# A Preview of the 2018 AASHTO Guide for the Development of Bicycle Facilities

2017 ITS-WISCONSIN FORUM

*November 8, 2017*

# Presenter



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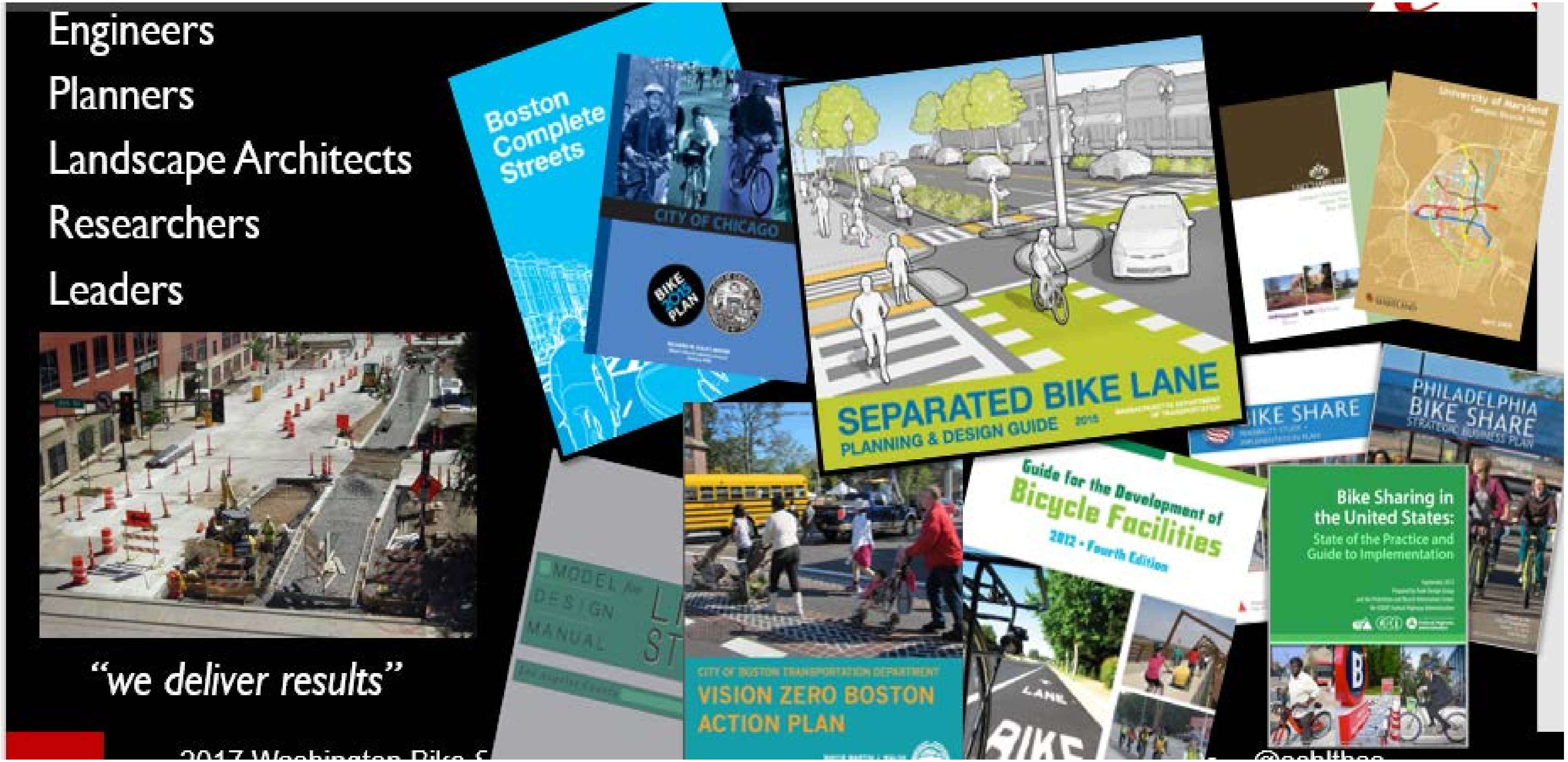
# ABOUT TOOLE DESIGN GROUP

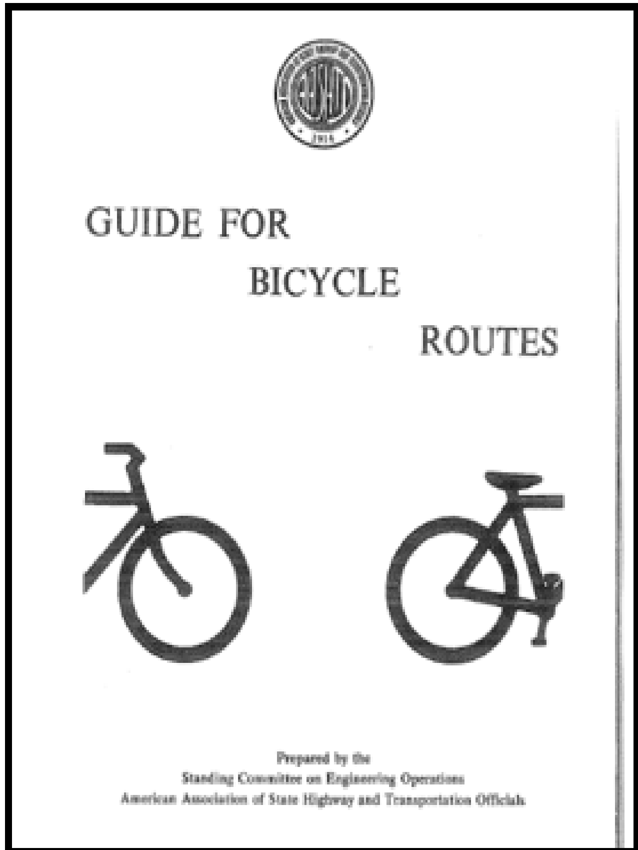
LOCATIONS

- Washington, DC
- Baltimore, MD
- Berkeley, CA
- Boston, MA
- Denver, CO
- Madison, WI
- Minneapolis, MN
- Orlando, FL
- Portland, OR
- Seattle, WA
- Spartanburg, SC

# About Toole Design Group



# 1974 AASHTO Bike Guide


GUIDE FOR
BICYCLE
ROUTES

Prepared by the
Standing Committee on Engineering Operations
American Association of State Highway and Transportation Officials

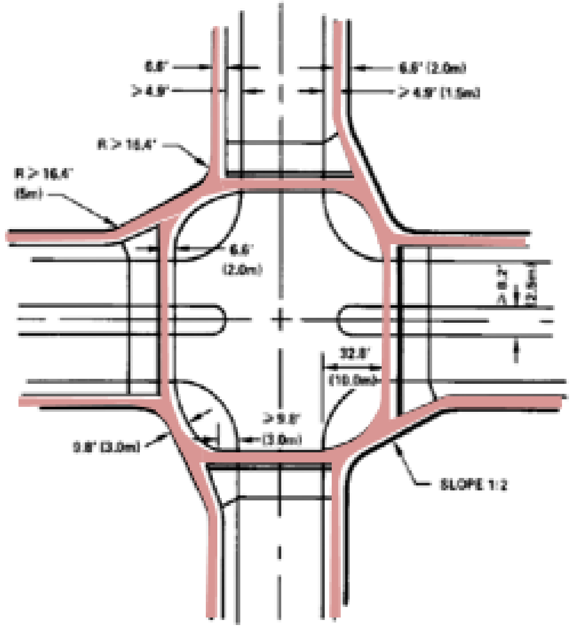



Figure 3.8.14. Recommended Intersection Design for Intersecting Arterial Roads with Bikeways on Each Road. Intersection is Asymmetrically Designed to Provide Bicycle Queue Areas at the Entrance to the Crossings. (Reference 26, p. 23)

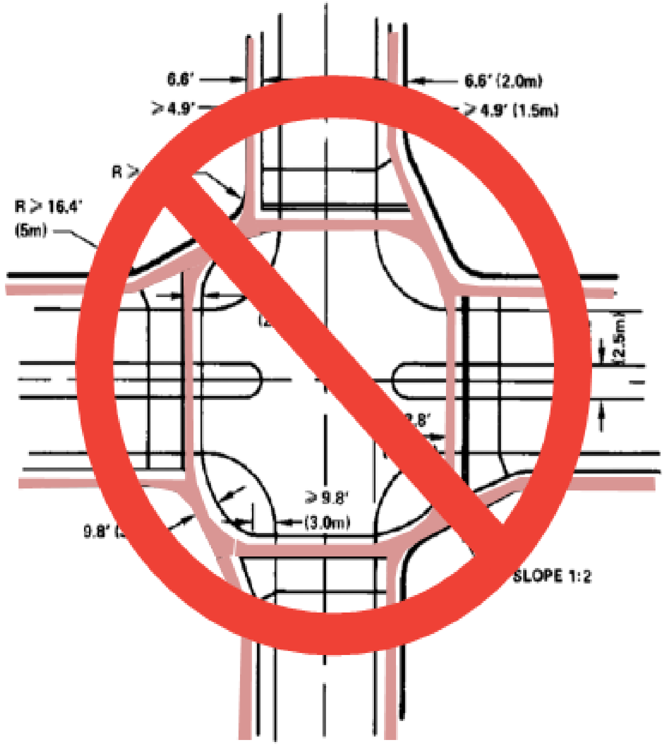
Protected Bike Lanes & Intersections


Davis, California 1967

# The 1981 Edition

Protected bike lanes removed in 2nd edition of the Bike Guide


(1.5m). Bicycle lanes should always be placed between the parking lane and the motor vehicle lanes. Bicycle lanes between the curb and the parking lane create hazards for bicyclists from opening car doors and poor visibility at intersections and driveways, and they prohibit bicyclists from making left turns; therefore this placement should never be considered.

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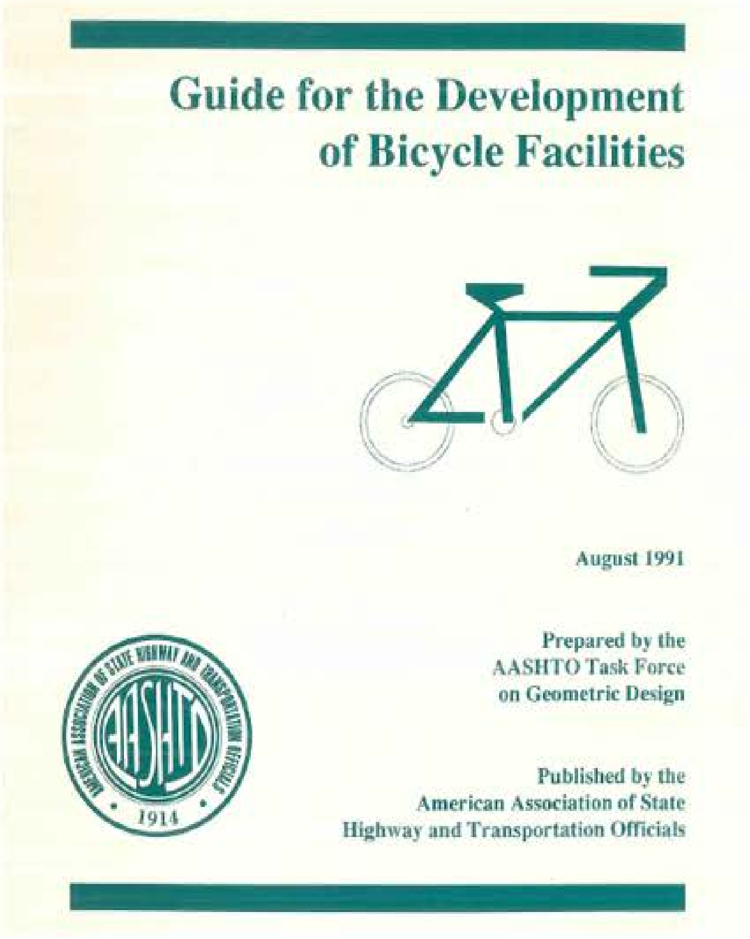
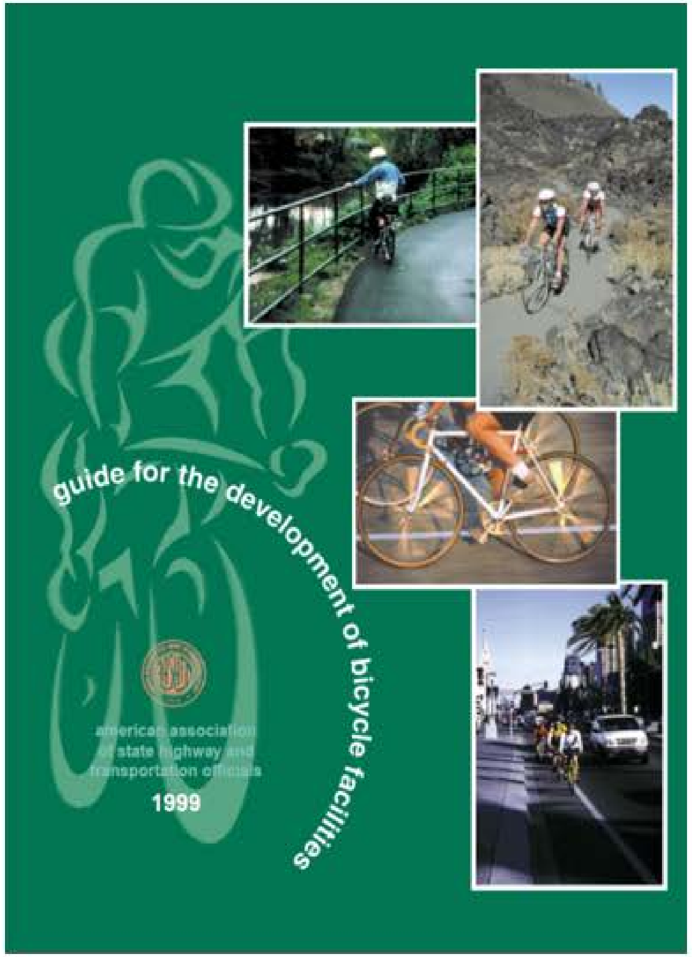
# HELP ME!

