

All About Guidance #1 What's in Your Library?

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December 16, 2015



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Today's presenters

Andy Clarke, Director of Strategy, Toole Design Group

Dan Goodman, Transportation Specialist, Office of Livability, FHWA

Tony Hull, Pedestrian and Bicycle Transportation Planning Specialist, Civil Street



Association of Pedestrian and Bicycle Professionals
Expertise for sustainable transportation



Today's webinar presenters

Andy Clarke has spent 30 years in the forefront of bicycle policy and programs in the United States and Europe. He was President of the League of American Bicyclists for 12 years, after establishing APBP as the first Executive Director. Andy was instrumental in the development of the Bicycle Friendly Community program and has worked on each Federal transportation bill since ISTEA in 1991.



Association of Pedestrian and Bicycle Professionals
Expertise for sustainable transportation



Today's webinar presenters

Dan Goodman is a Transportation Specialist on the Livability Team in the Office of Human Environment at the Federal Highway Administration (FHWA). He is a member of the Transportation Research Board's (TRB) Pedestrian Committee and chair of its Pedestrian Research Subcommittee. He serves as FHWA's representative to the AASHTO Joint Technical Committee on Non-Motorized Transportation.



Association of Pedestrian and Bicycle Professionals
Expertise for sustainable transportation



Today's webinar presenters

Tony Hull is an independent Nonmotorized Transportation Consultant with over 15 years of experience planning, design and evaluation of active transportation projects. His work includes extensive experience overseeing the development and implementation of pedestrian and bicycle count programs in the states of Delaware, Minnesota and Ohio. Most recently, Tony served as a key researcher and co-author of the NCHRP 797 Guidebook on Pedestrian and Bicycle Volume Data Collection. He is a graduate of the Ohio State University, serves on the TRB Committee on Pedestrians and is a long time member of APBP. Tony lives in Minneapolis, Minnesota, where it is never too cold for a nice walk or bicycle ride.



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What's in Your Library?

All About Guidance Part I

December 16, 2015

Tony Hull

tony@civilstreet.com

All About Guidance – APBP Two-Part Series

December #1 What's in your Library?

- Introduction overview about guides/standards
- New FHWA resources and guidance about design flexibility
- New era of design guidance, Mass DOT example



January #2 Using guidance effectively

- Case studies of practical applications for design guides to improve transportation outcomes

Why do we use guides?

Transportation agencies need to follow credible standards for designing streets

- Document acceptable practices
- Maintain consistency with design
- Maximize return on transportation investments
- Identify appropriate solutions
- Reduce liability

Guidance Develops Through Research

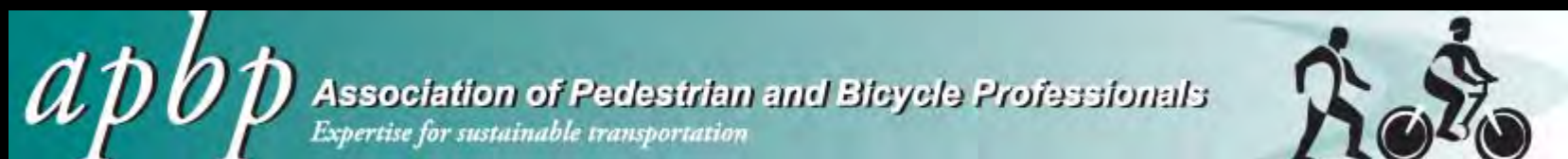
- Transportation Research Board
- National Cooperative Highway Research Program (NCHRP)
- State and Local Research Boards
- FHWA Experiment Process
- University Transportation Research Centers
- Performance Based Practical Design (PBPD)



All About Guidance #1 What's in Your Library?

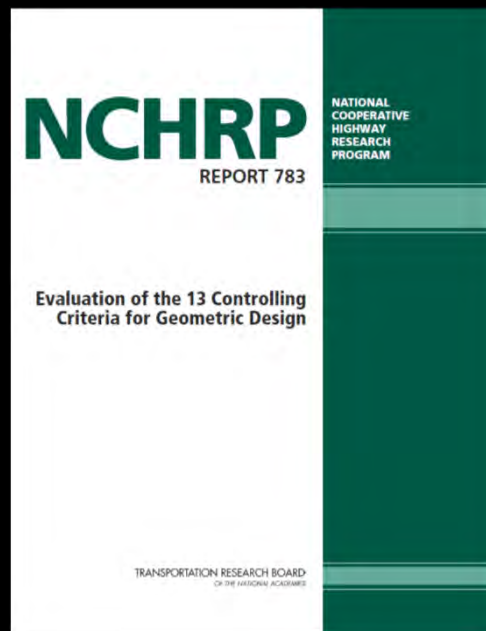
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December 16, 2015



Research is Changing the State of Practice

The NCHRP Report 783 “Evaluation of the 13 Controlling Criteria for Geometric Design” (2014)

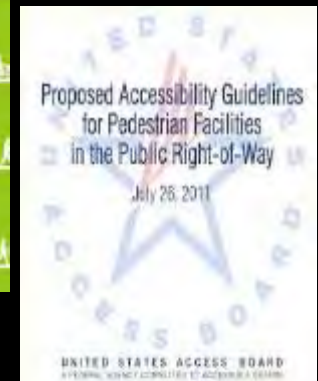
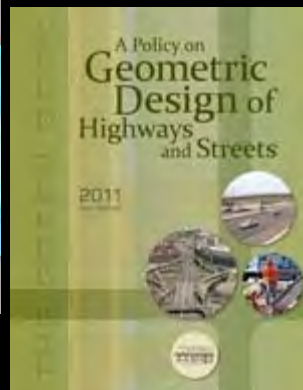


“The NCHRP Report 783 found that the 13 controlling criteria had minimal influence on the safety or operations on urban streets”

FHWA currently proposing significant revisions to the 13 controlling criteria

Why do we choose guides?

There is much confusion about the difference between guidance and standards, and the relationship hierarchy among various manuals



Standards

Standards are statutory requirements that must be followed.

- MUTCD
- AASHTO Green Book
[NHS]
- State highway and vehicle codes

- Locally adopted

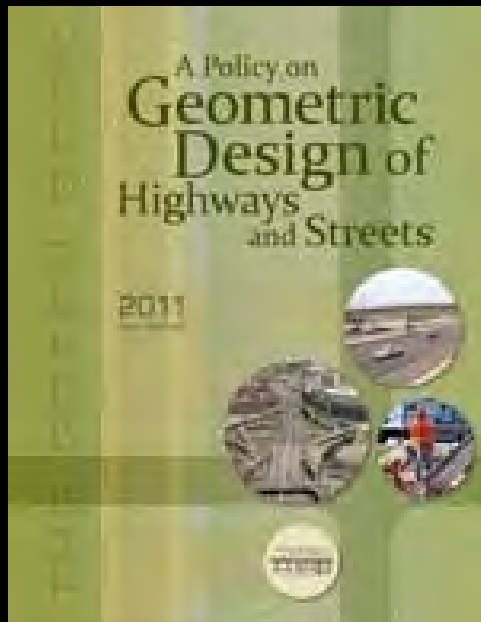
There are federal standards, such as the MUTCD that may be adopted by states or supplemented with state versions of the federal standard.

- PROWAG [once adopted]



AASHTO Green Book – *The Bible*

The AASHTO Policy on Geometric Design “the Green Book”



The Green Book provides detailed engineering guidance for structural and geometric elements, street width, lane width, shoulder width, medians, and other street features.

The Green Book is a standard when designing streets and roads that are part of the National Highway System (NHS).

Street Design – not a one-stop shop

The AASHTO Green Book contains detailed standards for traditional highway design, but has never been intended as a stand alone resource.



The Green Book, MUTCD, HCM, and other highway design manuals should always be consulted, but creating safe healthy livable streets require us to use an expanded library!

Modern Guides and Manuals

Guides and Manuals provide recommendations for addressing various conditions to inform designers based on solid research and best practices.

- AASHTO Ped & Bike Design Guides
- NACTO Bike, Transit & Street Design Guides
- ITE Design for Walkable Urban Thoroughfares
- State and Local Design Guides
- Best Practices



Thank you

All About Guidance Part I

December 16, 2015

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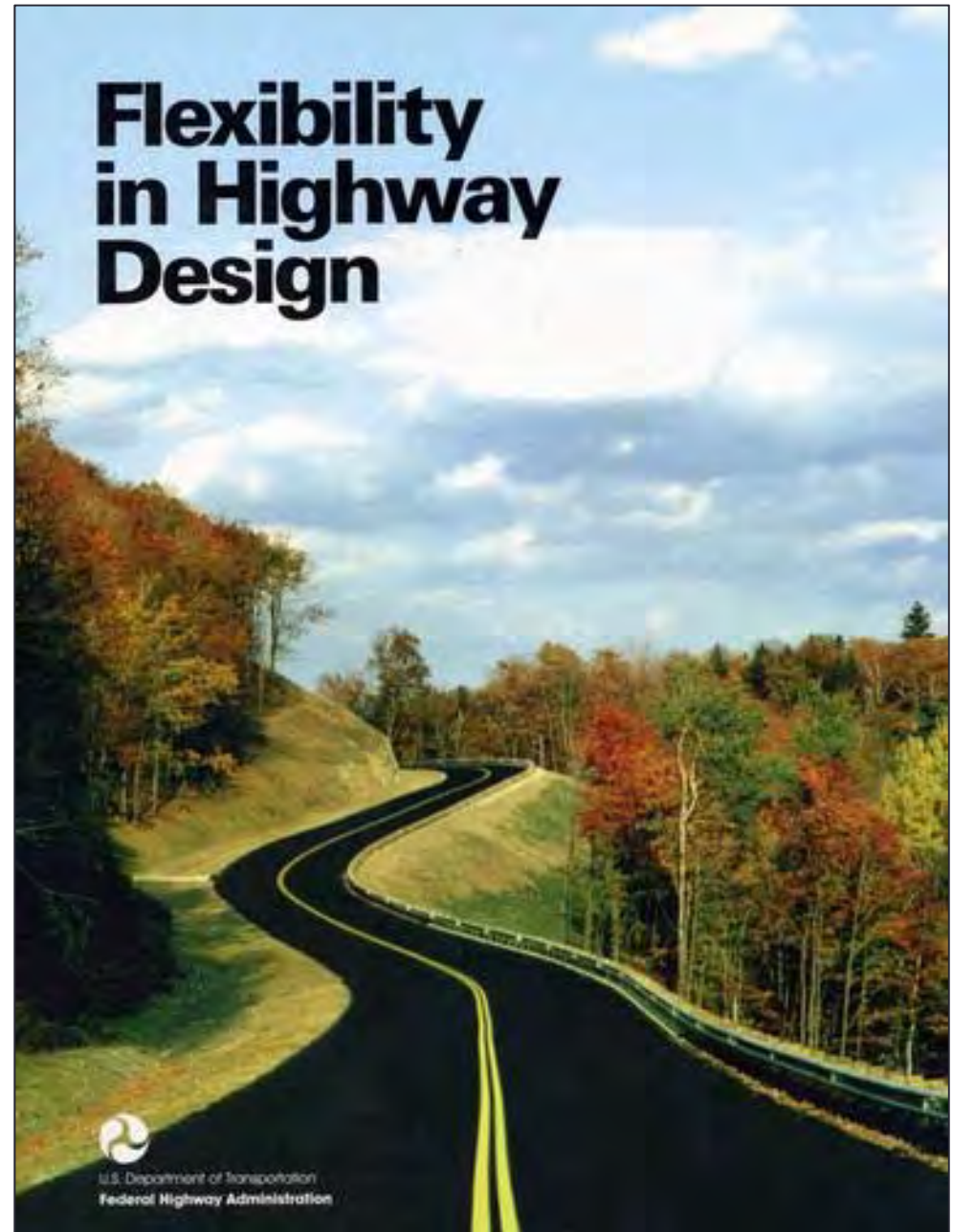
APBP Webinar
December 16, 2015



