

# Designing for Bicyclist Safety Along the Roadway



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**April 17, 2017**



# Housekeeping

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## ⇒ **Problems with audio?**

Dial into the phone line instead of using “mic & speakers”

## ⇒ **Webinar issues?**

Re-Load the webpage and log back into the webinar. Or send note of an issue through the Question box.

## ⇒ **Questions?**

Submit your questions at any time in the Questions box.



# Archive and Certificates

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Archive posted at [www.pedbikeinfo.org/webinars](http://www.pedbikeinfo.org/webinars)

- ⇒ Copy of presentations
- ⇒ Recording (within 1-2 days)
- ⇒ Links to resources

Follow-up email will include...

- ⇒ Link to certificate of attendance
- ⇒ Information about webinar archive



# PBIC Webinars and News

⇒ **Designing for Bicyclist Safety Series Continues on...**

□ **April 27: Intersections and Crossings**

⇒ **Find PBIC webinars and webinar archives**  
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The screenshot shows the PBIC website's "Webinars" section. At the top, there is a navigation bar with links for "Data & Resources", "Community Support", "Planning & Design", "Training & Events", and "Programs & Campaigns". Below the navigation, the "Webinars" section is titled "Webinars" and includes a sub-section "Upcoming and Recent PBIC Webinars:". Three webinars are listed with their dates and titles: 1) 11/17/2015 - "Road Users: Improving Safety for All Road Users" (BILUSM11 Webinar), presented by Keith Krieger, Steve STAF, and Brian Chamberlain, Lubbock. 2) 11/19/2015 - "Bicycle Safety Guide and Countermeasures Selection System (BILUSM11 Webinar)", presented by Tamara Robinson, FHWA Office of Safety, Carl Gunderson, SHC Highway Safety Research Center, Dan Nelson, Vermont Highway Division, Inc., and Peter Lagerway, Trade Design Group. 3) 11/19/2015 - "A Resident's Guide for Creating Safer Communities for Walking and Biking Webinars", presented by Tamara Robinson, FHWA, Loree Sand, PBIC, Eva Garcia, City of Brownsville, Texas, Warren Gonzalez, City of Brownsville, Texas, and John Paul Maffei, Livable Marches. A fourth webinar is partially visible: 12/15/2014 - "ActiveTran Policy Tool: A Model Methodology for Prioritizing Pedestrian and Bicycle Improvements on Existing Roads".



The screenshot shows the PBIC Facebook page. At the top, there is a banner image with the text "Pedestrian and Bicycle Information Center" and the website URL "www.pedbikeinfo.org". Below the banner, there is a navigation bar with links for "Timeline", "About", "Photos", "Likes", and "More". The page shows a "PEOPLE" section with 2,228 likes and a "Find New Customers" section. The main content area features a post from the "Pedestrian and Bicycle Information Center" with a video player and a text description: "Our Webinars at the National Center for Safe Routes to School are offering a free webinar on how their activities support Leaders of Opportunity." Below the post, there is a "SUPPORT" section with a link to "Safe Routes to School activities in support of Leaders of Opportunity - BIC and Safe program..." and a map of the United States.







Federal Highway Administration

Webinar 2—April 17, 2017

# DESIGNING FOR BICYCLIST SAFETY

# MEET YOUR PANELISTS

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# NOTE OF CAUTION

The knowledge and practice of designing for bicyclists is rapidly changing. Images in these materials and other guidelines may be outdated. Always check for the latest MUTCD interim and experimental TCD's.





# IMPERATIVE FOR CHANGE

- ✘ 1-5 mile trip typical for casual rider
- ✘ 50% of all trips are less than 3 miles
- ✘ Most U.S. facilities are LTS 3
- ✘ Most adult bicyclists comfortable on LTS 2



Greeley, Co

# KEY SAFETY FACTORS

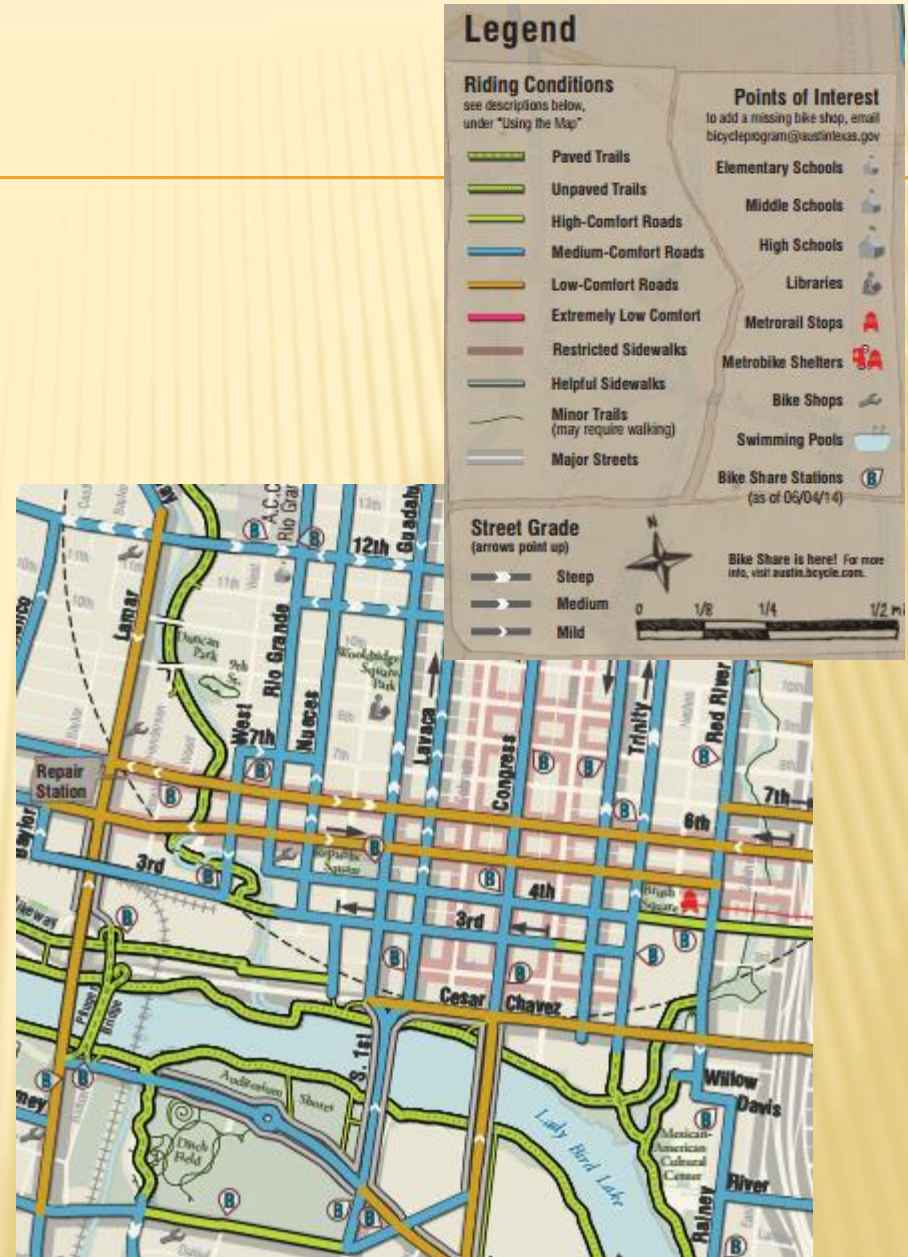
- ✘ Speed
- ✘ Number of lanes
- ✘ Visibility
- ✘ Traffic volume & composition
- ✘ Conflict points
- ✘ Proximity
- ✘ Bike control
- ✘ Connectivity