# The 1980's Wide Outside Lanes

# AASHTO Bike Guide History




1991 AASHTO Bike Guide




1999 AASHTO Bike Guide

"Bicycle lanes tend to complicate both bicycle and motor vehicle turning movements at intersections."

# The 1990's to 2000's

# AASHTO Bike Guide History

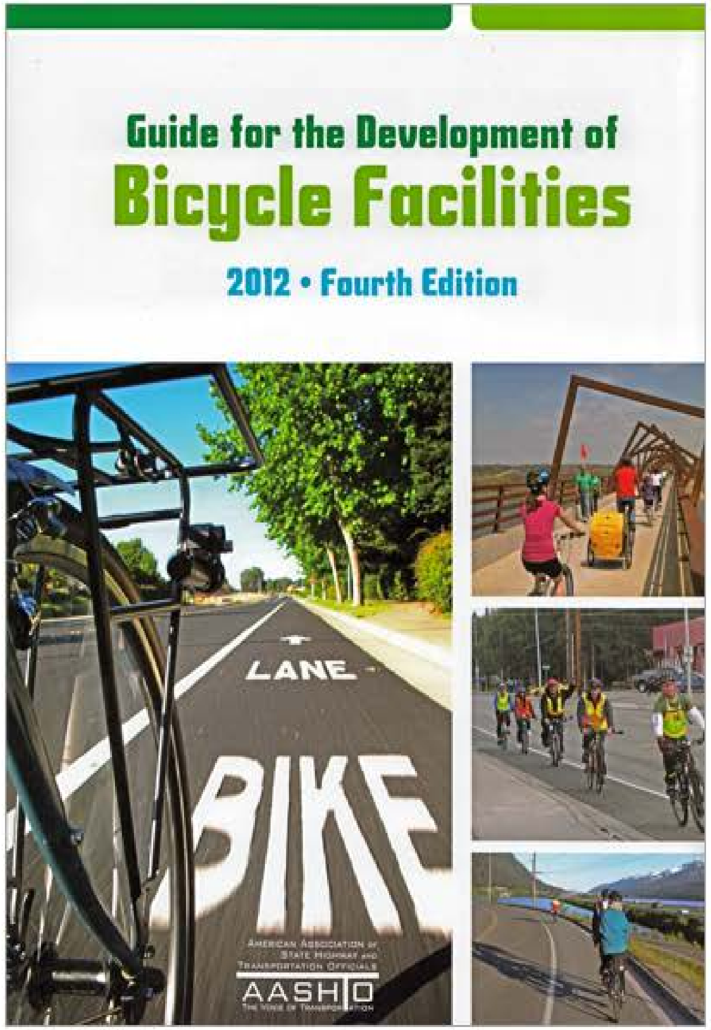
Published in 2012

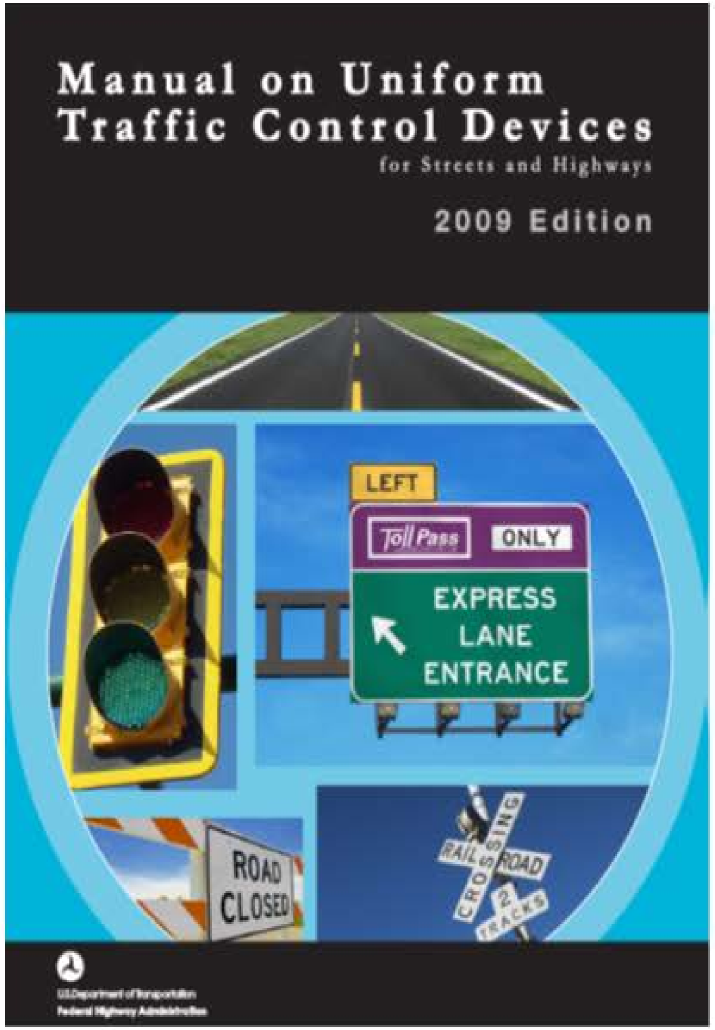
Written in 2009/2010

Content directed by NCHRP panel

- conform to 2009 MUTCD which had content written in 2007

2012 Edition expanded the guide to 7 chapters and over 200 pages, compared to the 1999 version which had 3 chapters and only 75 pages



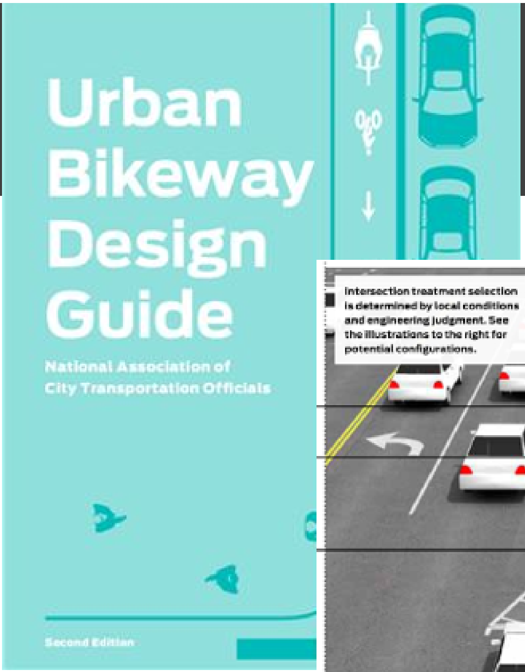



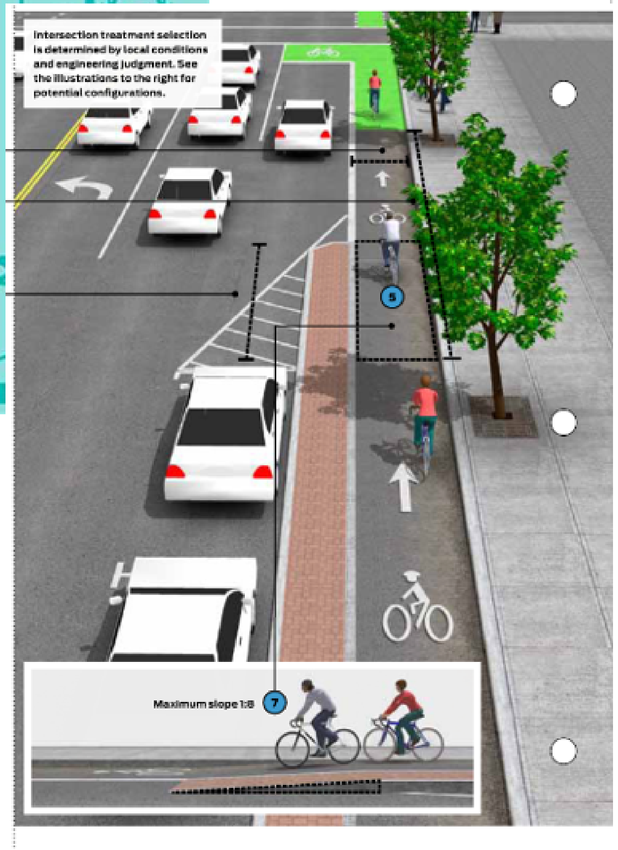
# Other Publications

## AASHTO Bike Guide History

As the 2012 Guide was developed, new types of bicycle facilities were being installed in the United States.

- National Association of City Transportation Officials *Urban Bikeway Design Guide* (2012)
- Institute of Transportation Engineers (ITE) *Separated Bikeways* (2013)
- FHWA memorandum *Bicycle and Pedestrian Facility Design Flexibility* (2013)
- U.S. Access Board *Supplemental Notice of Proposed Rulemaking* (2014)



# Separated Bike Lane Explosion

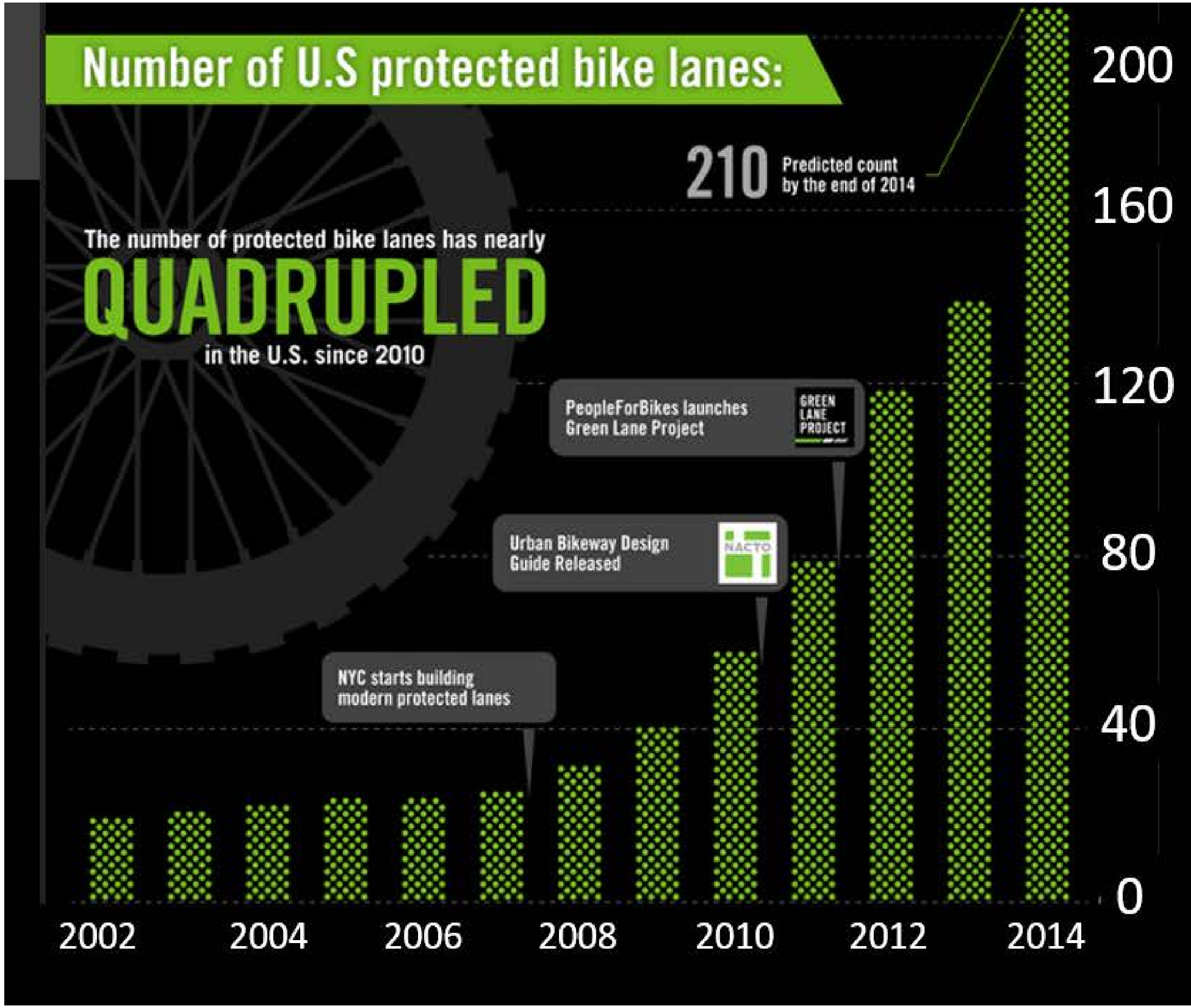



Chart Source:
People for Bikes

# AASHTO Bike Guide Schedule

- Interim Report: Fall 2016
- 1st Draft: March 2017
- 2nd Draft: Summer 2017
- 3rd Draft: Early Fall 2017
- Final Draft and Balloting: Winter/Spring 2018

