

Pedestrian Safety Peer Exchange  
September 10, 2019  
Urbana-Champaign

# National Direction and Illinois Pedestrian Policy

## An Overview

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# Goal: Improving Pedestrian Safety

1. Background on national direction, ideas, strategies, devices
2. Quick tour of IDOT's Complete Streets policy (pedestrians)



China

Netherlands

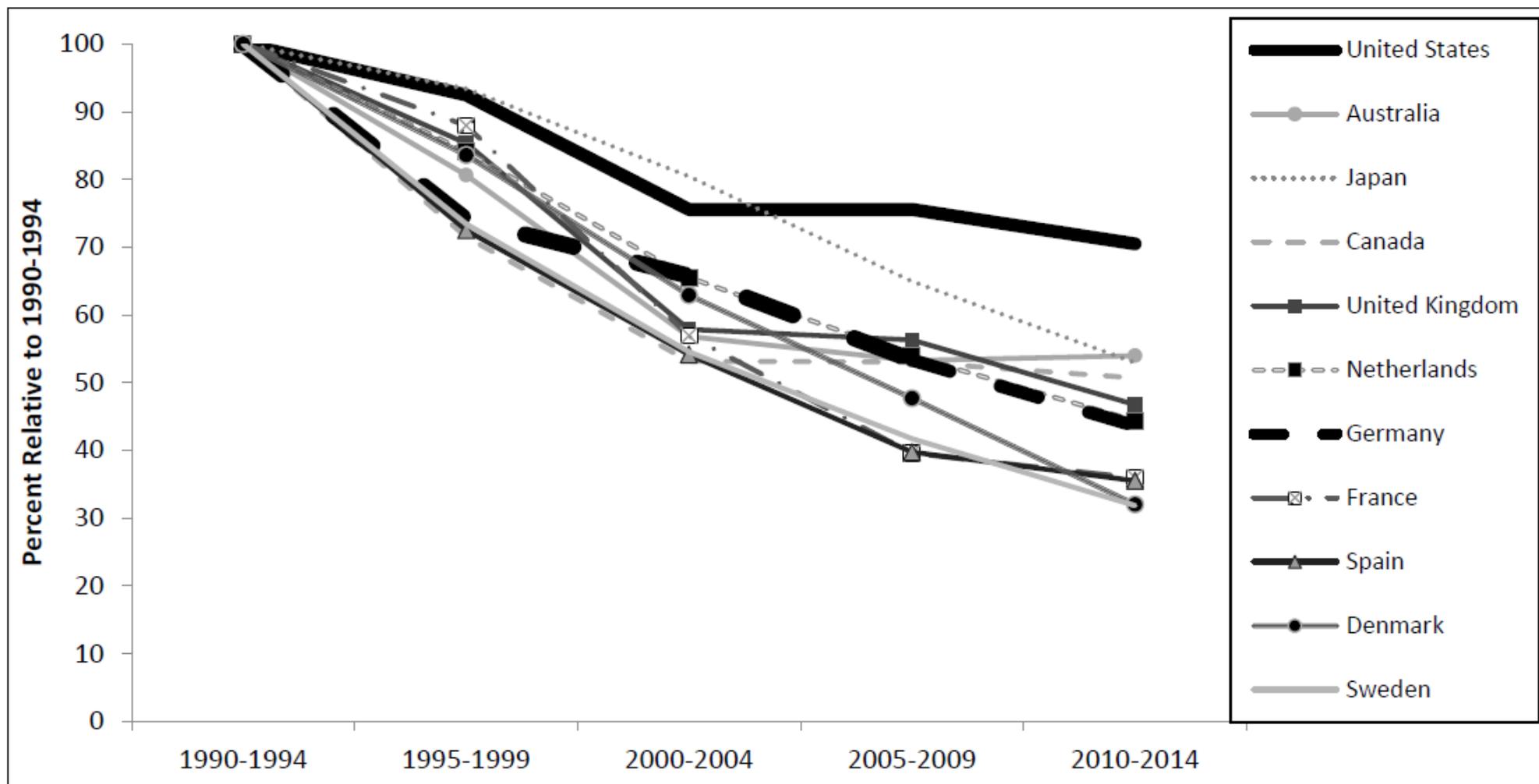


*'Safety in Numbers'*



Orlando, FL

# Good News or Bad News? (1990 – 2014)



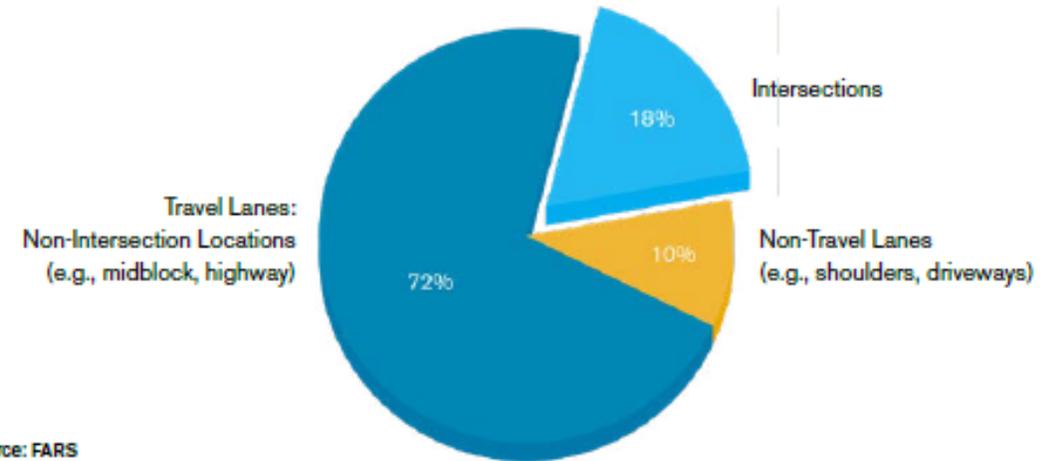
Pucher, J. and R. Buehler, "Trends in Walking and Cycling Safety: Recent Evidence from High-Income Countries, with a Focus on the United States and Germany," *American Journal of Public Health*, Vol. 107, 2017, pp. 281-287.