# BIKEWAY NETWORK

- ✘ Just like roads and sidewalks, bikeways need to be part of an connected network
- ✘ Combine various types, including on and off-street facilities



# HIERARCHY OF BIKEWAYS

```
graph TD; A[Shared-Use Paths] --> B[Separated Bike Lanes]; B --> C[Bike Lanes]; C --> D[Shoulders]; D --> E[Shared Roadway]
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Shared-Use Paths

Separated Bike Lanes

Bike Lanes

Shoulders

Shared Roadway



Designing for Bicyclist Safety

# SHARED ROADWAYS

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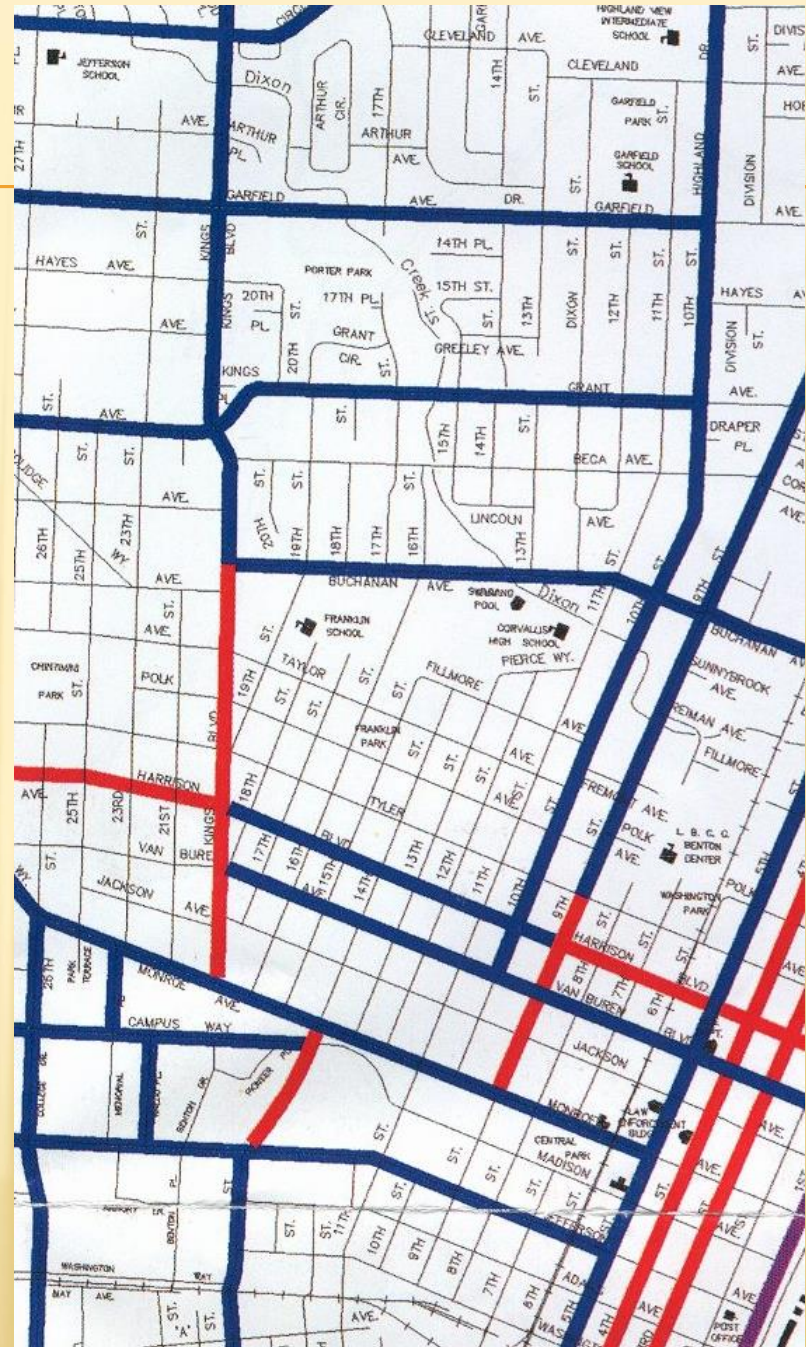


Photo by Harvey Muller



# SHARED ROADWAY

- ✘ Most common—roads as they are
- ✘ Appropriate on low-volume or low-speed
- ✘ 85% or more of a well-connected grid





# SHARED LANES

- ✘ Unless prohibited, all roads have shared lanes
- ✘ No special features for:
  - + Minor roads
  - + Low volumes (< 1000 vpd)
  - + Speeds vary (urban v. rural)



# SHARED LANES

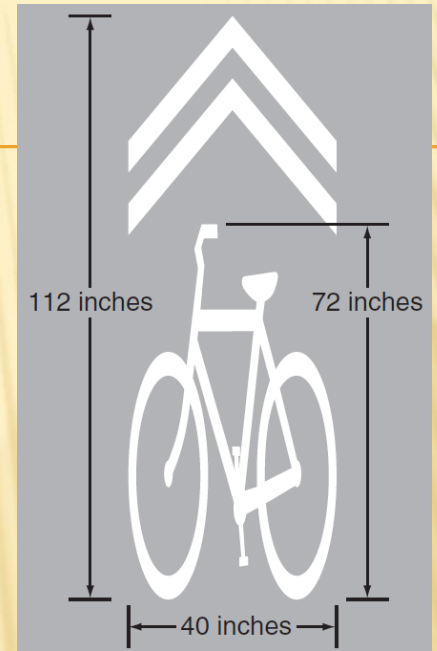
- ✘ Supplemental features
  - + Pavement markings or “sharrows”
  - + Detectors & signal timing





# SHARED LANE MARKING

- ✘ Lateral position
- ✘ Connect gaps in bike lanes