AASHTO Subcommittee Approvals needed from: design, traffic, bicycle

**Final Comments and Publication: End of 2018**

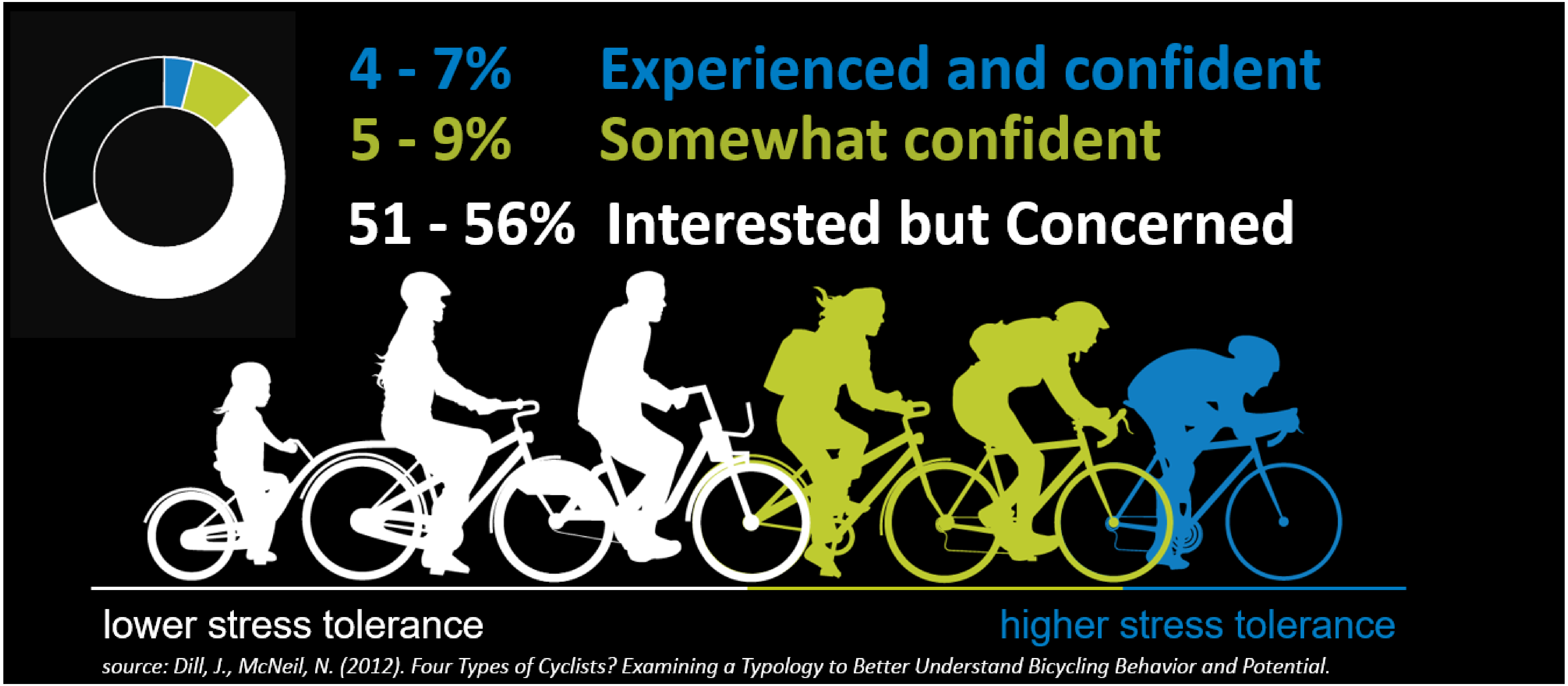
# Preliminary Chapter Outline

1. Introduction
2. Bicycle Operation & Safety
3. Planning
4. **Facility Selection**
5: **Elements of Design**
6. Shared Use Paths
7. **Separated Bike Lanes**
8. **Bicycle Boulevards**
9. Bike Lanes & Shared Lanes
10. **Traffic Signals and Active Warning Devices**
11. **Roundabouts, Interchanges, and Other Intersections**
12. **Rural Area Bikeways**
13. **Structures**
14. **Wayfinding**
15. Maintenance & Operations
16. Parking & End of Trip Facilities

## User Characteristics

- Until age 14, children tend to have slower response and execution times (Plumert et al., 2004; Kali, 1991)
- Children also tend to sacrifice cognitive functions to preserve motor functions, e.g., maintaining balance on bicycle (Wierda & Brookhuis, 1991)
- Older adults show slower processing time and task performance (Salthouse, 2009; Verhaeghen & Cerella, 2002)
  - Particularly true in the face of multiple stimuli (Verhaeghen & Cerella, 2002)

# Chapter 2- Bicycle Operation & Safety



# Default Design User for Guide

**4 - 7%**

**Experienced & Confident Cyclist**
**AASHTO 2012**

**51 - 56%**

**Interested but Concerned Cyclist**
**AASHTO 2018**

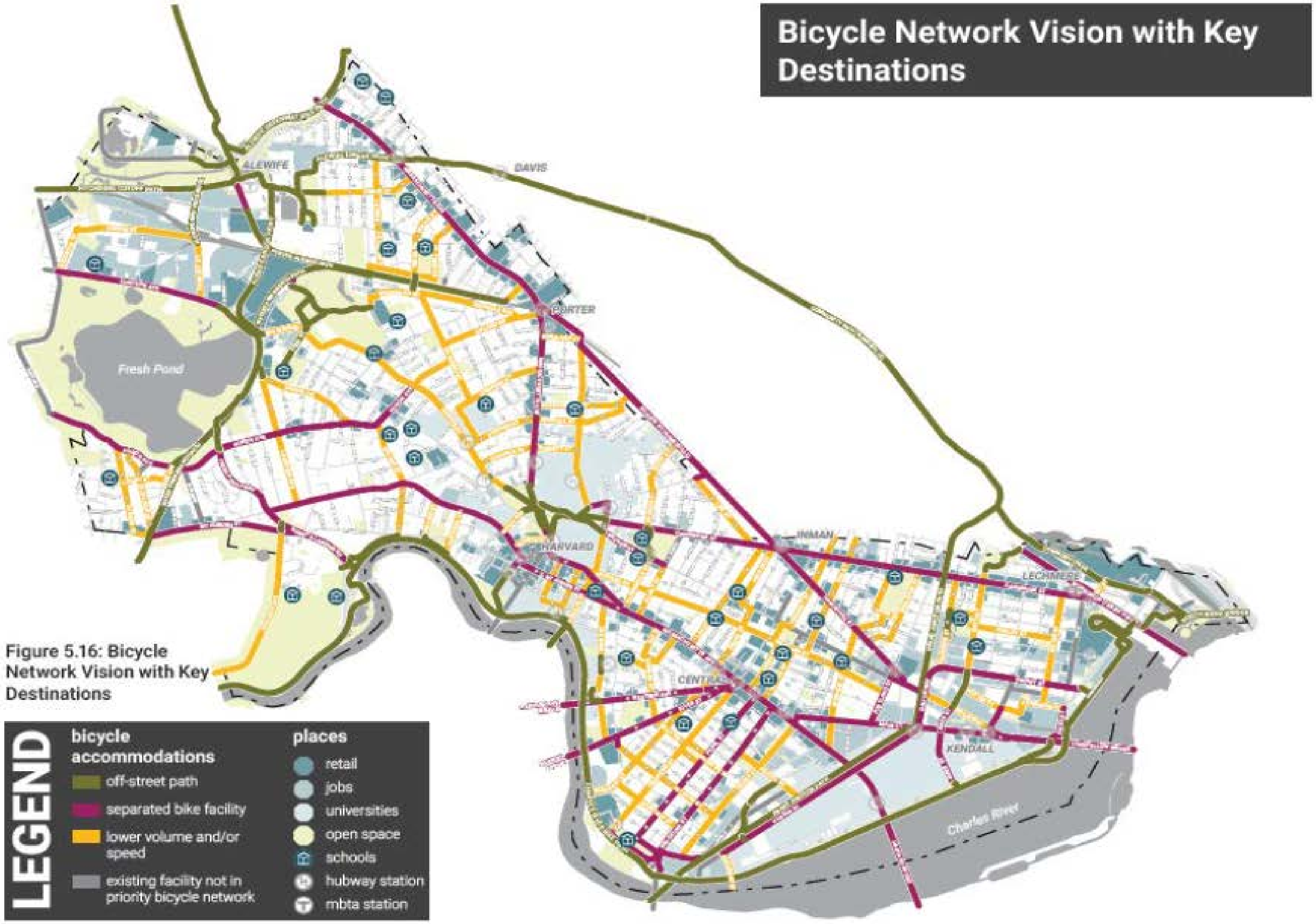



Figure 5.16: Bicycle Network Vision with Key Destinations

## Separated Bike Lane Research

- Reduced injury risk compared to riding in a travel lane (Lusk et al., 2013; Lusk et al., 2011; NYCDOT, 2014; Winters et al., 2013)
- Clearly preferred over striped or mixed travel lanes by both cyclists and motorists

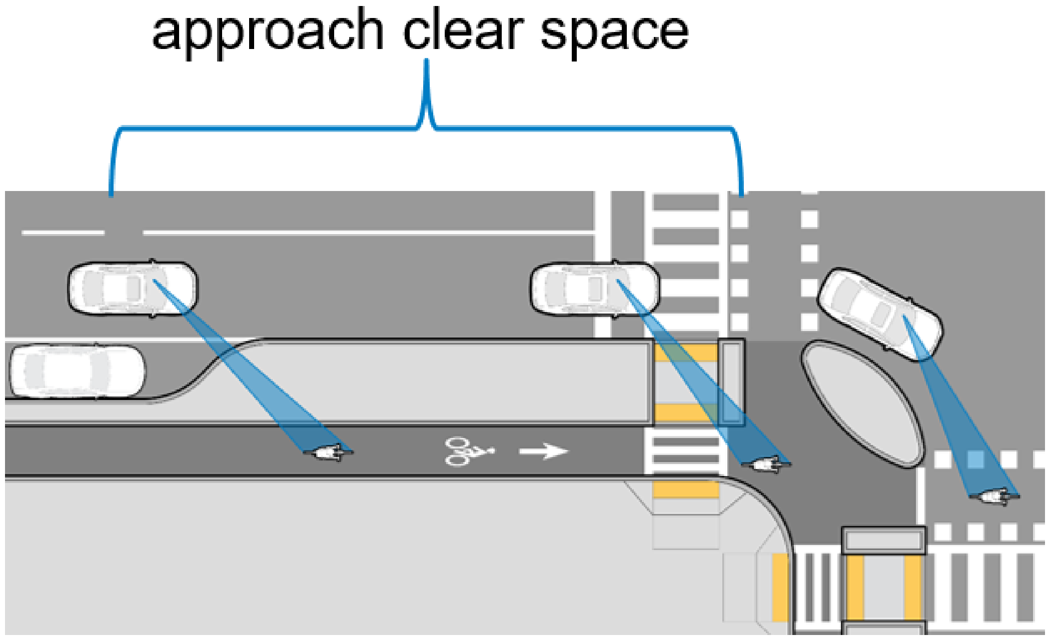
  (Monsere et al., 2014; Monsere et al., 2012; Sanders, 2014)
- One-way generally safer than two-way