**U.S. Department
of Transportation**
**Federal Highway
Administration**

FHWA Supports

- An integrated, safe, and convenient transportation system for all users
- Sustainable transportation policies and practices
- Connected pedestrian and bicycle *networks*
- Design flexibility



2013 Bicycle and Pedestrian Facility Design Flexibility Memorandum

“This memorandum expresses the Federal Highway Administration's (FHWA) **support for taking a flexible approach to bicycle and pedestrian facility design**. The American Association of State Highway and Transportation Officials (AASHTO) bicycle and pedestrian design guides are the primary national resources for planning, designing, and operating bicycle and pedestrian facilities. The National Association of City Transportation Officials (NACTO) [*Urban Bikeway Design Guide*](#) and the Institute of Transportation Engineers (ITE) [*Designing Urban Walkable Thoroughfares*](#) guide builds upon the flexibilities provided in the AASHTO guides, which can **help communities plan and design safe and convenient facilities for pedestrian and bicyclists**. FHWA **supports the use of these resources** to further develop nonmotorized transportation networks, particularly in urban areas.”

http://www.fhwa.dot.gov/environment/bicycle_pedestrian/guidance/design_flexibility.cfm

Outcomes



- Provide more comfortable walking and bicycling environments
- Improve safety for nonmotorized users
- Publicize the range of options available to better inform tradeoffs
- Encourage context sensitive solutions
- Enable a more proactive design approach
- Develop projects cost effectively that meet the identified purpose and need
- Create well-connected pedestrian and bicycle networks

Connected Multimodal Networks



Enhancing Access To:

- Jobs
- Transit
- Active transportation opportunities around schools
- Recreation and physical activity opportunities
- Grocery stores, government buildings, health care, and other essential services
- Residential areas

Network Principles

- Cohesion
- Directness
- Accessibility
- Alternatives
- Safety and Security
- Comfort

Challenges



- Achieve proactive outcome oriented design process
- Focus on engineering judgement/study, documentation, and experimentation
- Study applications of flexibility so results can inform updates to guidelines and practice
- Design for the activity you want to see
- Build capacity to navigate between guides



Pedestrian and Bicycle Information Center

Data & Resources

Community Support

Planning & Design

Training & Events

Programs & Campaigns

PLANNING & DESIGN

Planning & Data Collection Tools

Crash Data

Counts

Surveys

Inventories

Audits

Secondary Data Sources

Performance & Analysis

Level & Quality of Service

Intersection Safety Indices

Design Resource Index

The Design Resource Index identifies the specific location of information in key national design manuals for various pedestrian and bicycle design treatments. The Design Resource Index will help practitioners quickly access the right resources and should reduce the amount of time it takes to search through multiple design guides to find the information they need.

- For the navigable Excel version, [click here](#)
- For a printable 11x17 version, [click here](#)

As you use this document, we encourage you to share your observations and feedback. For example, we would like to get input on existing gaps in design guidance, research needs, and additional tools and resources that would help you navigate between various design resources. Please email this feedback to daniel.goodman@dot.gov.

<http://www.pedbikeinfo.org>

| Title | Sponsoring Agency |
|--|-------------------|
| Roadside Design Guide | AASHTO |
| A Policy on Geometric Design of Highways and Streets | AASHTO |
| Guide for the Development of Bicycle Facilities | AASHTO |
| Guide for the Planning, Design, and Operation of Pedestrian Facilities | AASHTO |
| Manual on Uniform Traffic Control Devices | FHWA |
| Designing Walkable Urban Thoroughfares: A Context Sensitive Approach | ITE & CNU |
| Recommended Design Guidelines to Accommodate Pedestrians and Bicycles at Interchanges | ITE |
| Traffic Control Devices Handbook | ITE |
| Urban Bikeway Design Guide | NACTO |
| Urban Street Design Guide | NACTO |
| Draft Guidelines: Public Rights-of-Way Accessibility Guidelines and Shared Use Path Guidelines | U.S. Access Board |

On-Street Bicycle Facility Design Treatments

5/14/15

| Key | Color |
|----------------------------|---|
| Design Treatment Addressed | |
| Interim Approval | |
| Experimental Status | |

| Roadside Design Guide (2011) | A Policy on Geometric Design of Highways and Streets (2011) | Guide for the Development of Bicycle Facilities (2012) |
|------------------------------|---|--|
| AASHTO | AASHTO | AASHTO |

| A. Bicycle Facility Selection | | | |
|-------------------------------|--|-------------------|---------------|
| A1 | Guidance of appropriate use/ typical application of bicycle facilities | | Section 2.5.2 |
| B. General Roadway Design | | | |
| B1 | Paved shoulders | Sections 2.7, 4.4 | Section 4.5 |
| B2 | Bicycle route signs | | Section 2.5.3 |
| B3 | Shared lane markings | | Section 4.4 |

Shared Use Path Design Treatments

3/2/2015

| Key | Color |
|----------------------------|---|
| Design Treatment Addressed | |
| Interim Approval | |
| Experimental Status | |

| Roadside Design Guide (2011) | A Policy on Geometric Design of Highways and Streets (2011) | Guide for the Development of Bicycle Facilities (2012) | Guide for the Planning, Design, and Operation of Pedestrian Facilities (2004) | Mar Cor (2011) |
|------------------------------|---|--|---|----------------|
| AASHTO | AASHTO | AASHTO | AASHTO | FH |

| B4 | Shared lane signage |
|------------------|---|
| B5 | Bicycle boulevards/neighborhood streets |
| B6 | Bicycle accommodations on residential streets |
| B7 | Bicycle accommodations on commercial streets |
| B8 | Bicycle treatments at roundabouts |
| B9 | Bicycle-safe drainage grates |
| B10 | Rumble strips (bicycle guideways) |
| B11 | Colored bicycle facilities |
| C. Bicycle Lanes | |
| C1 | Bicycle lane signs and pavement markings |
| C2 | Bicycle lane design |
| C3 | Bicycle lanes on one-way streets |
| C4 | Retrofitting bicycle facilities |
| C5 | Buffered bicycle lanes |
| C6 | Contra-flow bicycle lanes |
| C7 | Bicycle lanes adjacent to transit |
| C8 | Advisory bicycle lanes |
| C9 | Bicycle lanes adjacent to transit |

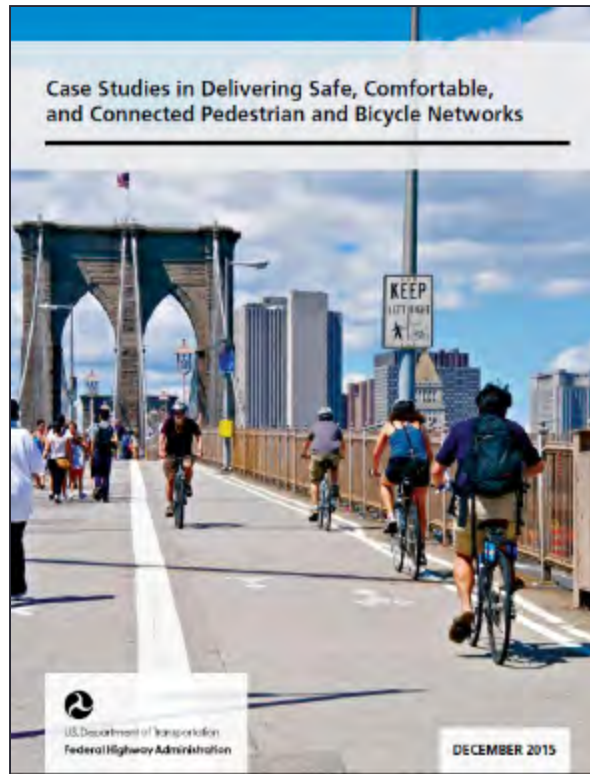
| A. General Shared Use Path Design | | | |
|-----------------------------------|---|---------------|--------------------------------|
| A1 | Width of shared use path | | Section 5.2.1 / Section 3.3.14 |
| A2 | Shoulders on path | | Section 5.2.1 / Section 3.3.14 |
| A3 | Clear zone adjacent to path | | |
| A4 | Barrier or guardrail requirements | Section 5.2.3 | |
| A5 | Sidepath design considerations | | |
| A6 | Separated bicycle and pedestrian paths | | |
| A7 | Equestrian considerations | | |
| A8 | Design speed | | |
| A9 | Horizontal alignment | | |
| A10 | Cross slope | | |
| A11 | Grade of shared use path | | |
| A12 | Surface structure | | |
| A13 | Bridges and underpasses | | |
| A14 | Drainage | | |
| A15 | Lighting | | |
| A16 | Minimum curve radius | | |
| A17 | Stopping sight distance for shared use path | | |
| A18 | Railroad grade crossings | | |
| B. Intersection Design | | | |
| B1 | Subway considerations | Section 5.2.5 | |

Pedestrian Facility Design Treatments

3/2/2015

| Key | Color |
|----------------------------|---|
| Design Treatment Addressed | |
| Interim Approval | |
| Experimental Status | |

| | Roadside Design Guide (2011) | A Policy on Geometric Design of Highways and Streets (2011) | Guide for the Development of Bicycle Facilities (2012) | Guide for the Planning, Design, and Operation of Pedestrian Facilities (2004) |
|------------------------------|---|---|--|---|
| | AASHTO | AASHTO | AASHTO | AASHTO |
| A. General Roadway | | | | |
| A1 | Waved shoulders | | Section 4.4 | Section 4.2.1 |
| A2 | Pedestrian accommodations on bridges/overpasses | | Sections 4.13.4, 4.17.1, 4.17.2 | Section 4.2.2 |
| A3 | Drainage, encroachment and bridge | | Section 2.4.6, 4.14.2 | Section 4.2.6 |
| A4 | Medians | | Section 4.11 | Section 4.2.1, 4.2.2 |
| A5 | On-street parking design | | Section 4.12 | Section 4.2.1 |
| A6 | Lighting and illumination | | Section 4.4.3 | Section 2.3.11, 2.24 |
| A7 | Shared crosswalks | | | Section 2.3.12 |
| A8 | Travel over streets | | Section 4.1 | Section 2.8 |
| A9 | Lane narrowing | | | Section 2.8 |
| A10 | Lane reduction | | | N/A |
| A11 | Chicanes | | | Section 2.4.2 |
| A12 | Speed humps, tables, and curbs | | | Section 2.5.2 |
| A13 | Chicanes | | | Section 2.8.1 |
| A14 | Signs, distance and sight lines | | Section 3.1 | Section 2.1, 4.2.3 |
| A15 | Railroad grade crossings | | | Section 2.3.12 |
| A16 | Curb ramps | | Section 4.17.3 | Section 3.3.5 |
| A.17 Sidewalks | | | | |
| A17.1 | Surface treatments | | | Section 2.3.13, 3.24 |
| A17.2 | 4-ft or more | Section 10.1.6, 10.2 | Section 4.17.1 | Section 2.4, 3.11 |
| A17.3 | Obstacles and protruding objects | Section 10.2.1 | | Section 3.1.2 |
| A17.4 | Materials | | | Section 4.1 |
| A17.5 | Maintenance of facility during construction | | | Section 4.4 |
| A17.6 | ADA compliant tactile paving | | | Section 3.2 |
| A17.7 | Grade and cross slope | | | Section 3.1.1 |
| A17.8 | Sidewalk width and geometry | | Section 4.17.1 | Section 3.3.1 |
| A17.9 | Signs | | | Section 2.3.2 |
| A.18 Pedestrians and transit | | | | |
| A18.1 | Stop bus stops | | Section 4.19 | |



Bicycle and Pedestrian Program

[Home](#) | [Information](#) | [Bicycle and Pedestrian Program](#) | [Contact](#)

Funding
 FHWA Guidance: Bicycle and Pedestrian Provisions of Federal Highway Act

Guidance
 Updated September 10, 2015

Resources
 This page was updated on September 10, 2015 to:

- Update references to Federal surface transportation legislation.
- To make technical corrections and clarifications.
- To include references and links to other policies or guidelines and to new links.