- ✘ Roadway too narrow for passing
- ✘ Position in intersections & transitions



# SHARED LANE MARKING



Supporting  
Characteristics

- ✘ More than 1 lane  
Downhill or level
- ✘ Short segment to fill  
gap in bikeway
- ✘ Speed < 30 mph
- ✘ High bicycle use

Nonsupporting  
Characteristics

- ✘ Single lane
- ✘ Uphill
- ✘ Parallel route option
- ✘ Long segment
- ✘ Speed > 40 mph
- ✘ Low bicycle use

# SHARED ROAD SIGNS

- ✘ Reminder for motorists



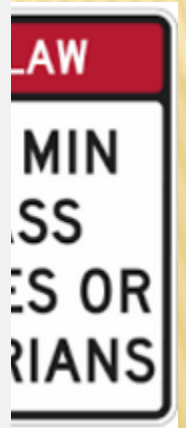
On Roadway





# PASSING SIGNS

- ✘ TCD's not meant to be educational
- ✘ Limit to areas with identified problem







Corvallis, Oregon

- ✘ Low speed/low volume
- ✘ Up to 25 mph for LTS 1





Salem, Oregon

- ✘ Increased speed or volume, increased LTS
- ✘ LTS 4





✘ Rural back roads



Designing for Bicyclist Safety

# PAVED SHOULDERS

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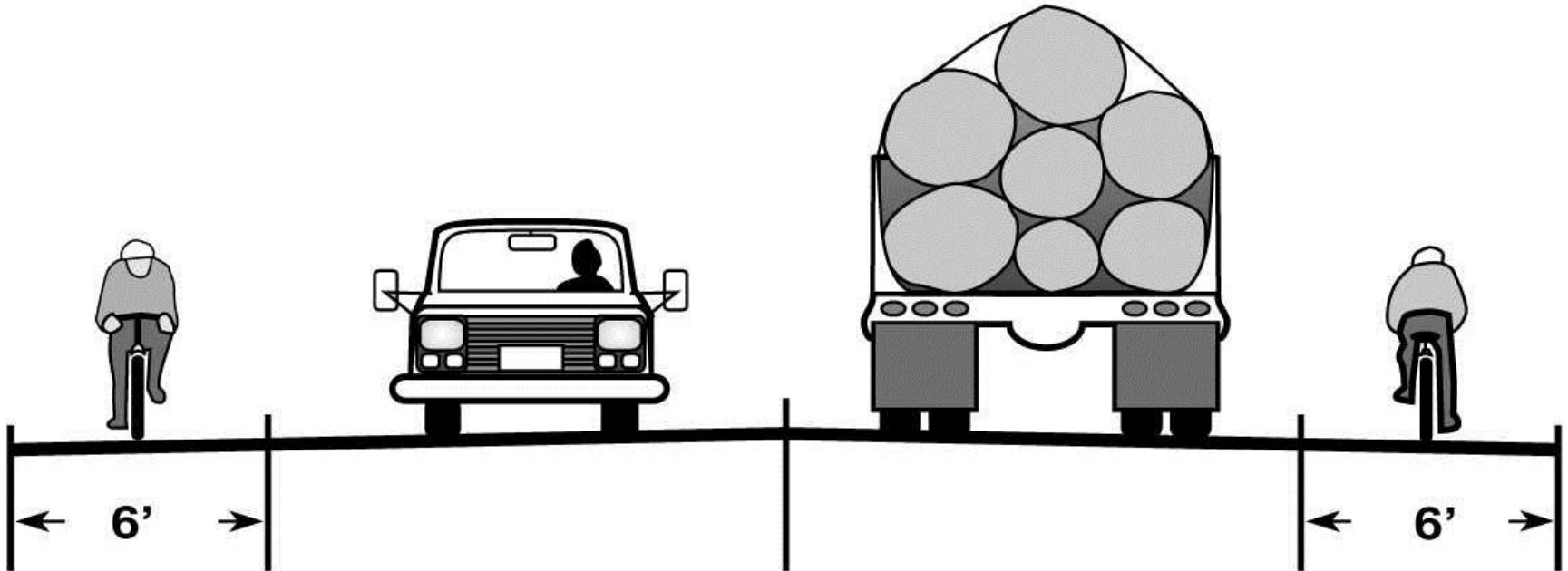
# PAVED SHOULDERS

- ✘ Useful for higher traffic volume and/or speed
- ✘ Frequently used for rural
- ✘ Uphill direction
- ✘ Not a travel lane – intersection conflicts
- ✘ Rumble strips
- ✘ Maintenance





