

Designing for Bicyclist Safety at Crossings and Intersections



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VHB

April 27, 2017



Housekeeping

⇒ **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?**

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Archive and Certificates

Archive posted at 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



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The screenshot shows the Pedestrian and Bicycle Information Center (PBIC) website. The header includes the PBIC logo and navigation links: Data & Resources, Community Support, Planning & Design, Training & Events, and Behavior Change. The main content area is titled "Webinars" and contains the following text:

Webinars

The Pedestrian and Bicycle Information Center (PBIC) offers webinars on a variety of topics related to pedestrian and bicycle safety. Sign up for our [newsletter](#) to receive webinar announcements, and follow us on [Facebook](#) and [Twitter](#).

Upcoming Webinars

04/18/2017 – Getting from Vision Zero Plan to Vision Zero Progress
Presented by: Rob Viola, New York City Department of Transportation; Luis Montoya, San Francisco Municipal Transportation Agency; and Cathy Tuttle, Seattle Neighborhood Greenways.

Designing for Bicyclist Safety Webinar Series
Presented by: Brooke Struve, Federal Highway Administration; Peter Lagerwey, Toole Design Group; and Michael Cynecki, Lee Engineering

Recently Delivered Webinars

03/14/2017 – Preparing for Successful Education and Enforcement Efforts
Presented by: Laura Sandt, UNC Highway Safety Research Center; Kara Macek, Governors Highway Safety Association; Shannon Purdy, National Highway Traffic Safety Administration; LT. Joe Raulerson, Gainesville Police Department; and LT. Michael Montanye, Greenville (NC) Police Department.



The screenshot shows the Facebook page for the Pedestrian and Bicycle Information Center. The page header includes the PBIC logo, the name "Pedestrian and Bicycle Information Center", the website URL www.pedbikeinfo.org, and logos for the UNC Highway Safety Research Center and the Department of Transportation Federal Highway Administration. The page features a "Like" button, a "Share" button, and a "Send Message" button. The main content area is titled "Photos" and displays a "VISION ZERO STRATEGIES SERIES" image. The page also includes a "Government Organization" section with the following text:

Our mission is to improve the quality of life in communities through the increase of safe walking and bicycling as a viable means of transportation and physical activity.

3,509 people like this and 3,446 people follow this

About See All

888-823-3977
www.pedbikeinfo.org
Government Organization



Upcoming Webinars

Visit www.pedbikeinfo.org to learn more and register

Incorporating Bicycle Networks into Resurfacing Projects

May 10, 1:00 – 2:30 PM Eastern Time



Measuring and Visualizing Multimodal Networks

May 17, 1:00 – 2:30 PM Eastern Time





Federal Highway Administration

Webinar 3—April 27, 2017

DESIGNING FOR BICYCLIST SAFETY

MEET YOUR PANELISTS

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KEY SAFETY FACTORS

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





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.



INTERSECTION DESIGN PRINCIPLES

- ✘ Reduce speed
- ✘ Minimize exposure to conflicts
- ✘ Communicate right-of-way priority
- ✘ Provide adequate sight distance





Designing for Bicyclist Safety

SHARED-USE PATH CROSSINGS



SIDE-STREET CROSSINGS



Adjacent Road Speed Limit (Mi/h)	Recommended Sidepath Separation Distance at Crossings
< 25 mi/h	6.5 ft (2.0 m)
35–45 mi/h	6.5–16.5 ft (2.0–5.0 m)
≥ 55 mi/h	16.5–24 ft (5.0–7.0 m)

**Separation distance may vary in response to available right of way, visibility constraints and the provision of a right turn deceleration lane.*

MID-BLOCK CROSSING DESIGN PROCESS

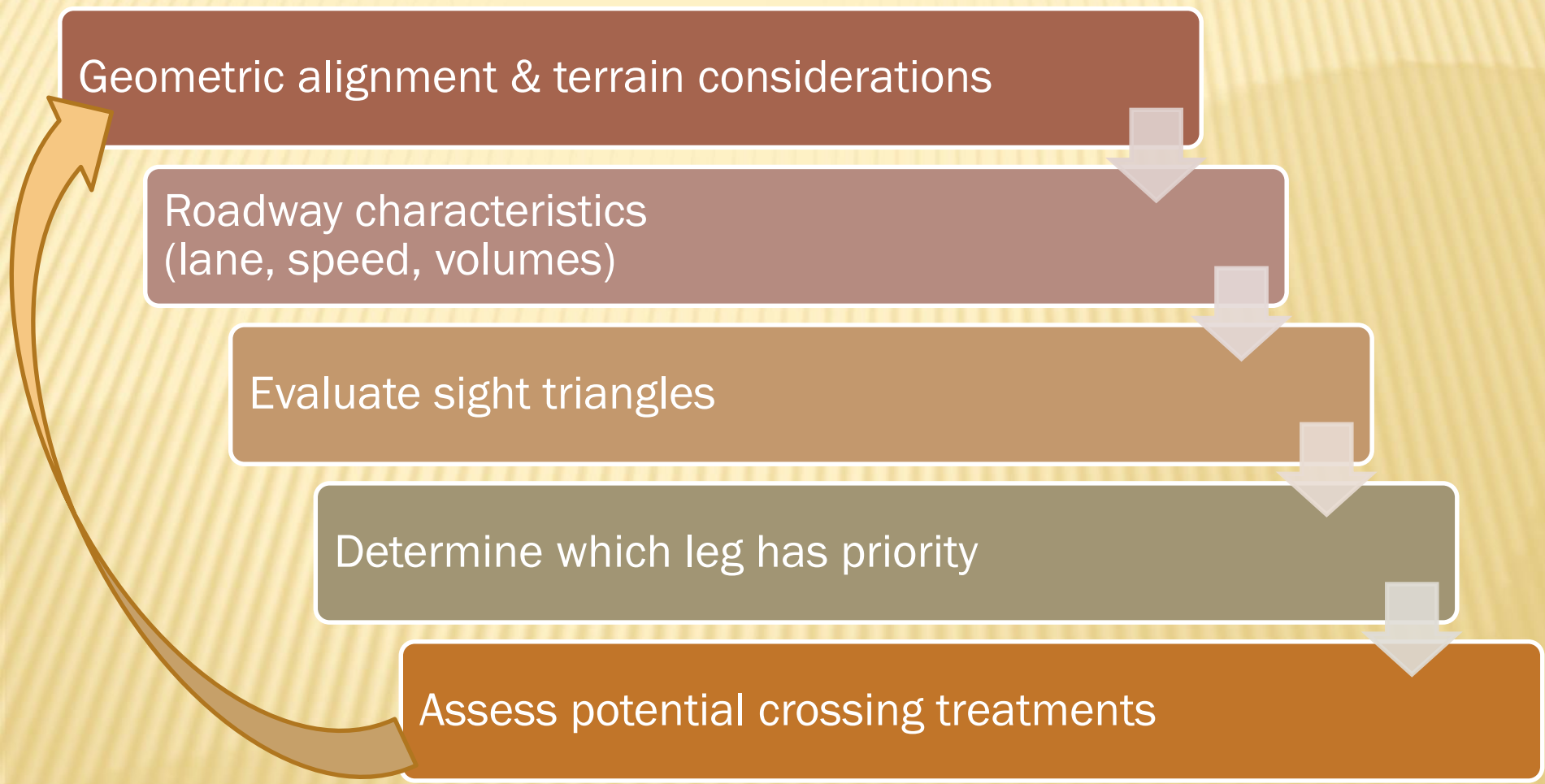
Geometric alignment & terrain considerations