  (Schepers et al., 2011; Thomas & DeRobertis, 2013)
- Two-way SBLs typically better on one-way roads, on the right side, and with additional design/op features like separated signal phases (Schepers et al., 2011; Zangenehpour et al., 2015)

More in Chapter 7

# Chapter 5- Elements of Design

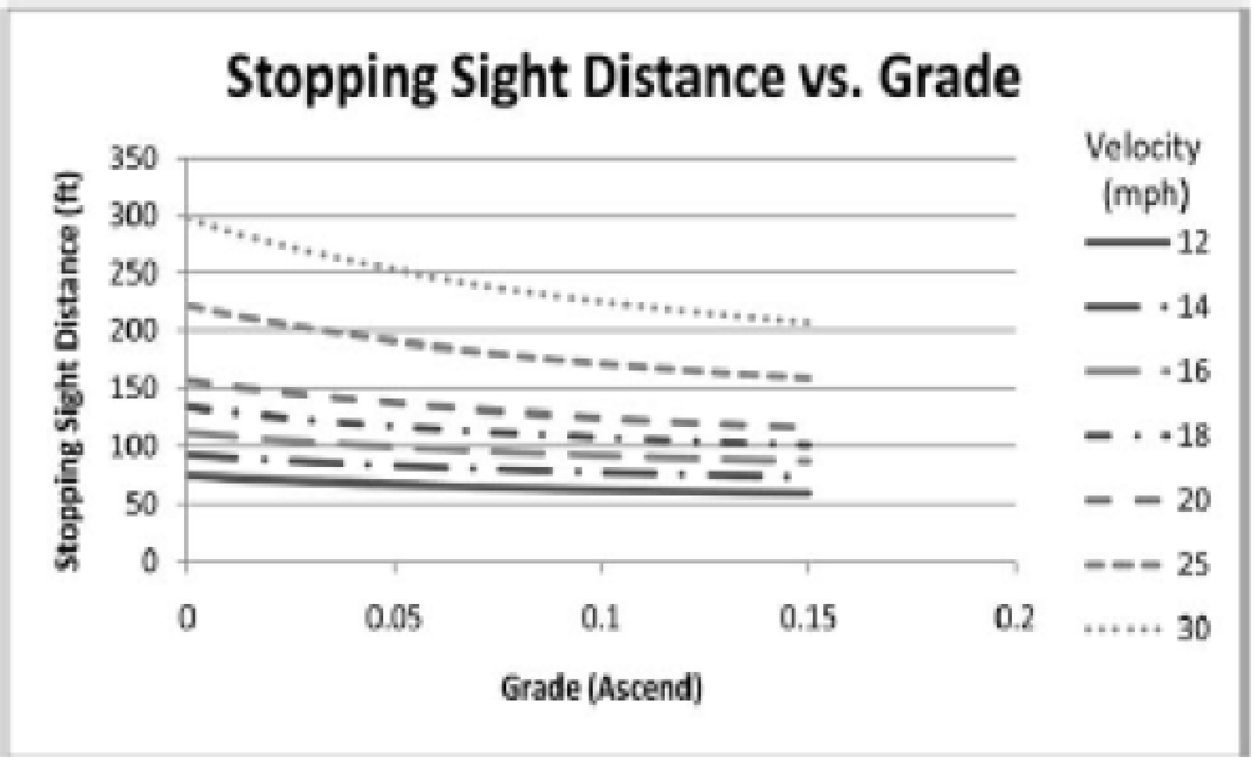
"How to" chapter for critical design elements



# Minimum Stopping Sight Distance

Table 5-4. Minimum Stopping Sight Distance

| U.S. Customary | | |
|---|---|---|
| $S = \frac{V^2}{30(f \pm G)} + 3.67V$ | | |
| where: | | |
| S | = | stopping sight distance (ft) |
| V | = | velocity (mph) |
| f | = | coefficient of friction (use 0.16 for a typical bike) |
| G | = | grade (ft/ft) (rise/run) |



# Sight Triangles

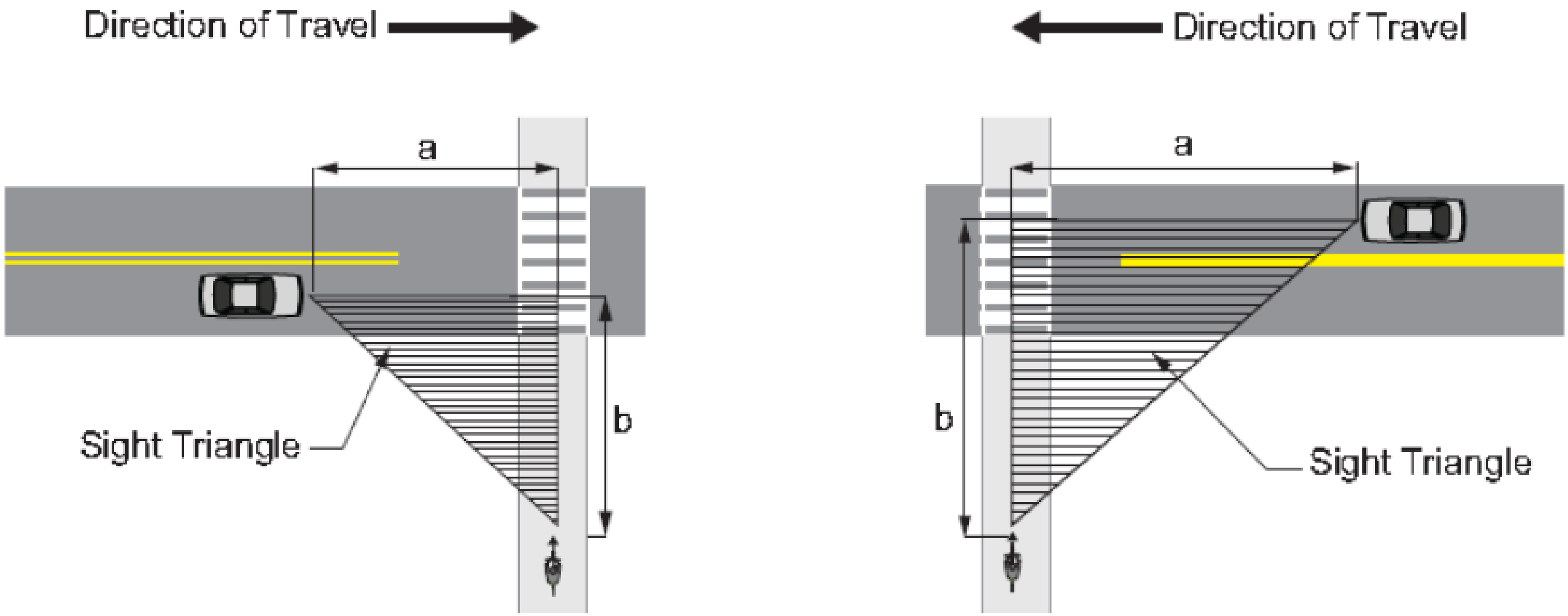



Figure 5-15. Yield Sight Triangles

# Horizontal Sight Distance

**Table 5-6. Horizontal Sight Distance**

| U.S. Customary | | |
|---|---|---|
| $HSO = R\left[1-\cos\left(\frac{28.65S}{R}\right)\right]$<br>$HSO = \frac{R}{28.65}\left[1-\cos^{-1}\left(\frac{R-HSO}{R}\right)\right]$ | | |
| where: | | |
| $S$ | = | stopping sight distance (ft) |
| $R$ | = | radius of centerline of lane (ft) |
| $HSO$ | = | horizontal sightline offset, distance from centerline of lane to obstruction (ft) |
| Note: Angle is expressed in degrees; line of sight is 2.3 ft above centerline of inside lane at point of obstruction. | | |

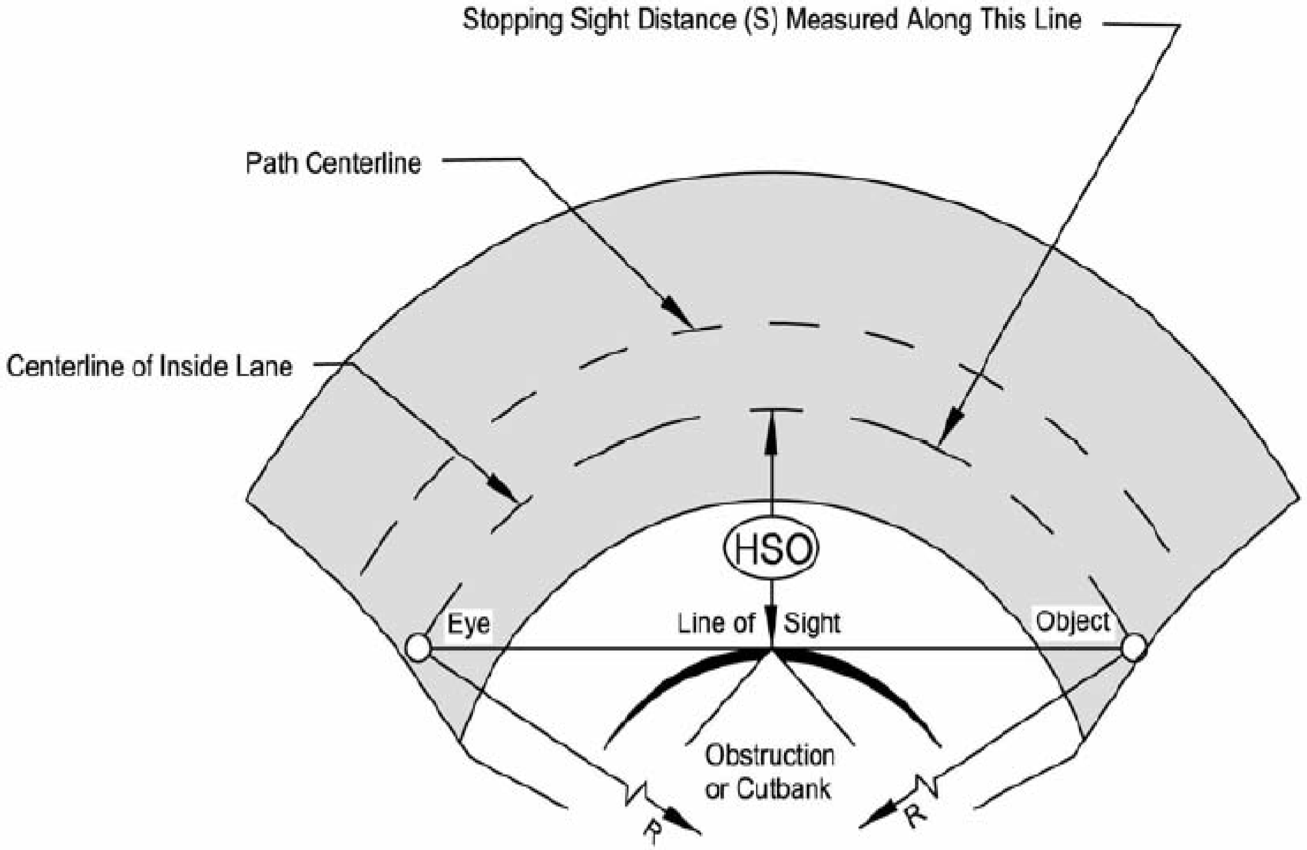



Figure 5-9. Diagram Illustrating Components for Determining Horizontal Sight Distance