# National Crash Patterns

- ▶ 72% of pedestrian fatalities occur at non-intersection locations (FARS)
- ▶ 75% of pedestrian fatalities occur during dark conditions, including “dark, lighted roadway” (FARS)

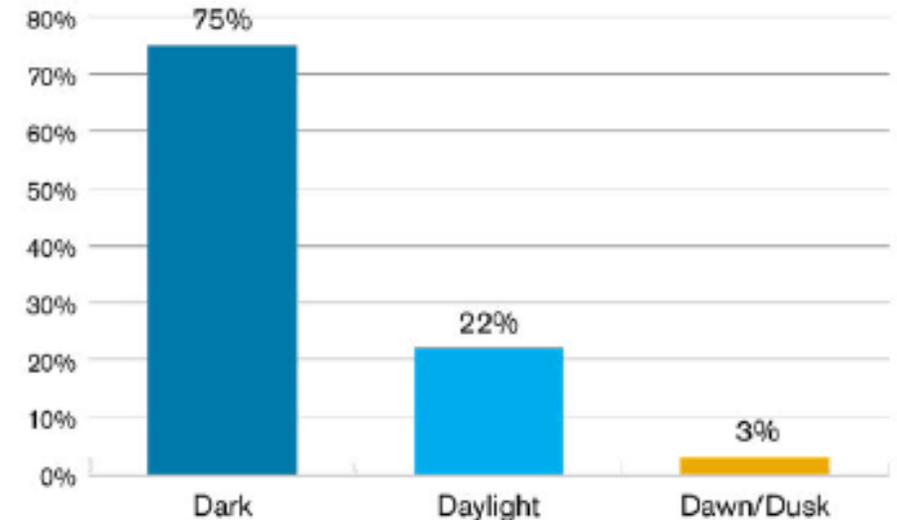


Figure 5 2016 Pedestrian Deaths in Relation to Location Type



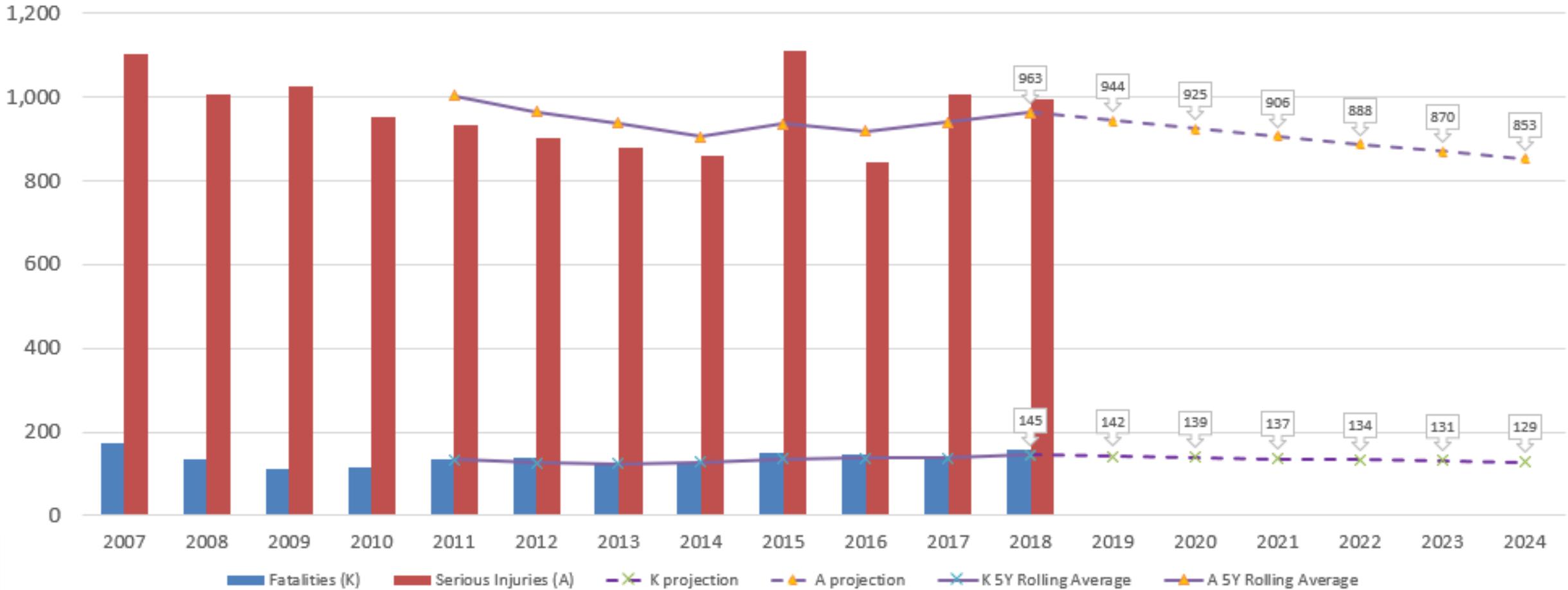
Source: FARS

Figure 4 2016 Pedestrian Fatalities by Light Level



Source: FARS

# Illinois' Serious Pedestrian Crashes



# NCHRP Project (20-05): Speed Management

## Top Strategies for Speed Reduction in Vision Zero Cities

- ▶ Reduce lane widths to 11 ft or 10 ft (Lane Diet)
- ▶ Reallocate/convert roadway space (Road Diet)
- ▶ Add speed humps or cushions
- ▶ Tighten curb radii (intersections)
- ▶ Include right-side bike lanes
- ▶ Provide pedestrian refuge islands
- ▶ Install curb extensions (midblock)

Source:

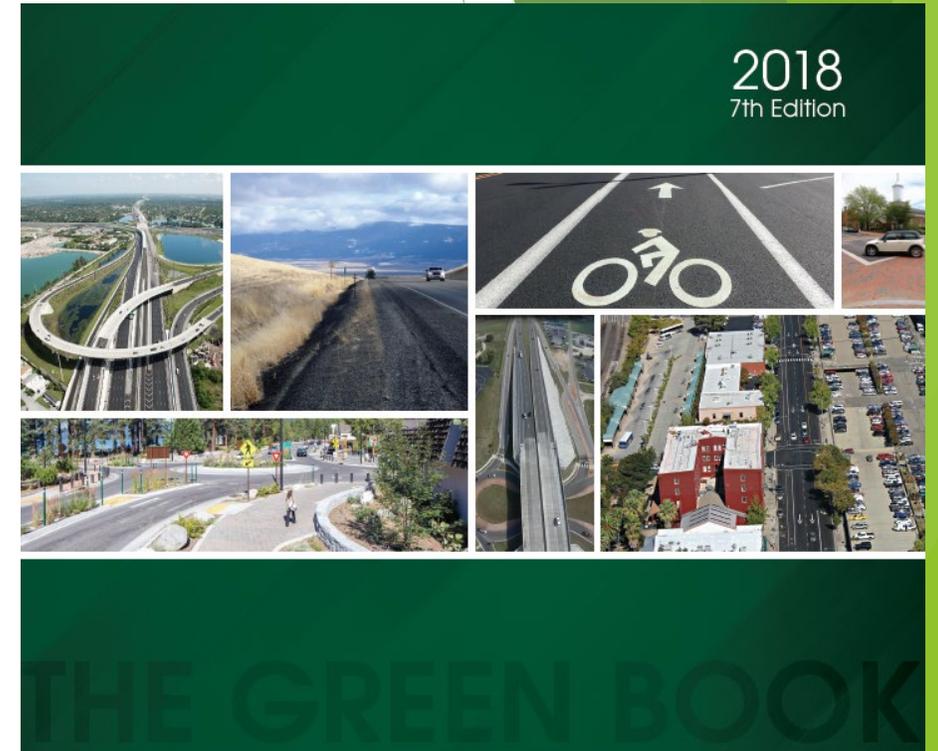
NCHRP Project 20-05, Topic 49-08 (Expected 4th quarter 2019)