Roadway characteristics
(lane, speed, volumes)

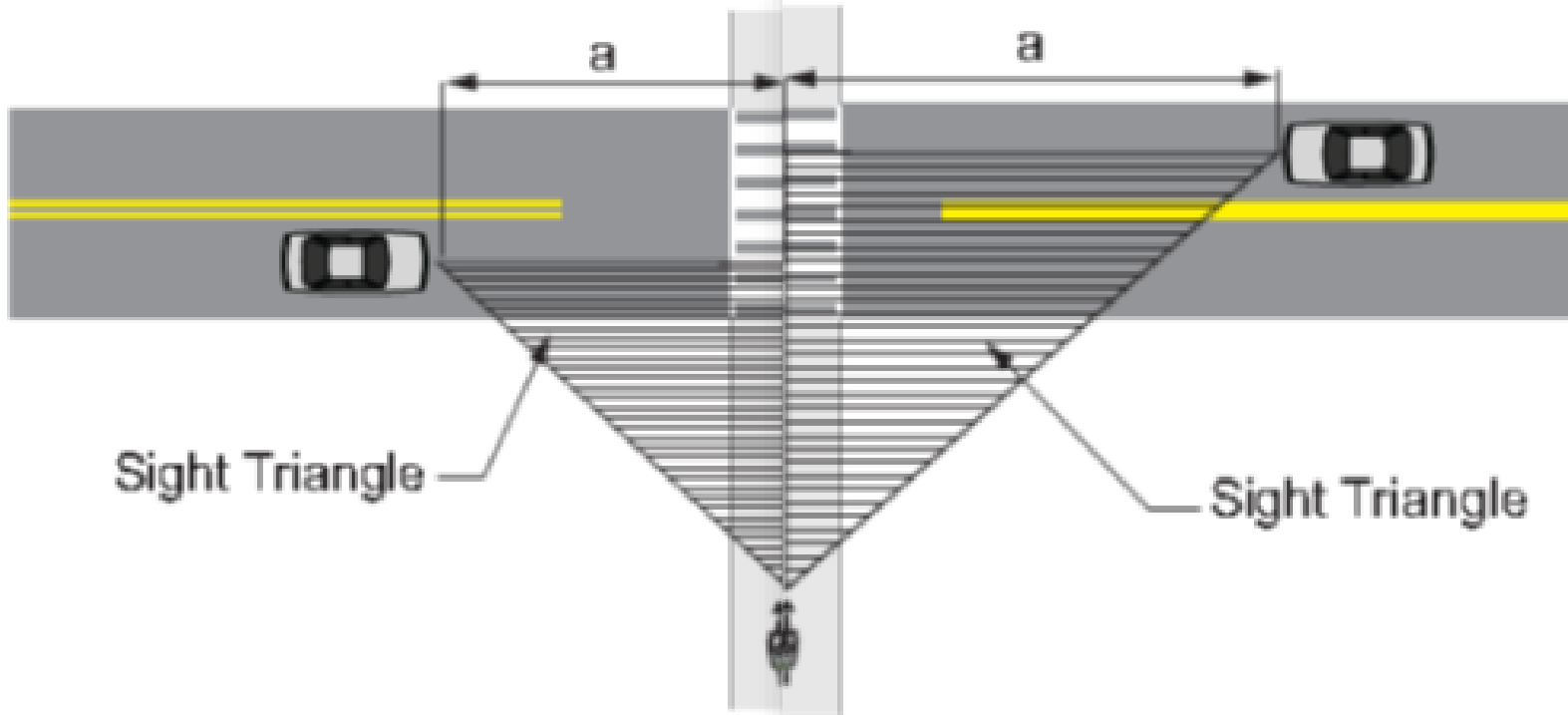
Evaluate sight triangles

Determine which leg has priority

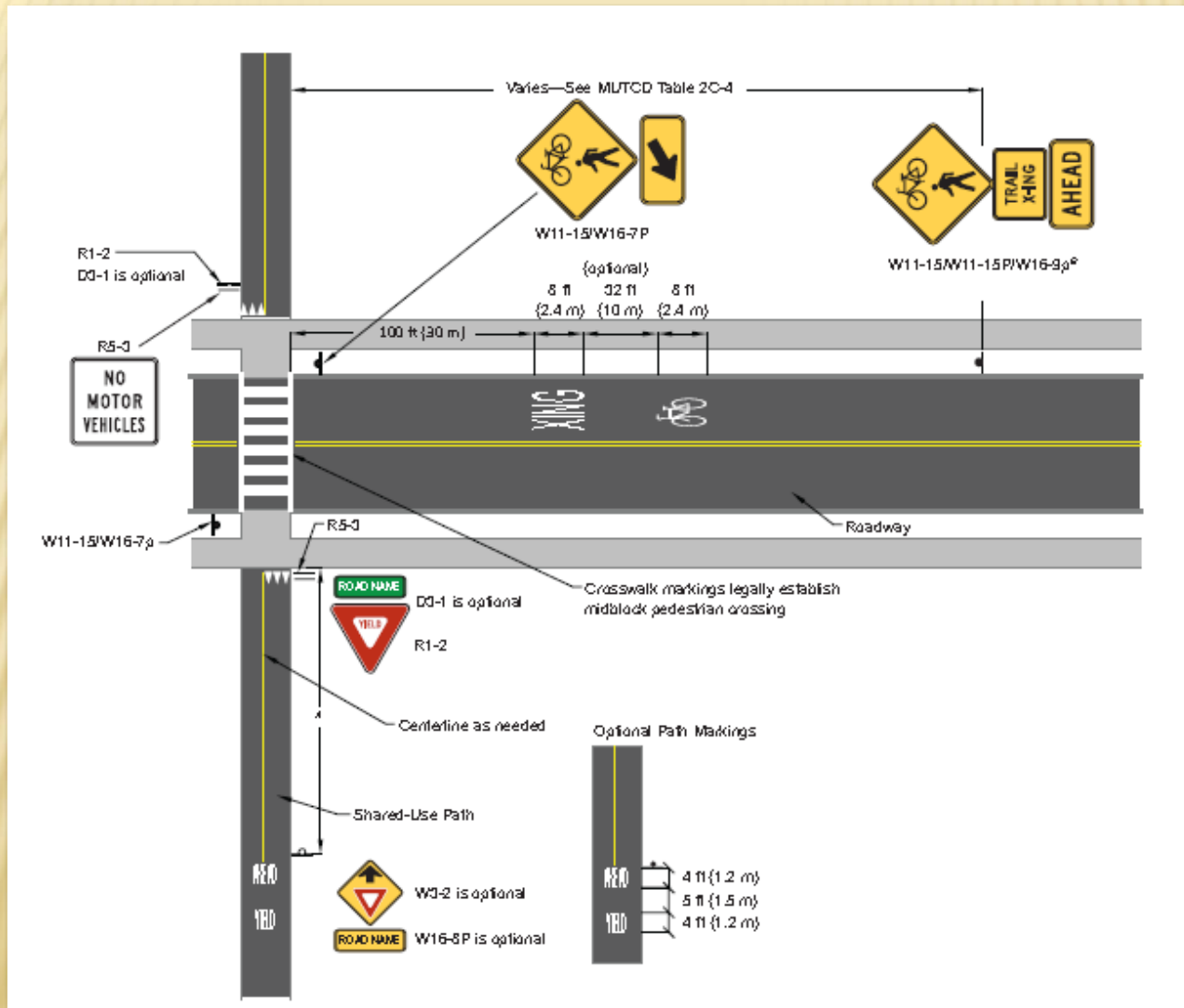
Assess potential crossing treatments



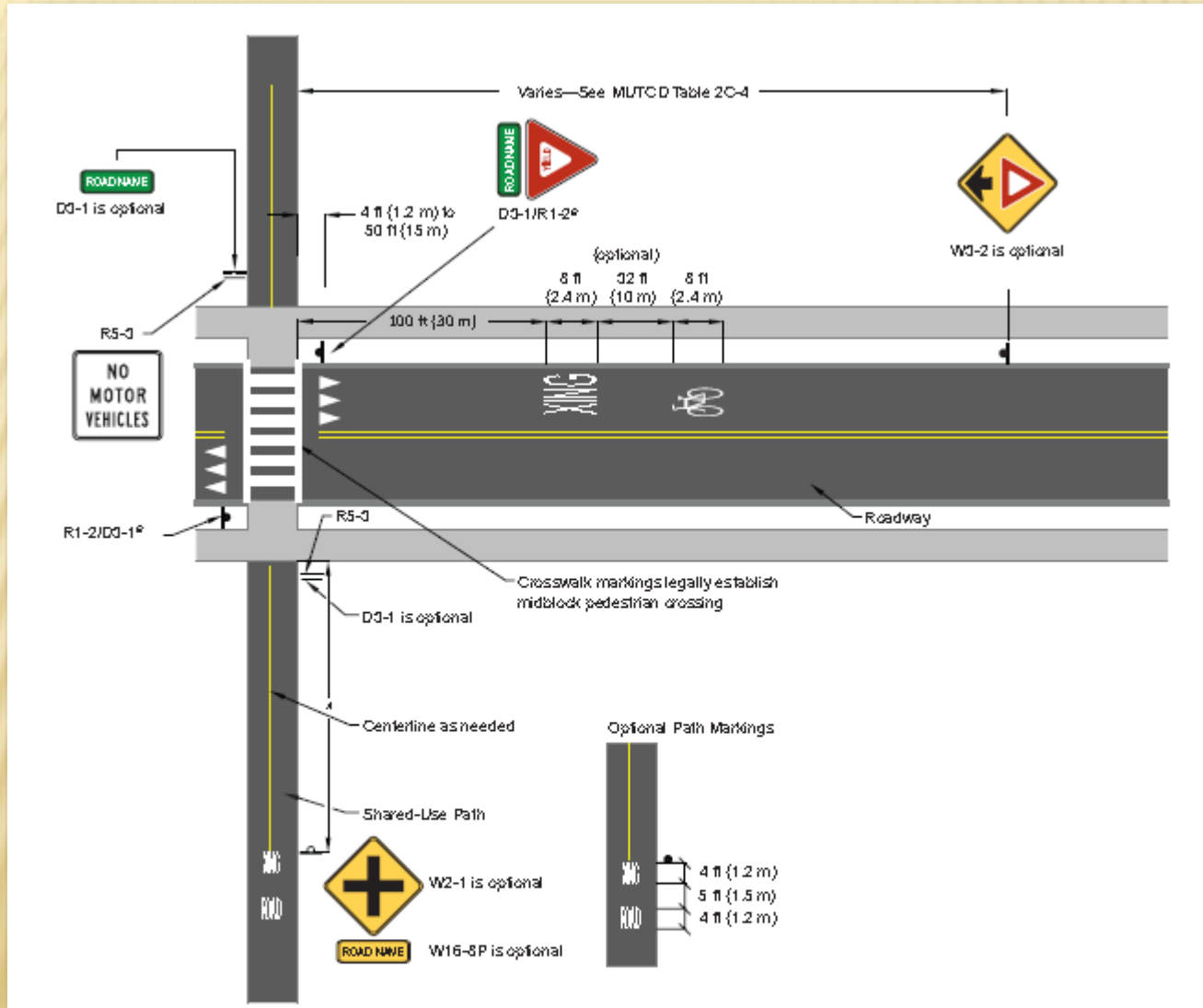
SIGHT TRIANGLES

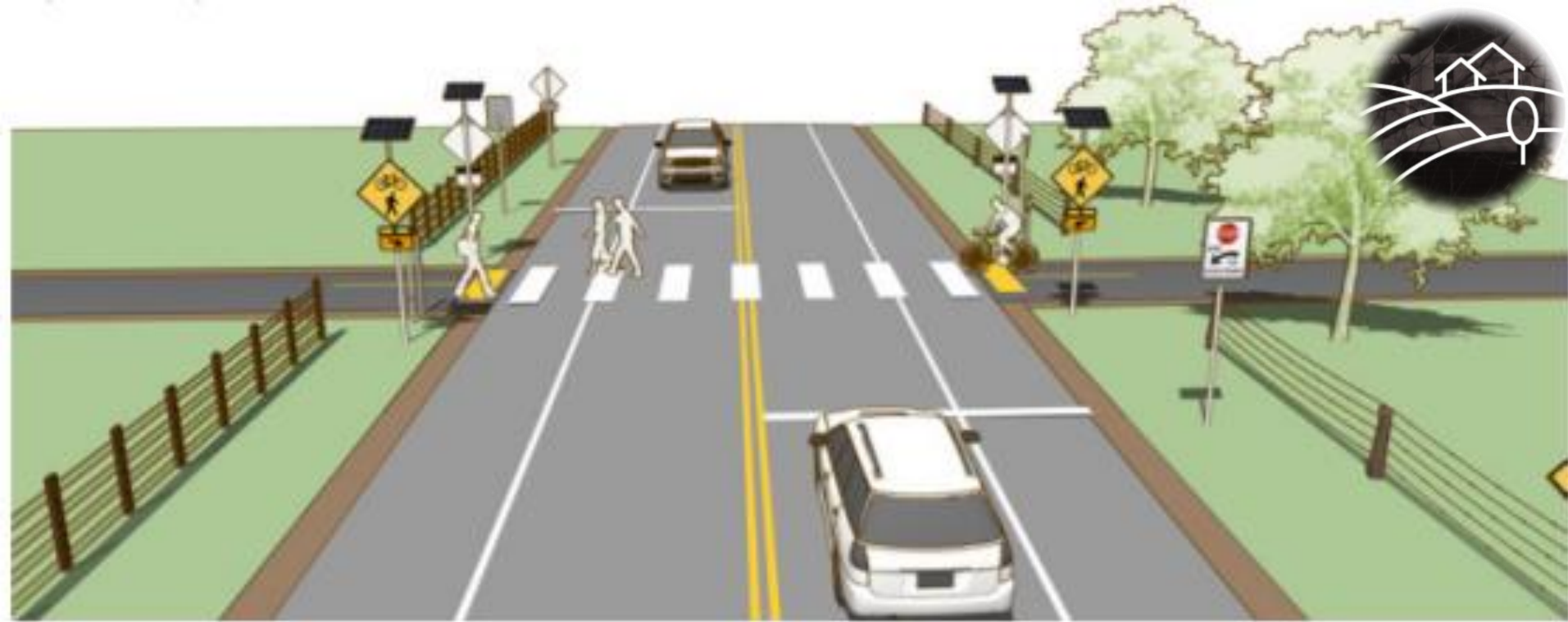


