Design Considerations

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EAST-WEST GATEWAY
Council of Governments

Design Considerations

- Design Flexibility
- Pedestrian and bicycle design concepts and tools
- How to make it fit

Design Flexibility

Design Flexibility

- 2010 USDOT Policy Statement

> "…DOT encourages transportation agencies to **go beyond the minimum requirements**, and proactively provide convenient, safe, and **context-sensitive facilities** that foster **increased use by bicyclists and pedestrians of all ages and abilities**, and utilize universal design characteristics when appropriate."

http://www.fhwa.dot.gov/environment/bicycle_pedestrian/overview/policy_accom.cfm

Design Flexibility

- 2016 FHWA resource

"Achieving Multimodal Networks"

https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/multimodal_networks/

Design Flexibility

- 2013 FHWA Memo
  - Supports "**taking a flexible approach to bicycle and pedestrian facility design**"
  - Recommends using AASHTO, ITE and NACTO guidance

- AASHTO Greenbook 2011, p xii:
  - "This policy is therefore not intended to be a detailed design manual that could supersede the need for the application of sound principles by the knowledgeable design professional**. Sufficient flexibility is permitted to encourage independent designs tailored to particular situations**."

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

Design Flexibility

- IDOT BDE Manual, pg i:

  "The designer should develop roadway designs that meet the Department's operational and safety requirements while preserving the environmental resources of an area. **Designers must exercise good judgment on individual projects and, frequently, they must be innovative in their approach to roadway design.** This may require, for example, additional research into the highway literature or use of other Department Manuals."

- MODOT Engineering Policy Guide 136.7.2.1.1

  "To maximize the value of the project the LPA should strive for as much flexibility in geometric design as possible.

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

Motorist Speeds and Vulnerable Users

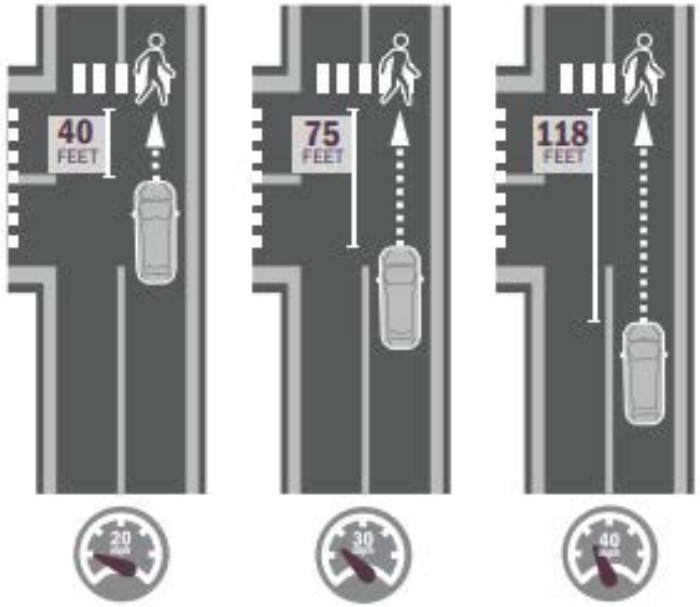
Design Concepts: Speed

- 2017 National Traffic Safety Board Safety Study " Reducing Speeding-Related Crashes Involving Passenger Vehicles" p ix
  - "Speed – and therefore speeding—increases crash risk in two ways: 1**) it increases the likelihood of being involved in a crash, and 2) it increases the severity of injuries sustained by all road users in a crash**."
  - "The relationship **is especially critical for pedestrians** involved in a motor vehicle crash, due to their lack of protection."

Design Concepts: Speed

Speed Increases Crash RISK

Speed increases the distance to stop.



Source: UK Department for Transport, Highway Code Stopping Distances Quiz

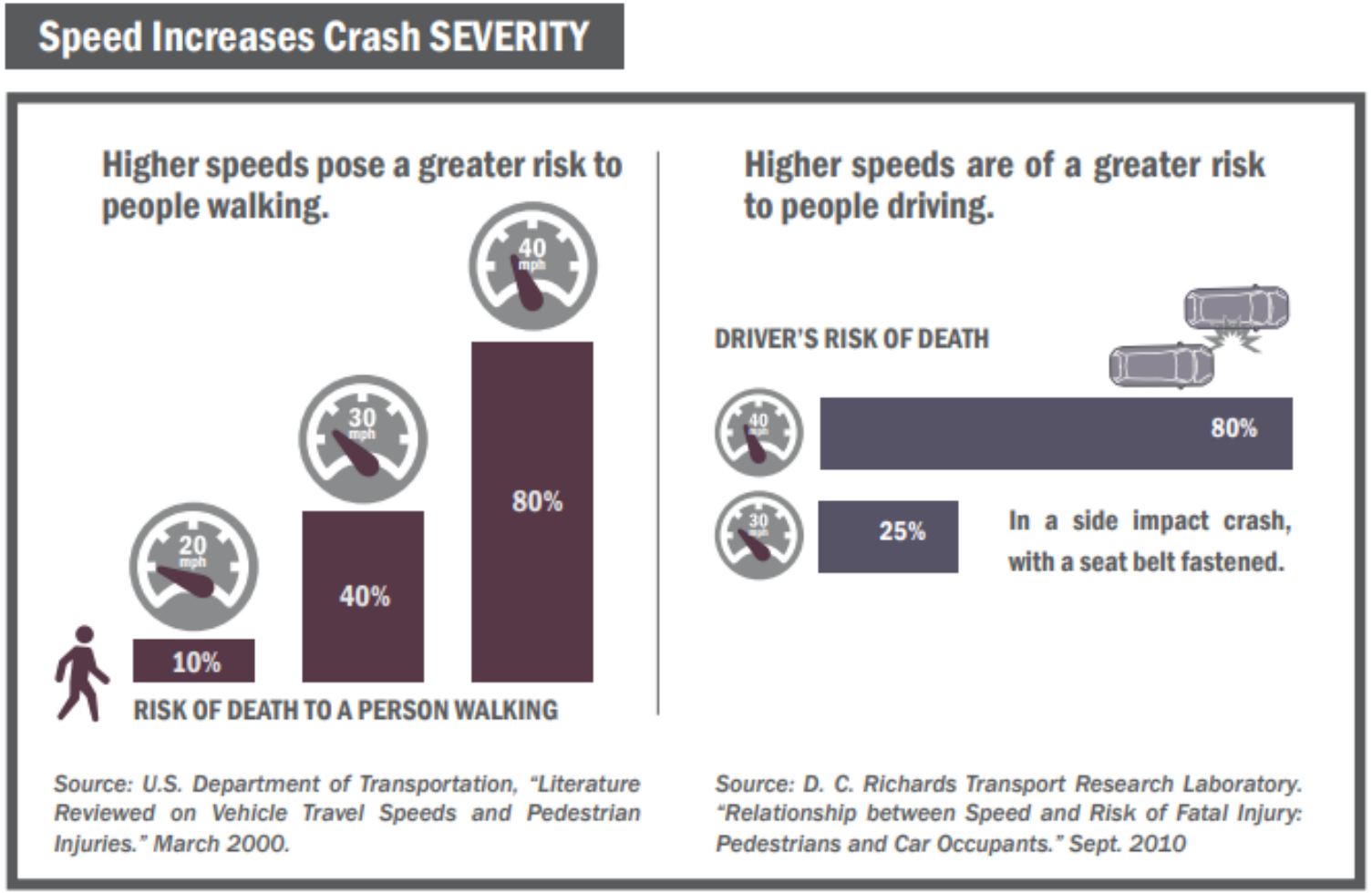
Speed narrows a driver's perspective.

As vehicle speed increases, the driver's field of vision narrows and limits the view of the street.

Source: National Association of City Transportation Officials, Urban Street Design Guide, Design Speed