*Pedestrian Safety Relative to Traffic Speed Management*

Toole Design Group, LLC

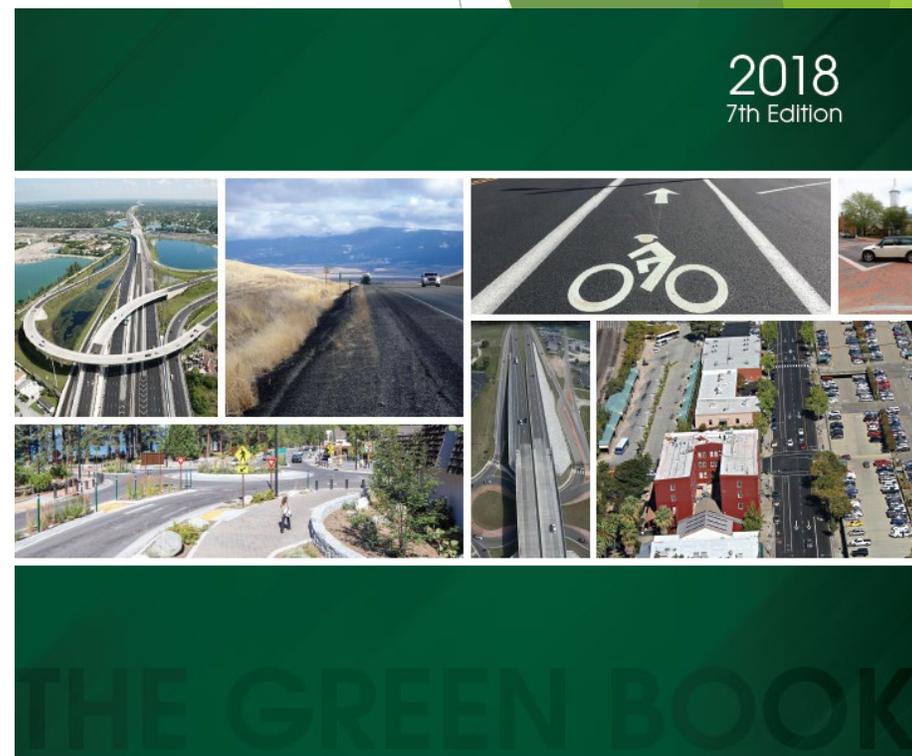
# AASHTO on Pedestrian Safety

- ▶ Provide enhanced marking and delineation
- ▶ Increase sign size and/or sign retro-reflectivity
- ▶ Apply repetition and redundancy in design (e.g. advance warning signs)
- ▶ Utilize Accessible Pedestrian Signals



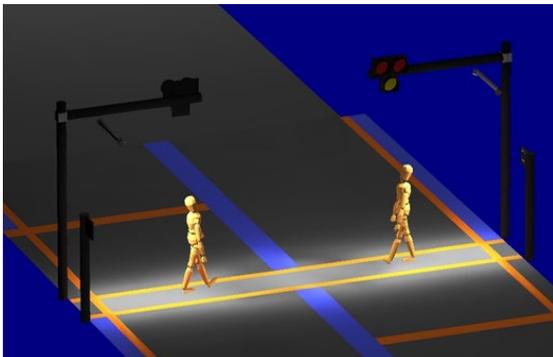
# AASHTO on Pedestrian Safety

- ▶ Minimize crossing widths
- ▶ Provide curb extensions & refuges
- ▶ Assume lower walking speeds (signal timing)
- ▶ Provide lighting and eliminate glare sources
- ▶ Apply 2020 Pedestrian Guide

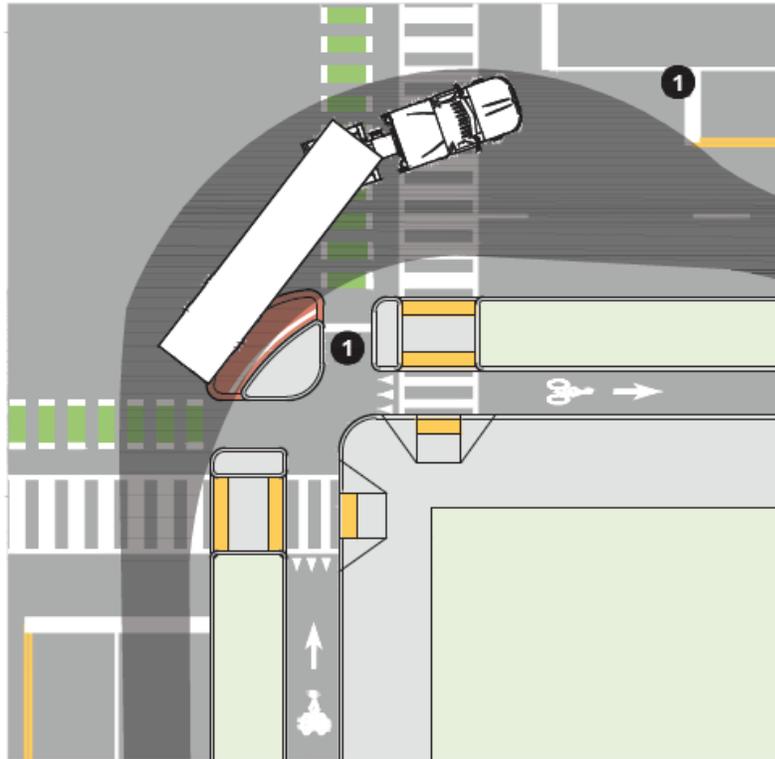


# Illinois SHSP: Focus on Speed / Exposure / Visibility

- ▶ Apply NACTO/ITE/PBIC speed management measures
- ▶ Map *Road Diet* (reconfiguration) opportunities; implement projects
- ▶ Use *high-visibility markings* and *signing* at *certain* crosswalks
- ▶ Incorporate *raised corner islands* and *raised medians* (refuges)
- ▶ Expand the use of *Lead Pedestrian Interval* (LPI) signals
- ▶ Research *optimal lighting* design for pedestrian crosswalks