PATH YIELDS TO ROADWAY



ROAD YIELDS TO PATHWAY





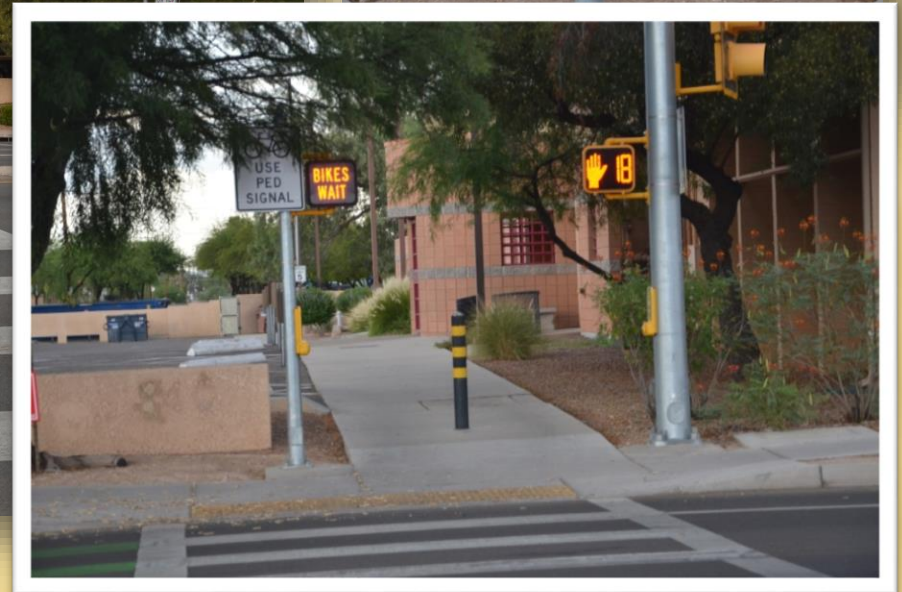
Crossing Countermeasures

- ✘ Advance warning signs
- ✘ Advance yield/stop line
- ✘ Raised island/crossing
- ✘ RRFB/PHB



BIKE “HAWK” PHB

- ✘ First installation Tucson, AZ
- ✘ “BIKES WAIT”/”BIKES OK”