# SHOULDER BIKEWAY



**Min: 5' against curb, parking or barrier, 4' on open shoulder**

**Travel lane dimensions per relevant standards**

Use AASHTO *shoulder* standards

For bicycles: 4 ft minimum, 6 ft desirable

No special markings

# RURAL & COUNTY ROADS





# RUMBLE STRIPS

- ✘ Safety countermeasure for motor vehicle ROTR crashes
- ✘ Can render shoulder unrideable





# RUMBLE STRIPS

- ✘ Minimum clear path
  - + 4 feet
  - + 5 feet adjacent to curb
- ✘ Periodic gaps
  - + Minimum length 12 feet
  - + Interval 40 – 60 feet
- ✘ Gaps at intersections
  - + 10 – 20 feet prior to cross-street or driveway
- ✘ Bicycle tolerable (?) rumble strips





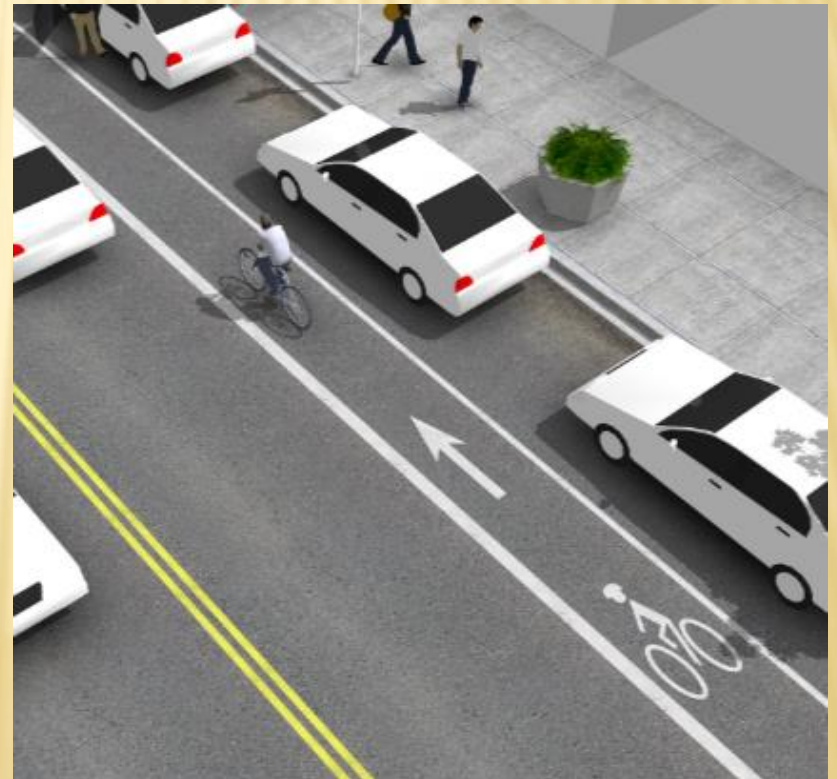
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# BIKE LANES

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# BIKE LANE DEFINED

Portion of the roadway or shoulder designated for exclusive or preferential use by people riding bicycles





# ADVANTAGES

- ✘ Low stress on wide/low speed streets
- ✘ Access to major destinations
- ✘ Mobility on arterials
- ✘ Guide bicyclist behavior and predictability
- ✘ Improve visibility



# ADVANTAGES

- ✘ Travel at bicyclist's pace

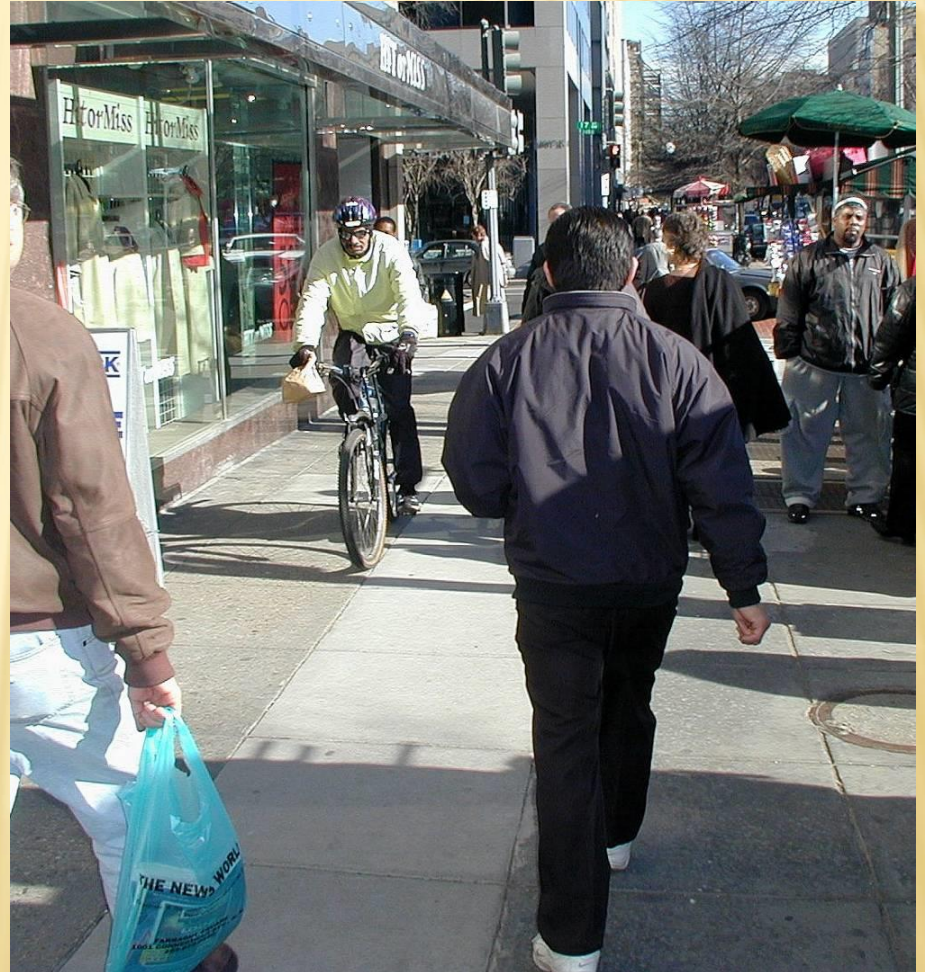


Geneva, Switzerland



# ADVANTAGES

- ✘ Reduce pedestrian conflicts