City of Chicago, Vision Zero Chicago Action Plan, p 47

Design Concepts: Speed

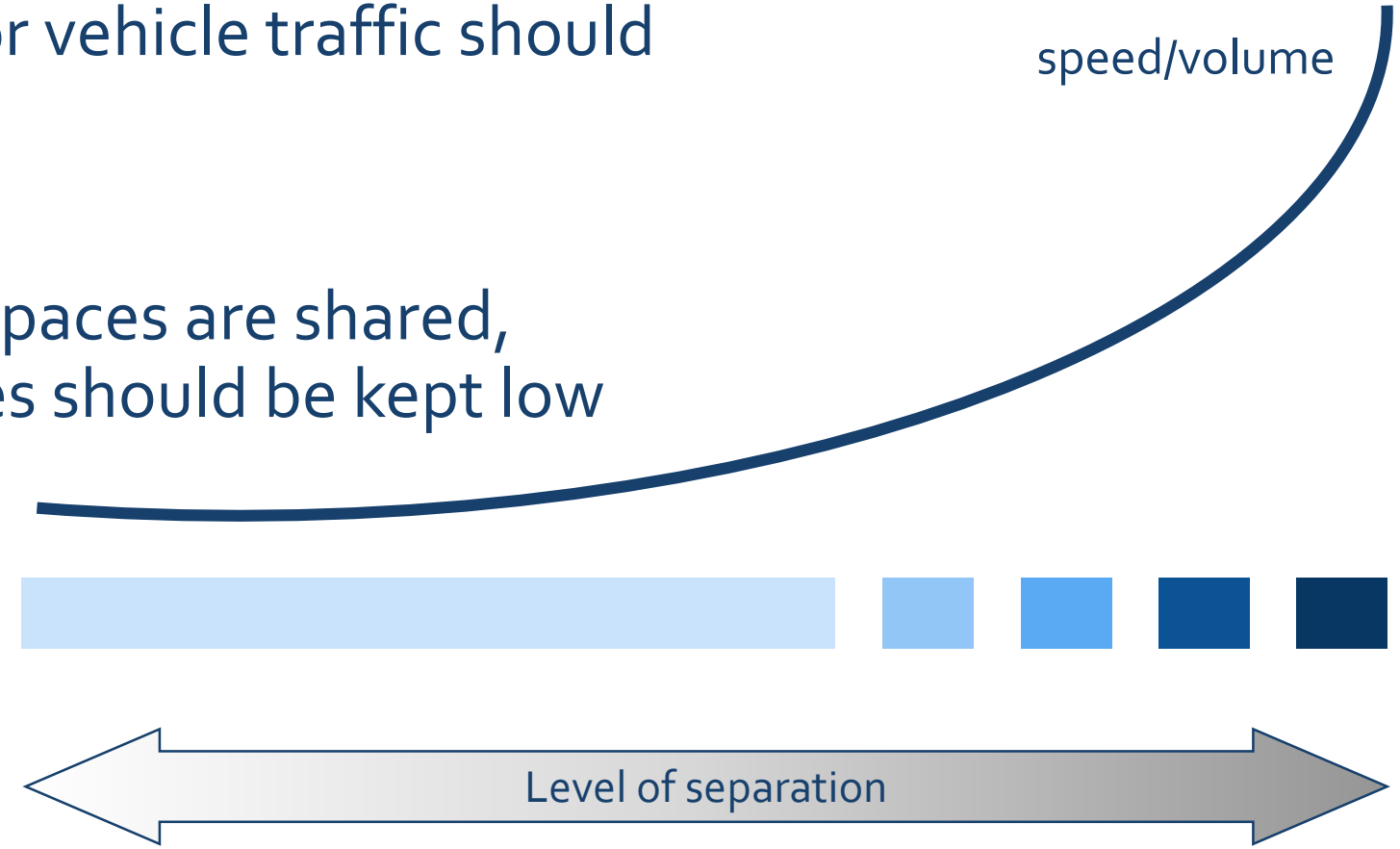


City of Chicago, Vision Zero Chicago Action Plan, p 47

Design Concepts: Speed

- As speed and/or volume increase, separation between bicyclists and pedestrians and motor vehicle traffic should increase

- By extension, where spaces are shared, speeds and/or volumes should be kept low



Pedestrian Design Concepts & Tools

Sidewalks for safety

- Adding a **sidewalk** reduces pedestrian crashes by **88%**
- Adding a **paved shoulder** reduces pedestrian crashes by **70%**
- 5’ width recommended (4’ minimum throughway required by ADA)

Designing for safety

Complete sidewalk networks

Pedestrian space design

Edge Zone

Furniture Zone

Throughway Zone

Frontage Zone

Furniture Zone

- Buffers pedestrians with plantings, furniture
- Provides snow storage space
- Aids in meeting ADA curb ramp requirements
- Plantings may calm speeds

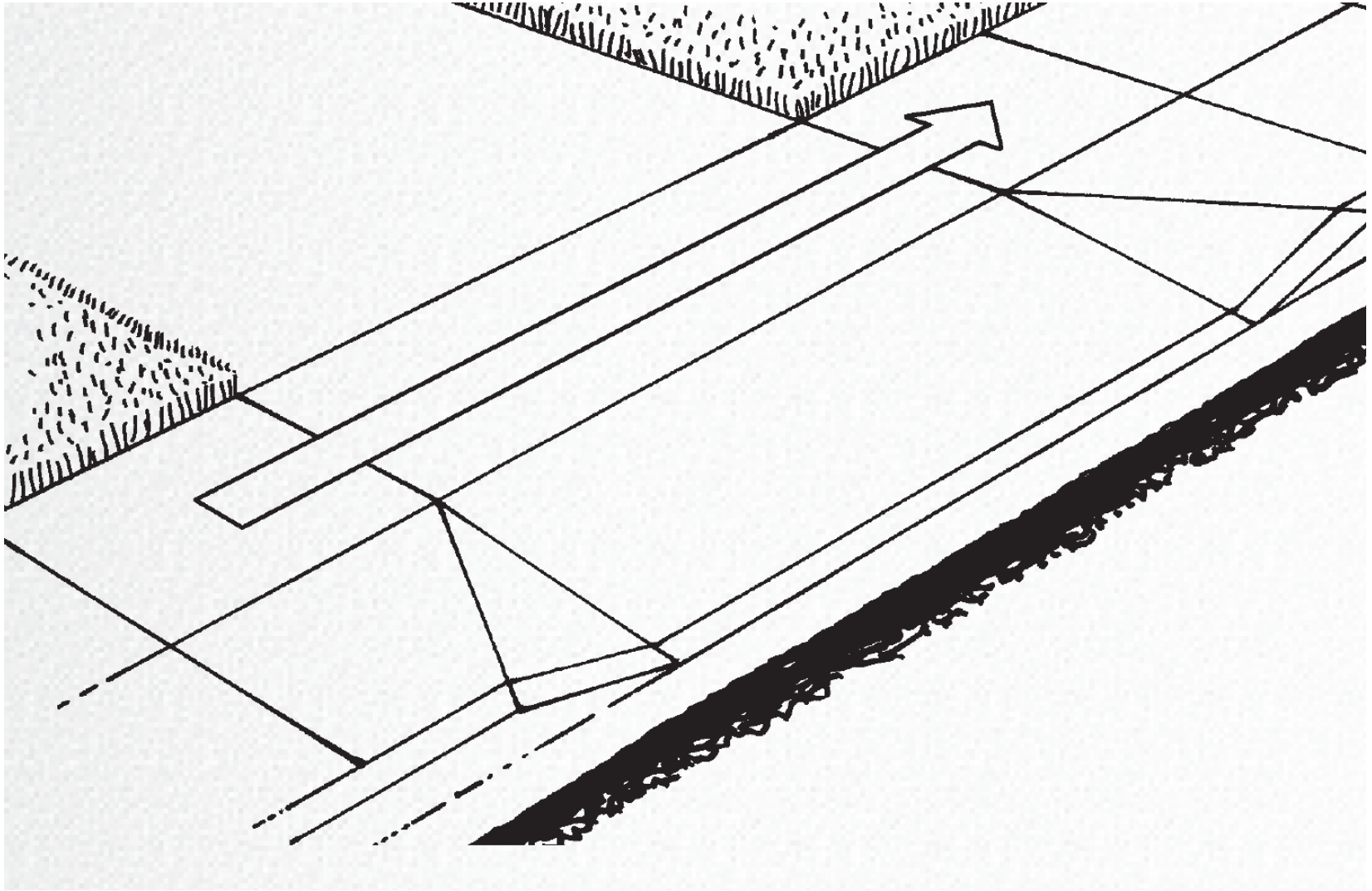
Throughway Zone

- Guidelines:
  - 5′ – 7′ width in residential areas
  - 8′ – 12′ width in commercial areas
  - Absolute minimum of 4′ at pinch points

Throughway Zone - Driveways

Every driveway introduces a conflict point

- Limit # of driveways
- Maintain level path for pedestrians
- Accessible driveway requires level pedestrian access route:
  - Cross slope: 2% max
  - Width: 4 ft. min



Designing for accessibility

Driveway design

Pedestrian Crossing Concepts

- Speed management
- Visibility & predictability
- Crossing distance
- Convenience (network)

Managing Motorist Speeds

- Normal travel:
  - Design street for the max speeds you want, not the speeds you have
  - Reallocate excess capacity to improve accommodations for all users
  - Provide adequate delineation and frame the traveled way
  - Narrow travel lanes (less than 11’)
  - Chicaning and skinny streets (residential treatment)
- Turning:
  - Compact intersections
  - Tight curb radii
  - Raised crosswalks