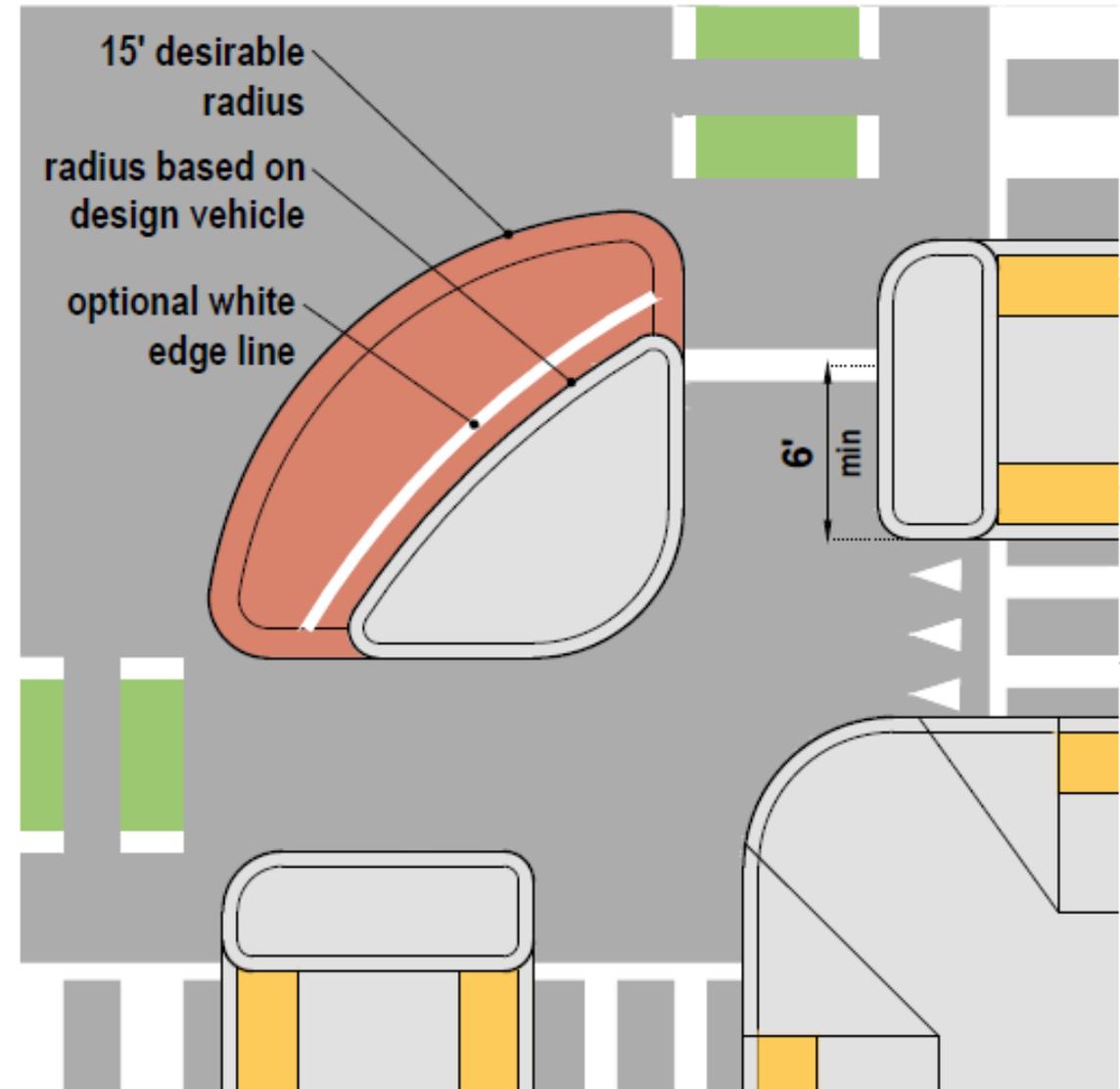


# Ultimate Separation? Protected Intersections



## legend

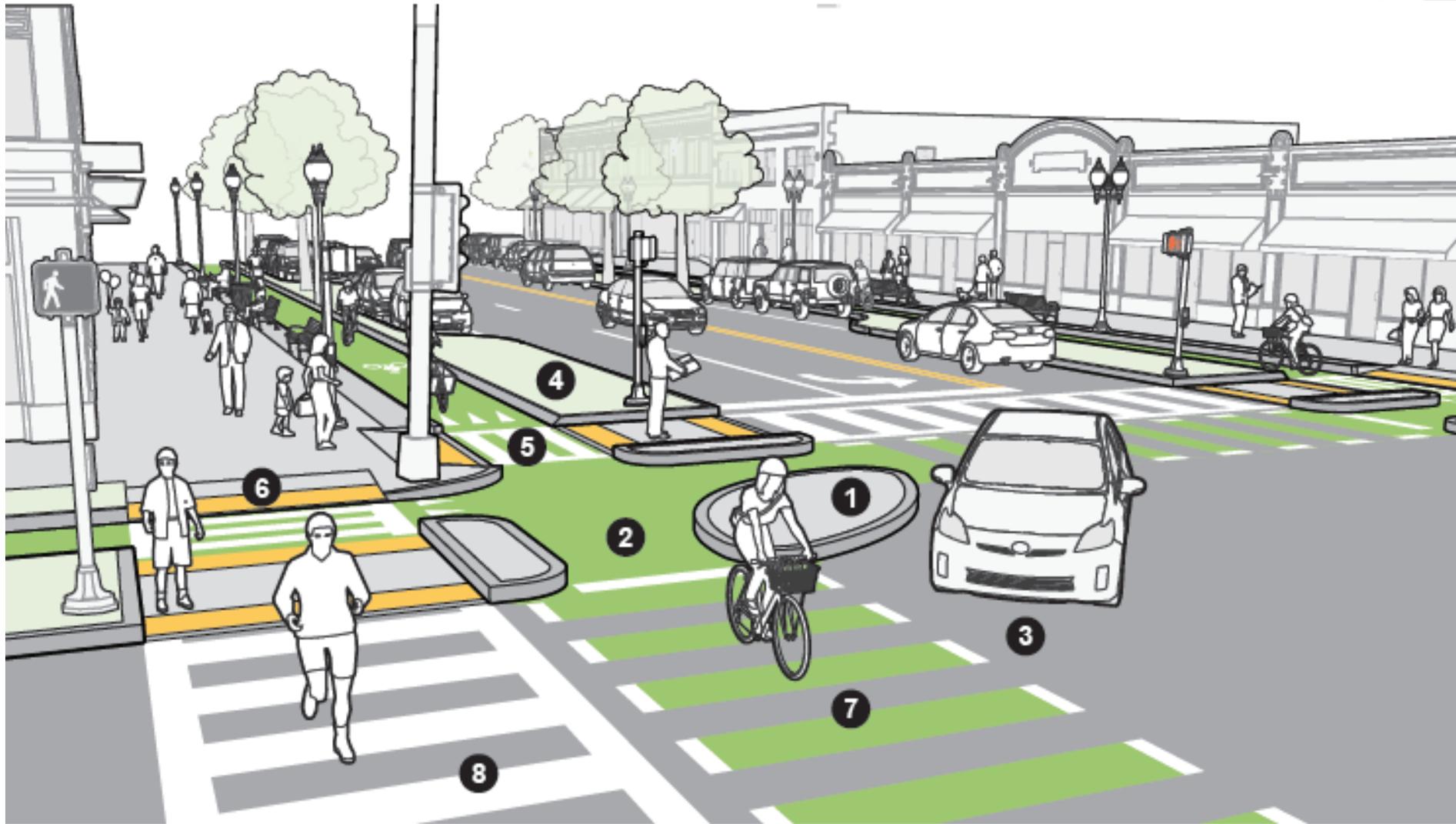
-  truck turning envelope
-  mountable truck apron
-  recessed stop line