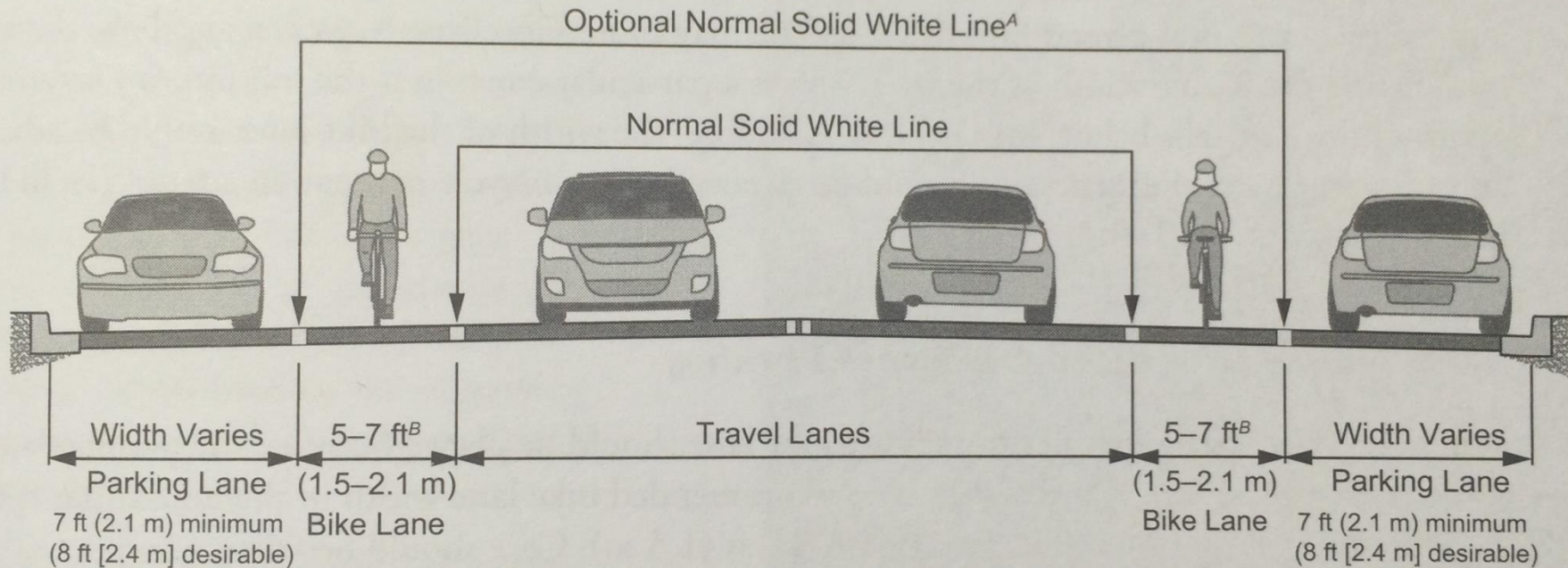
# DISADVANTAGES

- ✘ LTS 3 or 4 on arterials
- ✘ Often too narrow
- ✘ Removal of parking





# BIKE LANE WIDTH



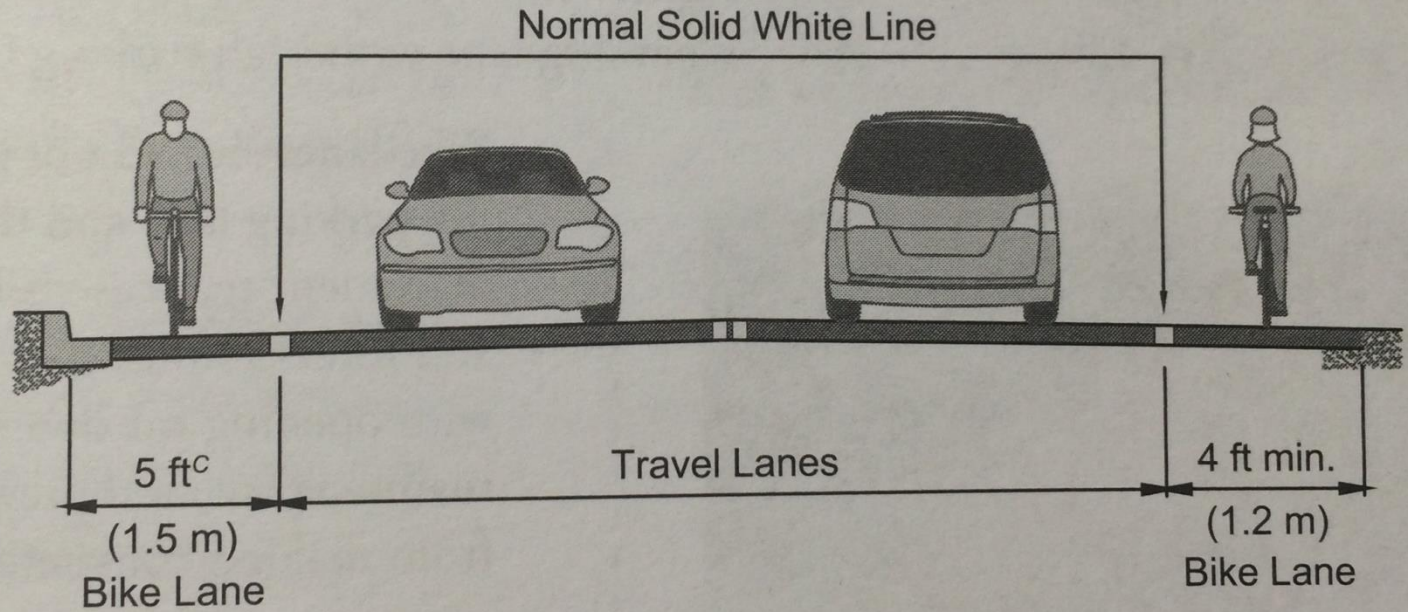
## On Street Parking

Desirable: 7 feet

AASHTO Guide minimum: 5 Feet

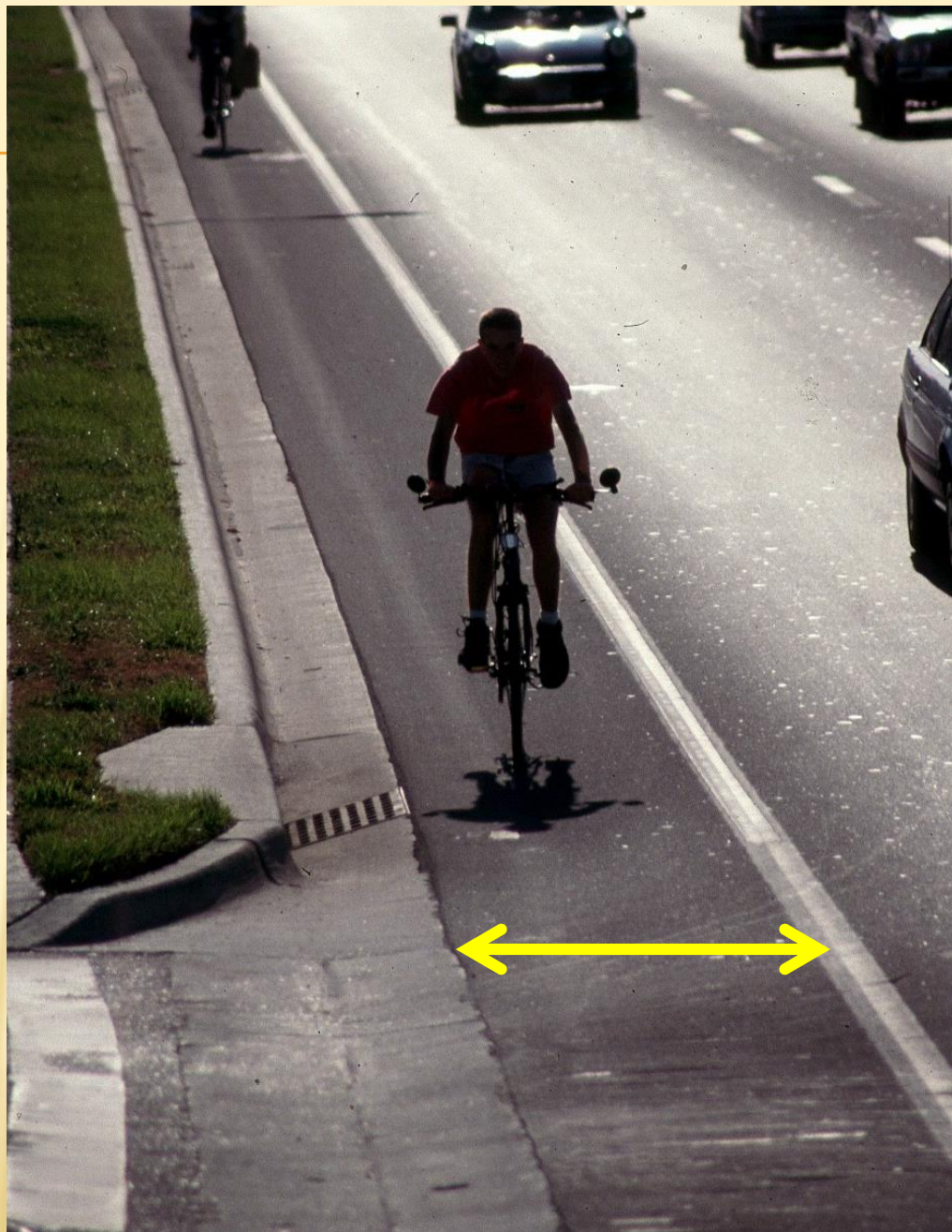


# BIKE LANE WIDTH



**Parking Prohibited**

# GUTTER PAN



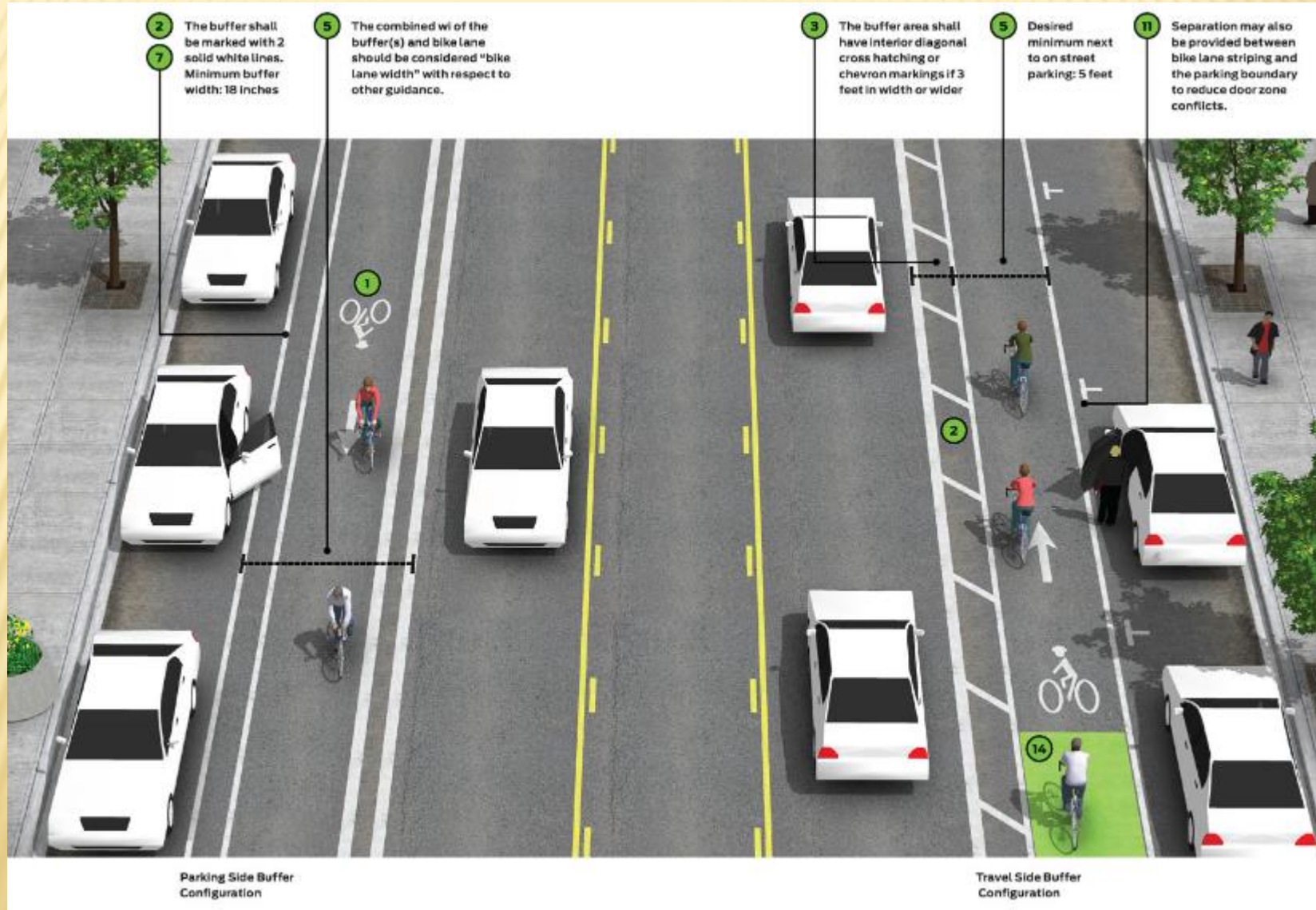


# BUFFERED BIKE LANE

- ✘ Shy distance
- ✘ Bike passing
- ✘ Door zone
- ✘ Wider w/out confusing motorists
- ✘ More comfortable



# BUFFERED BIKE LANE (NACTO)





# WIDE BIKE LANE/LOW SPEED



LTS 1

# 5 FT BIKE LANE/30 MPH



LTS 2



# 5 FT BIKE LANE/35 MPH



LTS 3

# 5 FT BIKE LANE/40 MPH



LTS 4



# PAVEMENT MARKING & SIGNING

- ✘ Longitudinal marking required
  - + Solid white line between bikes & motor vehicles
  - + Line recommended between bikes & parking
- ✘ Symbols at beginning & interval
- ✘ Signs



# SIGNING

- ✘ Beginning, end, & interval
- ✘ Optional



1988



2000



2009



# CONTRA-FLOW BIKE LANE

Reasons for:

- ✘ Continuity on one-way
- ✘ Avoid conflicts
- ✘ Maximize space

Considerations:

- ✘ Markings
- ✘ Signing
- ✘ Intersections





