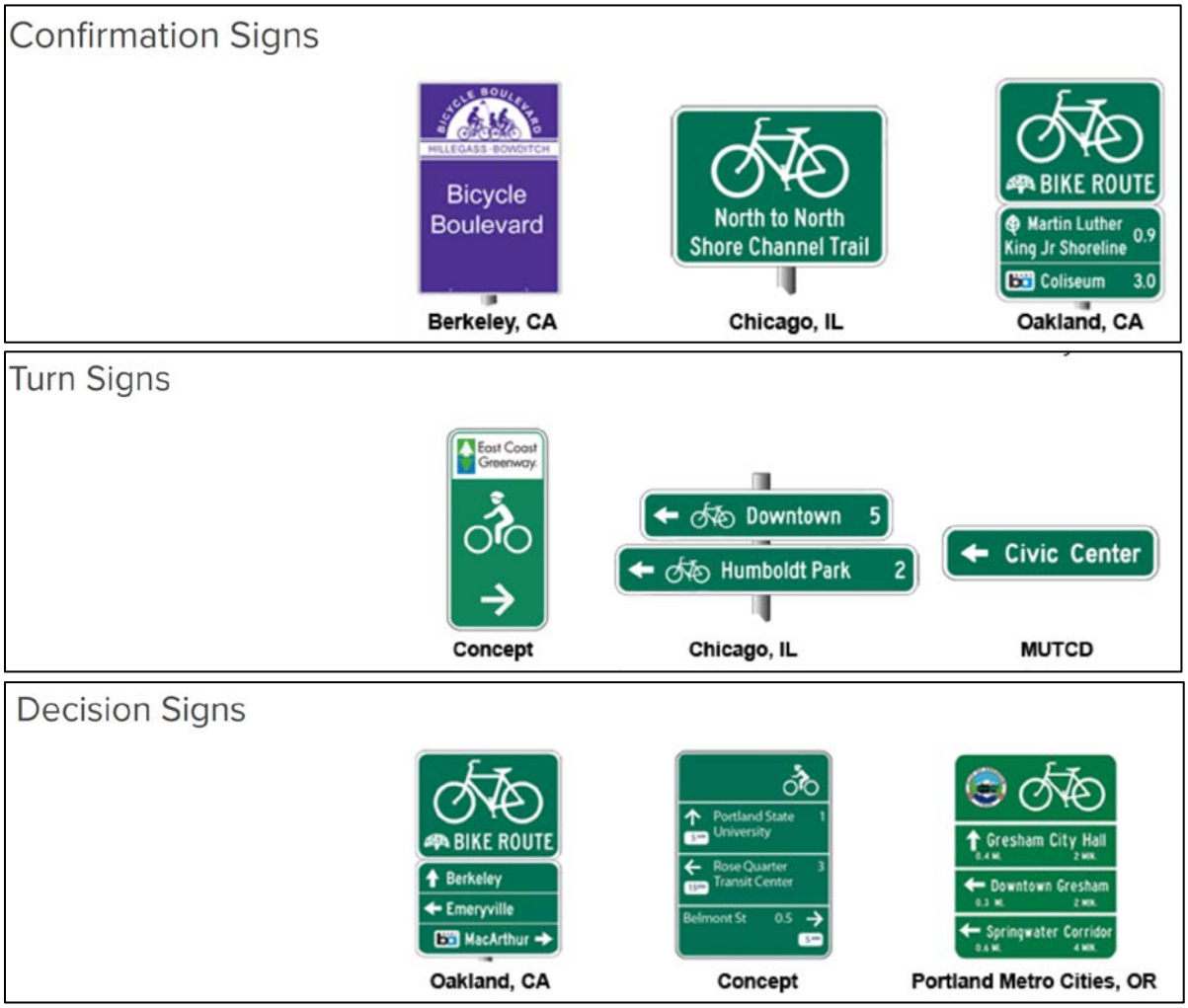


[1]

A bicycle wayfinding system consists of comprehensive signage and/or pavement markings to guide bicyclists to their destinations along preferred bicycle routes. Signs are typically placed at decision points along bicycle routes – usually at the intersection of two or more bikeways and at other key locations. National guidance for