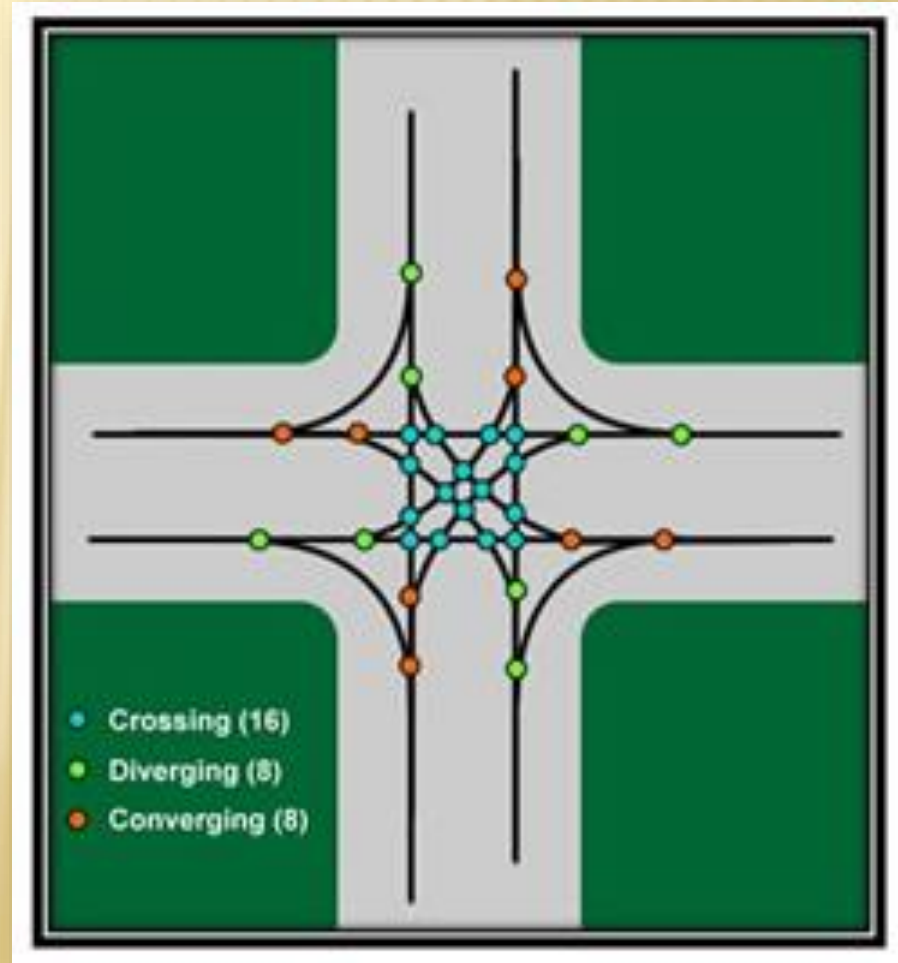


Designing for Bicyclist Safety

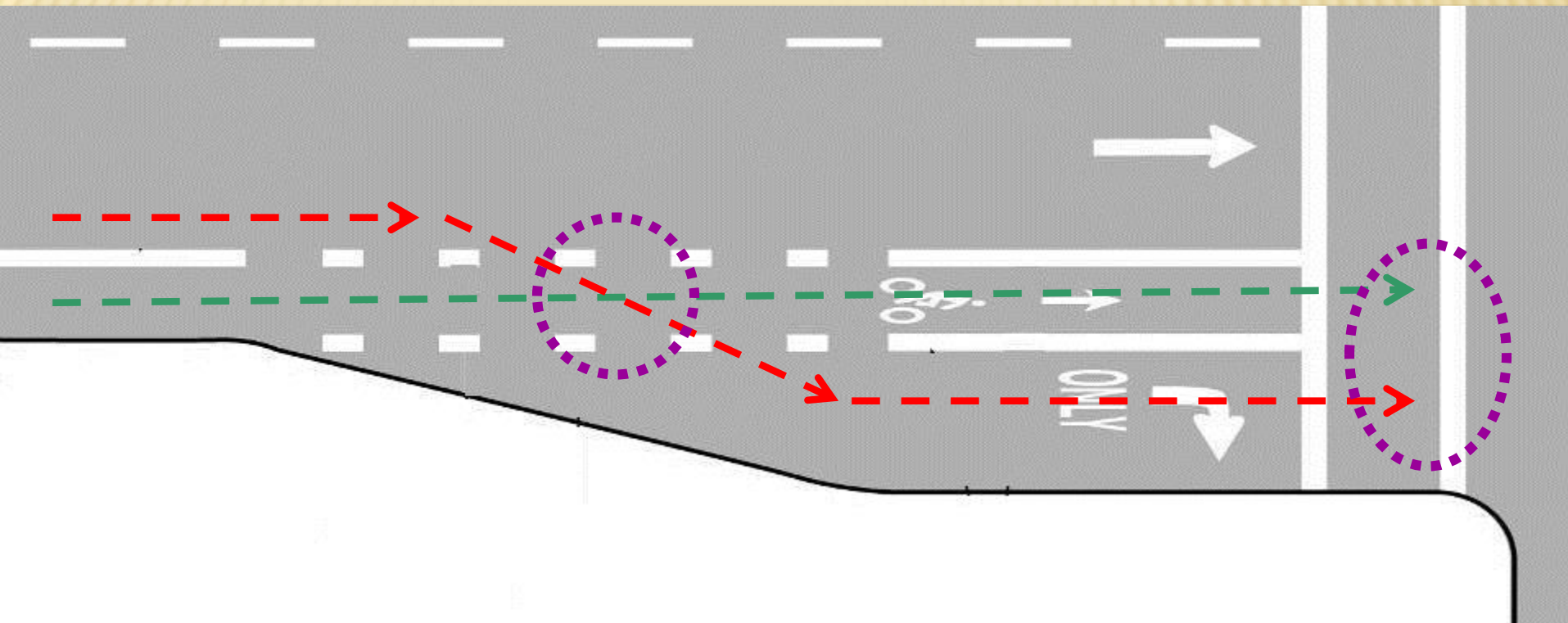
INTERSECTION DESIGN

INTERSECTION CONFLICTS

- ✘ Typical conflicts for both pedestrians and motorists, plus:
 - + Right-turn/thru movement