Designing for Bicyclist Safety

# SEPARATED BIKE LANES

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# SEPARATED BIKE LANES

- ✘ Exclusive bike facility
- ✘ Adjacent to or on roadway
- ✘ One-way or contra-flow
- ✘ Separated from traffic by vertical element



# SEPARATED BIKE LANES

## Advantages

- ✘ Very low stress midblock
- ✘ Encourages bike riding
- ✘ More conspicuous
- ✘ Crash rate reductions





# SEPARATED BIKE LANES

## Disadvantages

- ✘ Special treatments for
  - + Intersections
  - + Driveways
  - + Parking
  - + Transit
  - + Loading zones
- ✘ Additional space needed
- ✘ More costly than bike lanes
- ✘ More to learn



# DESIGN GUIDANCE

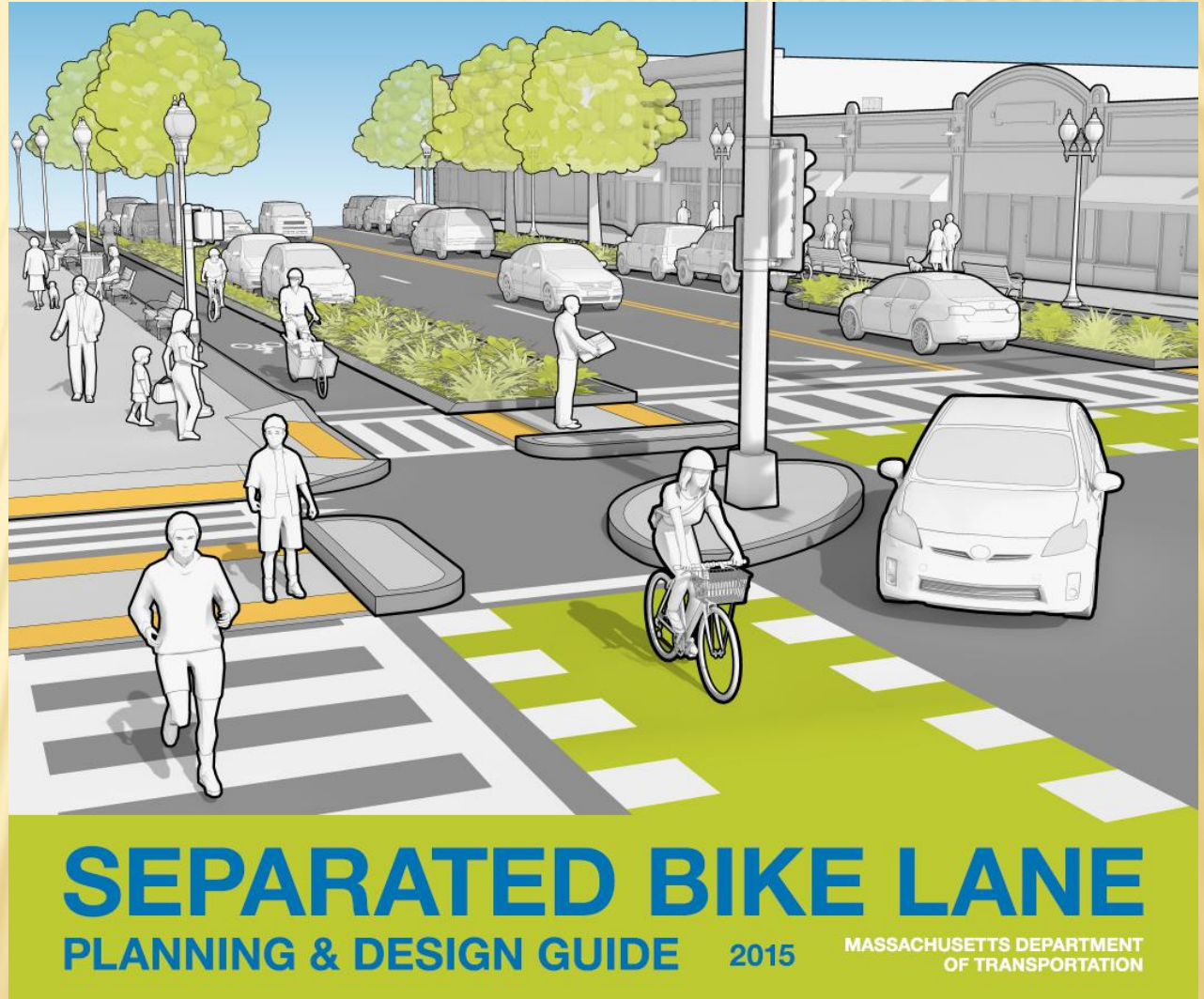
- ✘ Not addressed in AASHTO
- ✘ Emerging need for design guidance
- ✘ Evolving knowledge with increasing experience





# DESIGN GUIDANCE

✘ MassDOT



# CONSIDERATIONS

- ✘ Are cyclists already using corridor?
- ✘ Would potential cyclists use the corridor if a separated facility existed?
- ✘ Could a SBL connect origins and destinations?
- ✘ How can a SBL help build a low stress bicycle network?
- ✘ Could a separated bike lane improve connections for disadvantaged populations?