On this page:

- [Introduction](#)
- [Bicycle and Pedestrian Policy](#)
- [Legislative Background](#)
- [Integrating Bicycle and Pedestrian Facilities](#)
- [Funding Eligibility](#)
- [Funding Source and Matching Requirements](#)
- [Planning](#)
- [Implementation Processes](#)
- [Project Selection](#)
- [Design Resources](#)

FHWA Headquarters Contact
 For more information, please contact [Bicycle and Pedestrian](#).

**Bicycle and Pedestrian Funding, Design, and Environmental Review:
 Addressing Common Misconceptions**
 August 20, 2015

Introduction

The U.S. Department of Transportation (DOT) has been working to address nonmotorized safety issues nationwide and help communities create safer, better-connected bicycling and walking networks as part of the Department's [Safer People, Safer Streets Initiative](#).

Since launching the Safer People, Safer Streets Initiative in 2014, DOT has engaged safety experts, existing and new stakeholders, local officials, and the public on a range of targeted strategies to encourage safety for bicyclists and pedestrians on and around our streets, including [bus stops](#), [transit stations](#), and [other multimodal connections](#). Through these discussions, a

DESIGN CRITERIA

Design criteria are rules established at the beginning of a project to guide the design of a roadway. The selection of design criteria should reflect the desired purpose and function of a street and prioritize the safety of all users.

Within each functional classification, there are ranges of lane widths, shoulder widths, design speeds, and other criteria available to the designer. Designers determine which criteria to use based on the road's purpose, location, and other factors. Design criteria can vary significantly between different road types, such as arterials, major roads, and local streets. The key result is a design that meets all the design criteria and is normally safe, but has a high crash rate compared to other roads and is not substantially safe.

Designers have flexibility in selecting design criteria and are not always required to choose the most conservative values. Understanding the broad intent of the roadway needs of the community, and desired function of the roadway will help the designer identify the appropriate design criteria.



Design Criteria

KEY DESIGN FLEXIBILITY

The 2011 AASHTO Green Book recognizes the functional classification of highways can lead to roadway facilities that do not take into account the local context and that design has options beyond the standard.

A highway has wide-ranging effects in addition to providing traffic service to users. It is determined from the highway for consideration as an element of the built environment. The level of investment, and cost-benefit ratio in the reality of a community's socio-economic, physical, natural, and aesthetic.

AASHTO Green Book (2011), p. 2-40

OTHER RESOURCES

When a functional classification has been assigned to a roadway, however, there is still a degree of flexibility in the major controlling factor of design speed. There are several design speed options for roadways in government design codes.

FHWA Highway Geometric Criteria and

Lane widths of 10 feet are used and have a considerable impact on the roadway design.

MACTO Urban Streets

Geometric criteria of urban streets are defined by lane width and shoulder width. Lane widths of 10 feet are used and have a considerable impact on the roadway design.

APPLYING DESIGN FLEXIBILITY

SETTING DESIGN CRITERIA

The functional classification of a roadway directs designers to select the most appropriate design speed and design criteria. Designers should consider design speed, lane width, shoulder width, and stopping sight distance.

The AASHTO Green Book allows flexibility by providing a range of values. For example, on urban arterials design speeds range between 30 and 40 mph (2011, p. 2-27) and lane width may vary between 10 and 12 feet (2011, p. 2-28). AASHTO's National Transportation Design Guide provides a design speed of 30 mph for urban arterials (2011, p. 141) and 10 feet for urban streets (2011, p. 71).

Geometric criteria for urban streets are defined by lane width and shoulder width. Lane widths of 10 feet are used and have a considerable impact on the roadway design. Some urban streets are characterized by street lighting and street networks and increased pedestrian and bicycle activity. As stated in the AASHTO Geometric Design Guide, "There are many urban streets that are separated from the metropolitan center by suburban conditions but function similarly to an urban street" (2011, p. 88-92).

NOMINAL VS. SUBSTANTIVE SAFETY

The subjective or subjective safety performance of a roadway does not always directly correspond to its level of nominal safety. It is not uncommon for a roadway to be nominally safe (i.e., all design elements meet design

criteria) but at the same time be substantially unsafe (i.e., it does not account for a high crash potential relative to its expectations). Similarly, some roadways that are nominally unsafe (one or more design elements do not meet design criteria) can still function at a high level of substantive safety.

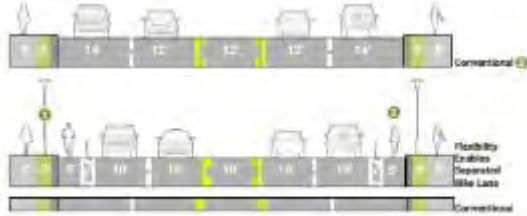
Throughout the design process, designers should use the flexibility inherent in the design criteria to achieve a balanced, safe, and cost-effective design. The goal for all roadways is to achieve a high level of substantive safety, which in most situations may require design exceptions. (FHWA, Urban and Suburban Facility Design Flexibility, memorandum, August 20, 2013)

RECOMMENDED RESOURCES

Several resources provide information on the flexibility available to designers in the selection. In addition to the AASHTO Guide for Planning, Design, and Operation of Transportation Facilities and the AASHTO Guide for the Development of Bicycle Facilities, the MACTO Urban Streets Design Guide and the Designing Walkable Urban Thoroughfares provide useful information on design criteria flexibility. (FHWA, "Bicycle and Pedestrian Facility Design Flexibility," memorandum, August 20, 2013)

CONTROLLED DESIGN CRITERIA AND DESIGN EXCEPTIONS

Historically, T3 controlling criteria have been identified by FHWA as having substantial implications to the operational and safety performance of any highway. FHWA is setting policy regarding controlling criteria for design, recommending T3 criteria for National Highway System roads with design speeds over 30 mph and T2 controlling criteria for roads under 30 mph, design speed and design loading should be capacity. (FHWA, "Bicycle and Pedestrian Facility Design Flexibility," memorandum, August 20, 2013)



Design Criteria

LANE WIDTH

Lane width is an important design criteria. Narrower lanes can increase crash risk and reduce the safety of all roadway users. By increasing lane width, designers can create space for a wider shoulder, a wider sidewalk with buffer, and reduced crossing distances. (FHWA, "Bicycle and Pedestrian Facility Design Flexibility," memorandum, August 20, 2013)

AND NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM, REPORT 702, Guidelines of the T3 Controlling Criteria for

Designers have flexibility in selecting design criteria and are not always required to choose the most conservative values. Understanding the broad intent of the roadway needs of the community, and desired function of the roadway will help the designer identify the appropriate design criteria.



Design Criteria

The AASHTO Green Book offers substantial flexibility on lane widths, allowing a range of between 9 and 12 feet, depending on desired speed, roadway, and context of a roadway (2011, p. 4-7). Historically, 12-foot lanes have been used for major vehicle lanes. Additionally, the AASHTO Green Book allows 10-foot road lanes in low speed environments (45 mph or less) (2011, pp. 4-7-8-9).

Designers have flexibility in selecting design criteria and are not always required to choose the most conservative values. Understanding the broad intent of the roadway needs of the community, and desired function of the roadway will help the designer identify the appropriate design criteria.

CASE STUDIES



SMART TRANSPORTATION GUIDEBOOK NEW JERSEY (NEW JERSEY)

The Smart Transportation Guidebook for New Jersey is a comprehensive resource for transportation planners and designers. It provides guidance on a wide range of transportation issues, including smart growth, transit, and bicycle and pedestrian facilities. The guidebook is organized into several sections, each focusing on a specific transportation mode or issue. It includes a wealth of information, including case studies, best practices, and technical details. The guidebook is a valuable resource for anyone involved in transportation planning and design in New Jersey.



DRURY FARM LANE ROAD DIET (ILLINOIS)

In 2015, the City of Drury completed a road diet on Drury Farm Lane to reduce a three-lane roadway to a two-lane roadway. The road diet was implemented to improve traffic flow, reduce travel time, and improve safety. The road diet was implemented by narrowing the travel lanes and widening the shoulders. The road diet was implemented successfully, and the road is now operating more efficiently than before. The road diet was a key component of the City of Drury's transportation plan, and it has been a model for other communities looking to improve their roadways.



MASSACHUSETTS AVENUE LANE DIET (MASSACHUSETTS)

The City of Boston and the Massachusetts Department of Transportation have implemented a lane diet on Massachusetts Avenue to improve traffic flow, reduce travel time, and improve safety. The lane diet was implemented by narrowing the travel lanes and widening the shoulders. The lane diet was implemented successfully, and the road is now operating more efficiently than before. The lane diet was a key component of the City of Boston's transportation plan, and it has been a model for other communities looking to improve their roadways.

Achieving Multimodal Networks: Applying Design Flexibility and Reducing Conflicts



1. Design Criteria
2. Intersection Geometry
3. Traffic Calming and Design Speed
4. Road Diets
5. Crossing Treatments
6. Signalized Intersections
7. Paved Shoulders
8. Separated Bike Lanes
9. Slow Streets
10. Bus Stops
11. State Highways Transitioning to Main Streets
12. Bridge Design

1. Network Connectivity
2. Improving Access to Existing Transit Stations
3. Multimodal Access to New Transit Stations
4. School Access
5. Accessibility
6. Turning Vehicles
7. Freight Interaction
8. Transit Conflicts
9. Separated Bike Lanes at Intersections
10. Shared Streets
11. Shared Use Paths
12. Midblock Path Intersections

Coming Soon!