[1] Share Lane Marking AASHTO Bike Guidance

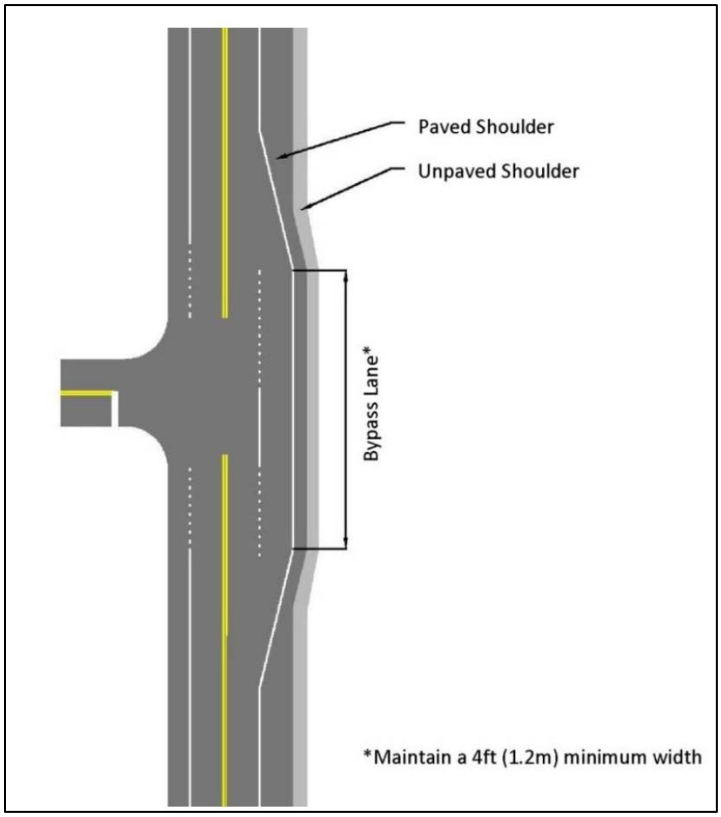
bicycle wayfinding signage is found in Chapter 9 of the Manual on Uniform Traffic Control Devices. Cities and regions may develop alternate bicycle wayfinding signage designs.

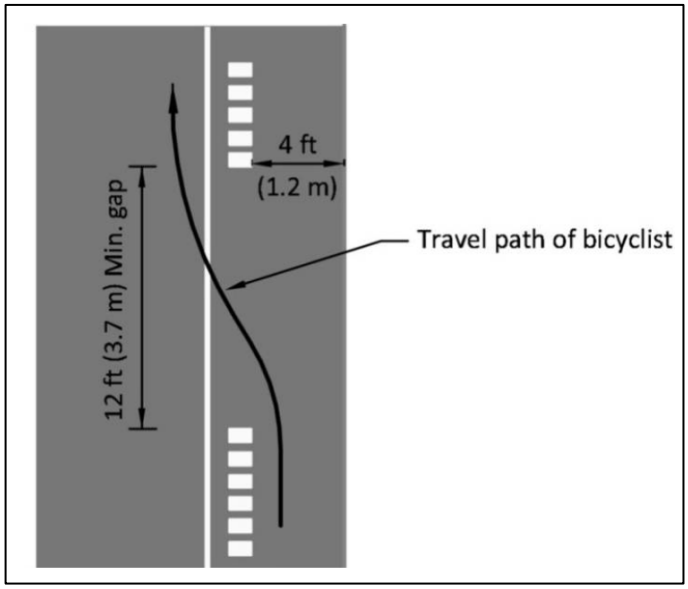


[2]

[2] https://nacto.org/publication/urban-bikeway-design-guide/bikeway-signing-marking/bike-route-wayfinding-signage-and-markings-system/

Paved shoulders are found on the edge of rural roads that typically don't see high numbers of cyclists. These may be enhanced to serve as a functional space for bicyclists and pedestrians to travel in the absence of other facilities with more separation. Paved shoulders also extend the life of the road by reducing edge deterioration. Communities should follow the AASHTO guidelines when designing and constructing paved shoulders for bicycle use.