## legend

-  mountable truck apron

# Ultimate Separation? Protected Intersections



# IDOT's Complete Streets Policy

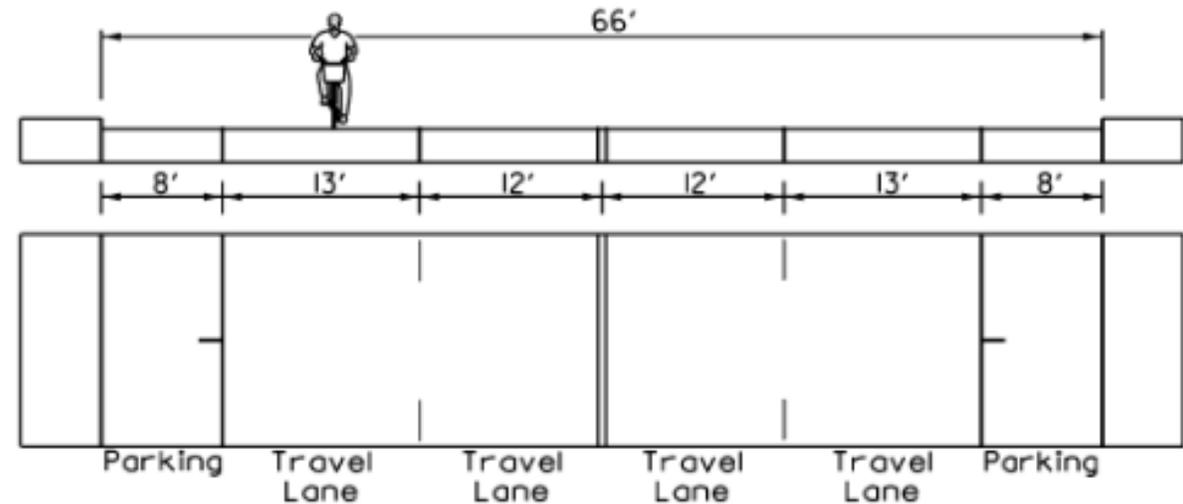
- ▶ Updated BDE Manual Chapter 17 was issued 8/30/19
- ▶ Based on the Illinois Complete Streets law
- ▶ Provides guidance for all state projects as of 8/30/19
- ▶ BLRS Chapters 41 and 42 continue to apply on local projects
- ▶ Use Forms BDE 1702 and BDE 1703 for documentation
- ▶ Applies to new construction, reconstruction, rehabilitation and resurfacing projects
- ▶ Coordination, questions, and form submittals, should continue to come through Jon McCormick