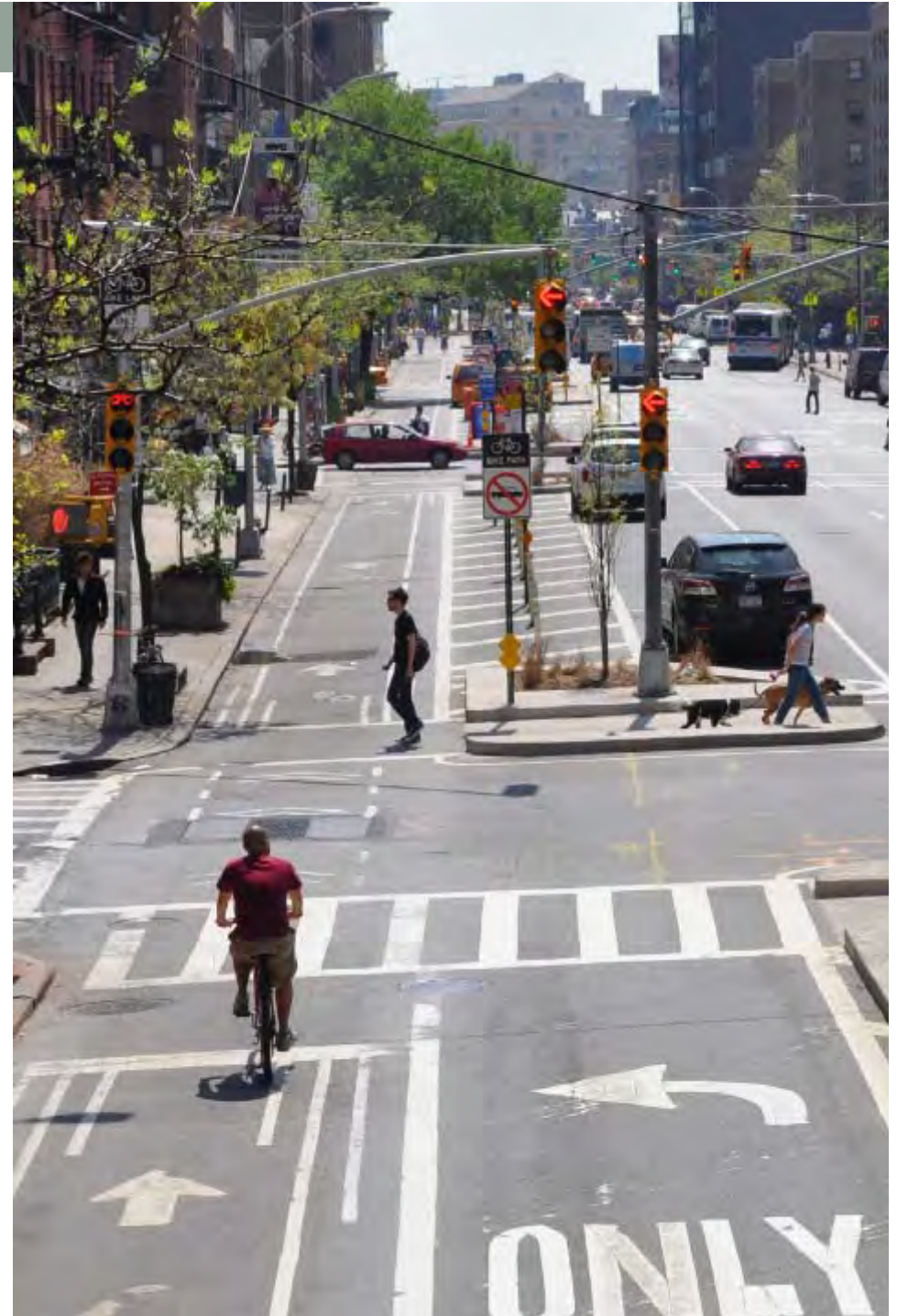


- Workbook for Building On-Road Bicycle Networks through Resurfacing Projects
- Bike Network Mapping Idea Book
- Guidebook for Evaluating, Establishing, and Tracking Pedestrian and Bicycle Performance Measures
- Small Town and Rural Street Design Guide
- Strategic Agenda for Pedestrian and Bicycle Transportation

Dan Goodman

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Environment, and Realty
Federal Highway
Administration

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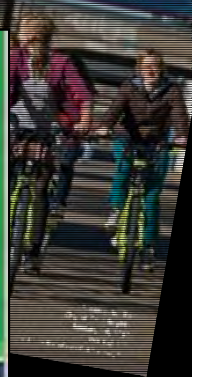
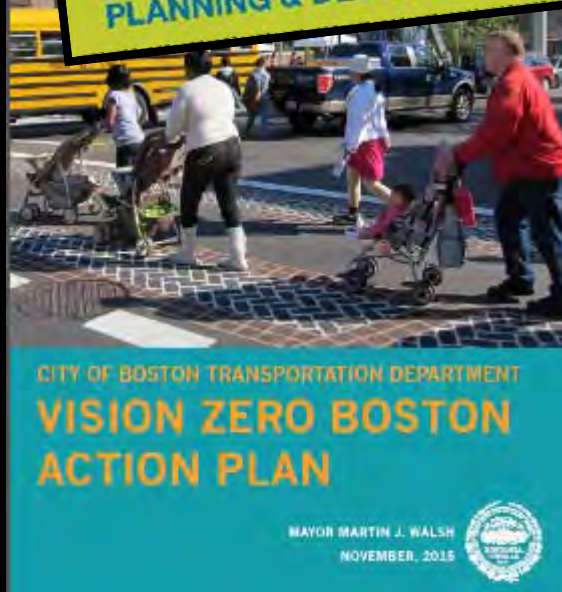
All About Guidance and Flexibility... Oh, and Engineering Judgment

Andy Clarke

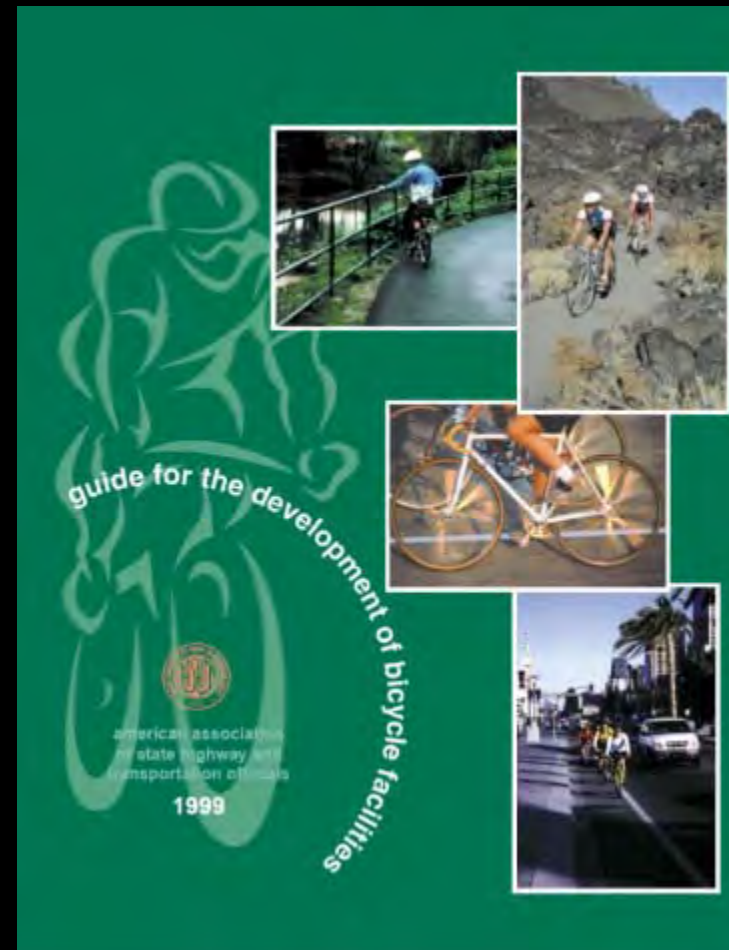
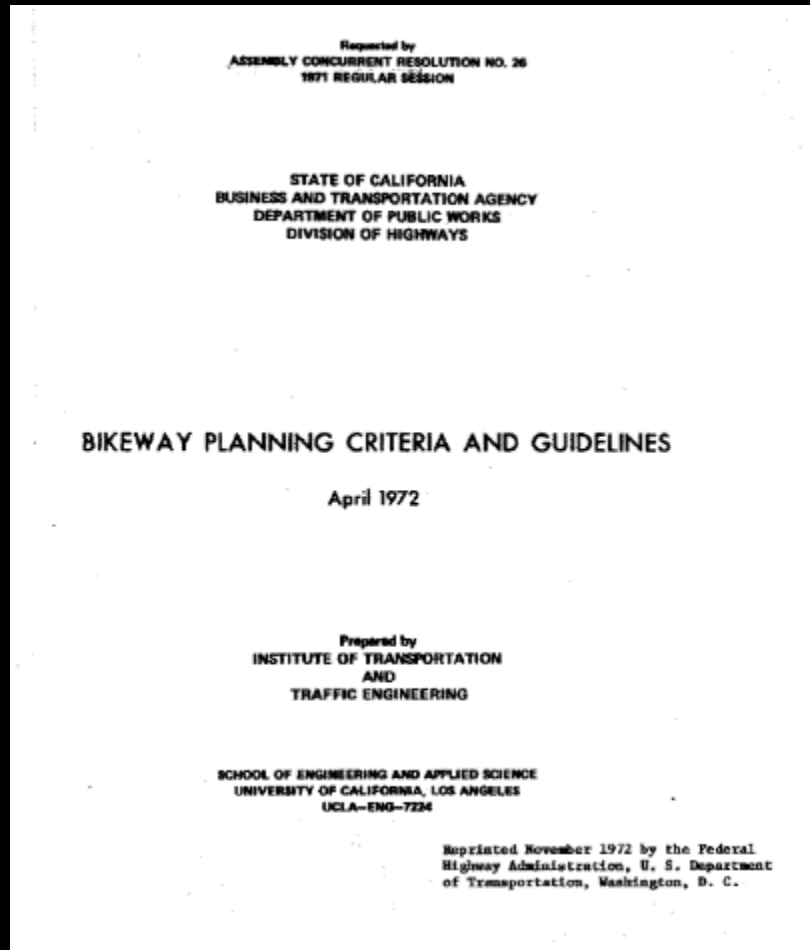
Toole Design Group