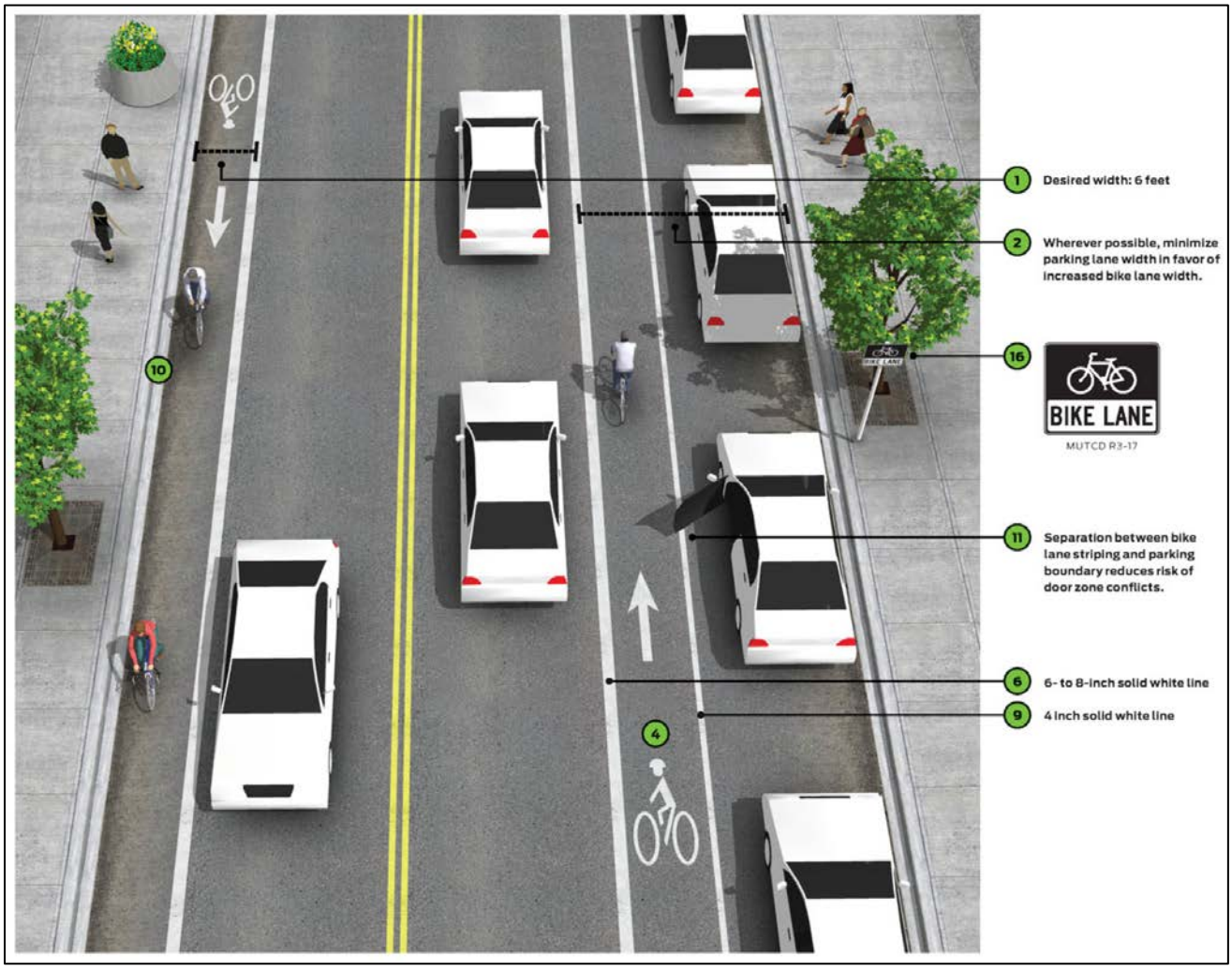


[3]