# 'Context' and New Features (Introduction, 17-1)

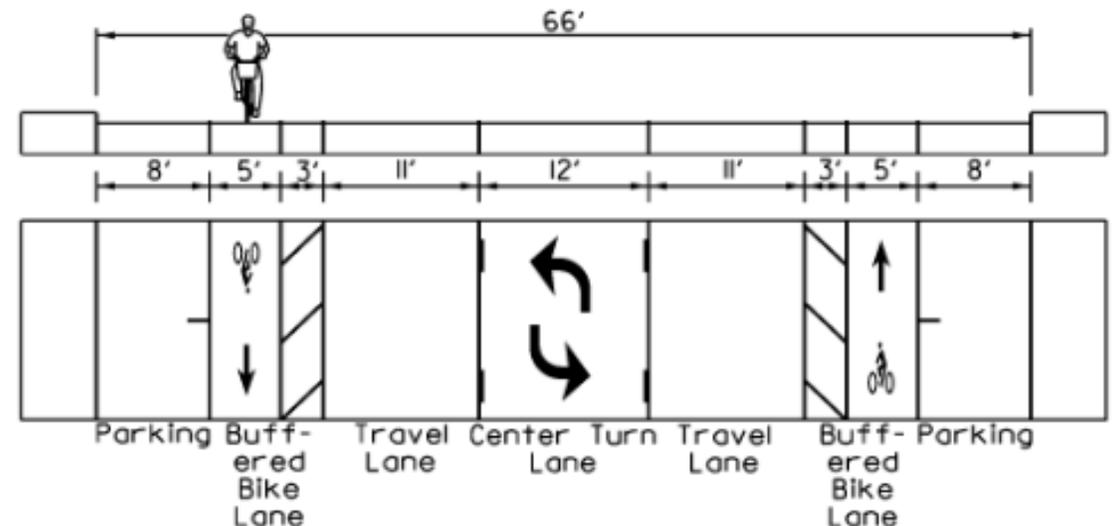
- ▶ Five AASHTO (GB7) classifications
  - Rural, Rural Town, Suburban, Urban, Urban Core - **Contexts**
  - Design decisions based on the *existing* and *future* corridor
- ▶ Policy includes *newer* bicycle features/considerations
  - Road Diets
  - Buffered Bike Lane
  - Separated Bike Lane (SBL)
  - Bicycle Box
  - Two-Stage Bicycle Turn Box
  - Bicycle Level of Service (BLOS)
  - Urban, Suburban, and Rural Roadways - **Context related**

# On-Road Bikeways – Road Diets (17-2.02(g))

- ▶ Reduce # of traffic lanes
- ▶ Reduce width of traffic lanes
- ▶ Adjust/ add/ convert median (primarily for pedestrian refuge)
- ▶ Remove parking
- ▶ Proven safety benefits based on speed reduction, improved BLOS