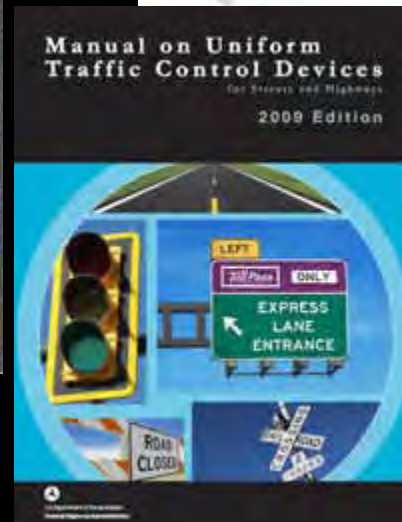
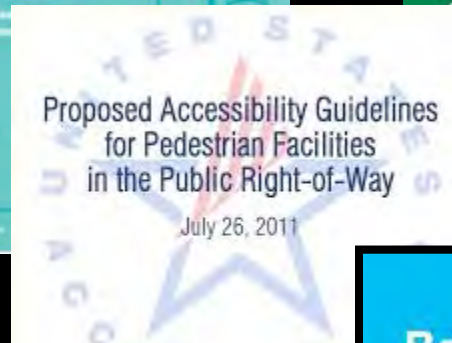
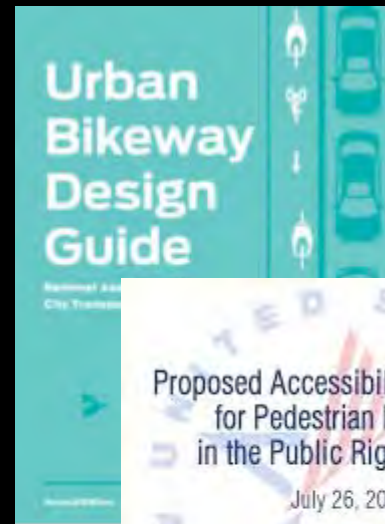
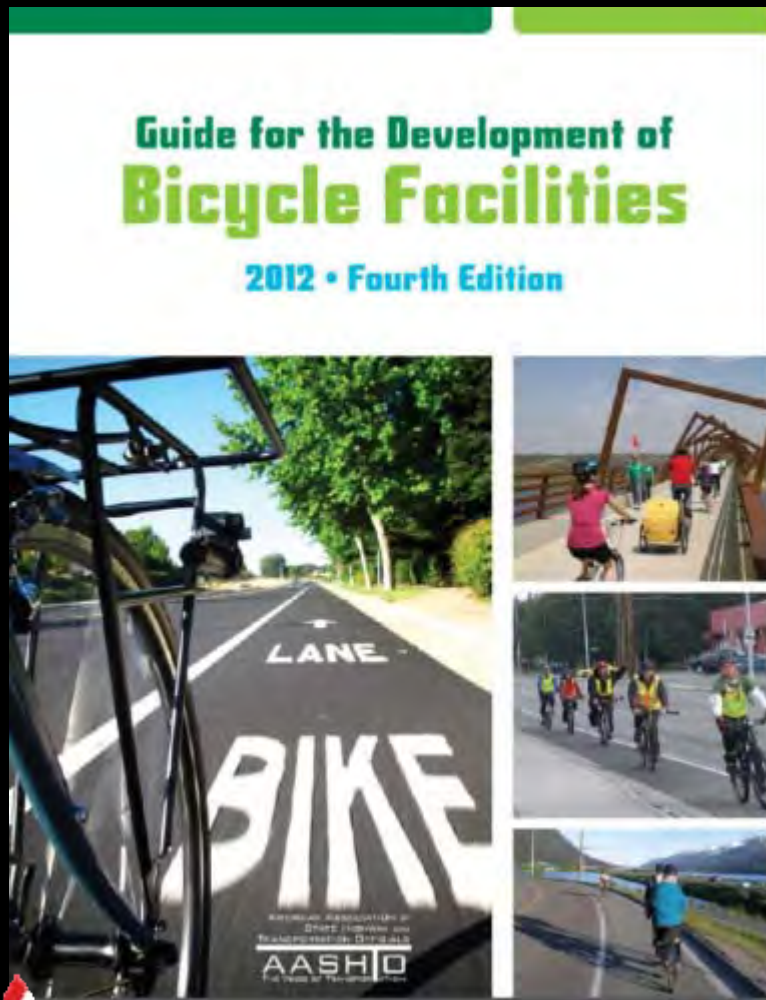
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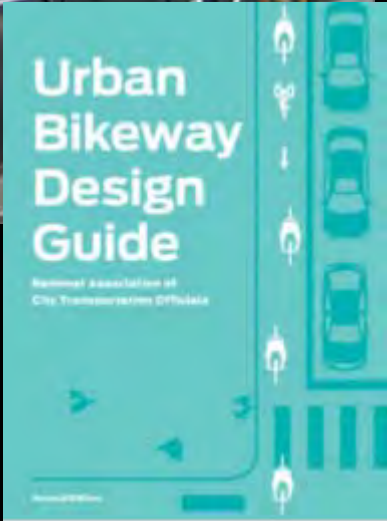
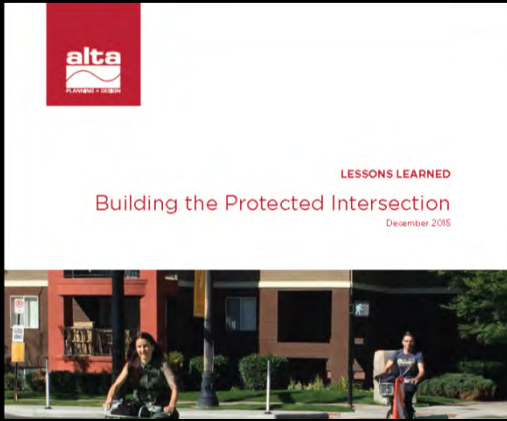


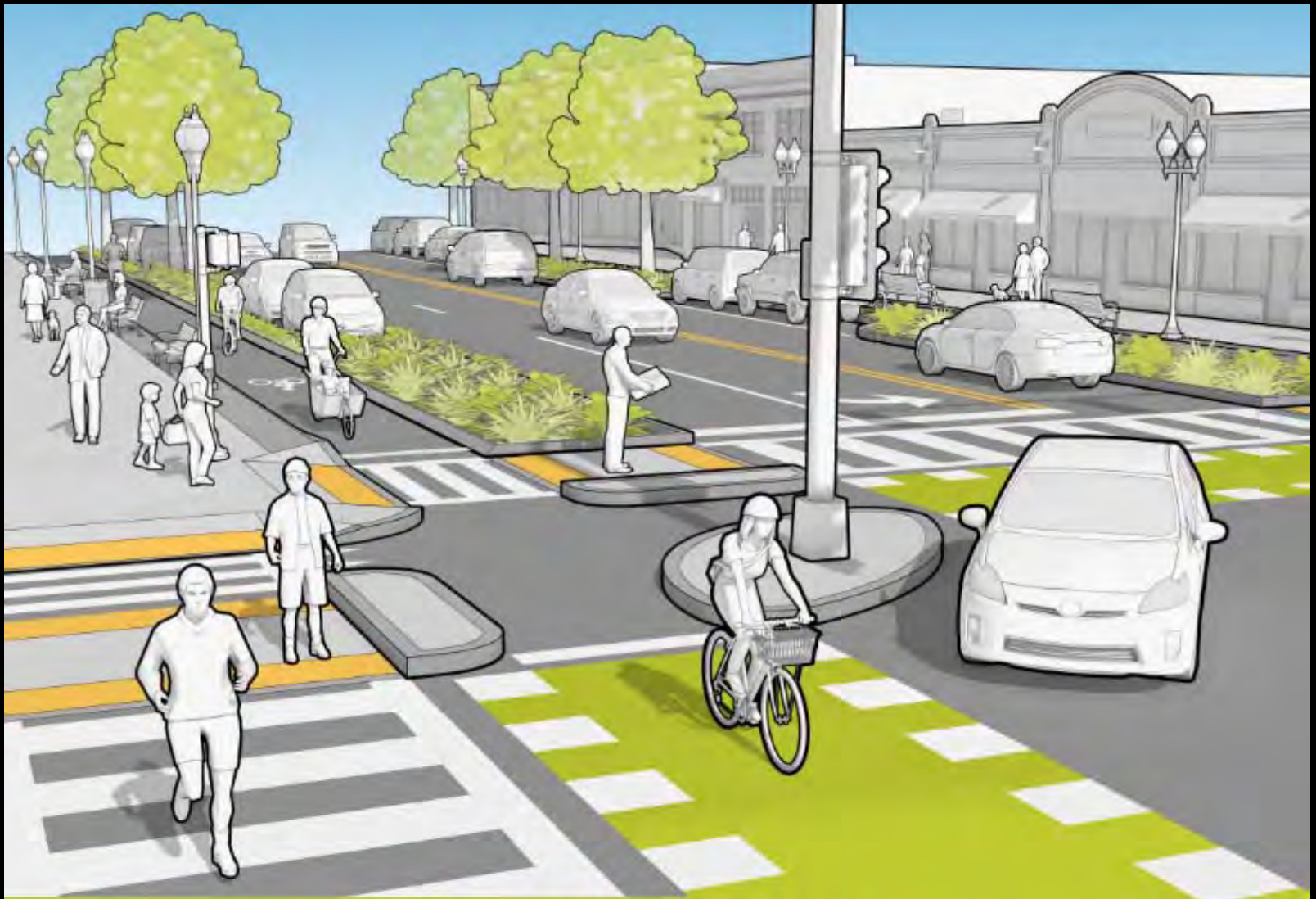
1972-2012 Guidance



Careful What you Ask For





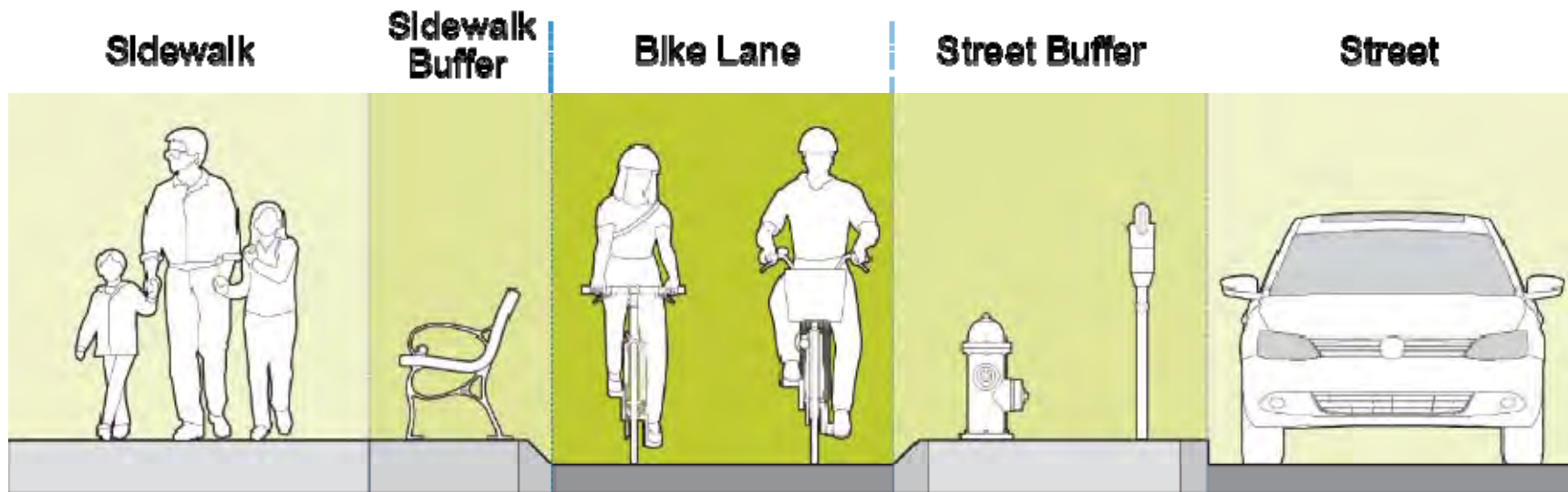


SEPARATED BIKE LANE

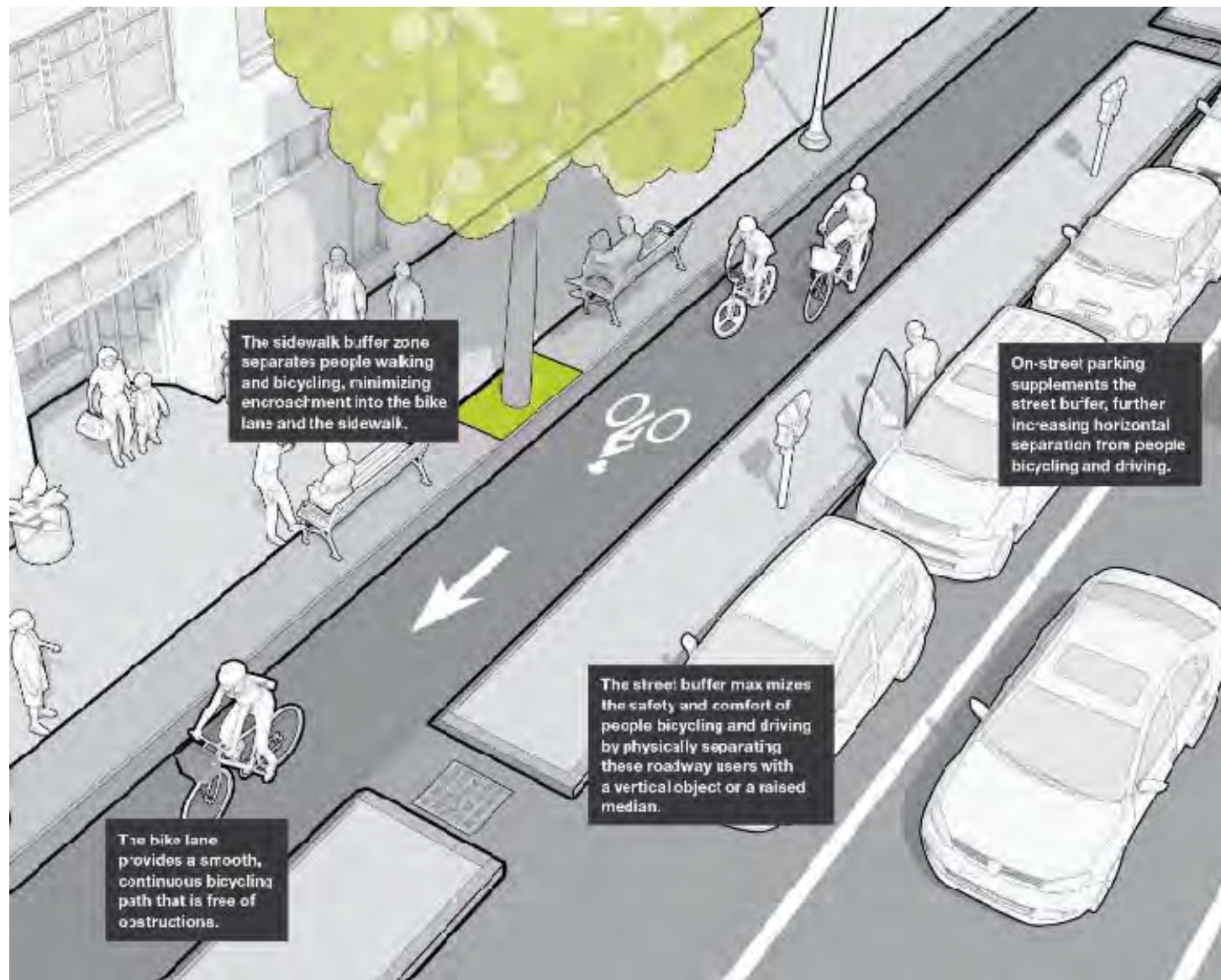
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MASSACHUSETTS DEPARTMENT
OF TRANSPORTATION