[3] AASHTO Bike Design Guide

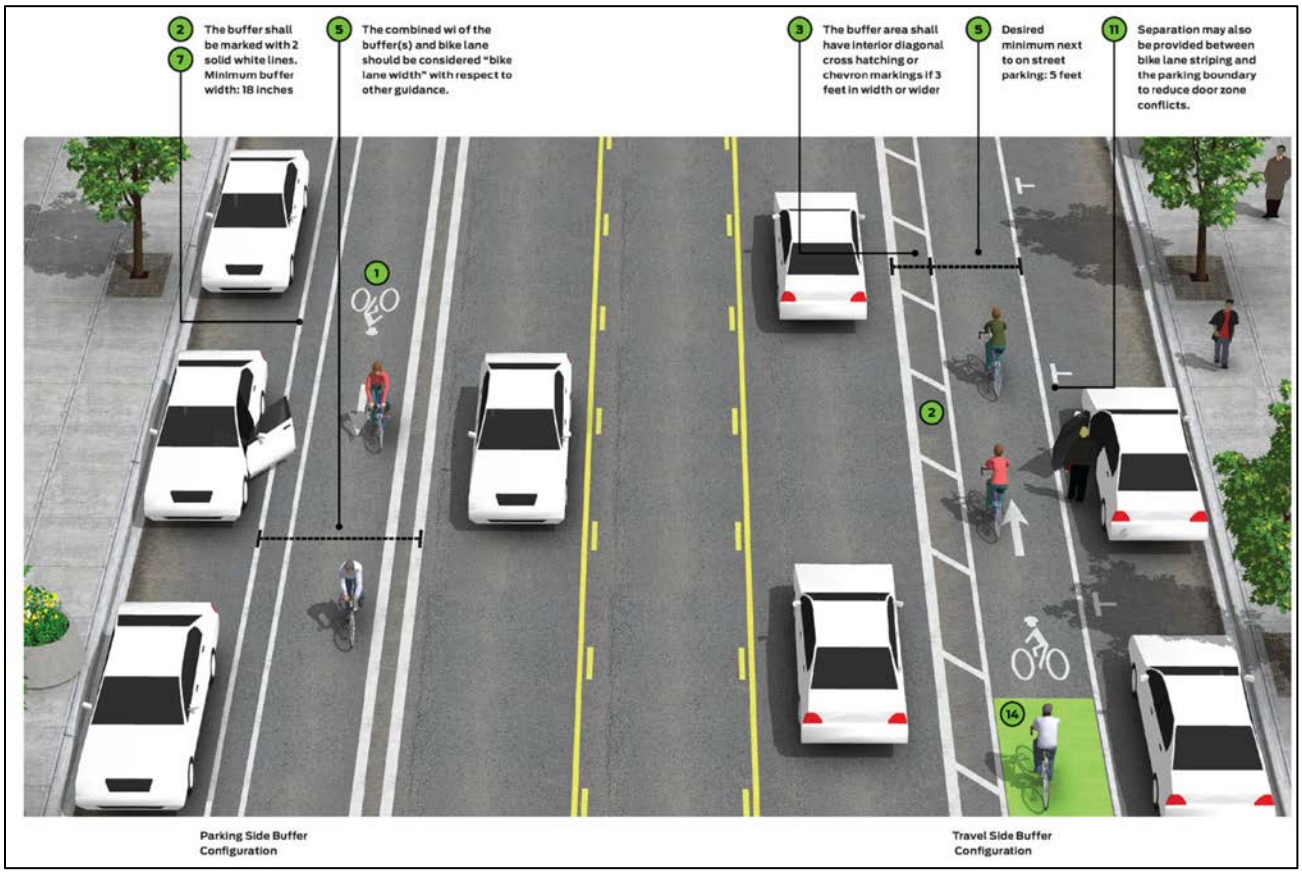
BIKE LANES AND SHARED USE PATHS

A conventional bicycle lane is defined as a portion of the roadway that has been designated for bicycles through striping, signage, and pavement markings. Bike lanes allow bicyclists to ride at their preferred speed and facilitate predictable behavior and movement between bicyclists and motorists. A conventional bike lane is distinguished from a cycle track, or protected bike lane, in that it has no physical barrier (bollards, medians, raised curbs, etc.) that keeps motorized traffic from driving in the lane. Conventional bike lanes are located on the curbside when no parking is present. Bike lanes typically run in the same direction of traffic, though they may be configured in the contra-flow direction on low-traffic corridors. Lane markings can be found in the MUTCD section 9C-3.



[4] https://nacto.org/publication/urban-bikeway-design-guide/bike-lanes/conventional-bike-lanes/

Buffered bike lanes are conventional bicycle lanes paired with a designated buffer space, separating the bicycle lane from the adjacent motor vehicle travel lane. The buffered bike lane provides more comfort than a conventional bike lane, but less security than a protected bike lane. A buffered bike lane is allowed as per MUTCD guidelines for buffered preferential lanes (section 3D-01).



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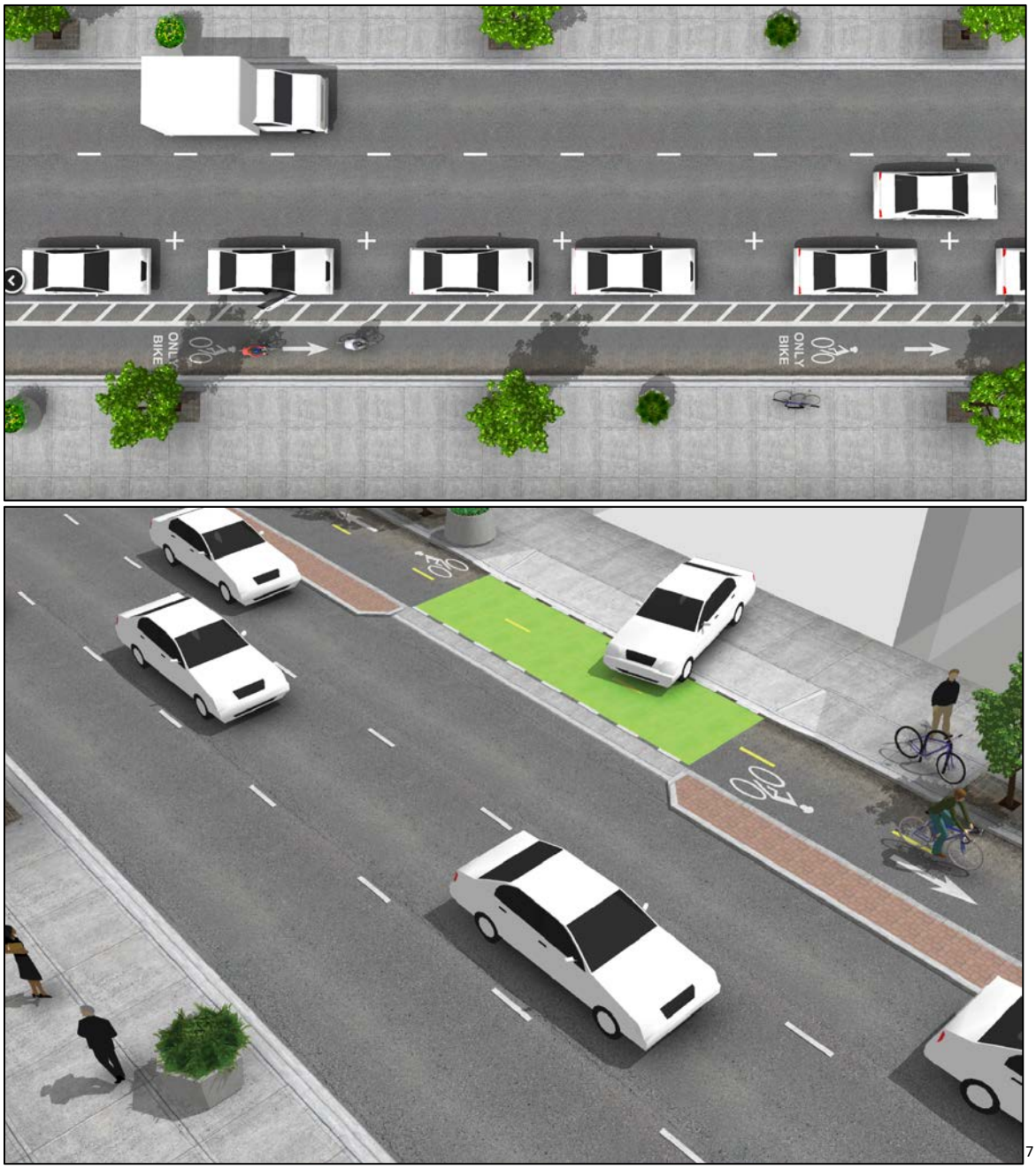
[5] https://nacto.org/publication/urban-bikeway-design-guide/bike-lanes/buffered-bike-lanes/