Visibility tools

Markings & signs

Visibility tools

RRFB

Tools to reduce distance

Curb extensions

Tools to reduce distance

Curb extensions

+ stormwater

Tools to reduce distance

Median refuge islands

Bikeway Concepts & Tools

Safety in Numbers

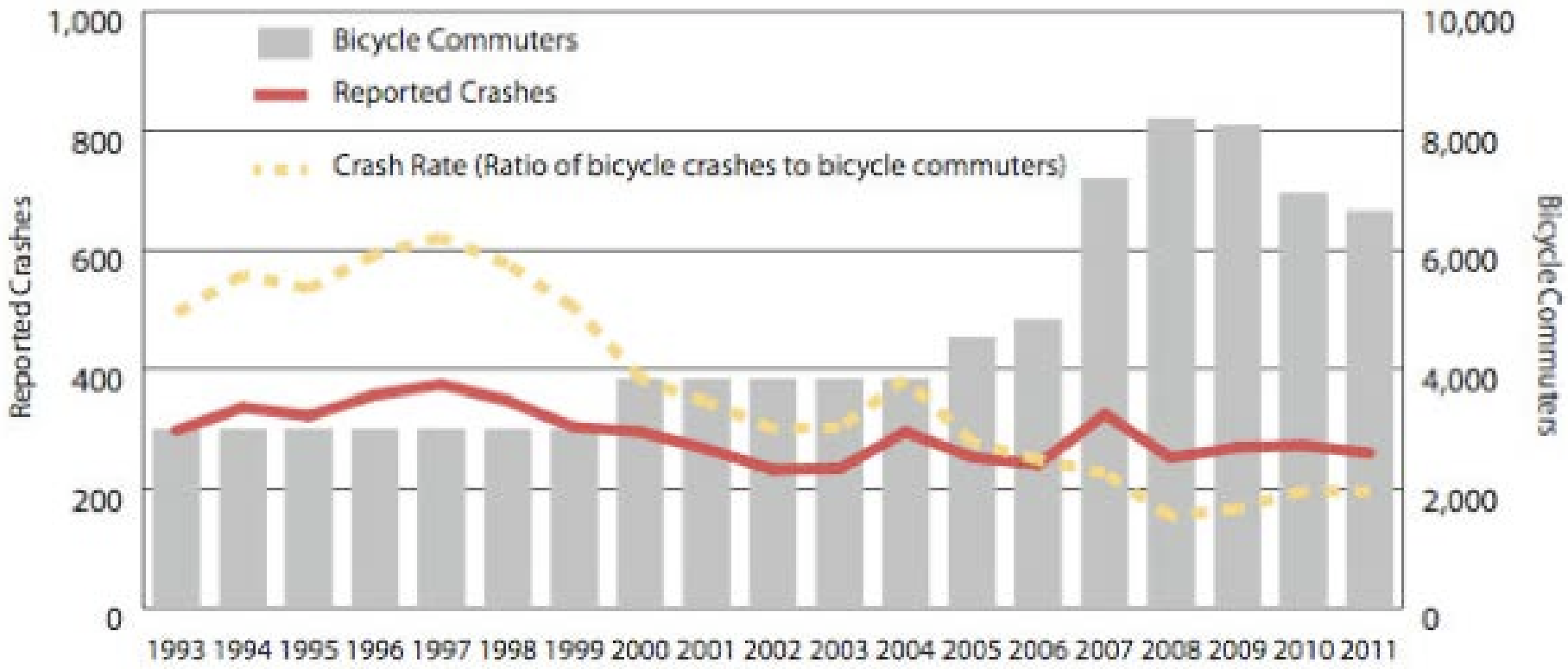
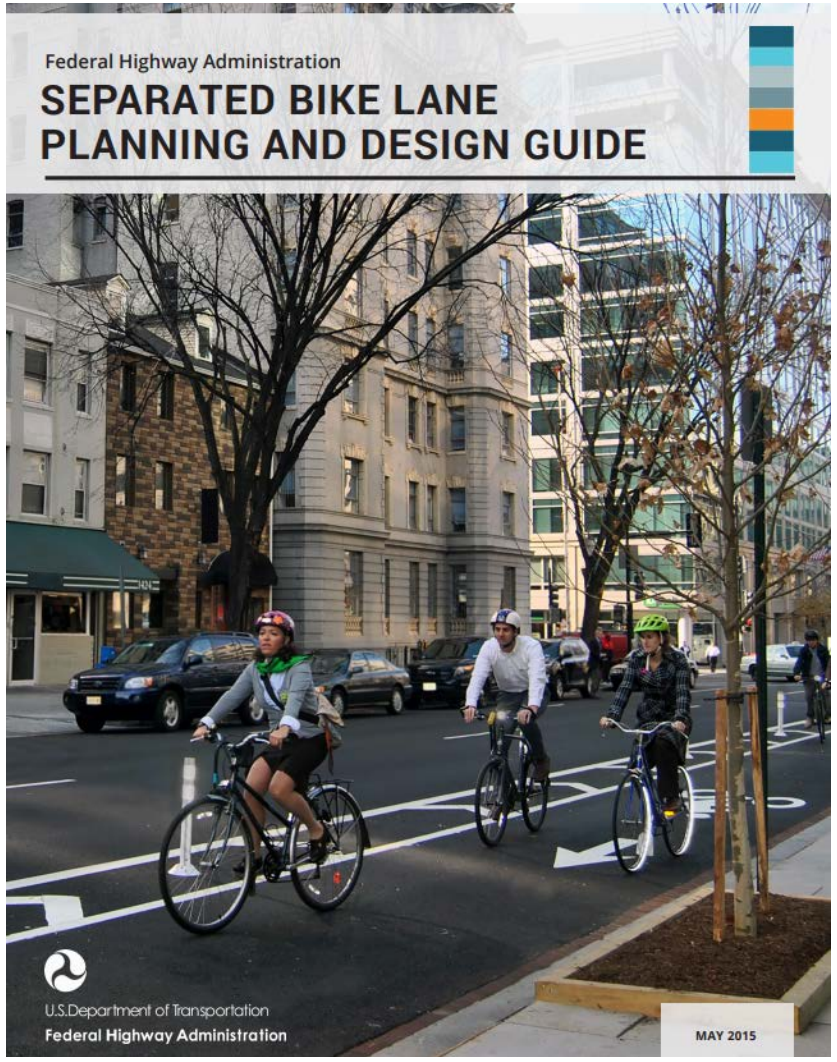
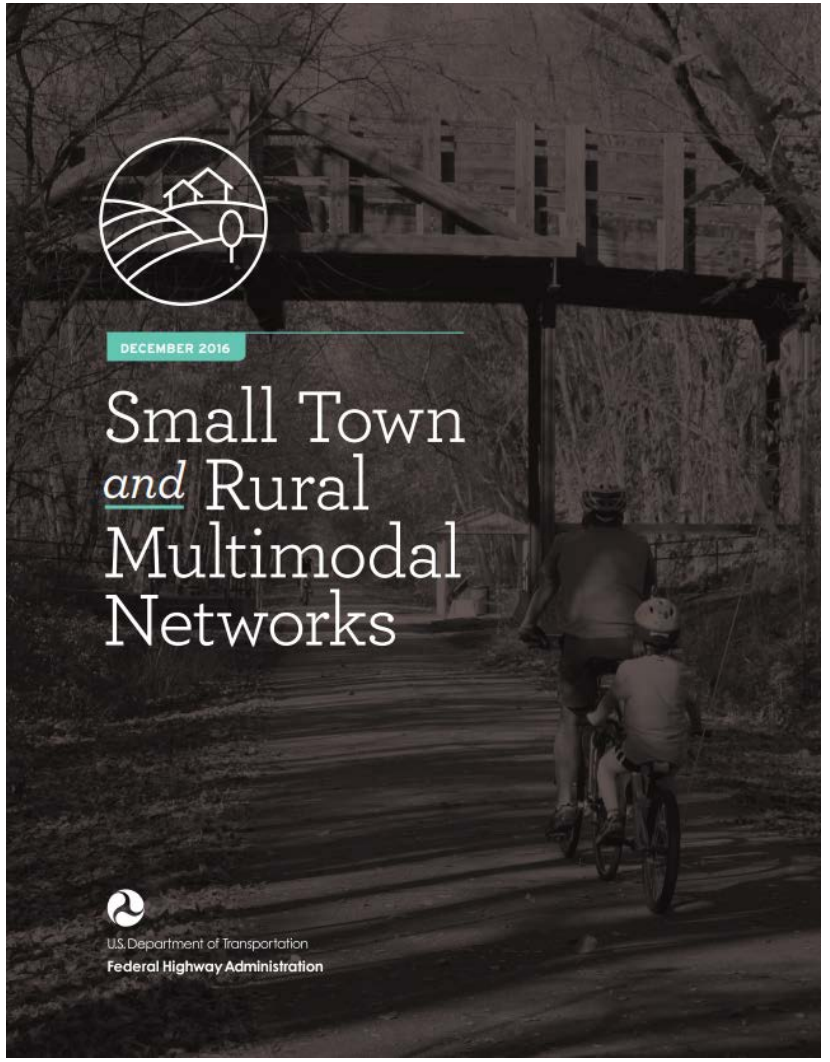


Figure 2.3 - Estimated city-wide bicyclist crash rate, 1993-2010. Source: U.S. Census Bureau 1990-2000 Decennial Census, 2005-2011 American Community Survey