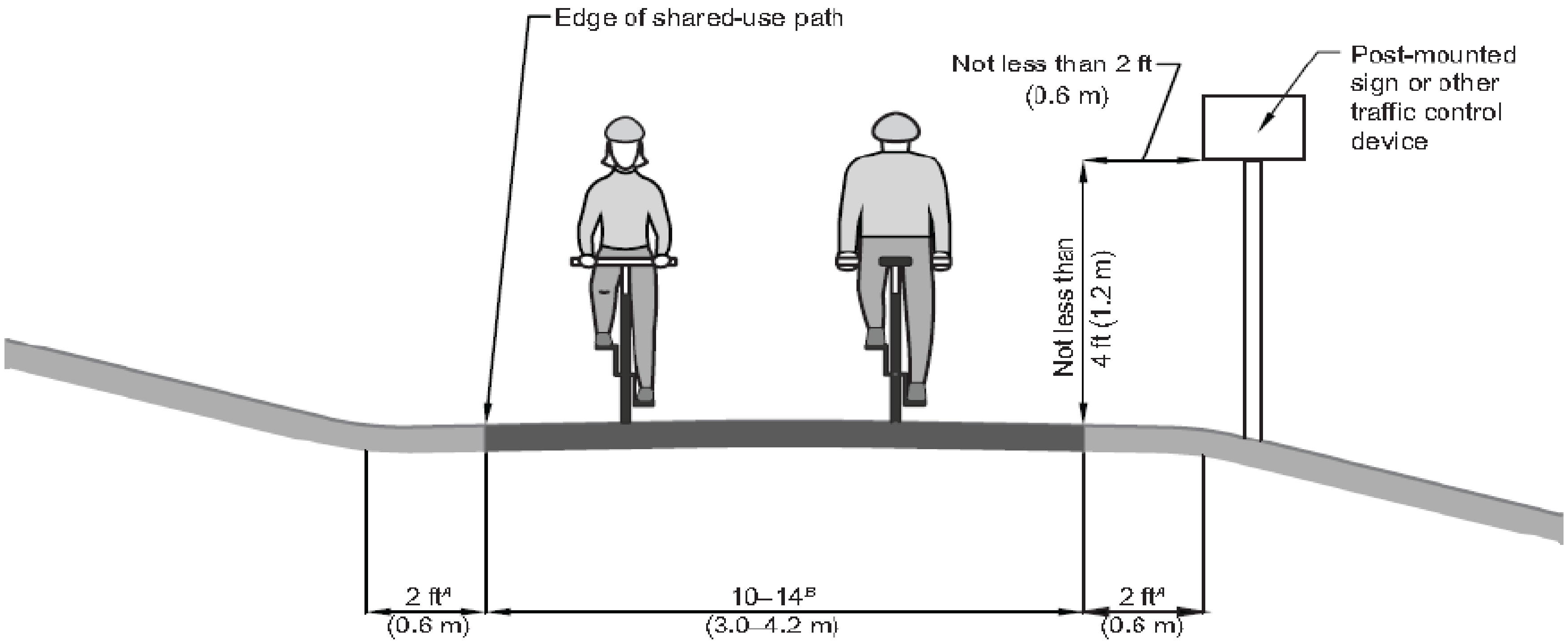
# Chapter 6- Shared Use Path Design

## Largely the same content except:

Low Volume Pedestrians
May be shared

High Volume Pedestrians
separate

# Typical Cross Section




Notes:

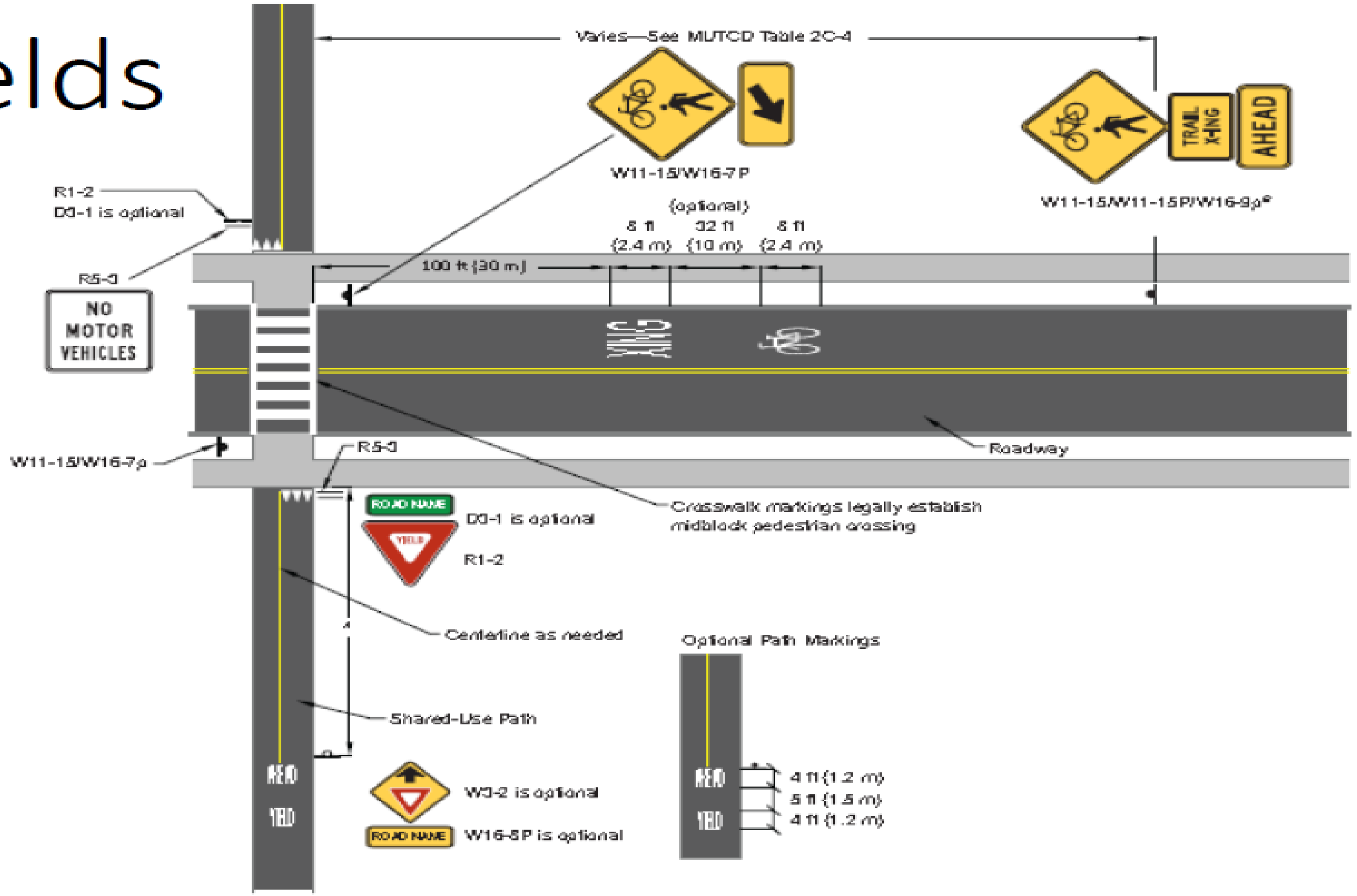
[A] (1V:6H) Maximum slope (typ.)

[B] More if necessary to meet anticipated volumes and mix of users, per the *Shared Use Path Level of Service Calculator* (9)

Figure 5-1. Typical Cross Section of Two-Way, Shared Use Path on Independent Right-of-Way

# Intersection Treatments

## Path Yields




Notes:

A Advance warning signs and solid centerline striping should be placed at the required stopping sight distance from the roadway edge, but not less than 50 ft (15 m).

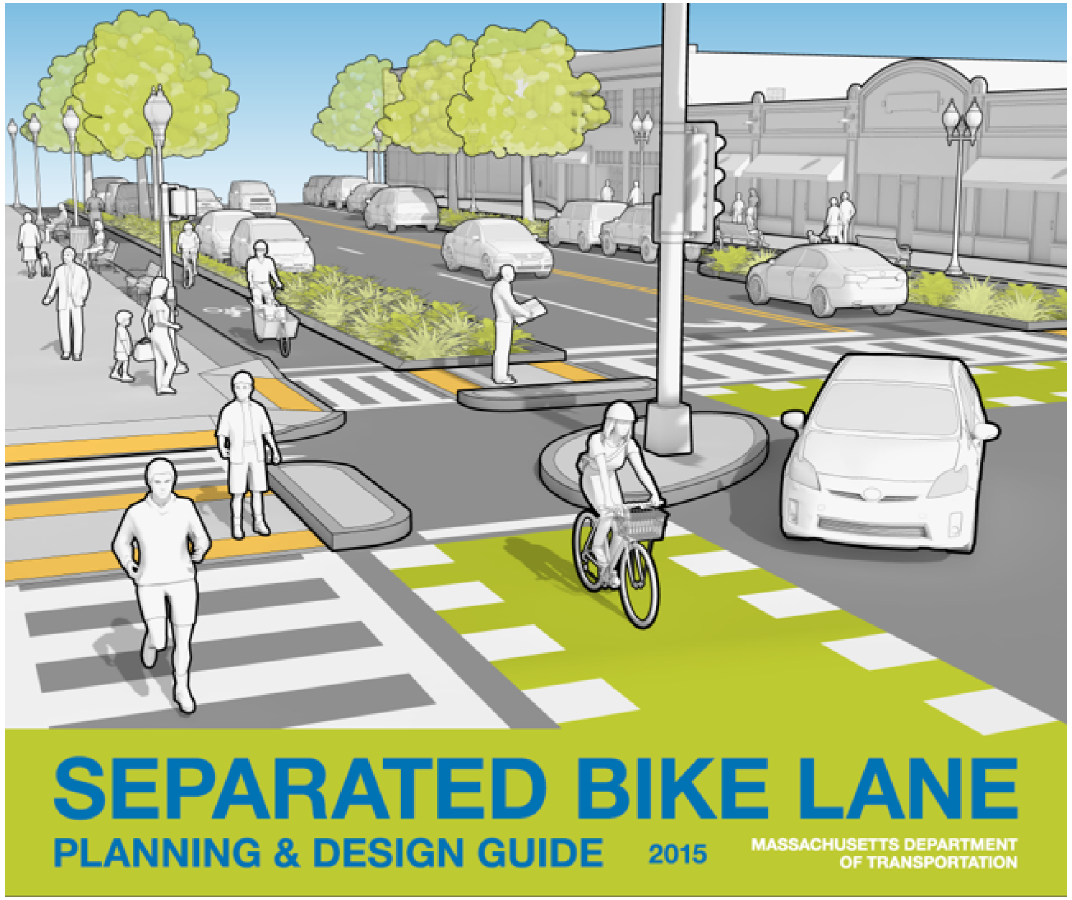
B W11 series sign is required, supplemental plaques are optional.

Figure 5-17. Example of Mid-Block Path—Roadway Intersection—Path Is Yield Controlled for Bicyclists

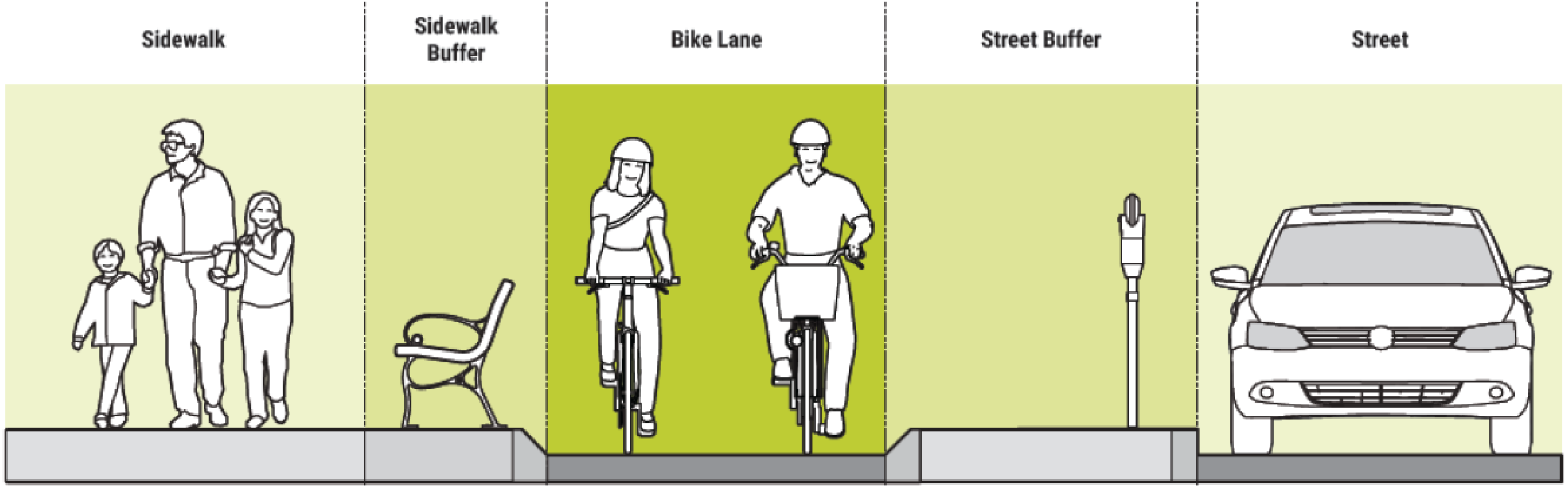
# MassDOT 2.0

Improved:

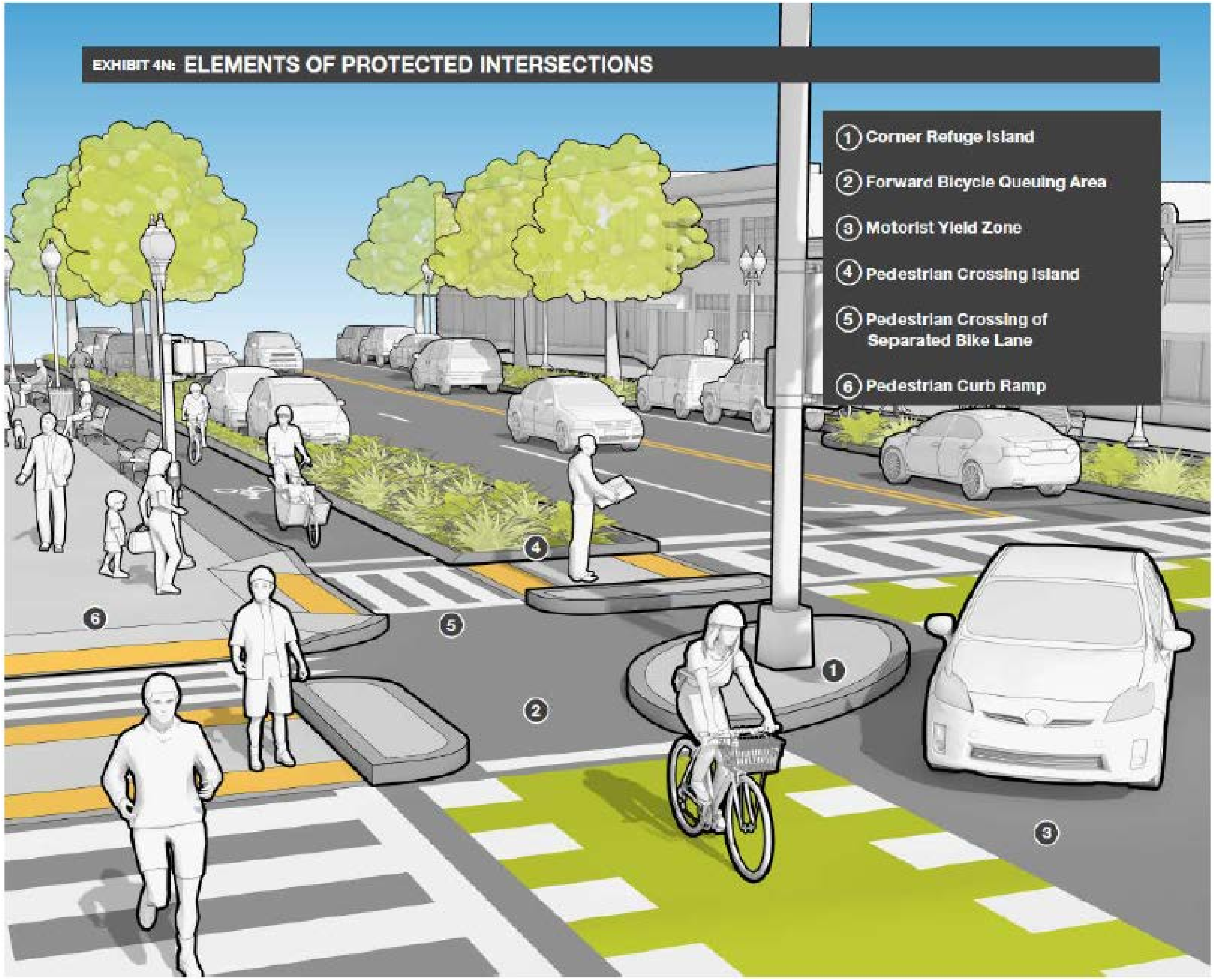
- ADA Guidance
- Transit Stop Design
- Sight Distance Assessment
- Constrained Tradeoff Assessment
- Transition Guidance



# Separated Bike Lane Zones

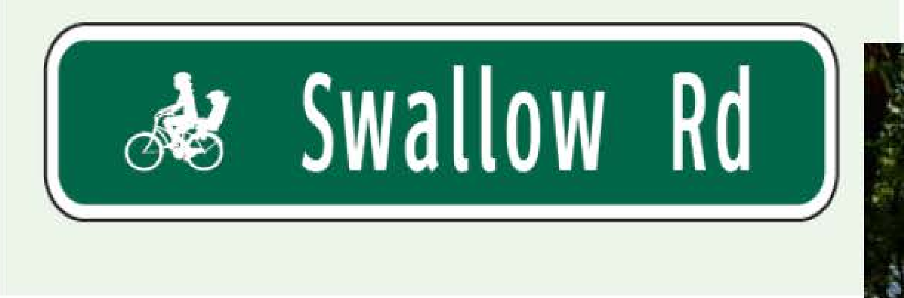


# Intersection Treatments



# Chapter 8- Bicycle Boulevards

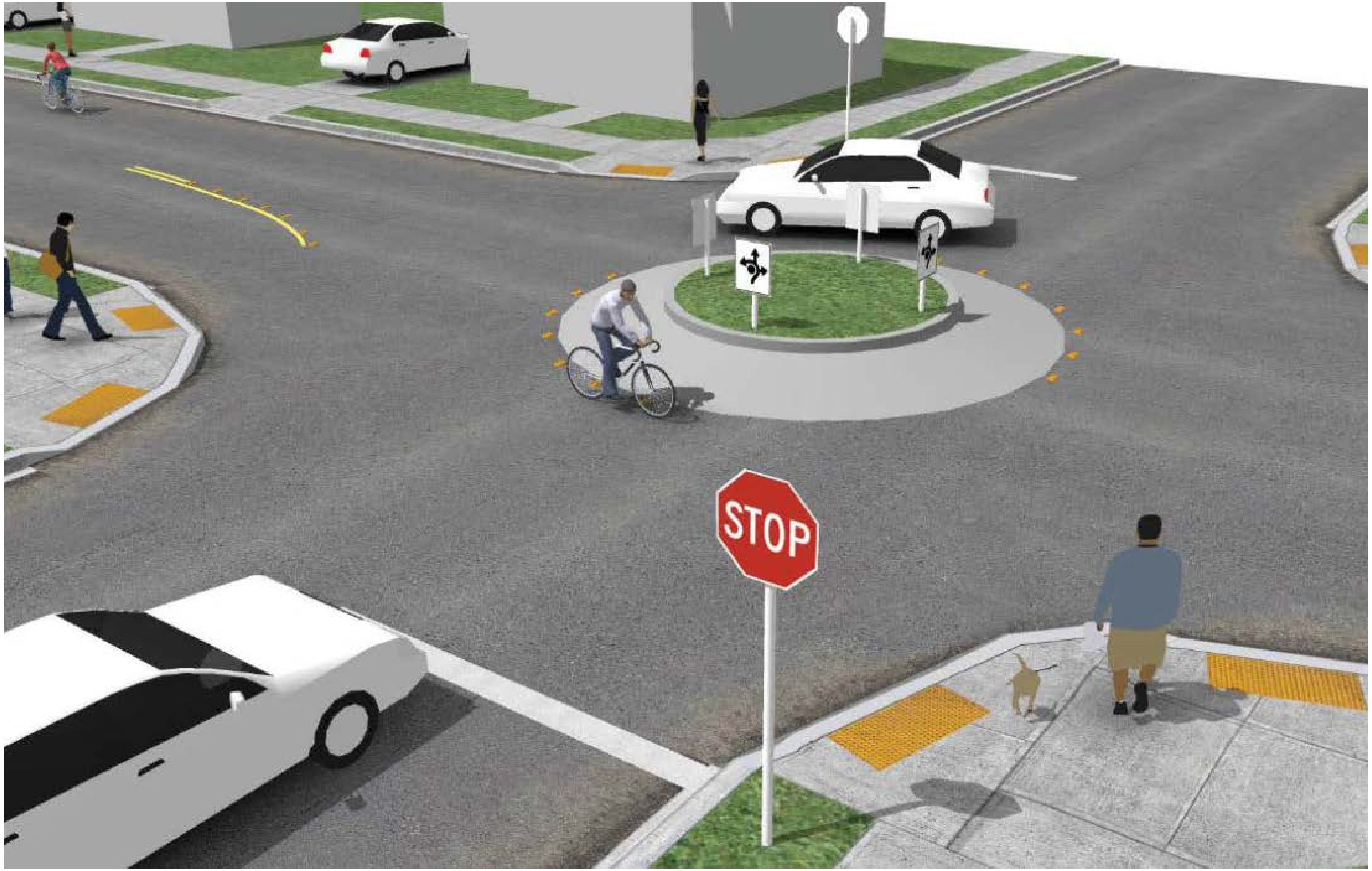
# MUTCD Community Wayfinding



# Traffic Calming 101

# Mini-Traffic Circle



# Raised Intersection

# Chapter 9- Shared Lanes and Bike Lanes

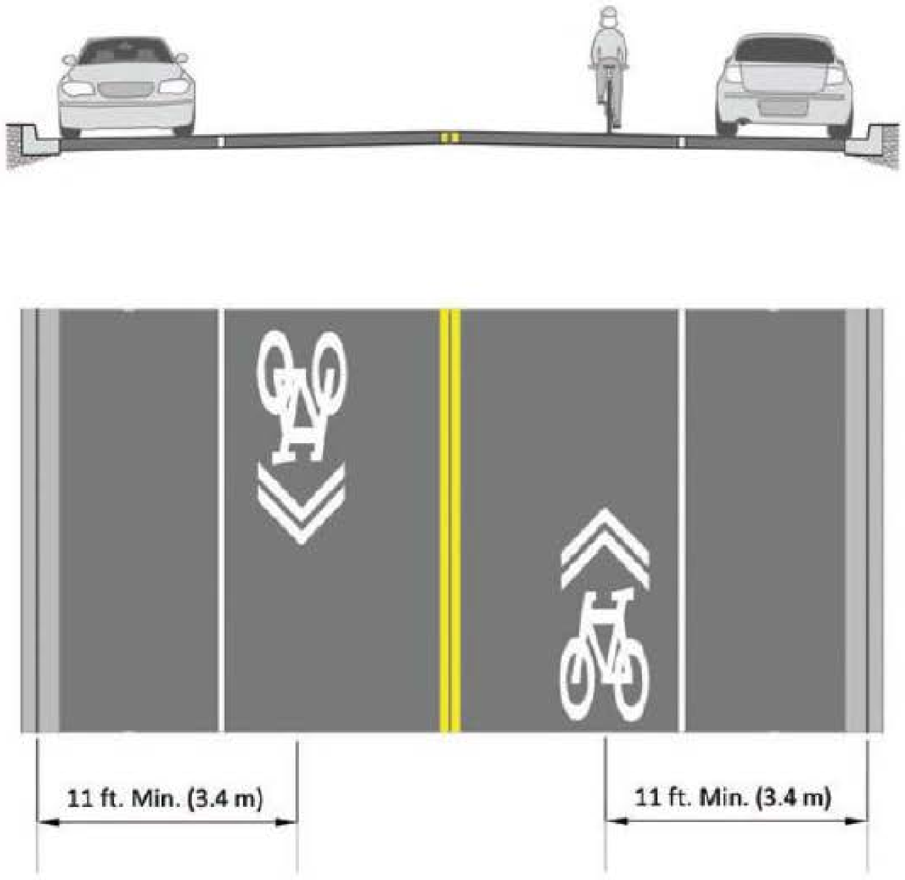



Figure 4-5. Typical Shared-Lane Marking Cross Section on Street with Parking

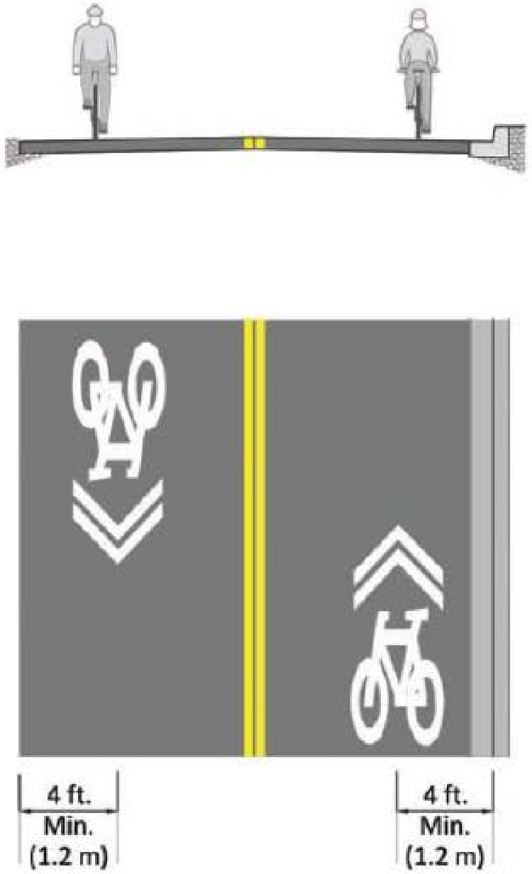
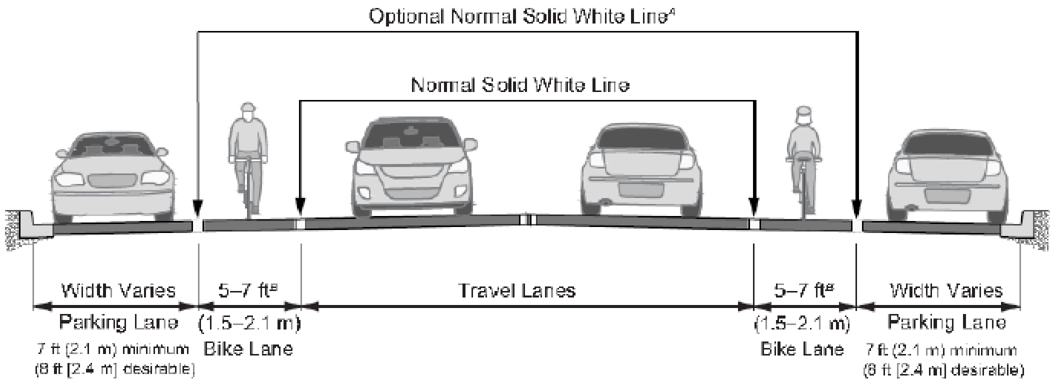
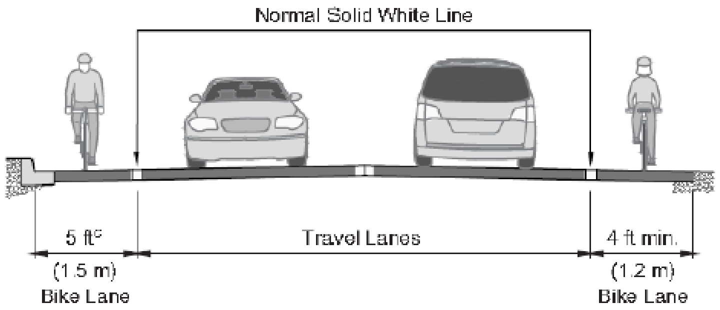