Contra-flow bicycle lanes are bicycle lanes designed to allow bicyclists to ride in the opposite direction of motor vehicle traffic. They convert a one-way traffic street into a two-way street: one direction for motor vehicles and bikes, and the other for bikes only. Contra-flow lanes are separated with yellow center lane striping. Combining both direction bicycle travel on one side of the street to accommodate contra-flow movement results in a two-way cycle track, these are especially useful for the connectivity of an existing bicycle route. Look to NACTO for design guidance when constructing a contra-flow bike lane.

 [6]

[6] https://nacto.org/publication/urban-bikeway-design-guide/bike-lanes/contra-flow-bike-lanes/

A protected bike lane, or cycle track, is an exclusive bike facility that combines the user experience of a separated path with the on-street infrastructure of a conventional bike lane. A protected bike lane is physically separated from motor traffic and distinct from the sidewalk. Protected bike lanes come in different forms but share similar qualities—they provide secure space that is intended to be used exclusively for bicycles and other forms of micromobility. In situations where on-street parking is allowed, bike lanes can become protected by being located to the curbside of the parking. Look to NACTO for design guidance.

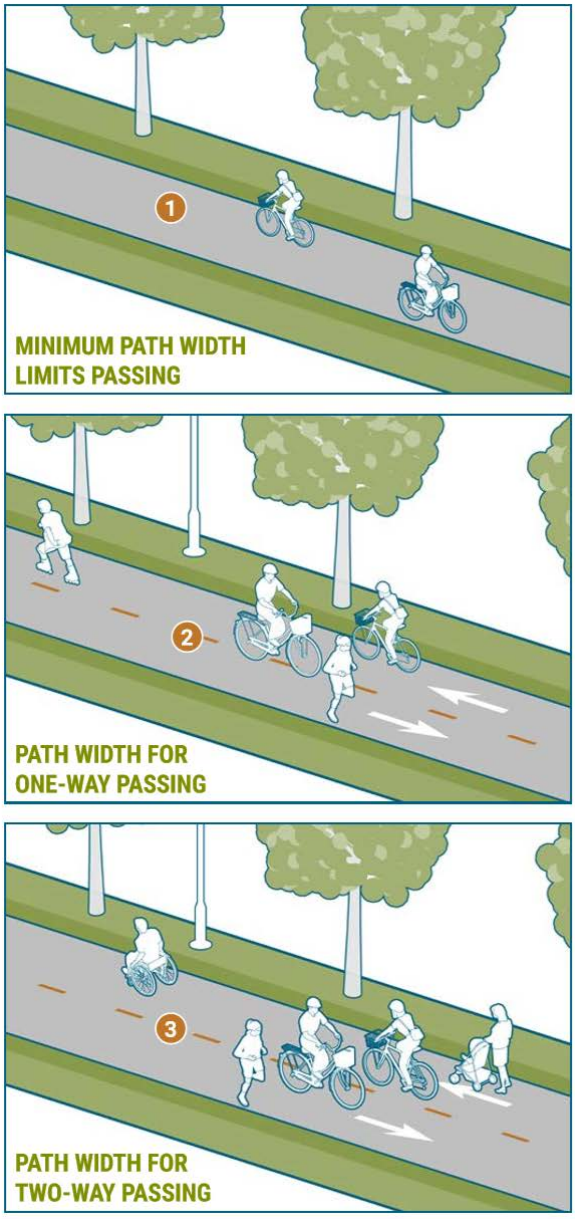


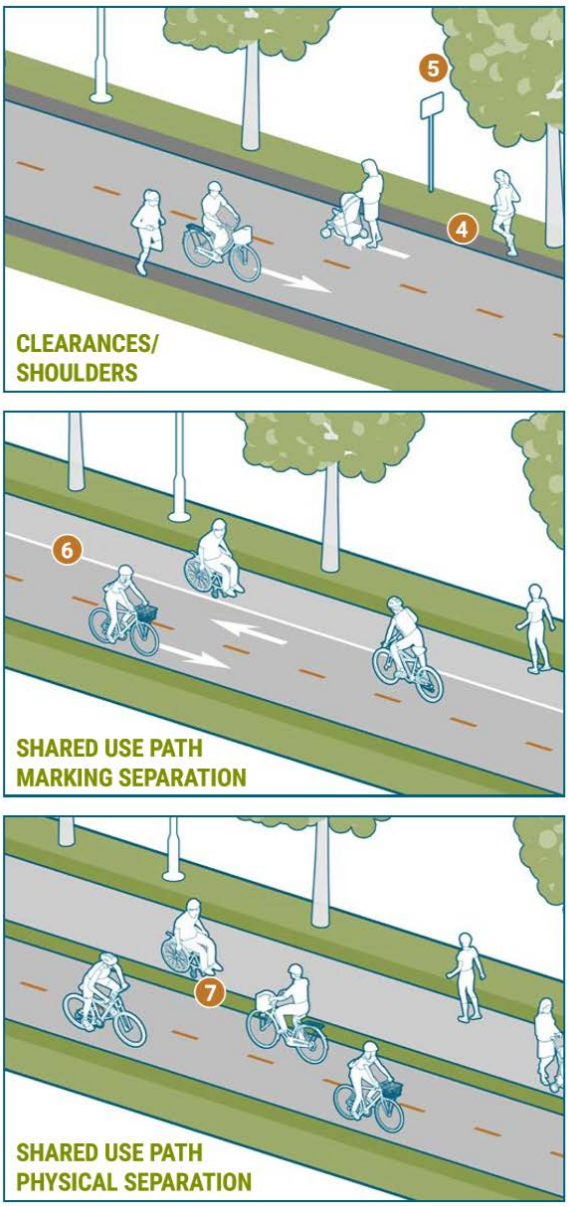
[7]

[7] https://nacto.org/publication/urban-bikeway-design-guide/cycle-tracks

A shared use path is a bikeway physically separated from motorized vehicular traffic by an open space or barrier and either within the highway right-of-way or within an independent right-of-way. Shared use paths may also be used by pedestrians, skaters, wheelchair users, joggers and other non-motorized users. This treatment may be used on relatively high speed or high trafficked roadways where active users don't feel comfortable riding with traffic. Look to AASHTO's guidance when designing a shared use path.

[8]





[8] https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/multimodal_networks/fhwahep16055.pdf

LEVEL OF STREESS ANALYSIS AND FACILITY SELECTION

It is ACOG's goal to provide a safe and convenient network of bicycle facilities for the average, inexperienced bicycle rider. ACOG recommends shared use paths or cycle tracks when possible, but the circumstances of each community don't always allow for these facilities.

The Level of Stress Analysis table was developed to assist communities in deciding which type of facility is appropriate for the road in which it's located. Streets will range from "Low Stress" to "High Stress" based on the posted speed limit and Average Annual Daily Traffic (AADT) counts.