Bikeway Types

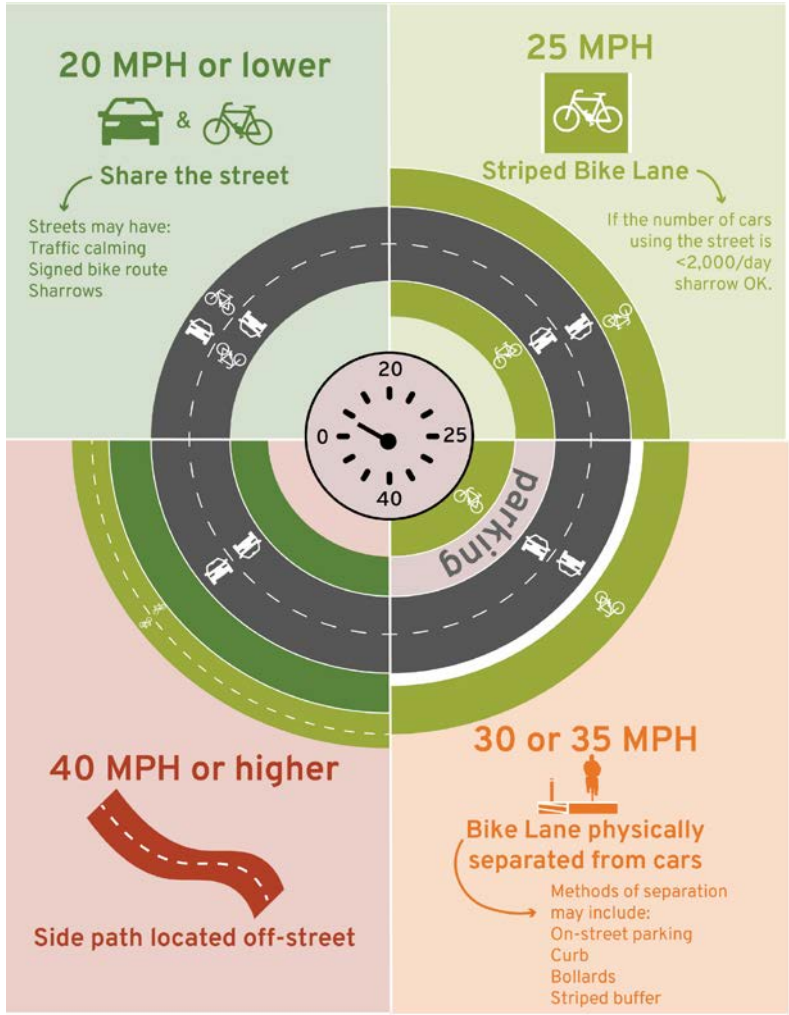




On-road Bikeway Types

LEVEL OF SEPARATION

- Marked shared lanes
- Bicycle boulevard/shared streets
- Advisory shoulders/lanes
- Bike lanes
- Buffered bike lanes
- Cycle tracks/Protected bike lanes (PBL)



Marked Shared Lanes

- Placement indicates desired path of cyclist
- Denotes a priority street for bicycling
- Minimally affect traffic patterns
- Simple to implement
- Appropriate for lower volume/lower speed streets
- Improve motorists awareness of cyclists
- Of limited appeal to many cyclists

Bicycle Boulevard

- Shared street
- Appropriate for low volumes and speeds
- Comfortable for all levels of cyclists

Bicycle Boulevard

Advisory Shoulders & Lanes

- Separate bicyclist from vehicle traffic
- Vehicles share space
- Vehicles yield to bicyclists
- Suitable on lower volume (< 6,000 ADT) roads
- More dedicated space than SLMs provide

Standard Bike Lanes

- Separate bike from vehicle traffic
- More comfortable on higher speed (> 25 mph), higher volume (> 3,000 ADT) roads
- Greater visibility than SLMs
- Appealing to more cyclists than SLMs

Standard Bike Lanes With Parking

- Safer than no bike lane
- Door zone hazards

Standard Bike Lanes

- 5’ minimum recommended width
- 6’ also OK
- 7’ or wider – consider a buffered bike lane

Buffered Bike Lanes

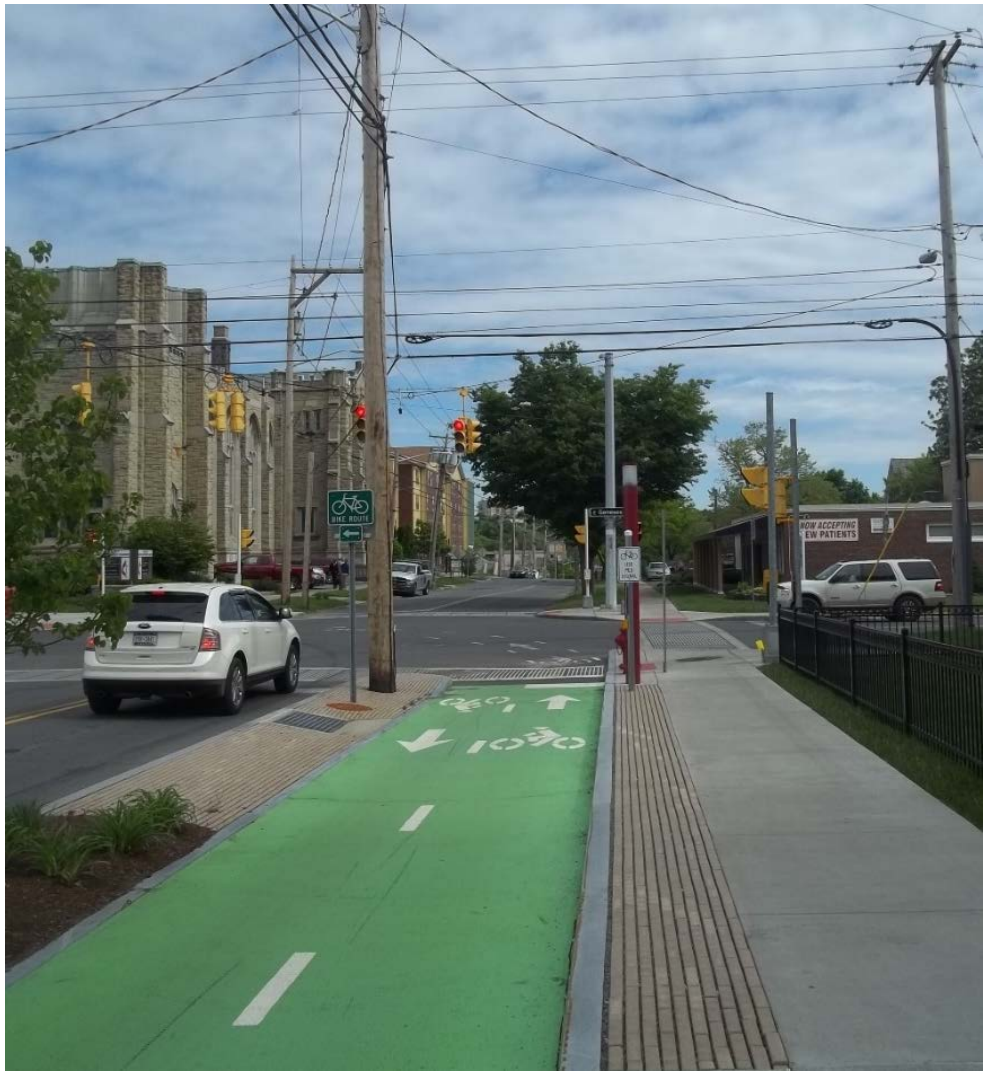
- May require using an existing travel or parking lane
- Appropriate for higher volume/higher speed streets (>30 mph)
- Appealing to a range of cyclists. The cyclist's path is clearly delineated and riders are away from car traffic

Buffered Bike Lanes

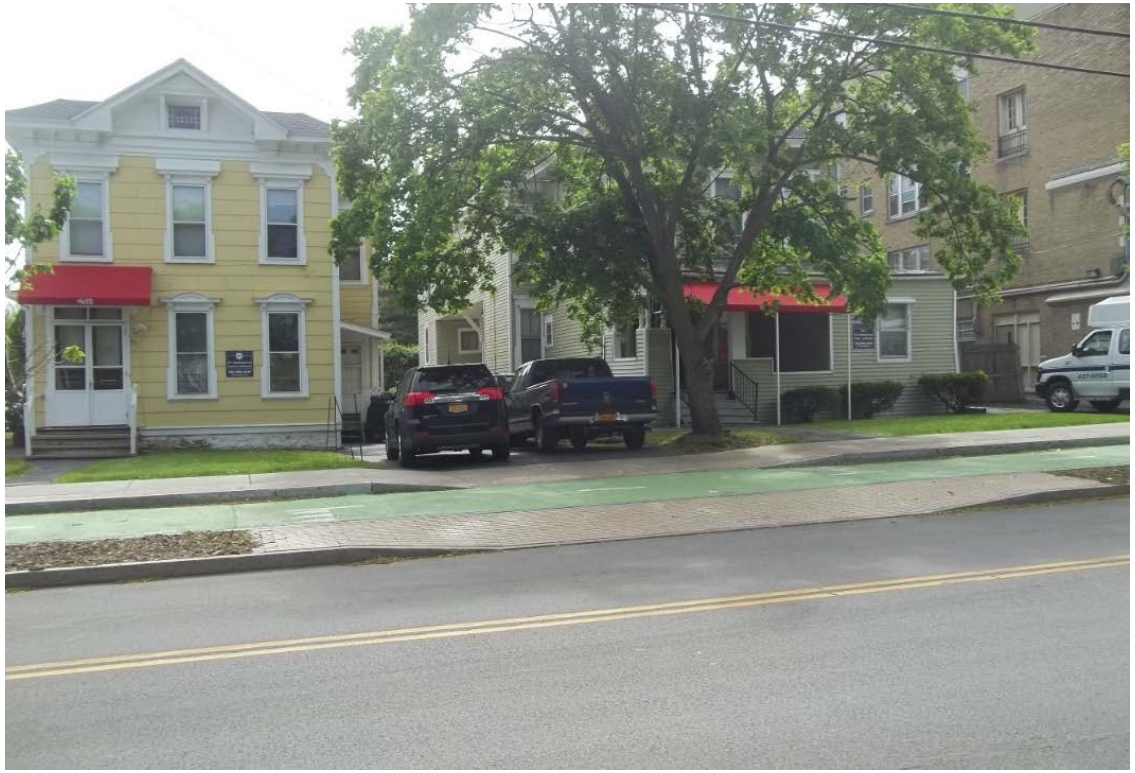
- Buffer can be between bike lane and travel lane, parking lane, or both