 - + Weaving to left turn



RIGHT-TURN/THRU CONFLICT



LEFT-TURN CONFLICT





INTERSECTION COUNTERMEASURES

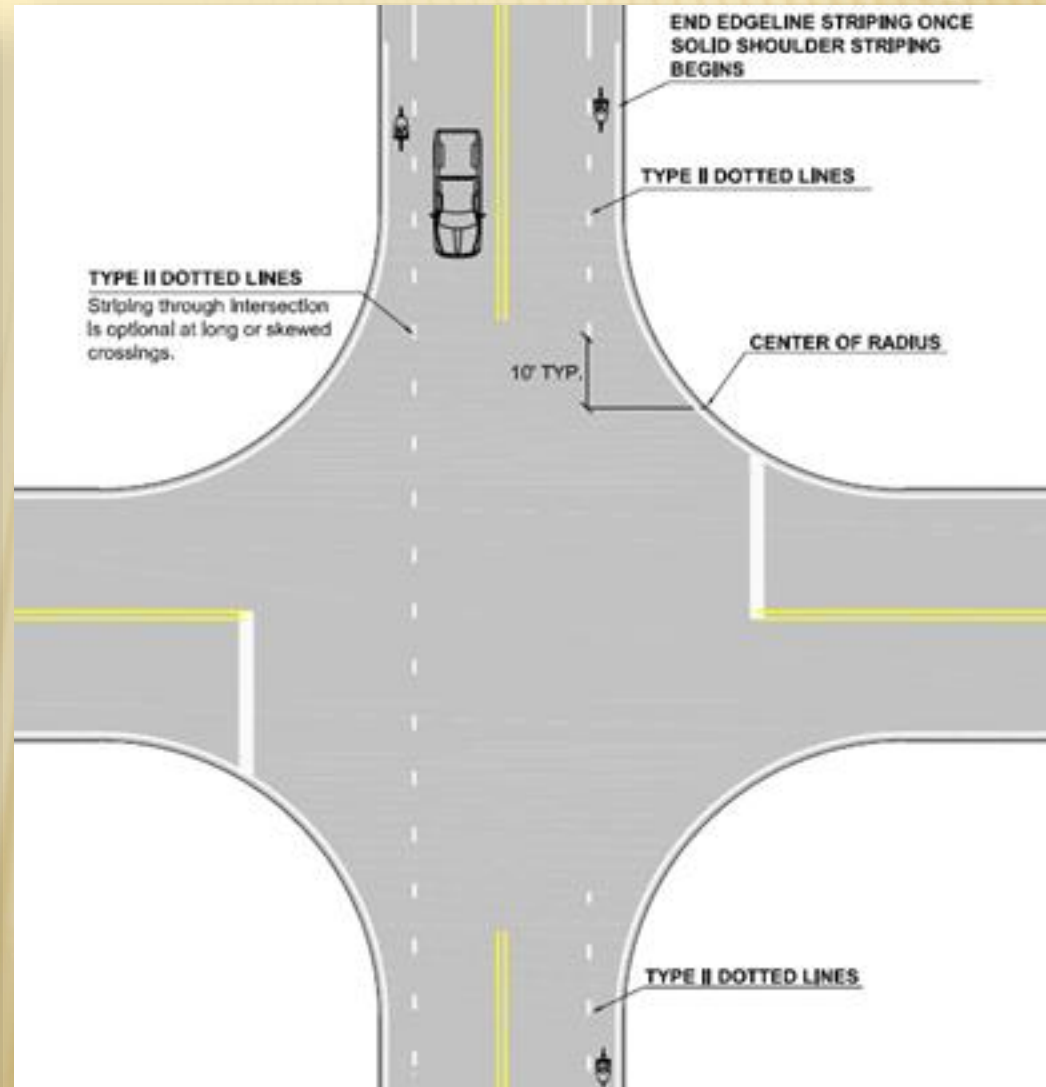
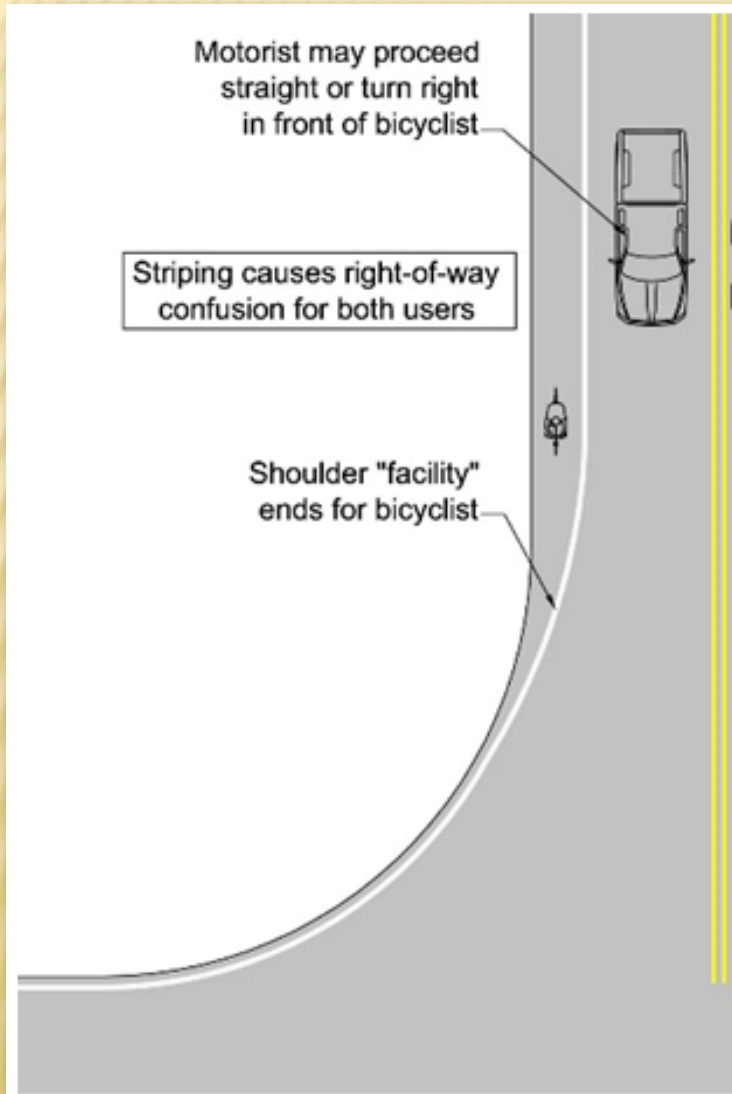
SHOULDER RIDING AT INTERSECTION