	Average Annual Daily traffic (AADT) volume		
Average motor vehicle operating speed	Less than 2,000	2,000-10,000	Over 10,000
Less than 30 mph	Sign-on-road bike route, sharrows, bike boulevard or nothing	Striped/buffered bike lanes; wide paved shoulder in rural areas	Striped or buffered bike lanes
30-40 mph	Striped/buffered bike lanes; wide paved shoulder in rural areas	Striped or buffered bike lanes	Buffered bike lanes or cycle tracks
41-50 mph	Striped/buffered bike lanes; wide paved shoulder in rural areas	Buffered bike lanes or cycle tracks	Shared use path or cycle tracks
Over 50 mph	Striped or buffered bike lanes	Buffered bike lanes or cycle tracks	Shared use path or cycle tracks

Level of Stress
Low Stress
Medium-Low Stress
Medium Stress
Medium-High Stress
High Stress

FOUR TYPES OF BICYCLISTS

STRONG AND FEARLESS

ENTHUSIASTIC AND CONFIDENT

INTERSTED BUT CONCERNED

NO WAY NO HOW

PEDESTRIAN FACILITIES

As a region we must prioritize building sidewalks to address the overall deficiency we experience in the OCARTS region. Not all sidewalks provide the same level of comfort or ease of access. General design standards for sidewalks is difficult, given their construction is based on amount and location of right-of-way, though it is important to ensure all sidewalks are adequate given their situation. Below are the standards as set by FHWA and adopted by ACOG.

FHWA Designing Sidewalks and Trails for Access guidelines sets sidewalk requirements by roadway classification and land use. A 60-inch minimum is required for each section below.

ROADWAY CLASSIFICATION AND LAND USE	SIDEWALK REQUIREMENTS	FUTURE FASING
Highway (rural)	Minimum of 60 inch shoulders required	Secure/preserve ROW for future sidewalks.
Highway (rural/suburban – less than 1 dwelling unit/acre)	One side preferred. Minimum of 60 inch shoulders required.	Secure/preserve ROW for future sidewalks.
Suburban Highway (1-4 dwelling units/acre)	Both sides preferred. One side required.	Second side required if density becomes greater than 4 dwelling units/acre
Major Arterial (residential)	Both sides required.	
Collector and Minor Arterial (residential)	Both sides required.	60 inch minimum
Local Street (Residential- less than 1 dwelling unit/acre)	One side preferred. Minimum of 60 inch shoulders required.	Secure/preserve ROW for future sidewalks
Local Street (Residential- 1 to 4 dwelling units/acre)	Both sides preferred. One side required.	Second side required if density becomes greater than 4 dwelling units/acre
Local Street (Residential- more than 4 dwelling units/acre)	Both sides required.	
All Streets (commercial areas)	Both sides required.	
All Streets (industrial areas)	Both sides preferred. One side required.	