Figure 4-6. Typical Shared-Lane Marking Cross Section on Street with No On-Street Parking

# Typical Bicycle Lane Cross Sections




**On Street Parking**




**Parking Prohibited**

Notes:

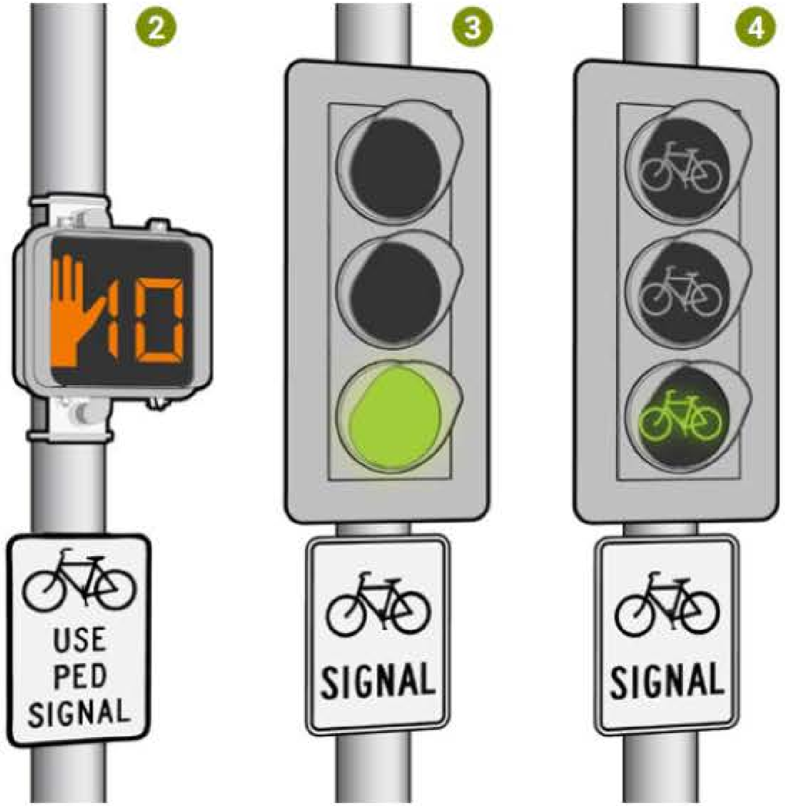
[A] An optional normal (4–6-in./100–150-mm) solid white line may be helpful even when no parking stalls are marked (because parking is light), to make the presence of a bicycle lane more evident. Parking stall markings may also be used.

[B] Bike lanes up to 7 ft (2.1 m) in width may be considered adjacent to narrow parking lanes with high turnover.

[C] On extremely constrained, low-speed roadways (45 mph [70 km/h] or less) with curbs but no gutter, where the preferred bike lane width cannot be achieved despite narrowing all other travel lanes to their minimum widths, a 4-ft (1.2-m) wide bike lane can be used.

# Buffered Bike Lanes

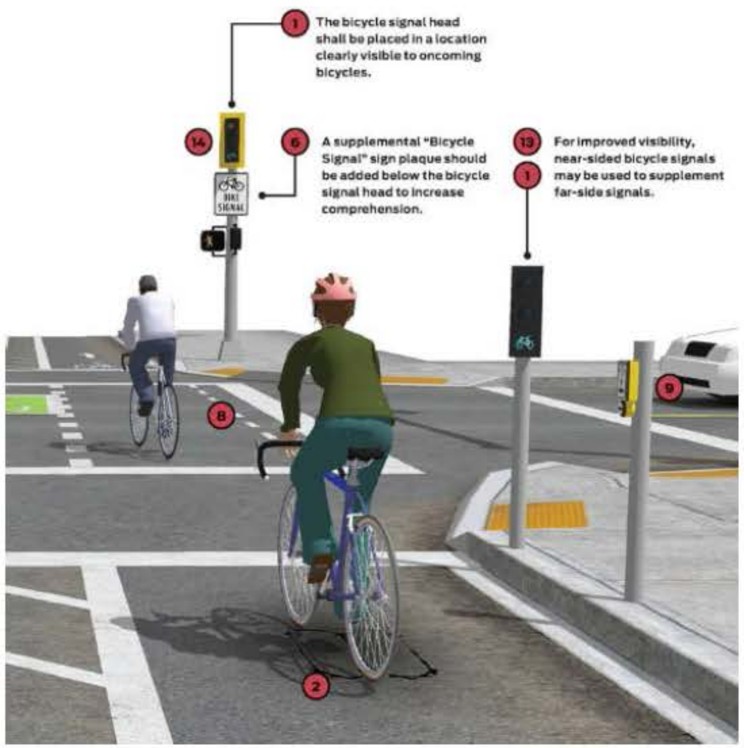
# Figure 10.14. Examples of Signal Indication Strategies for Bicyclists

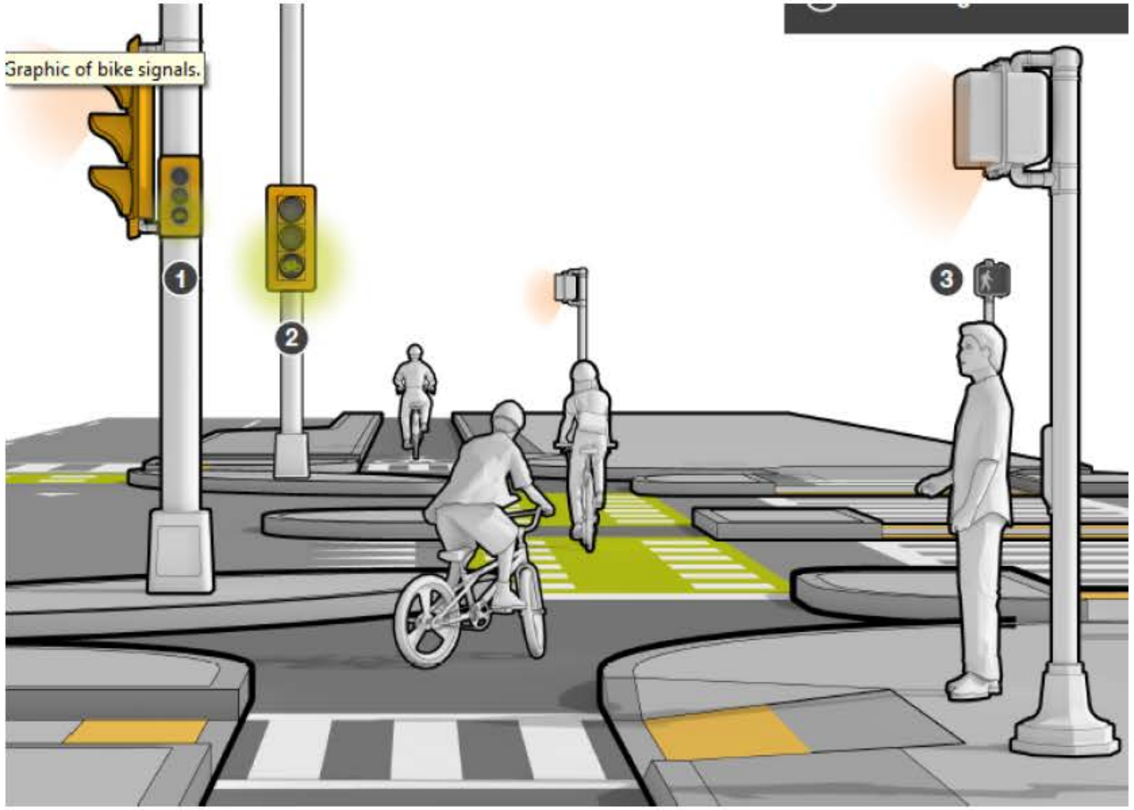



# Rectangular Rapid Flashing Beacons

# More Traffic Signals

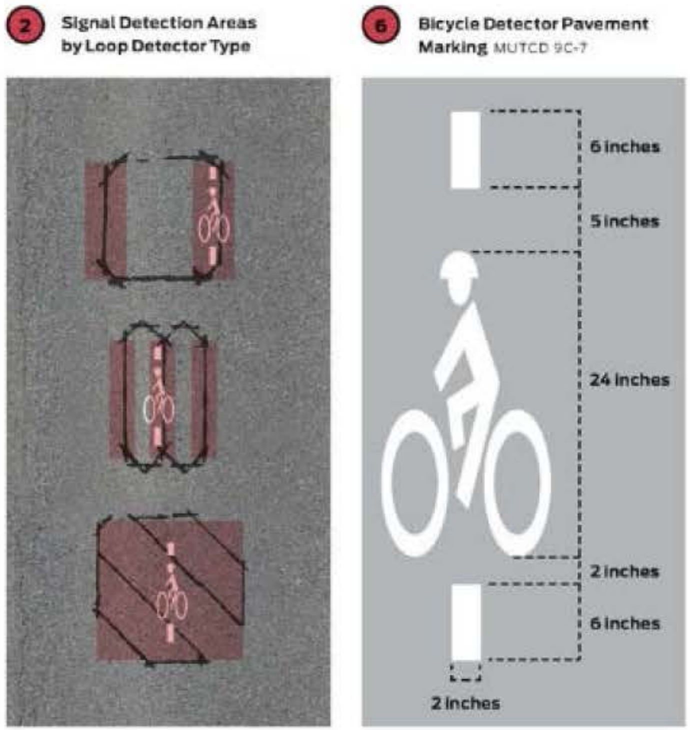
Figure 10.19. Examples of Bicycle Signal Placement with Pedestrian Signals