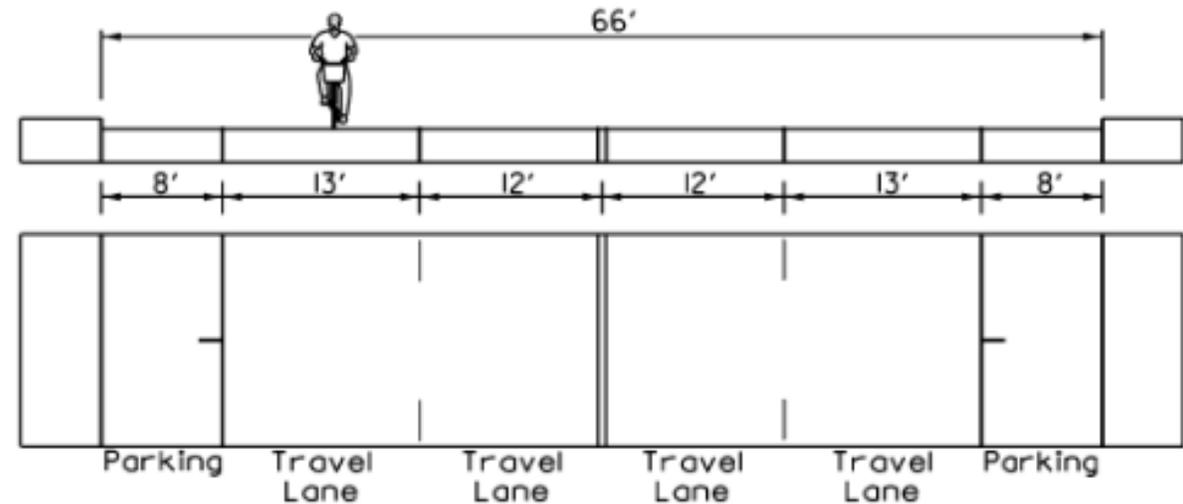
EXAMPLE EXISTING ROADWAY-BEFORE RECONFIGURATION



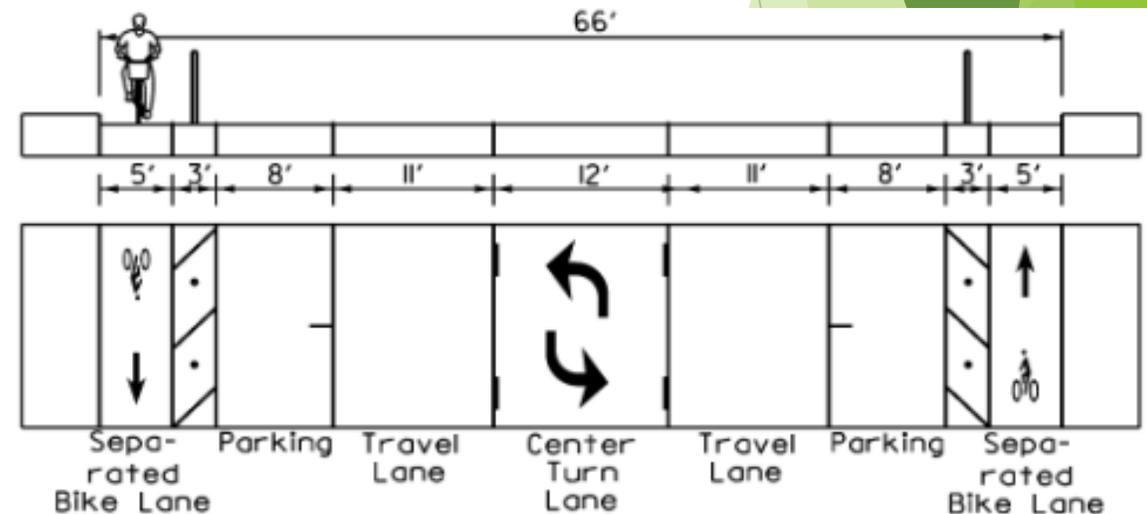
EXAMPLE PROPOSED ROADWAY WITH BUFFERED BIKE LANES

# On-Road Bikeways – Road Diets (17-2.02(g))

- ▶ Consider signal adjustments, upstream traffic operations
- ▶ Provide accommodations at each end of the road diet
- ▶ Coordinate using CSS process including public meeting(s)