http://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/sidewalk2/pdf/05chapter4.pdf

SAFE TRANSPORTATION FOR EVERY PEDESTRIAN (STEP)

The Federal Highway Administration (FHWA) also promotes Safe Transportation for Every Pedestrian (STEP). This program recommends several countermeasures to ensure pedestrians have safe facilities to travel. These improvements primarily focus on conflict points, such as marked and unmarked crossings. Below are countermeasures included within the STEP program. While these improvements are recommended by the FHWA and ACOG, we still encourage communities to adjust based on their unique circumstances.

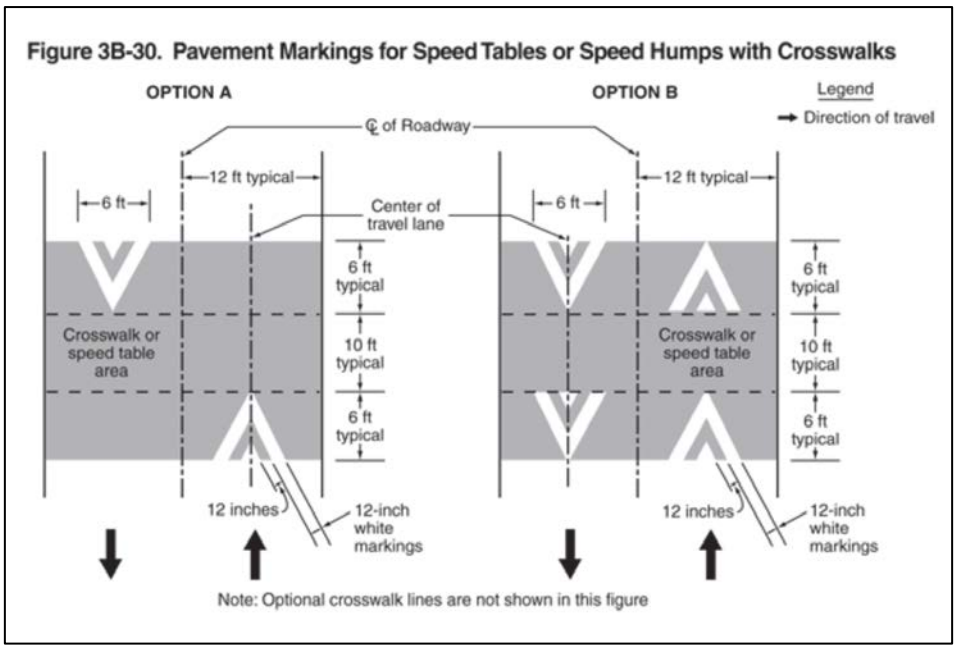
Crosswalk Visibility Enhancements may be used in combination to indicate preferred locations for people to cross, to increase visibility of the crossing location, and to help reinforce the driver's requirement to yield the right-of-way to pedestrians at crossing locations. These countermeasures help address the issues of drivers not yielding to pedestrians, inadequate crossing options for the pedestrian, and recognized conflict areas. Below are enhancements to consider.

- High-visibility crosswalk markings
- Parking restriction on crosswalk approach
- Overhead lighting
- Advance Yield Here To (Stop Here For) Pedestrians sign and stop or yield line
- In-Street Pedestrian Crossing sign
- Curb extension

[9]

[9] https://safety.fhwa.dot.gov/ped_bike/step/docs/techSheet_VizEnhancemt2018.pdf

Raised crosswalks are ramped crossings spanning the entire width of the roadway, often placed at midblock crossing locations. This treatment is ideal for roadways of less than 9,000 AADT and where speeds are less than 30 mph. This helps address lack of pedestrian visibility and excessive vehicle speed. See MUTCD Section 3B.25 for information about Speed Hump Markings and other markings that can be used with raised crosswalks.



[10]

[10] https://mutcd.fhwa.dot.gov/htm/2009/part3/fig3b_30_longdesc.htm

A pedestrian refuge island is a median with a refuge area that is intended to help protect pedestrians who are crossing the road. This countermeasure is sometimes referred to as a crossing island or pedestrian island. This countermeasure is effective on roads with established crossings that do not already have a raised median See MUTCD section 3D for more information.