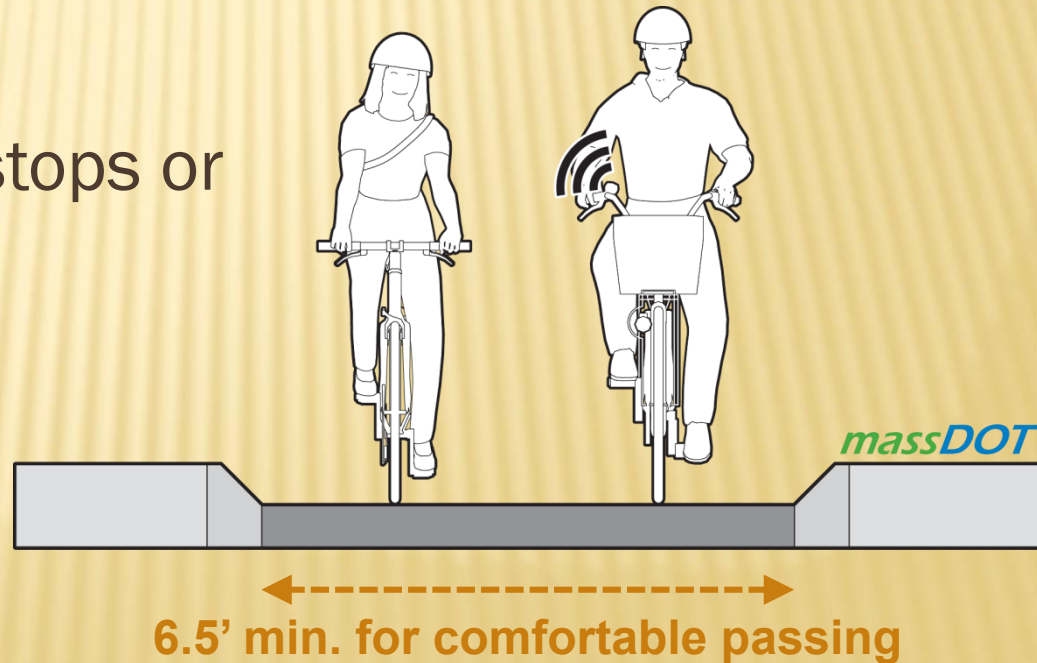


# BIKE LANE WIDTH

✘ One-way

**Widths vary by peak hour volume**

- + 6.5-10 ft recommended
- + 5-8 ft minimum
- + 4' allowable at bus stops or accessible parking



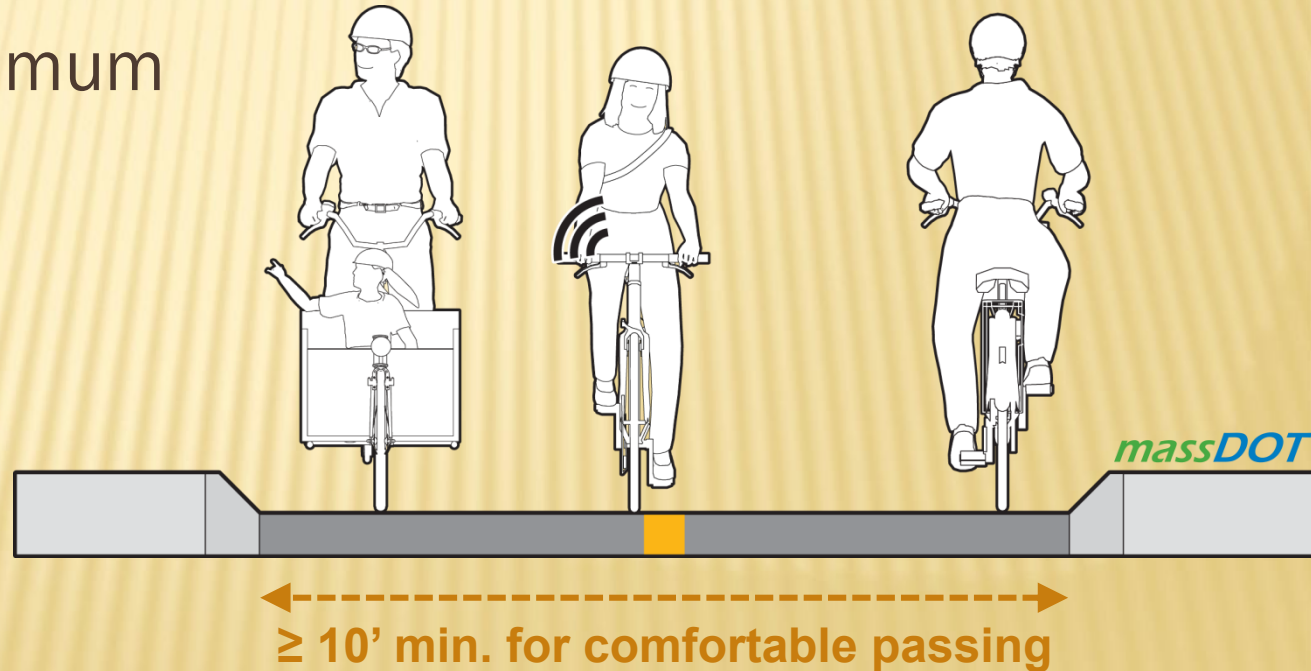
# BIKE LANE WIDTH

✘ Two-way

Widths vary by peak hour volume

+ 10-14 ft recommended

+ 8-11 ft minimum





# CONSTRAINED CORRIDORS

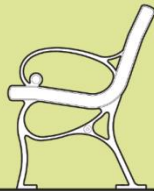
5

sidewalk



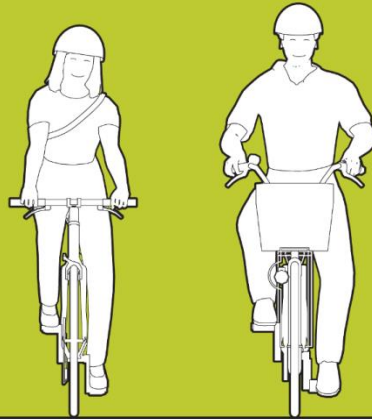
2

sidewalk  
buffer



4

bike lane



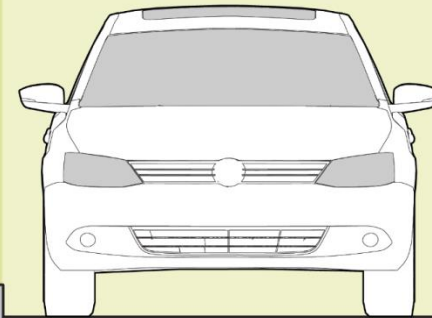
3

street buffer



1

street



# VERTICAL SEPARATING ELEMENTS

- ✘ Safety of bicyclists
- ✘ Safety of motorists
- ✘ Maintenance
- ✘ Appearance





# BEVELED CURB



Atlanta, GA



# TURTLES



Austin, TX



# ARMADILLOS





# RIGID BOLLARDS



Indianapolis, IN



# PLANTERS



Vancouver, BC



# RAISED MEDIAN



Montreal, QC



# CONCRETE BARRIER



New York, NY

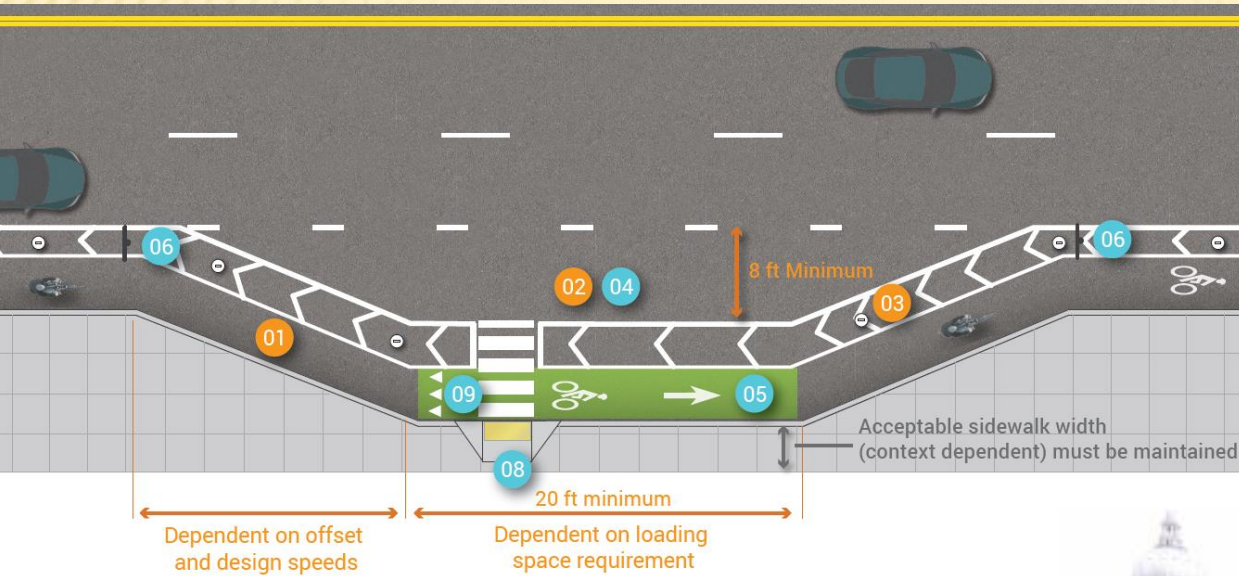
# CURBSIDE ACTIVITY

- ✘ Motor vehicle parking
- ✘ Loading zones
- ✘ Bike parking
- ✘ Bus stops





# LOADING ZONES



A dedicated loading zone along Polk Street in San Francisco, CA. (Source: Alek Pochowski)

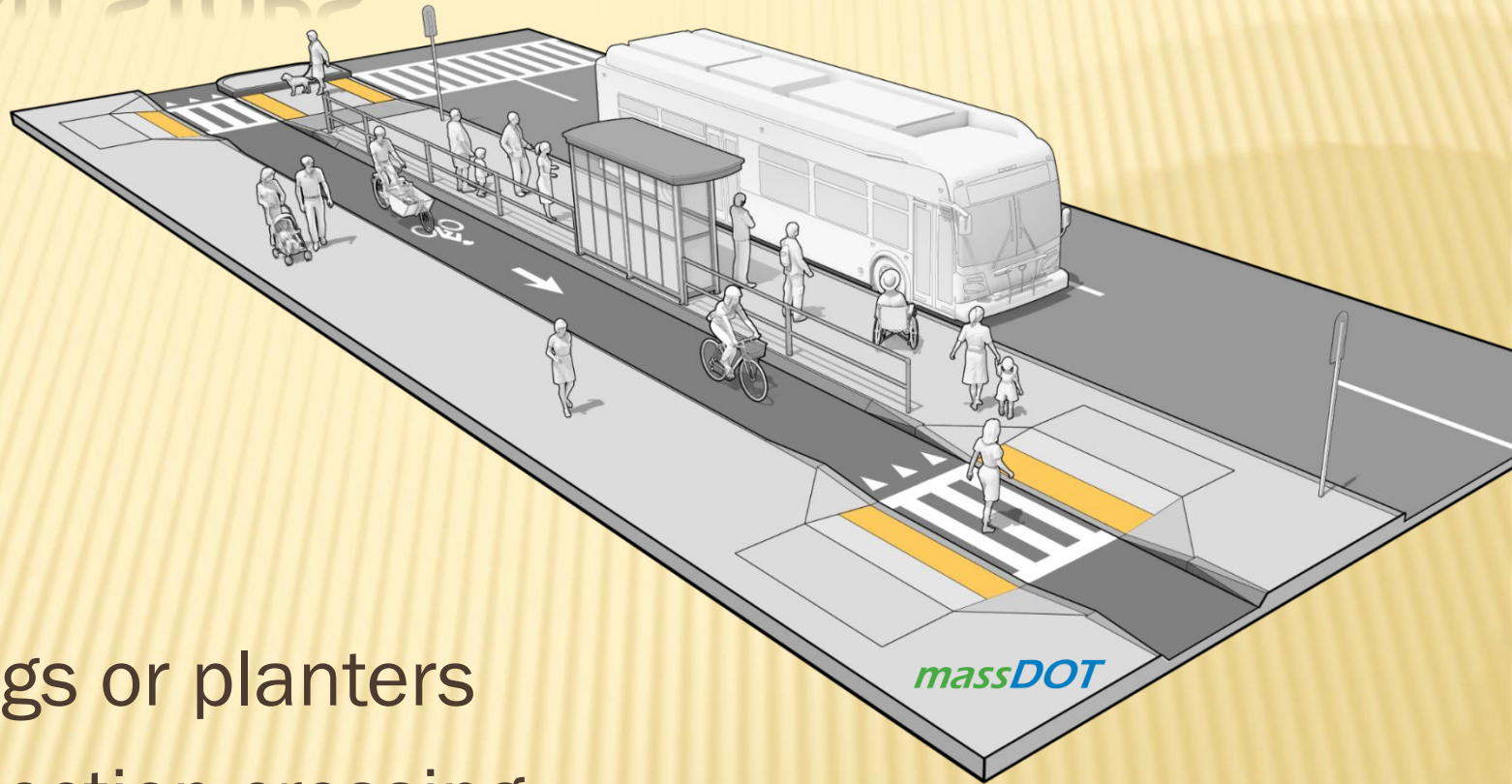