Cycle Tracks/SBLs/PBLs

- Provides a physical separation between travel lane and bike lane
- Appropriate for higher traffic volumes and speeds
- Appealing to a wide range of cyclists
- May be at-grade or raised
- Bigger change and requires more space and potentially changes to utilities/ drainage



Cycle Tracks/PBLs



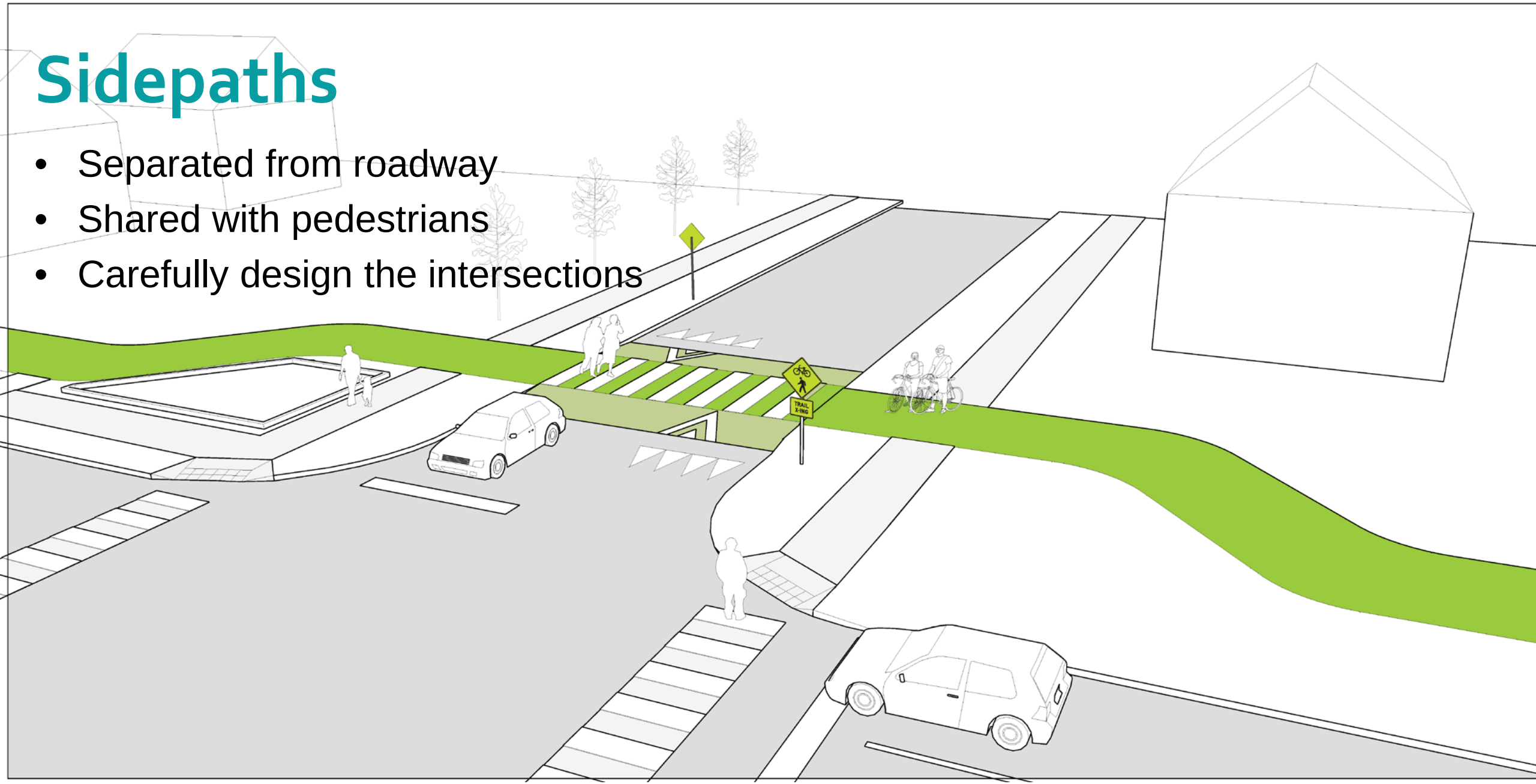
Cycle Tracks/PBLs

Off-street facilities/shared-use paths

- 10’ minimum width
- when to separate users
- materials to separate users

Sidepaths

- Separated from roadway
- Shared with pedestrians
- Carefully design the intersections



Intersection Design Considerations

Compact Intersections

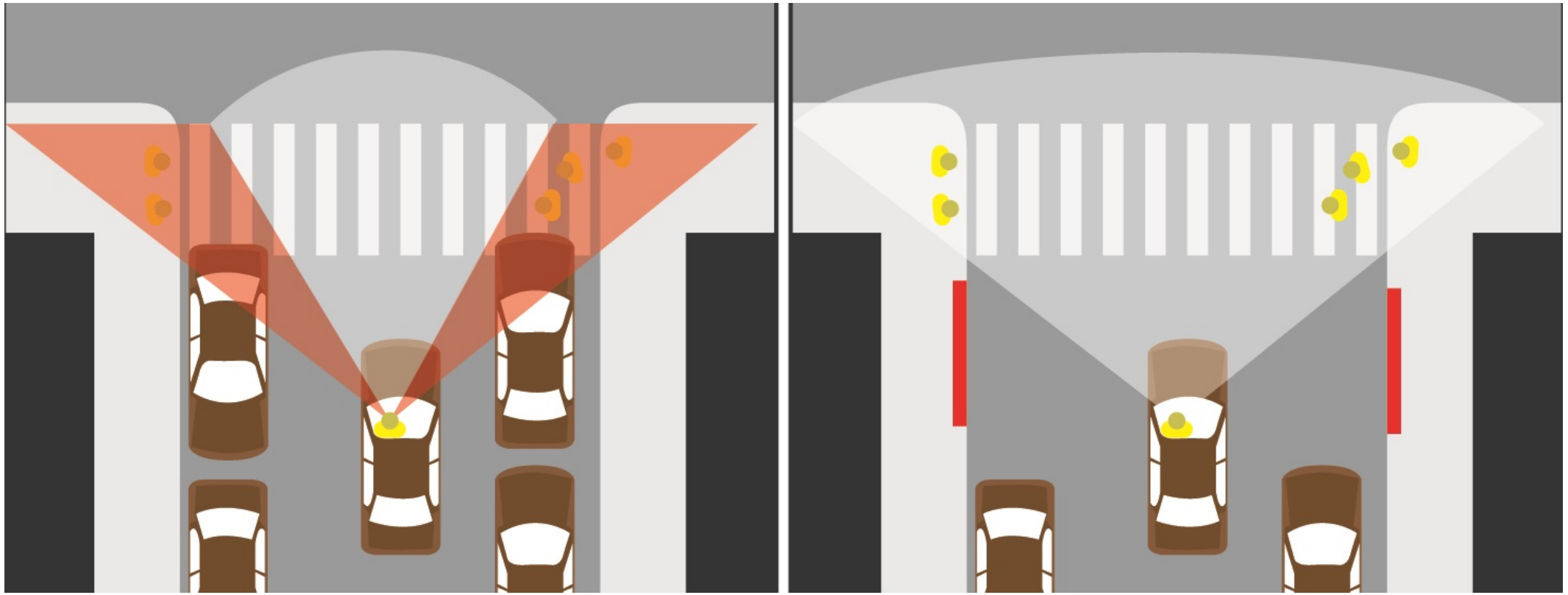
- Reduce visual size of intersection and provide improved accommodations for people walking, biking, and taking transit
- Eliminate open, underutilized, unprogrammed space
- Tighten curb-radii