- ✘ Shoulder not a travel lane
- ✘ Modify shoulder striping
- ✘ Opportunity to switch to shared lanes **OR**
- ✘ Add bike lane thru intersection





SHOULDER STRIPING



INTERSECTION WITH SHARED LANES

- ✘ Additional/all lanes are shared at intersection



BIKE LANE THRU INTERSECTION





BIKE LANE THRU INTERSECTION



HIGHLIGHT CONFLICT ZONE



Dotted Line Extensions



Shared Lane Markings



Colored Conflict Area



Elephant's Feet

HIGHLIGHT CONFLICT ZONE



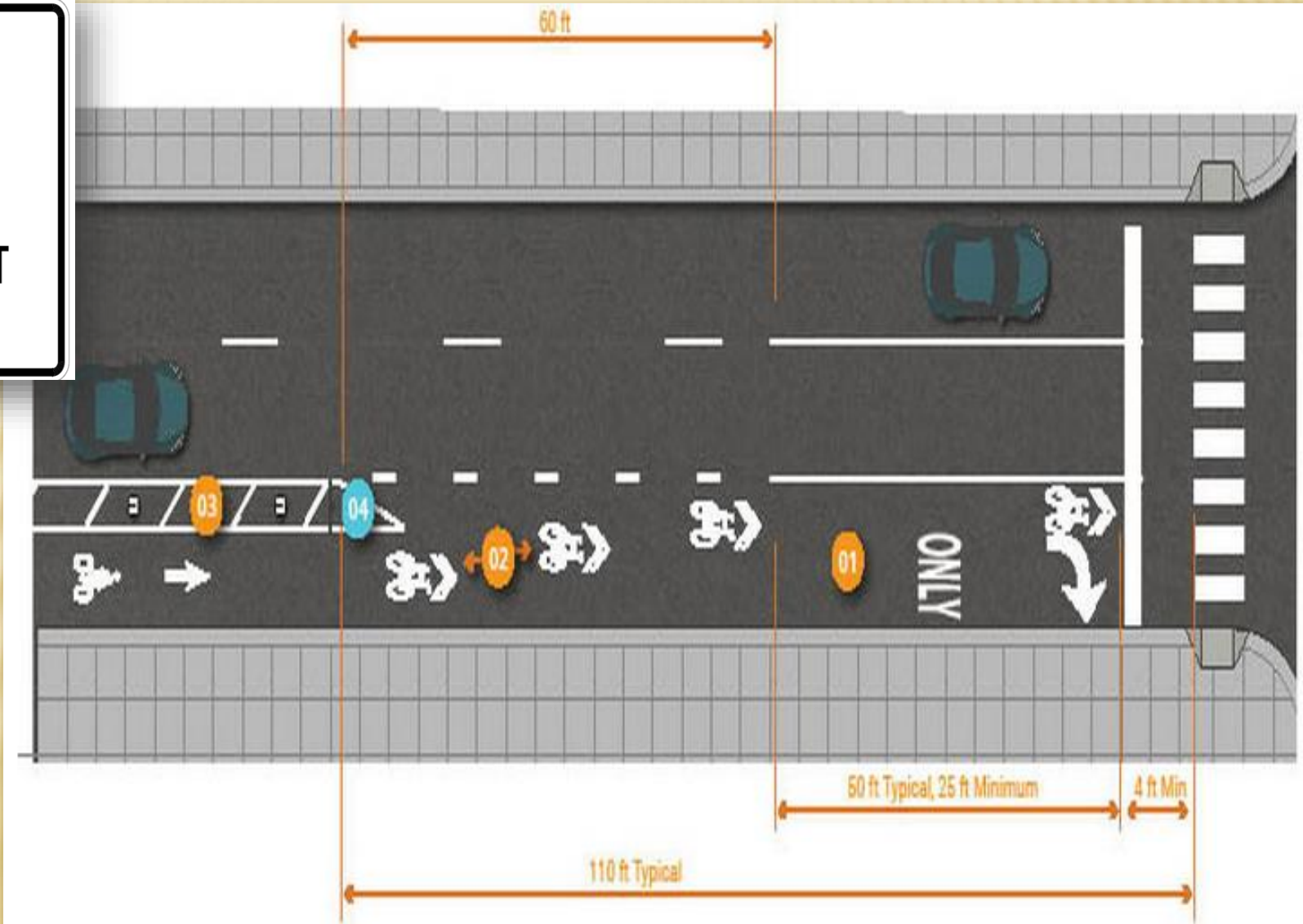
BIKE LANE THRU INTERSECTION



SHARROW W/ GREEN BACKGROUND



RIGHT TURN SHARED LANE



TWO-STAGE LEFT TURN BOX



TWO-STAGE LEFT-TURN QUEUE BOX

- ✘ Required design elements include:
 - + Bicycle symbol
 - + Turn or through arrow
 - + Turn on red prohibition
 - + Passive detection of bicycles
- ✘ Size to prevent conflicts



BIKE BOX



BIKE BOX

- ✘ Increase visibility
- ✘ Reduce signal delay for bikes
- ✘ Positioning for left-turn
- ✘ Prevent “right-hook” (except at onset of green)
- ✘ Groups bikes



BIKE BOX

- ✘ Required elements:
 - + Advance stop bar
 - + Bike symbol
 - + RTOR prohibited
 - + Setback from crosswalk
 - + Countdown ped signal
 - + Yellow change & red clearance



BICYCLE SIGNAL FACE

Application for:

- ✘ Bicyclist non-compliance
- ✘ Provide a leading or lagging bicycle interval
- ✘ Continue the bicycle lane on the right-hand side of an exclusive turn lane
- ✘ Augment the design of a segregated counter-flow
- ✘ Unusual or unexpected arrangements of the bicycle movement through complex intersections, conflict areas, or signal control.