# TRANSIT STOPS

- ✘ Considerations
  - + Opposite side of street
  - + Guide passengers
  - + Two crossings
  - + Communicate to bicyclists
  - + Floating bus stop
  - + In-lane bus operation





# TRANSIT STOPS



- ✘ Railings or planters
- ✘ Intersection crossing
- ✘ Stop or yield markings

# TRANSIT STOPS







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# MIXING BIKES & RAILWAYS

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FIRED  
F.I.B.

SANDS

PIZZA

WORLD OF BEER

VILLAS RISE  
820-343-8199

CE

BIKE  
ON  
SIDEWALK  
OK

YIELD  
TO  
PEDS

BIKE  
N 4th Ave.

20%  
OFF  
ALL  
SEASONS





Designing for Bicyclist Safety

# SUMMARY THOUGHTS

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# Discussion

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⇒ Send us your questions



⇒ Follow up with us:

⇒ Brooke Struve [brooke.struve@dot.gov](mailto:brooke.struve@dot.gov)

⇒ Michael Cynecki [mcynecki@lee-eng.com](mailto:mcynecki@lee-eng.com)

⇒ Peter Lagerwey [plagerwey@tooledesign.com](mailto:plagerwey@tooledesign.com)

⇒ General Inquiries [pbic@pedbikeinfo.org](mailto:pbic@pedbikeinfo.org)

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