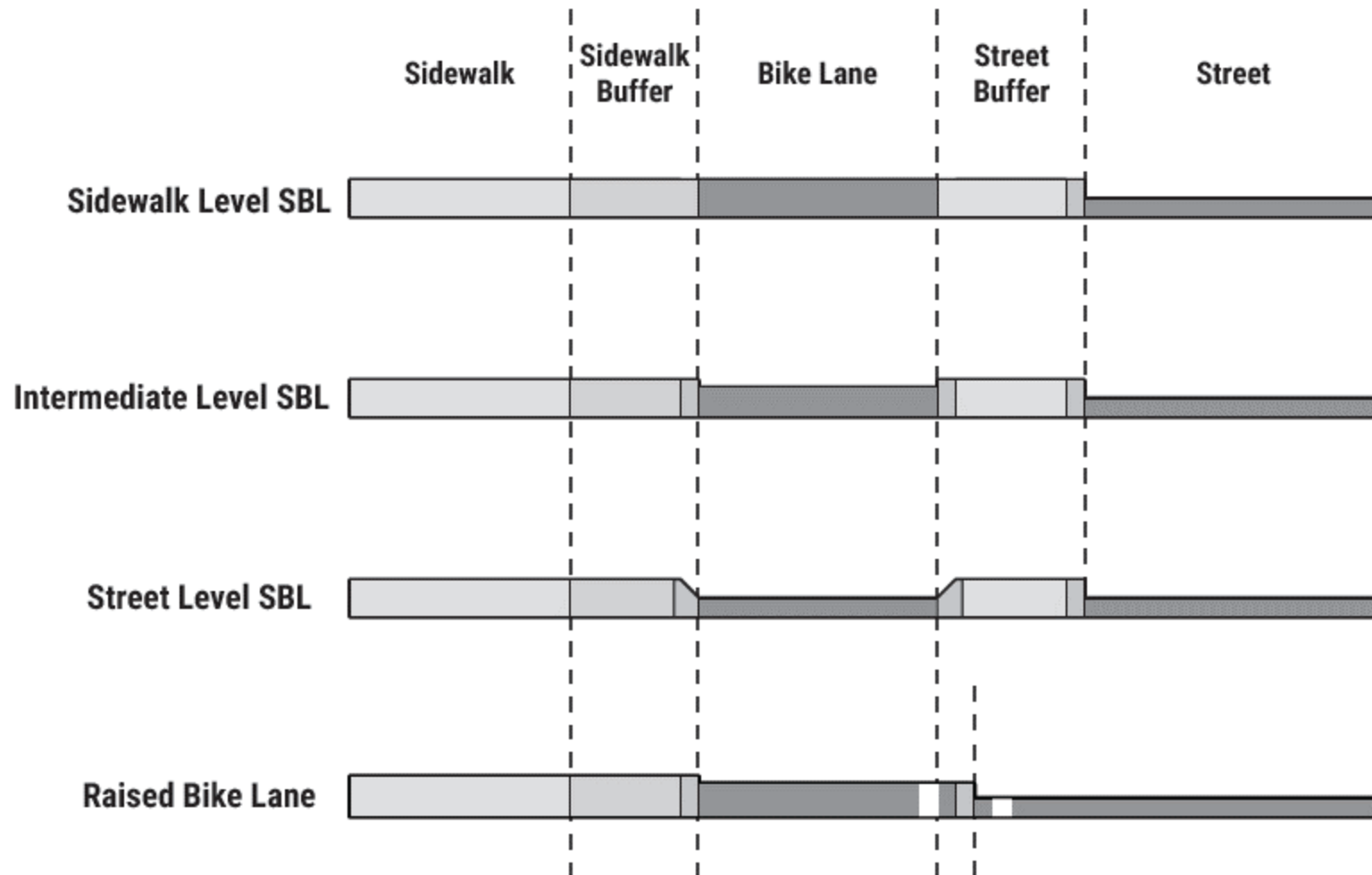
What is a Separated Bike Lane?



Benefits of Zones



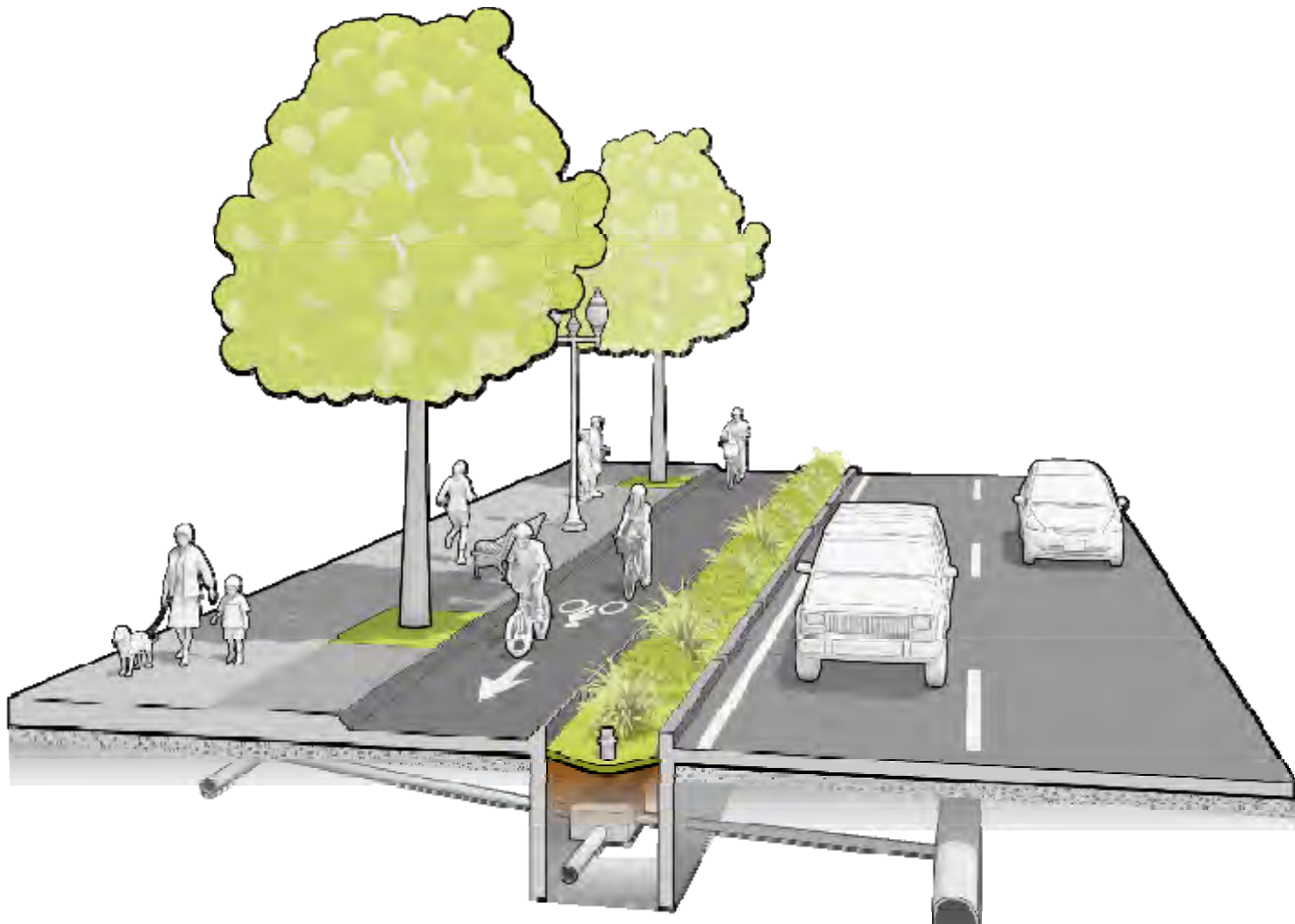
Separated Bike Lanes Types



Landscaping

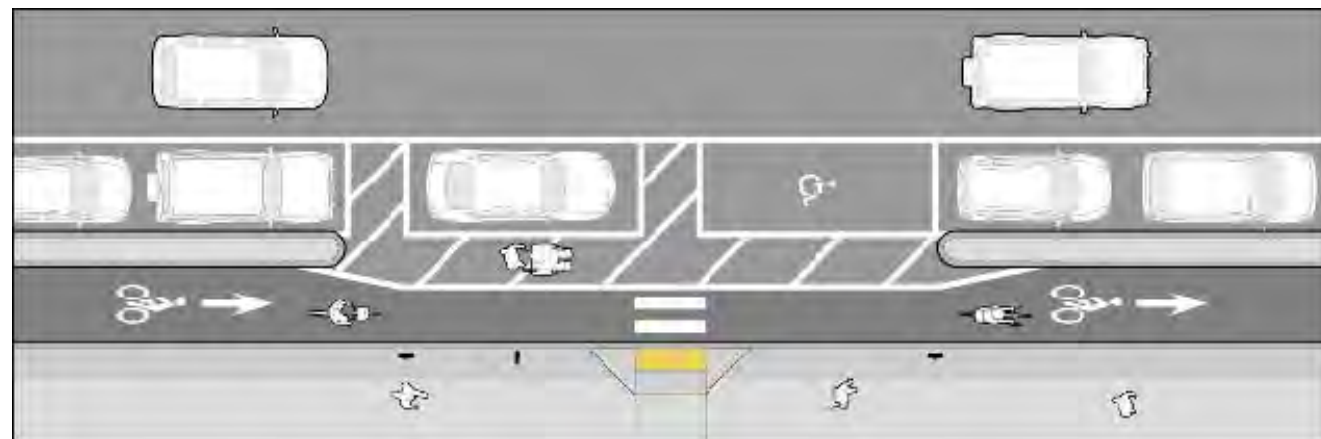
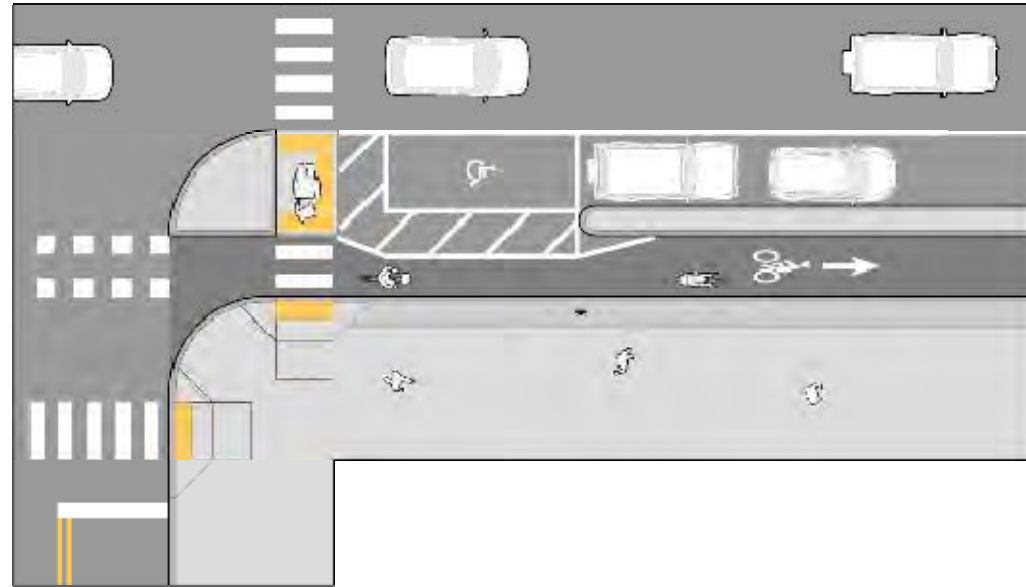