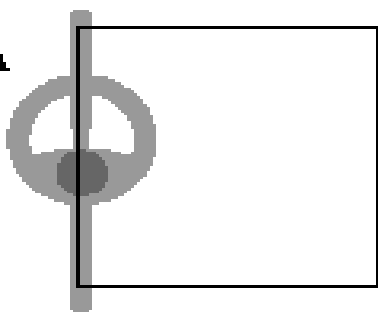
SAFER SIGNALS FOR BICYCLISTS

- ✘ Bikes start-up and travel slower than cars
 - + Differentiating bike detection to optimize signals
 - + Set initial and gap times to accommodate bikes
- ✘ Leading Bike Interval
- ✘ Segregate Conflicting Movements

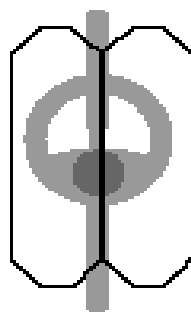


BICYCLE DETECTION

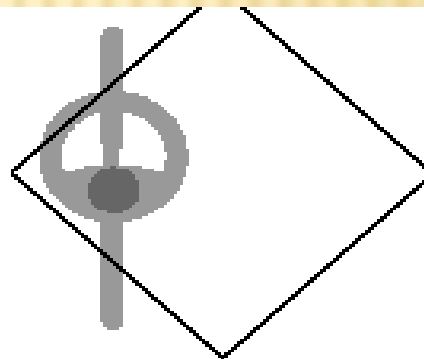
- ✘ Loops
- ✘ Video
- ✘ Microwave
- ✘ Buttons



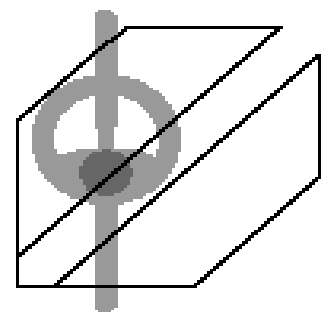
Square



Quadrupole



Diamond



Diag. Quadrupole

Direction of Travel

BICYCLE DETECTION



Portland, OR

PUSH BUTTONS





BICYCLISTS AT ROUNDABOUTS

WHAT DOES IT TAKE TO MAKE ROUNDABOUTS WORK FOR BICYCLISTS?

- Slow speeds – lots of deflection; truck apron
- Simple, single lane, throughout
- Splitter islands
- “Escape ramps” for multi-lane roundabouts



End bike lane to encourage cyclist to enter roadway

Bend OR



End bike lane to encourage cyclist to enter roadway

Bend OR



Slow speed allows cyclists to share roadway

Bend OR



Bend OR



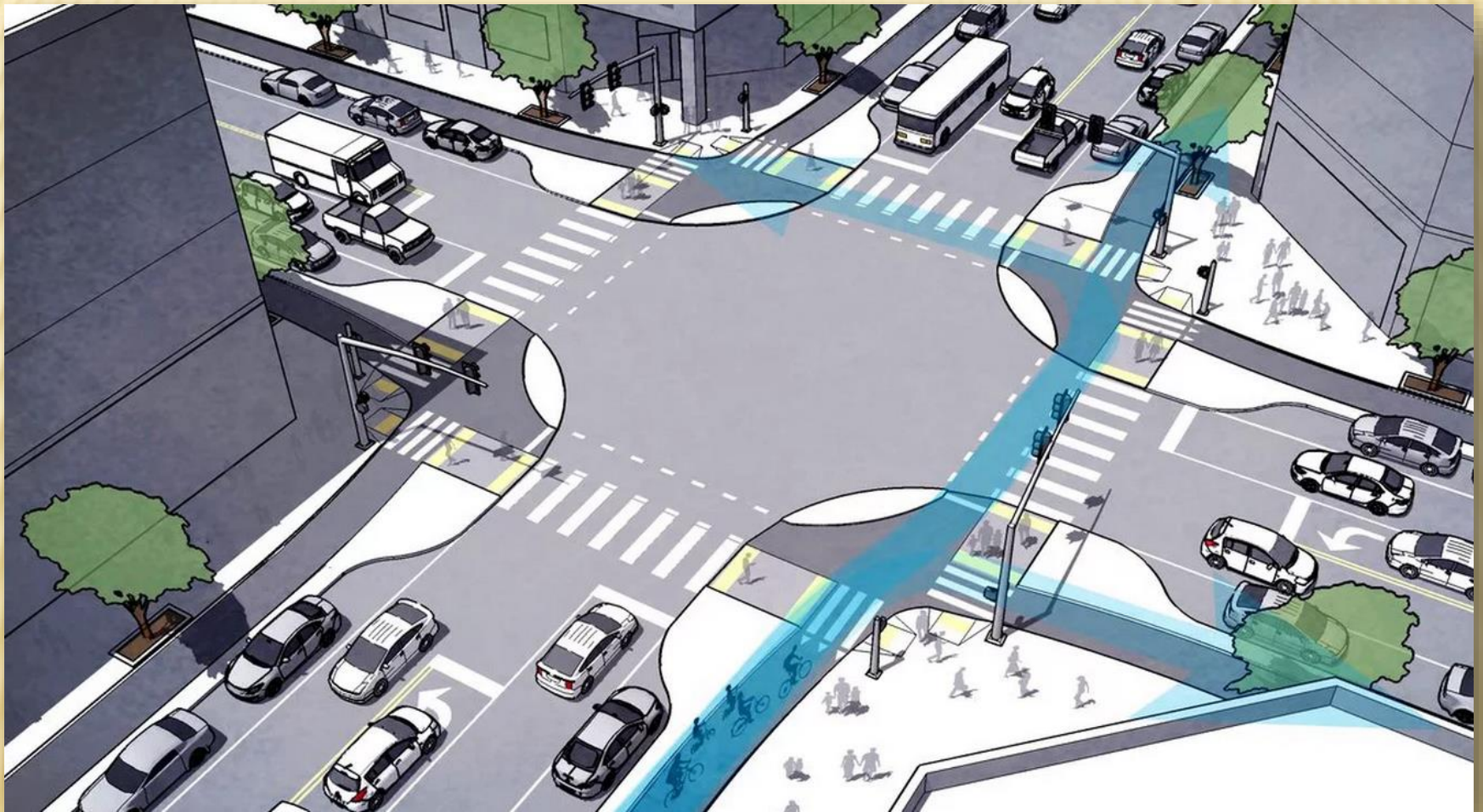
Bend OR

What if a cyclist doesn't want to enter the roundabout?



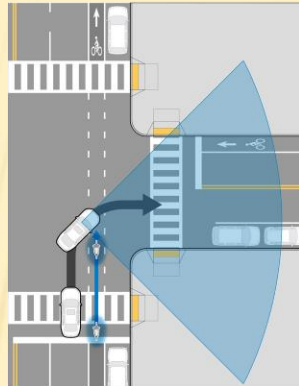
Bend OR

“PROTECTED” INTERSECTION

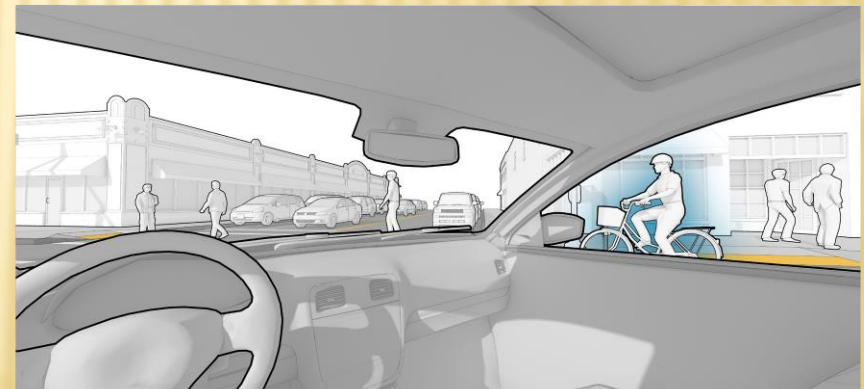
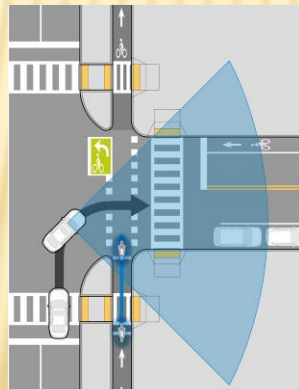