# Loop Detection

## Figure 10.21. Examples of Inductive Loop Detection



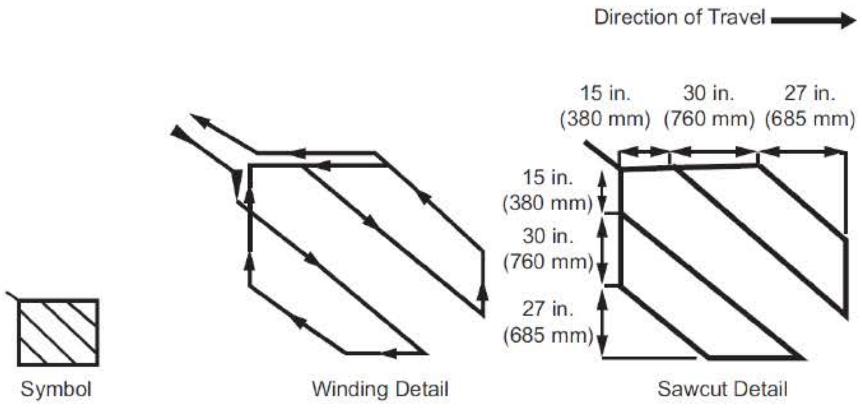




Figure 4-31. Diagonal Quadrupole Loop Detector

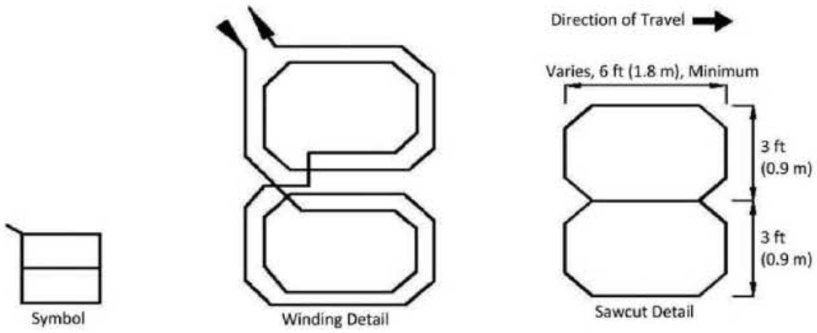
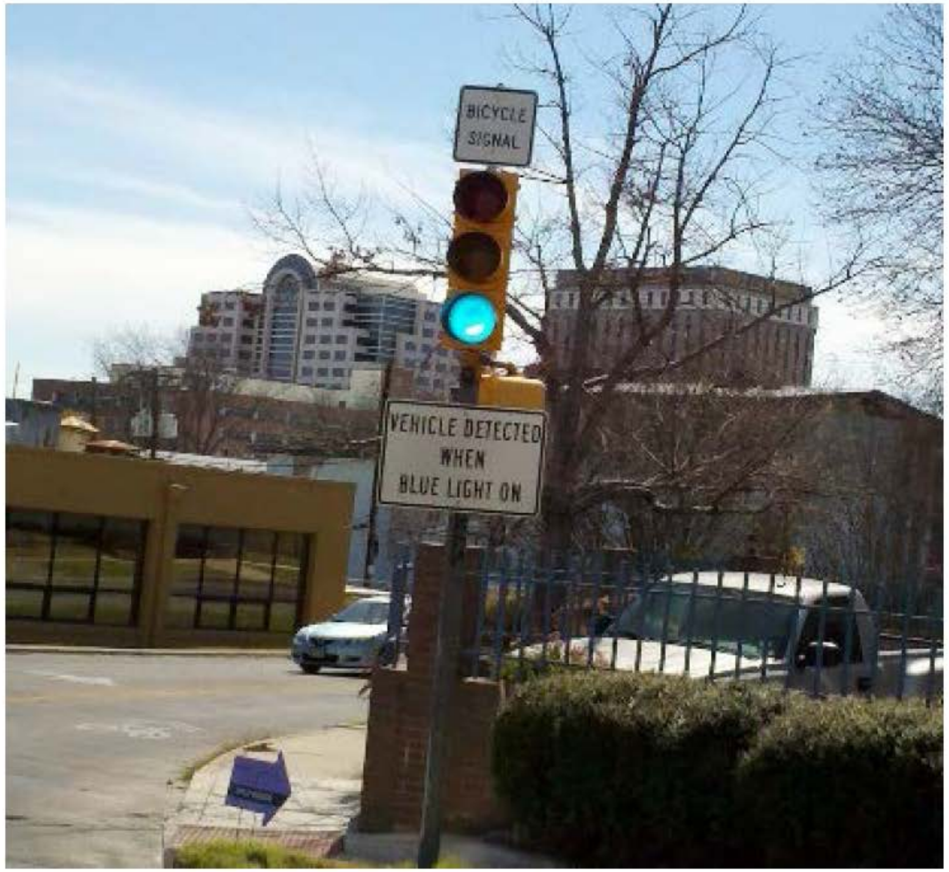



Figure 4-32. Conventional Quadrupole Loop Detector

# Confirmation of Detection

Figure 10.22. Example of Detector Confirmation Indication

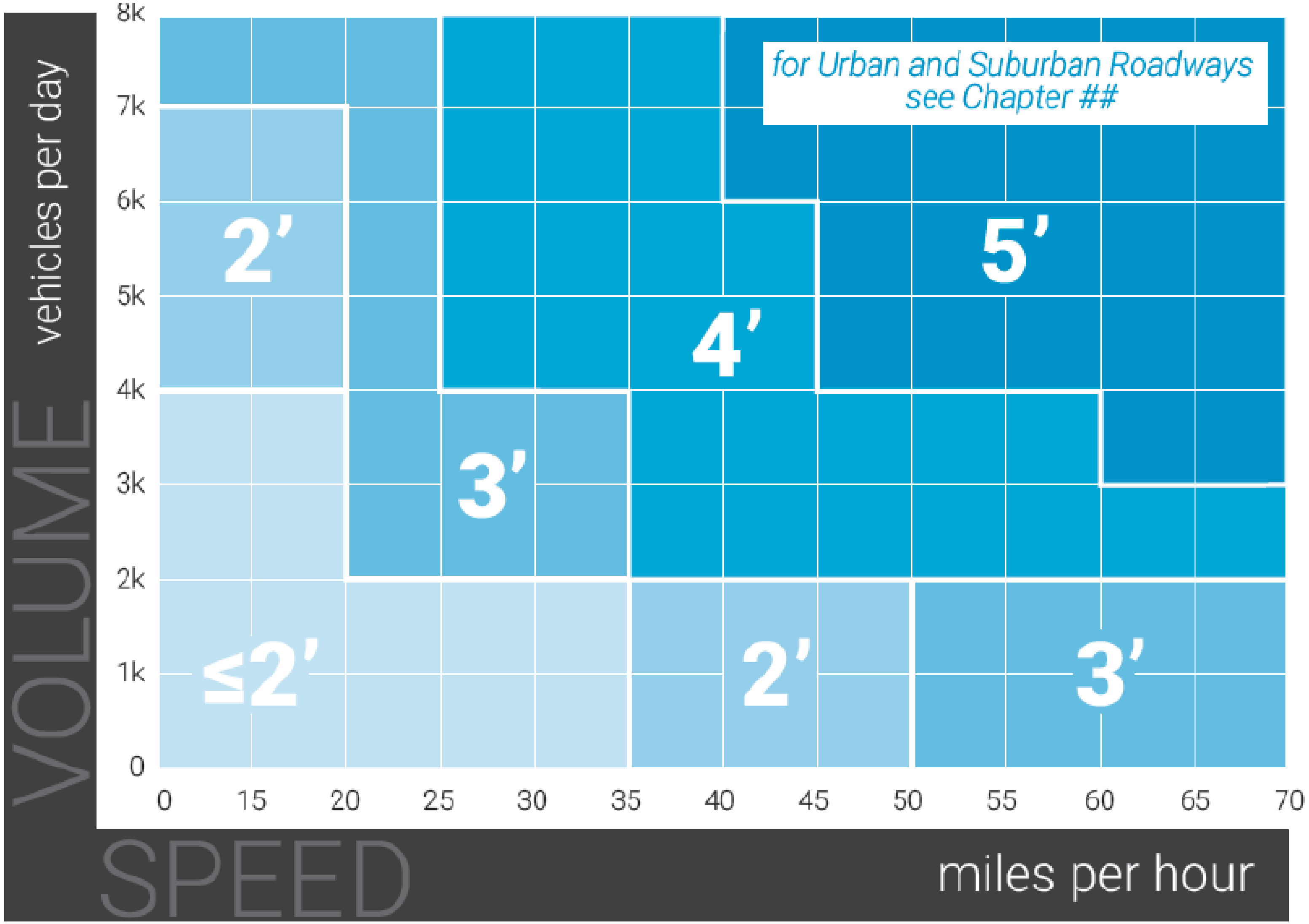



# Roundabouts, Interchanges & Alt. Intersections

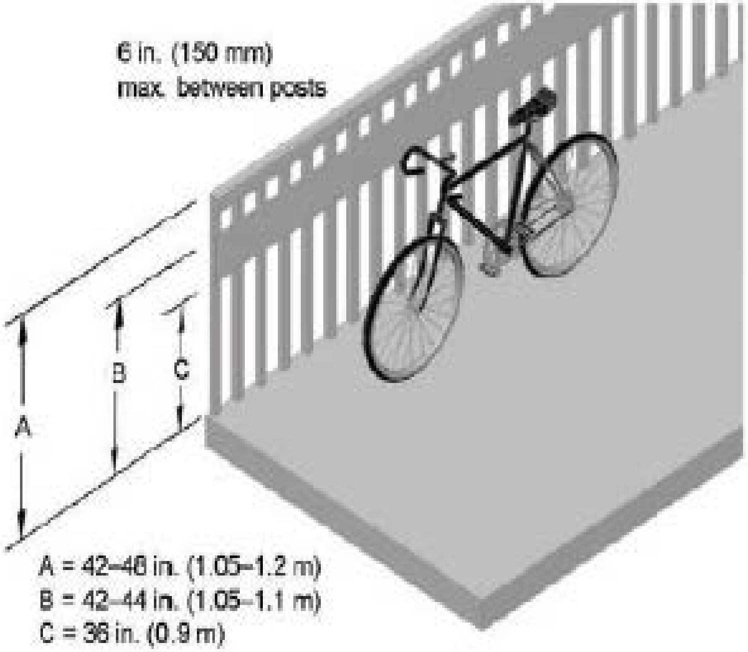
- Provide Separated Facility
- Uncontrolled motorist crossings < 25mph or
  - Unless lots of gaps
  - Add active warning
  - Add control
- Separate peds/bikes

# Chapter 12- Rural Roadways

# Recommended Paved Shoulder Widths



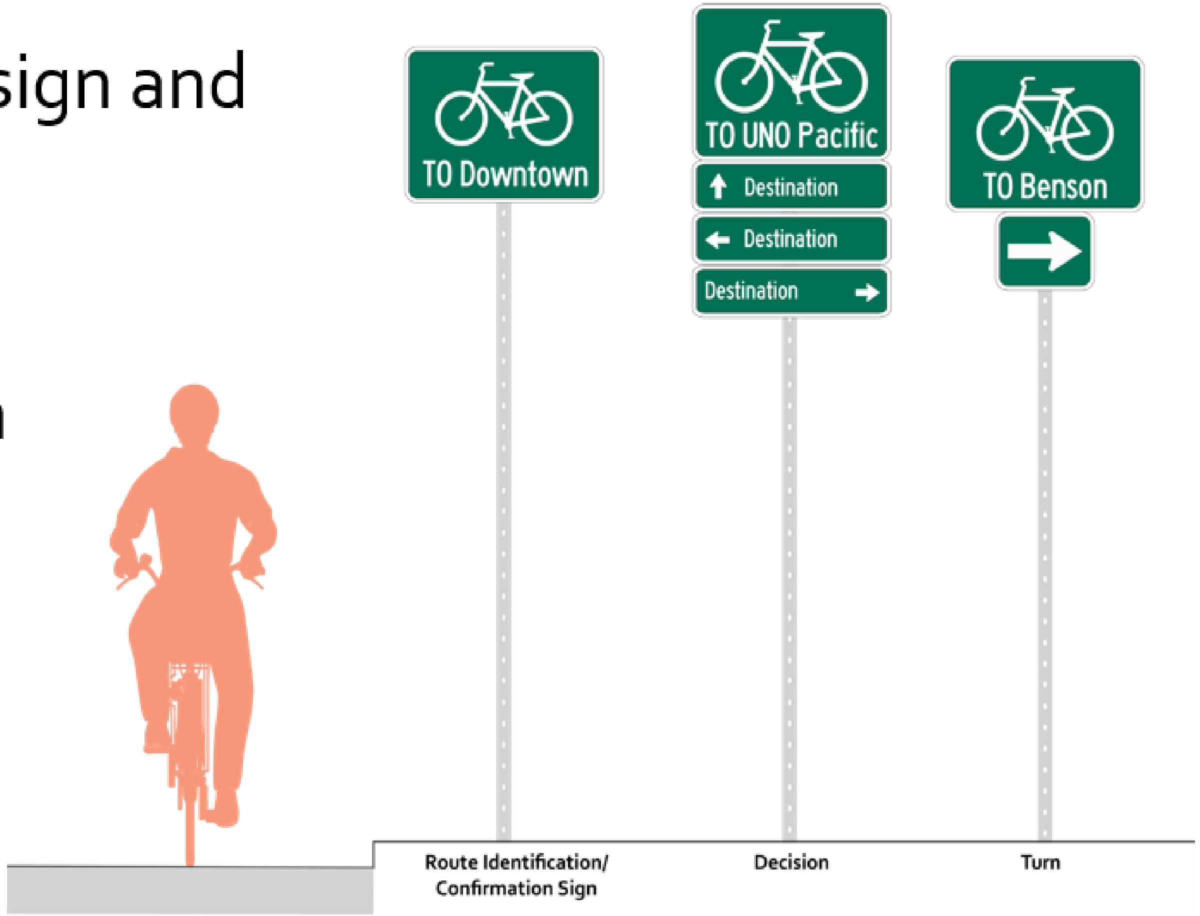
# Chapter 13- Structures



# Chapter 14- Wayfinding

Expanded guidance for sign design and placement

Added flexibility for sign design




NO


Bobcat

# Chapter 16- Bike Parking