Tools to reduce distance & manage speed

Reclaim Space

Daylighting

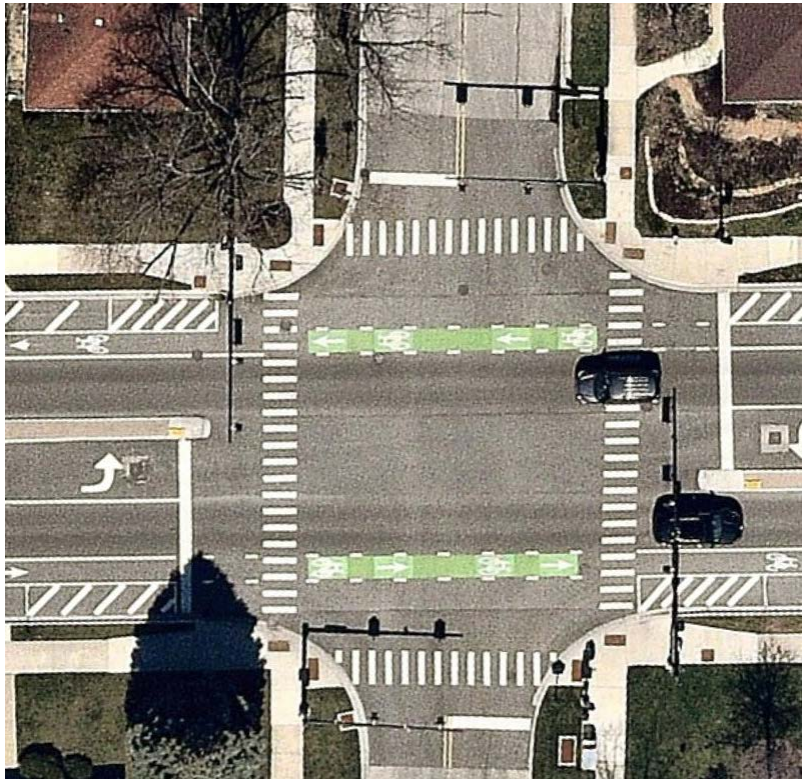
- Remove parking and visual obstacles 20-25 feet from cross-street



SFMTA, "Daylighting" Makes San Francisco Crosswalks Safer

Intersection Markings

- Indicates the intended path for the cyclist
- Provides more visibility and increases predictability of cyclist movements



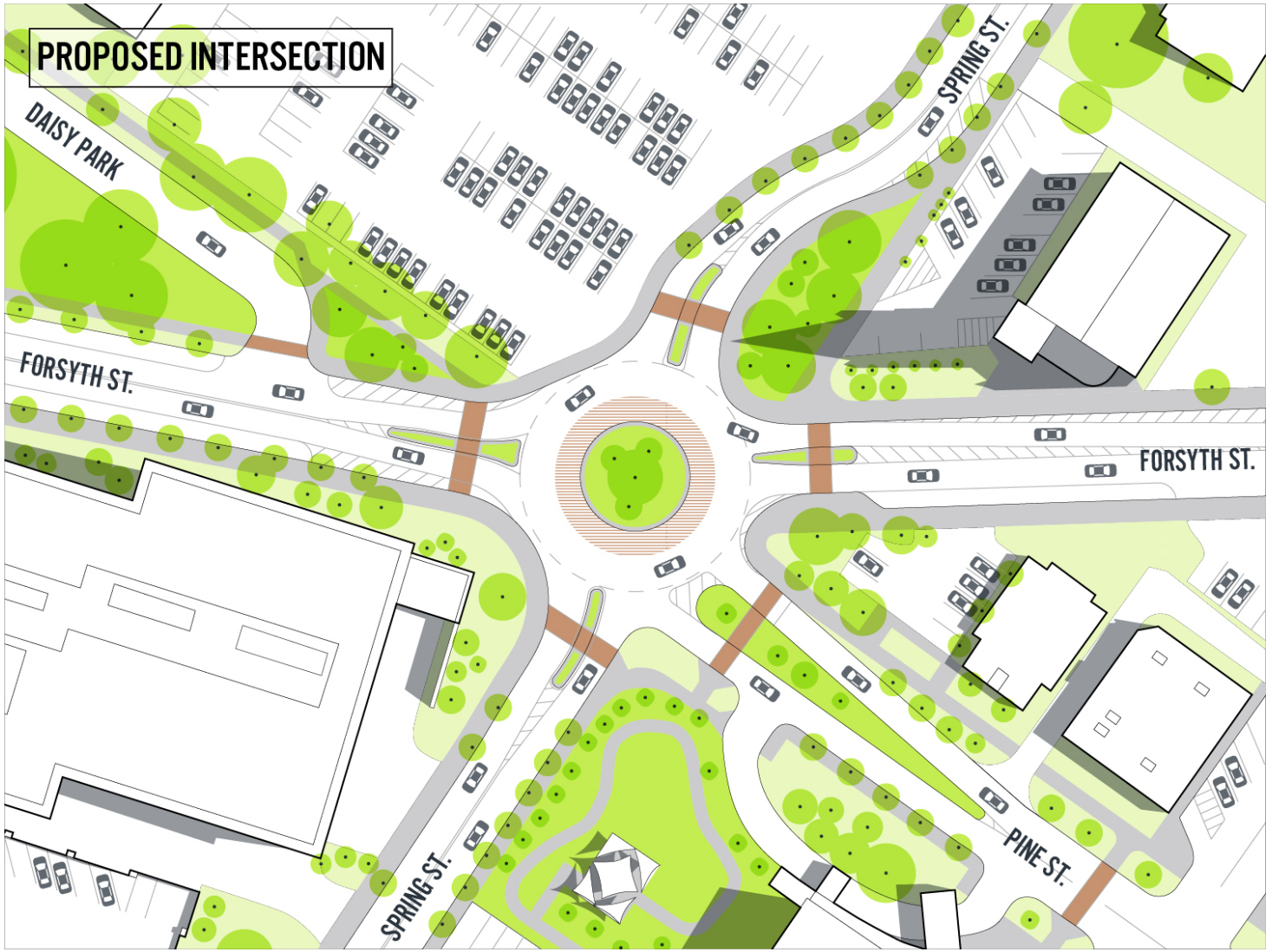
Separation in time

- Ped Hybrid Beacon (77-95% compliance)
- Signal
  - Automatic vs. actuated (esp. for mainline)
  - Pedestrian timing
    - 7 sec. min. Walk
    - 3.5 ft/sec Flashing Don't Walk
    - Use maximum time available

Signal Tools

- Countdown signals
- Leading pedestrian intervals (LPI)
- Lagging left turn
- Reduce curb radius

Roundabouts



Design Considerations - Rightsizing

Passive vs. Proactive Design

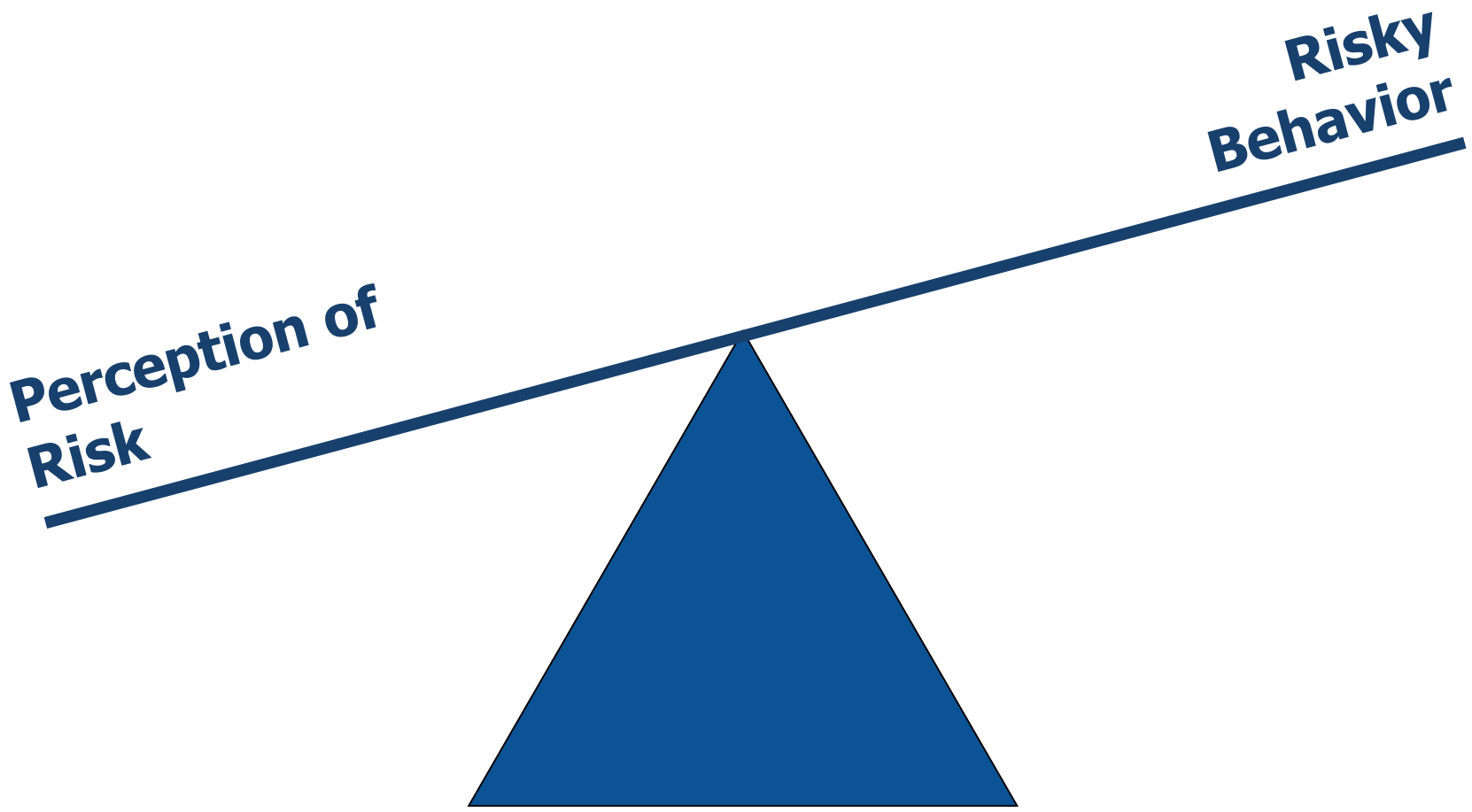
Passive Design

- Uses past or present as basis of design
- Designs for worst-case scenario
- Form follows standards
- Self-fulfilling prophesies (clear zones, 85% speed, etc)