VISIBILITY AT CONFLICT POINTS

motorist's view at
conventional bike lane



motorist's view at
separated bike lane

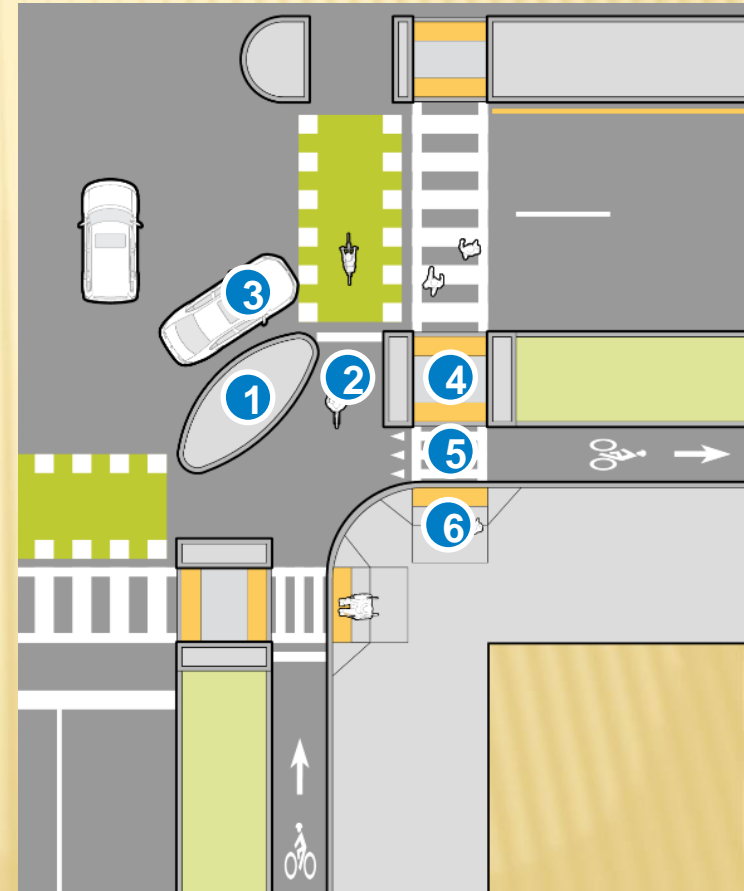


VISIBILITY AT CONFLICT POINTS

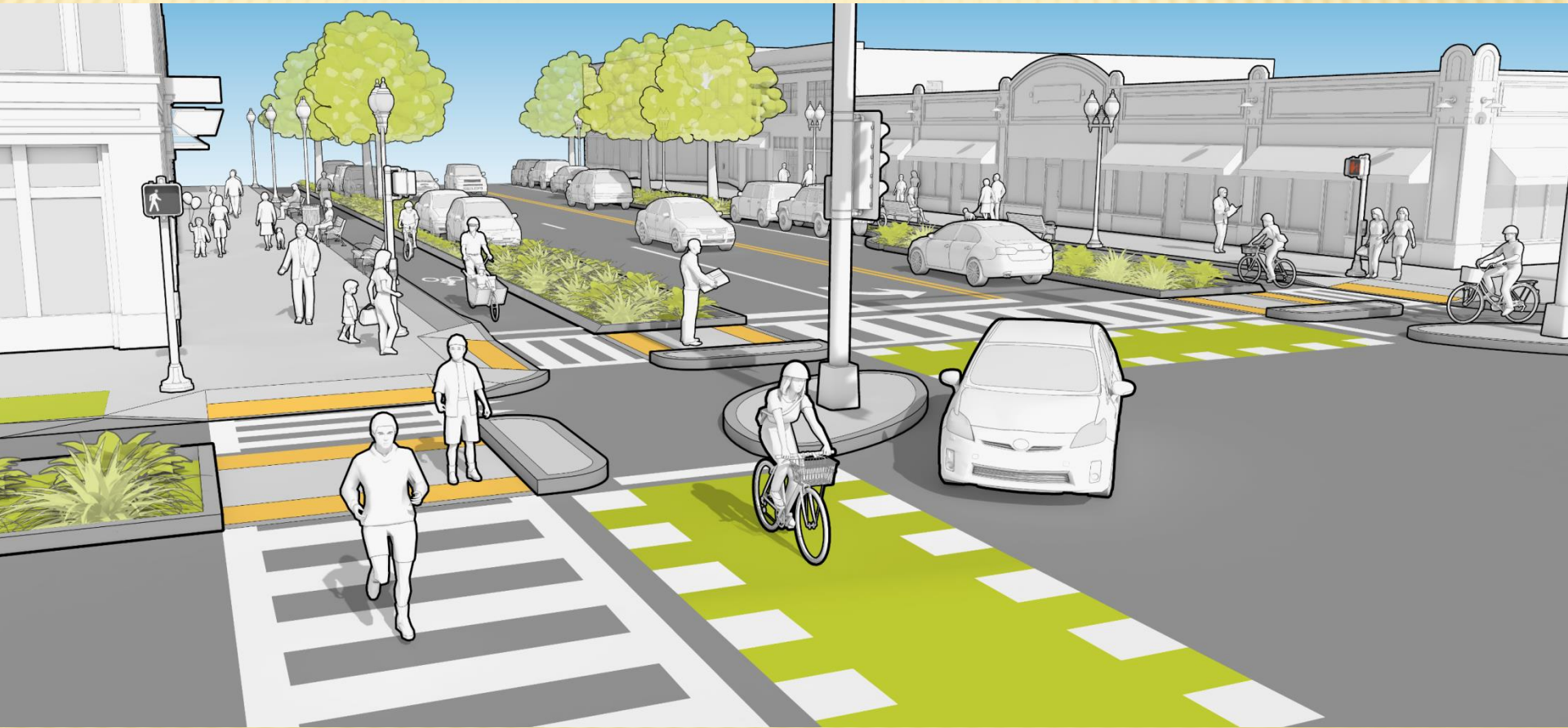


PROTECTED INTERSECTIONS

- 1 Corner refuge island
- 2 Forward bicycle queuing area
- 3 Motorist yield zone
- 4 Pedestrian crossing island
- 5 Pedestrian crossing of separated bike lane
- 6 Pedestrian curb ramp



PROTECTED INTERSECTIONS



CHICAGO, IL



CHICAGO, IL





Designing for Bicyclist Safety

SUMMARY THOUGHTS

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
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- ✘ Visibility
- ✘ Traffic volume & composition
- ✘ Conflict points
- ✘ Proximity
- ✘ Bike control
- ✘ Connectivity





Designing for Bicyclist Safety

QUESTIONS

Discussion

⇒ Send us your questions



⇒ Follow up with us:

⇒ Brooke Struve brooke.struve@dot.gov

⇒ Greg Bakos gbakos@vhb.com

⇒ General Inquiries pbic@pedbikeinfo.org

⇒ Archive at www.pedbikeinfo.org/webinars