Drainage and Stormwater Management



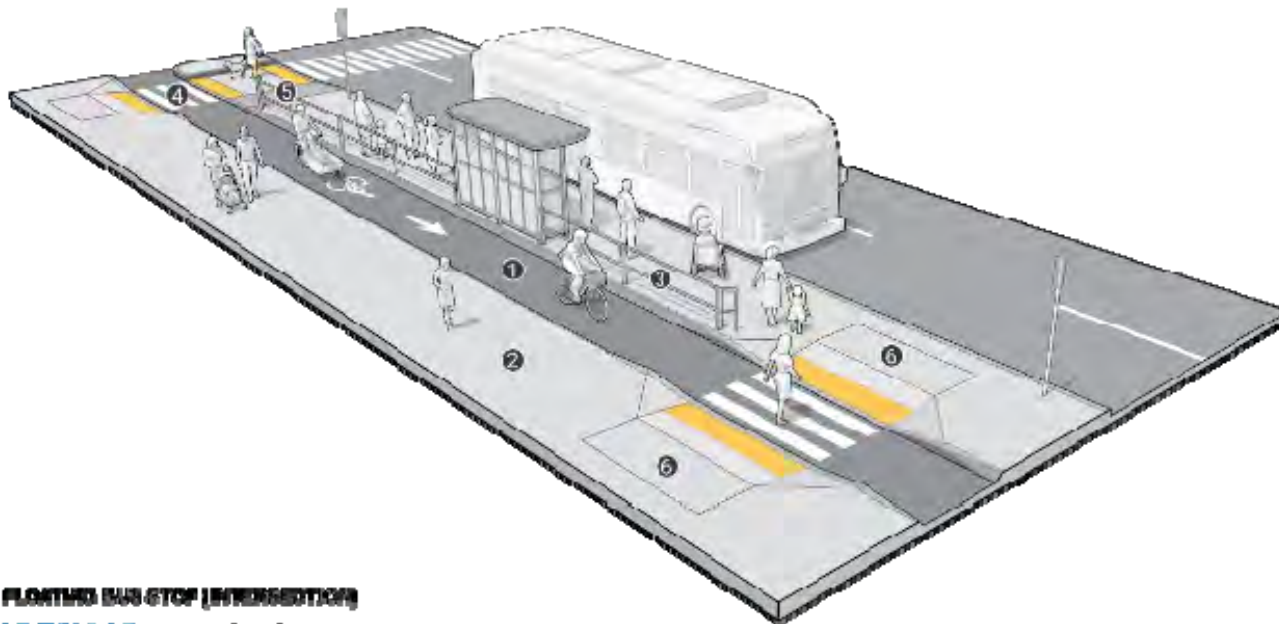
Accessibility

- Compatible with accessible curbside uses:
 - Parking
 - Loading
 - Bus stops



Elements of Transit Stops

EXHIBIT 5.4.C: FLOATING BUS STOP (FAR-SIDE)



FLOATING BUS STOP (INTERSECTION)

EXHIBIT 5.4.C shows a street-level view of a far-side floating bus stop. Transit operators generally prefer far-side stops because conflict with crossing vehicles and turning motor vehicles are minimized.

The stop is located on a one-blocker, a so-called a bus bulb. The bulb narrows the road's cross-section, typically creating a space for bus operators and allows more space for passenger boarding.

- Consider railing adjacent to expanded bike lane to preserve right-of-way for the separated bike lane and sidewalk. ① ②
- Consider railing or platform to eliminate pedestrian access to and from busy bus stops. ③
- Integrate bus stop into the pedestrian crossing at the intersection for convenient access. ④

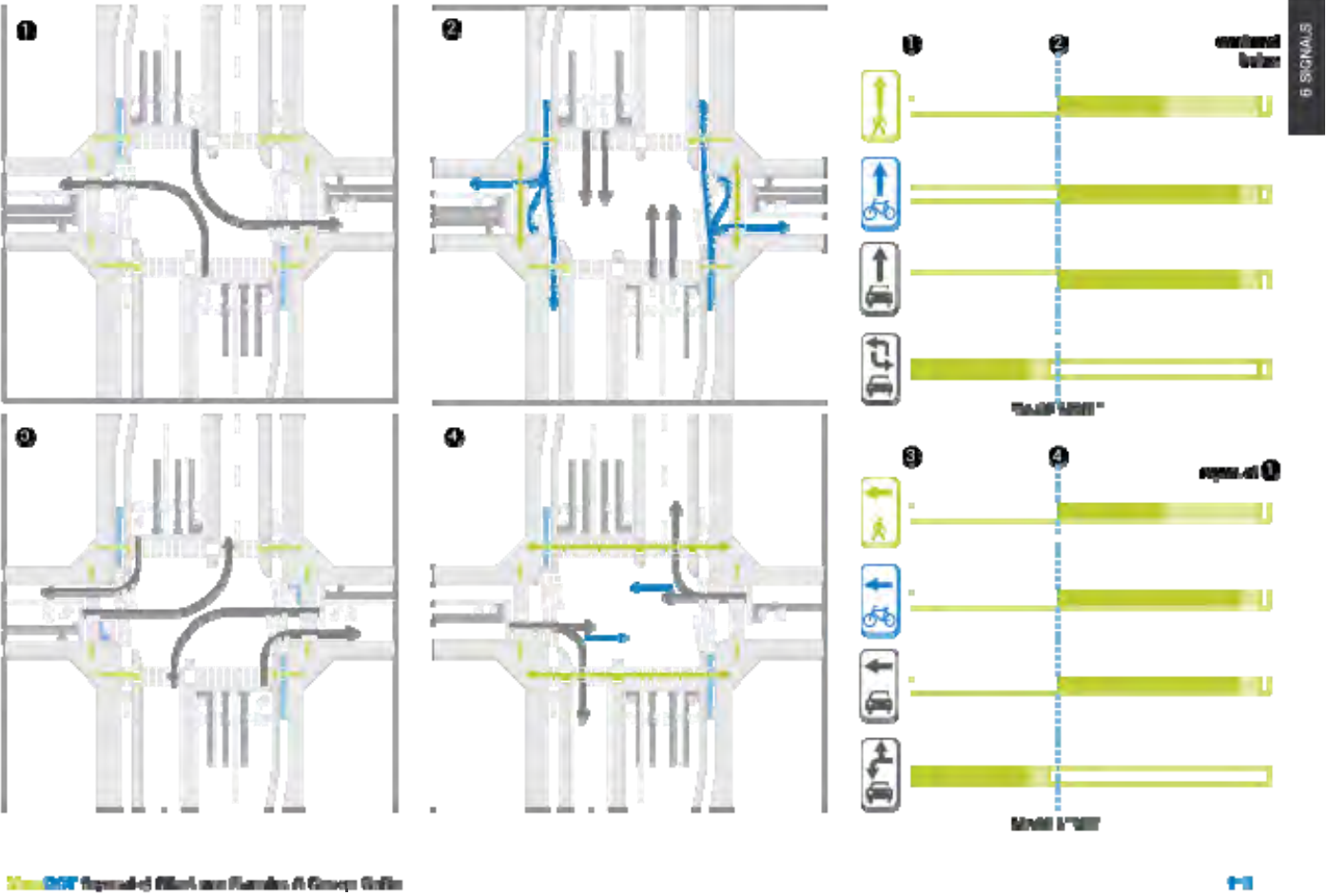
- Ramp to street level pedestrian cut-through must have a running slope between 8 percent (minimum) and 8.5 percent (maximum). ⑤
- Provide level boarding at curb ramps (7' x 7' minimum). ⑥

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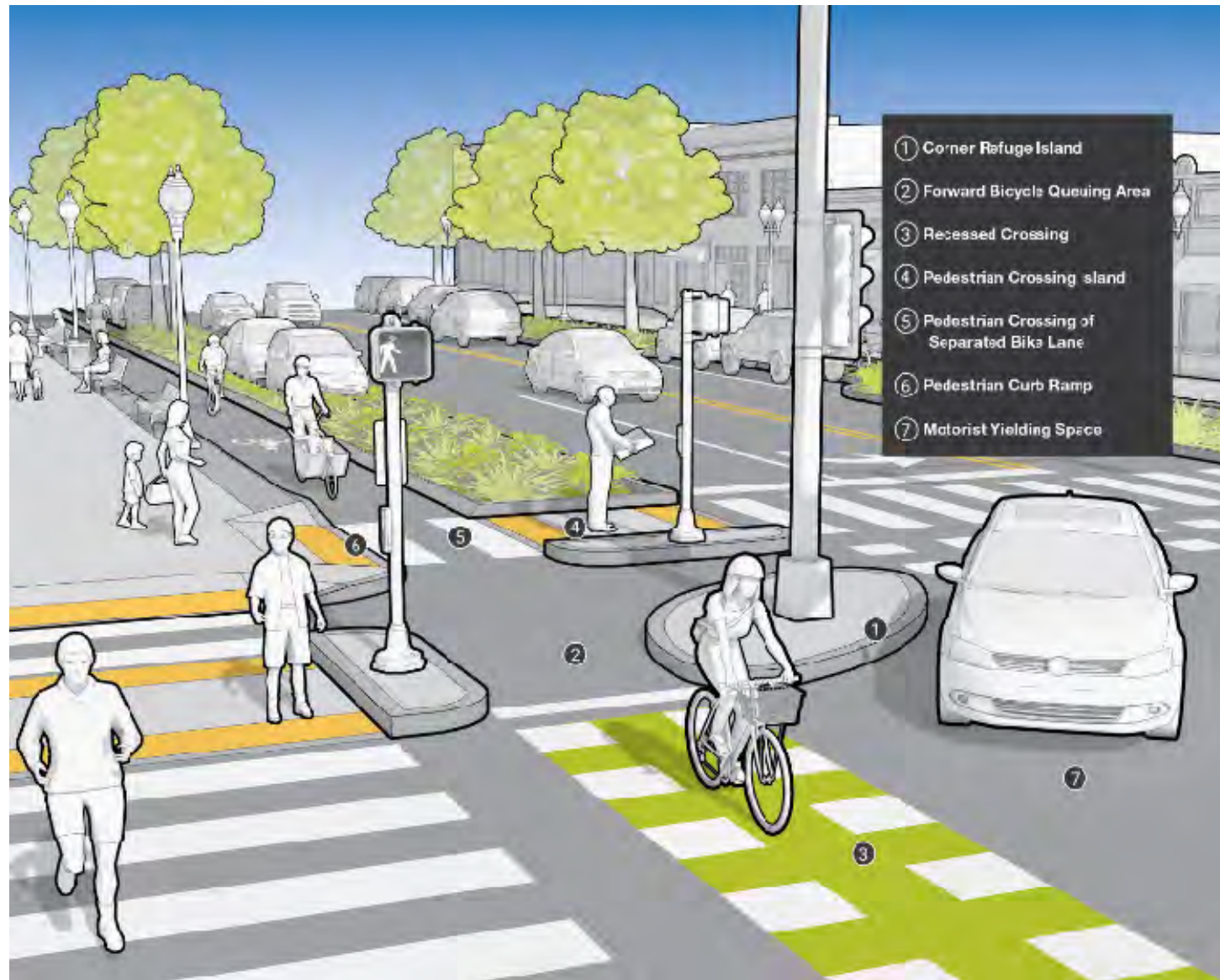
Example Signal Phasing Options