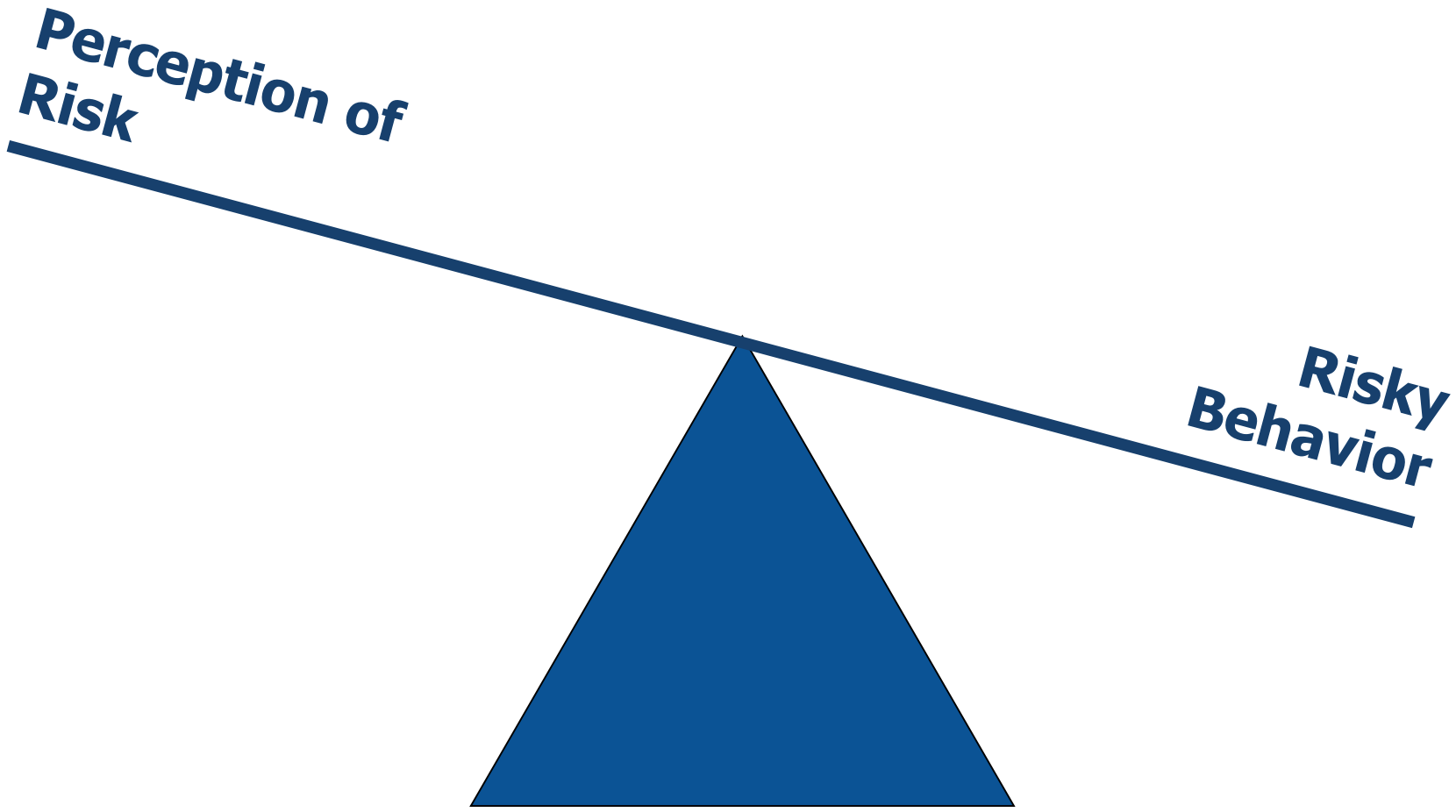
Proactive Design

- Designs toward desired future conditions
- Designs for realistic scenario
- Form follows function
- Design flexibility/ discretion (context-sensitivity)

Passive vs. Proactive Design



Passive vs. Proactive Design

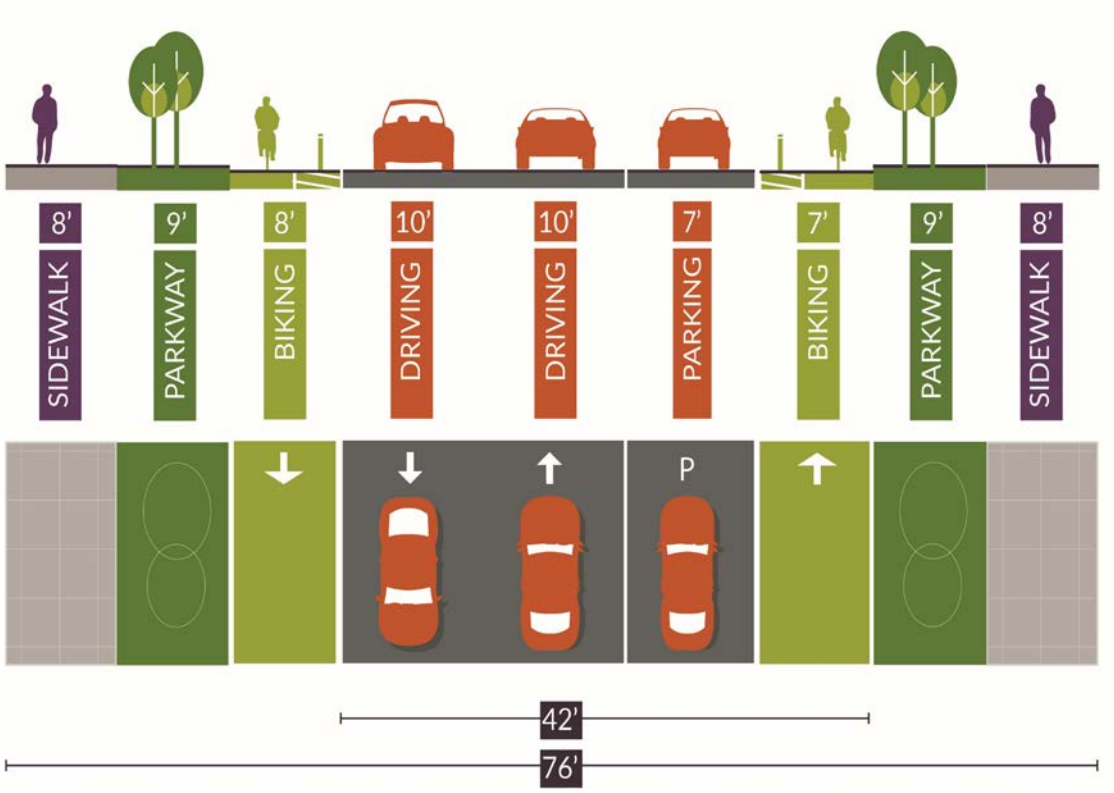


Don’t ask “How much do we need?”

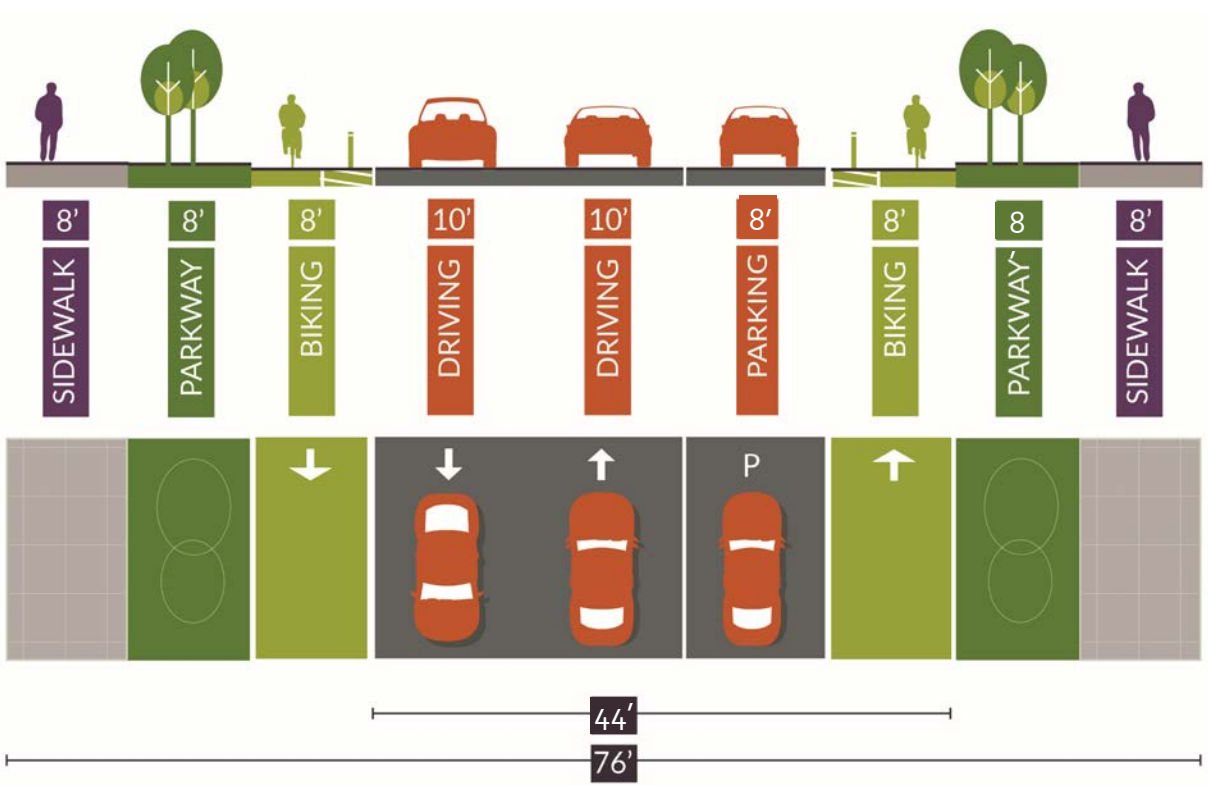
Ask:

- How much do we have?
- What do we want?
- How do we design it to fit?