[11]


[12]

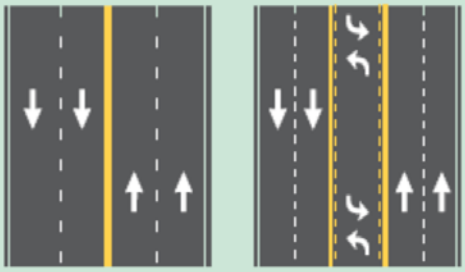
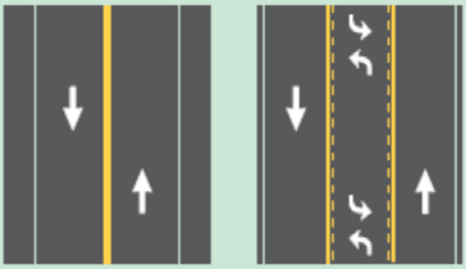
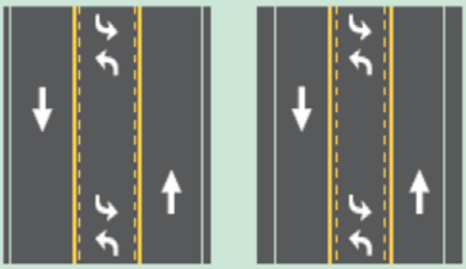
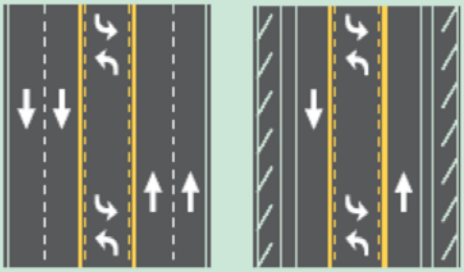
[11] https://www.youtube.com/watch?v=7T4T-QXN6ks
[12] https://nacto.org/publication/urban-bikeway-design-guide/intersection-treatments/median-refuge-island/

Pedestrian Hybrid Beacons (PHB) are used to control traffic and rests on off until a pedestrian activates it via pushbutton or other form of detection. When activated, the beacon displays a sequence of flashing and solid lights that indicate when pedestrians should cross and when it is safe for drivers to proceed. The beacons help bring attention to pedestrians as they cross heavily trafficked areas. These beacons may also be replaced by standard traffic lights that are pedestrian actuated. These should be used in conjunction with signs and pavement markings. For more information, view part 4F in the MUTCD.

13

[13] Michigan Complete Streets

Road Diets are a strategy that result in a reduction in the number of travel lanes, which is usually achieved by converting a four-lane, undivided road to a three-lane road. The space gained by eliminating lanes is typically reserved for other uses and travel modes. This is often used on roadways with lower levels of traffic than the existing roadway was built to accommodate.

4-lane to 5-lane: In some cases it is necessary to keep two lanes in each direction for capacity purposes. Narrowing lane width to provide a TWLTL introduces the benefits of separating turning vehicles and reducing operating speeds.	
2-lane to 3-lane: If a capacity expansion of an existing two-lane road is desired, in some cases a three-lane cross section can provide similar operational benefits to a four-lane cross section while maintaining the safety benefits of the three-lane configuration.	
3-lane to 3-lane: In some cases practitioners could reduce the width of each lane instead of reducing the number of lanes. Converting an existing three-lane roadway to a three-lane cross section with narrowed lanes can accommodate bicycle lanes or parking, and provide some traffic calming benefit.	
5-lane to 3-lane: In some cases jurisdictions have reconfigured five-lane sections to three lanes, adding features such as diagonal parking and protected bicycle lanes with the extra cross section width.	

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[14] https://safety.fhwa.dot.gov/road_diets/guidance/info_guide/ch1.cfm#f2

Rectangular Rapid-Flashing Beacon (RRFB) is a pedestrian-actuated conspicuity enhancement used in combination with a pedestrian, school, or trail crossing warning sign to improve safety at uncontrolled, marked crosswalks. The device includes two rectangular-shaped yellow indications, each with an LED-array-based light source that flashes with high frequency when activated. The RRFB is not currently included in the MUTCD. FHWA has issued interim approval for the optional use of the RRFB (Interim Approval 21 or IA-21).

[15]

[15] https://altaplanning.com/news/fhwa-rescission-interim-approval-rectangular-rapid-flashing-beacons/

Note: With the introduction of new facilities – additional local education and enforcement is required.

Pedestrian Crash Countermeasure for Uncontrolled Crossings	Safety Issue Addressed				
	Conflicts at crossing locations	Excessive vehicle speed	Inadequate conspicuity/ visibility	Drivers not yielding to pedestrians in crosswalks	Insufficient separation from traffic
Crosswalk visibility enhancement	✓	✓	✓	✓	✓
High-visibility crosswalk markings*	✓		✓	✓	
Parking restriction on crosswalk approach*	✓		✓	✓	
Improved nighttime lighting*	✓		✓		
Advance Yield Here To (Stop Here For) Pedestrians sign and yield (stop) line*	✓		✓	✓	✓
In-Street Pedestrian Crossing sign*	✓	✓	✓	✓	
Curb extension*	✓	✓	✓		✓
Raised crosswalk	✓	✓	✓	✓	
Pedestrian refuge island	✓	✓	✓		✓
Pedestrian Hybrid Beacon	✓	✓	✓	✓	
Road Diet	✓	✓	✓		✓
Rectangular Rapid-Flashing Beacon	✓		✓	✓	✓

*These countermeasures make up the STEP countermeasure "crosswalk visibility enhancements." Multiple countermeasures may be implemented at a location as part of crosswalk visibility enhancements.

** FHWA Field Guide for Selecting Countermeasures at Uncontrolled Pedestrian Crossing Locations*