FIGURE 14.14-1. Example of Signal Phasing Options for Major and Minor Street Intersections
Note: Signal timing should be varied to suit requirements



MassDOT Regional Office and Planning & Design Office

Elements of Protected Intersections



Separated Bike Lane Planning and Design Guide
Intersections



Flexibility is not a Free for All

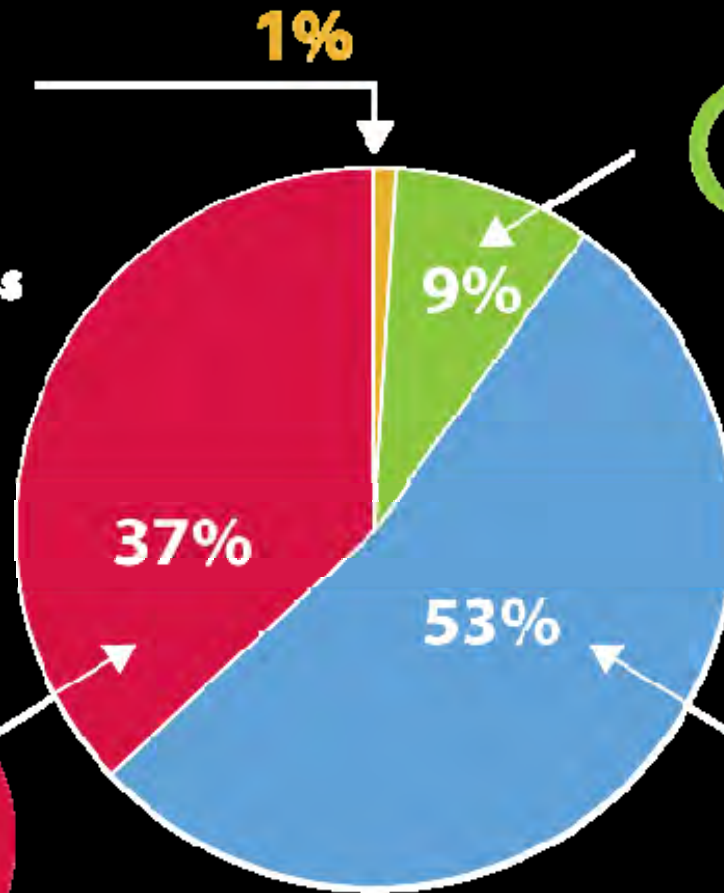




Strong and fearless



Enthusiastic and confident



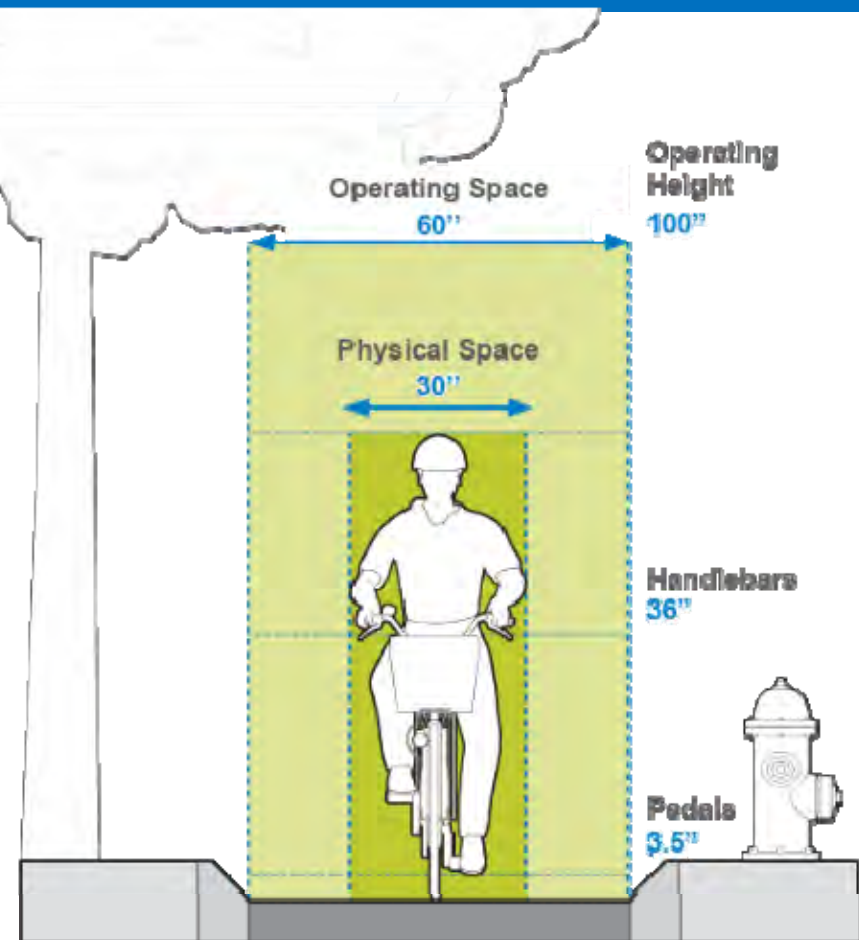
Not able or interested



Interested but concerned

Width

- One-way: 5' – 10'
- Two-way: 8' – 14'
- Width factors:
 - Bicycle volumes
 - Bicyclist physical and operating space
 - Passing maneuvers
 - Shy distance to objects
 - Curb reveal and design
 - Bike lane elevation



Comparison of Visibility

EXHIBIT 2A: MOTORIST'S VIEW AT SEPARATED BIKE LANE

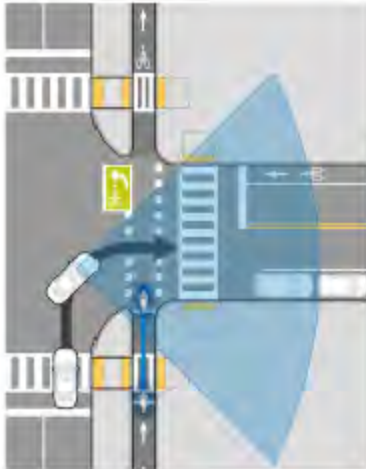
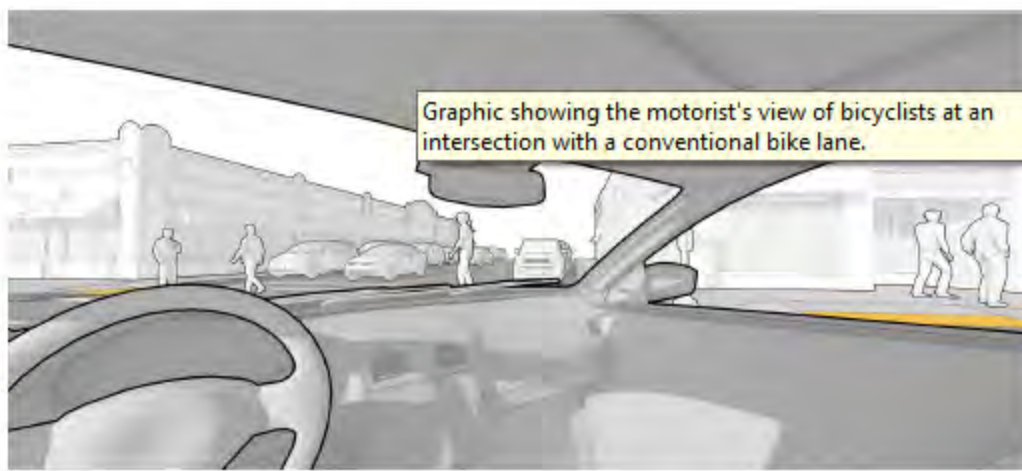


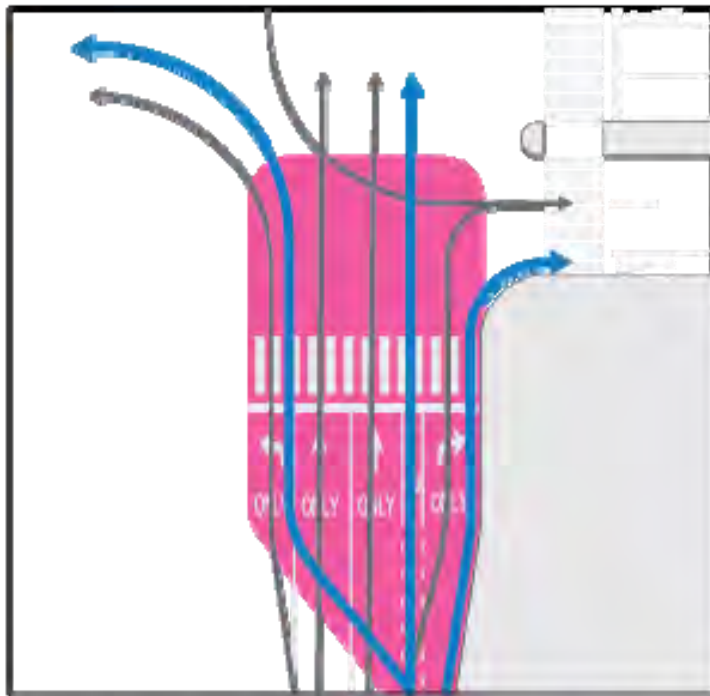
EXHIBIT 2B: MOTORIST'S VIEW AT CONVENTIONAL BIKE LANE



Graphic showing the motorist's view of bicyclists at an intersection with a conventional bike lane.

Bicyclist Exposure at Intersections

Exposure Level:
High



CONVENTIONAL BIKE LANES AND SHARED LANES

Exposure Level:
Low



PROTECTED INTERSECTIONS

Bicycle →
Motor Vehicle →
Conflict Area ●

Driveway Crossing

EXHIBIT 4.2.D- RAISED DRIVEWAY CROSSING



MassDOT Regional Bike Lane Planning & Design Guide

Design for what, and who, you want







Conclusion

- Wealth of planning and design information now available
- Permission given to use it [by FHWA]
- Must be used for good – equity, livability
- Flexibility doesn't guarantee success
 - Stay focused on outcomes
 - Train engineers around you



Thank You

Andy Clarke

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