Cross Sections



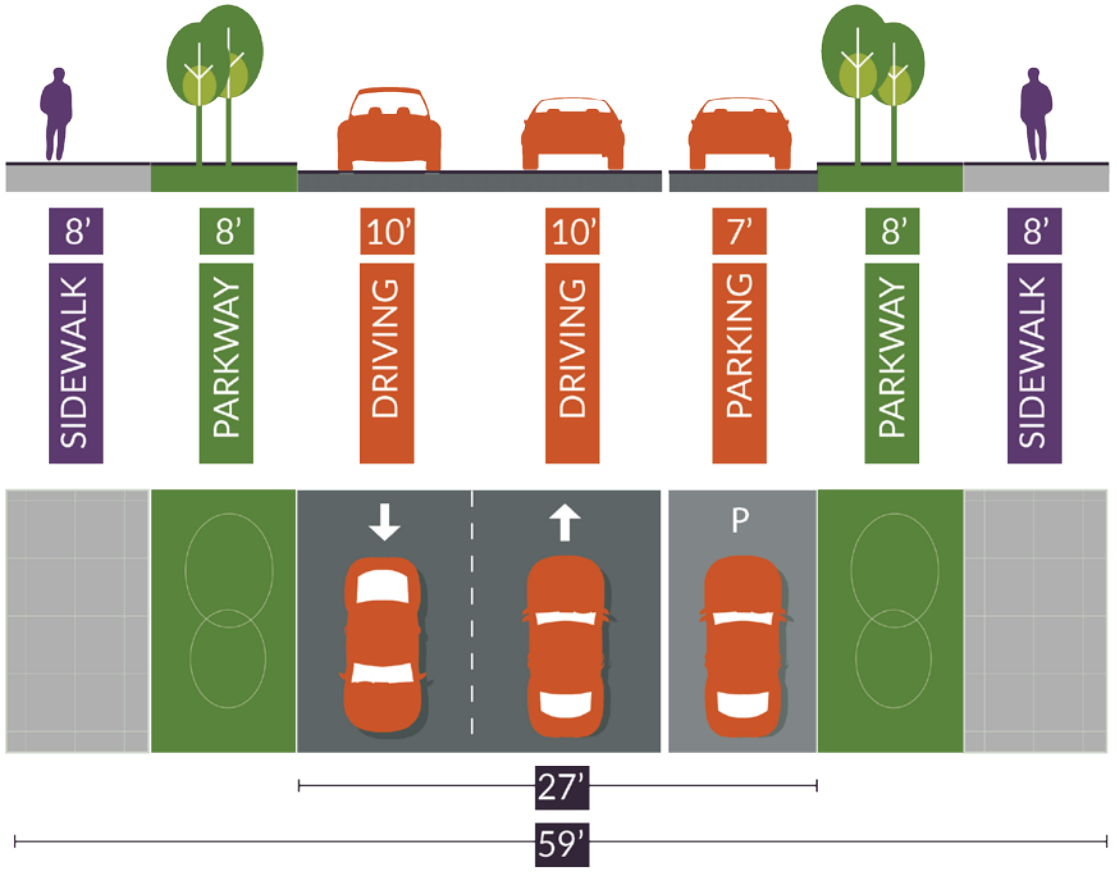
No curb work required but bike facilities are tight.



Requires curb work but comfortable for bicyclists of all ages/abilities.

Cross Section Example

Current State



Community Residential Baseline

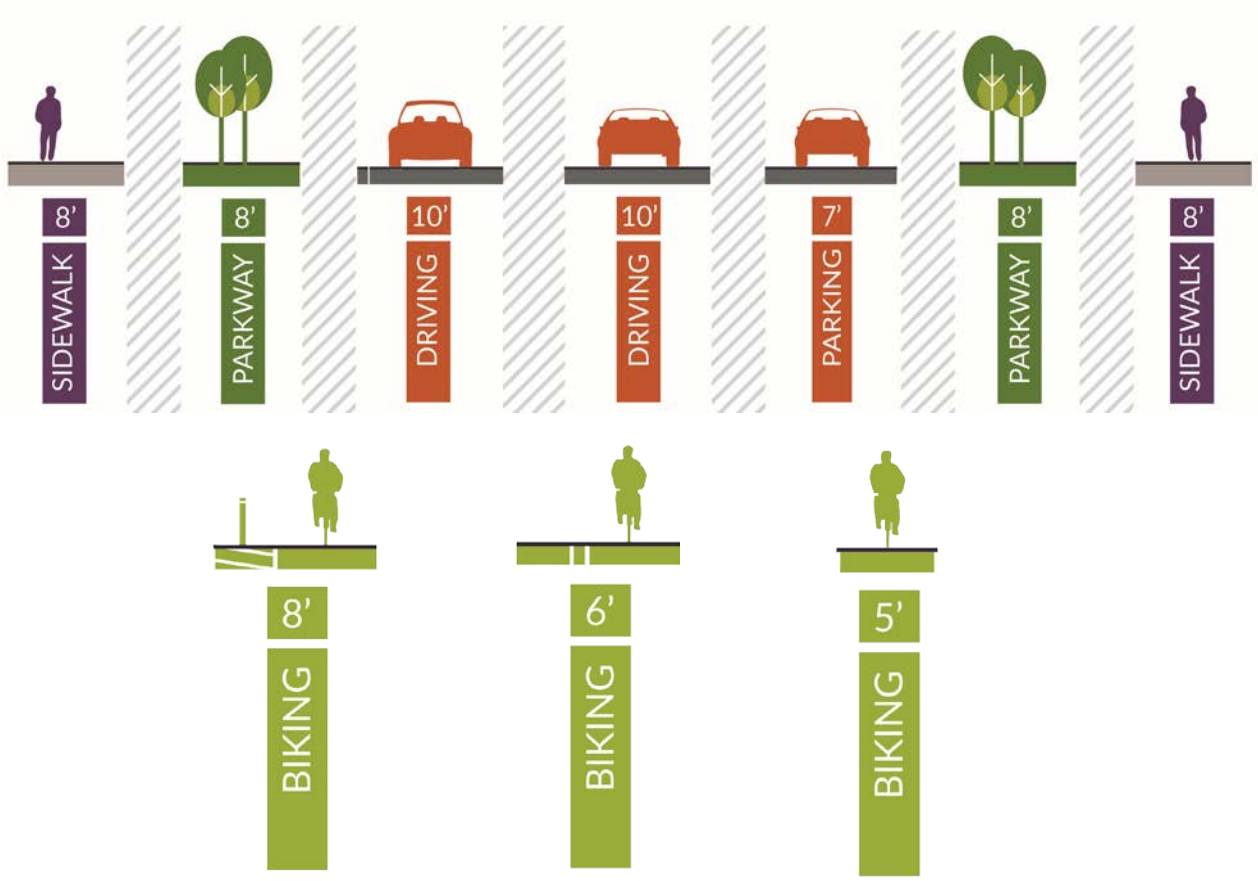
17 ft. of extra space to work with

Cross Section Example

Street Modifications (for bike priority streets)

1. Bike facilities
    - Protected bike lane
    - Buffered bike lane
    - Standard bike lane

2. Traffic calming elements



Constrained corridor? Rightsize it!

- Convert 4-lane to 2 lanes, TWLTL, & bike lanes
- 29% crash reduction for ALL users

FHWA proven safety countermeasure

"Road diets can be low cost if planned in conjunction with reconstruction or simple overlay projects, since a road diet mostly consists of restriping. Roadways with Average Daily Traffic (ADT) of 20,000 or less may be good candidates for a road diet and should be evaluated for feasibility."

Rightsizing tool: Narrower travel lanes

Ten feet should be the default width for general purpose lanes at speeds of 45 mph or less.

- *ITE Traffic Engineering Handbook, 7th Edition*

Rightsizing tools

On-street parking

Rightsizing tools

Add bikeway

Rightsizing tools

Parklets

Additional Questions/Discussion?