EXAMPLE EXISTING ROADWAY-BEFORE RECONFIGURATION



EXAMPLE PROPOSED ROADWAY WITH SEPARATED BIKE LANES

# Road Diets

- ▶ Seeking 4-to-3 road diet opportunities to add bike accommodations
- ▶ New focus: urban resurfacing projects
- ▶ 2019 Policy includes operational requirements, public involvement, local coordination, and performance monitoring



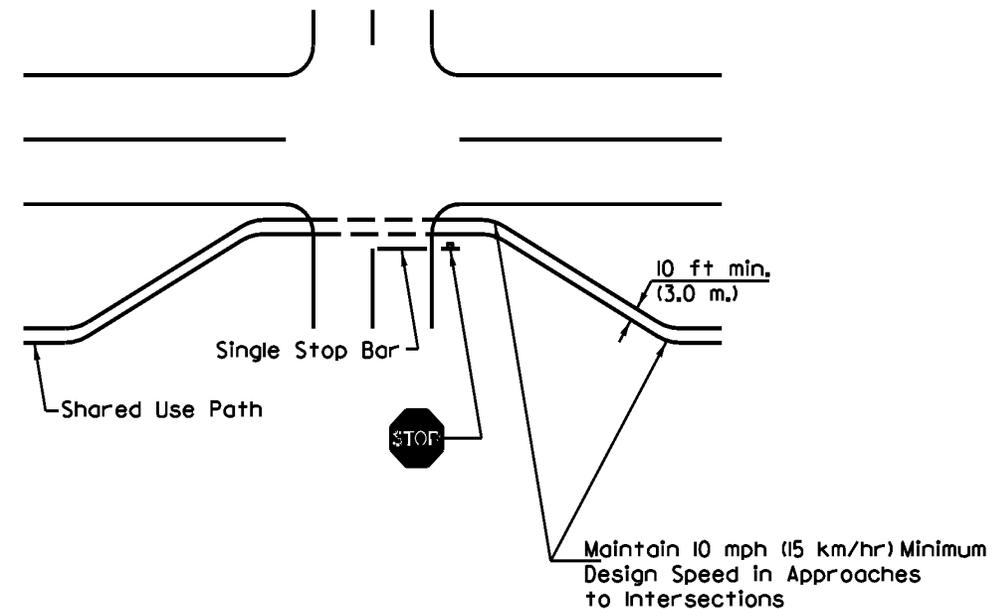
Chicago, IL



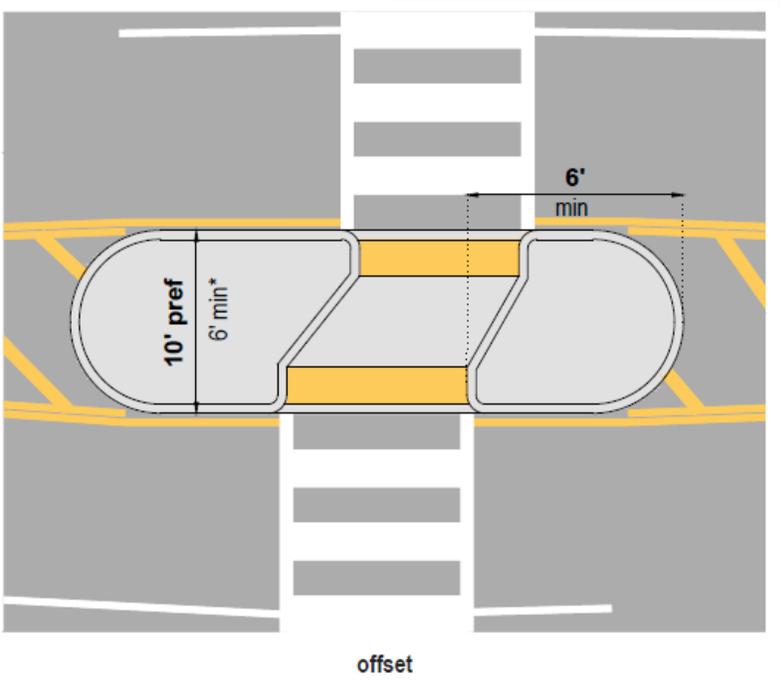
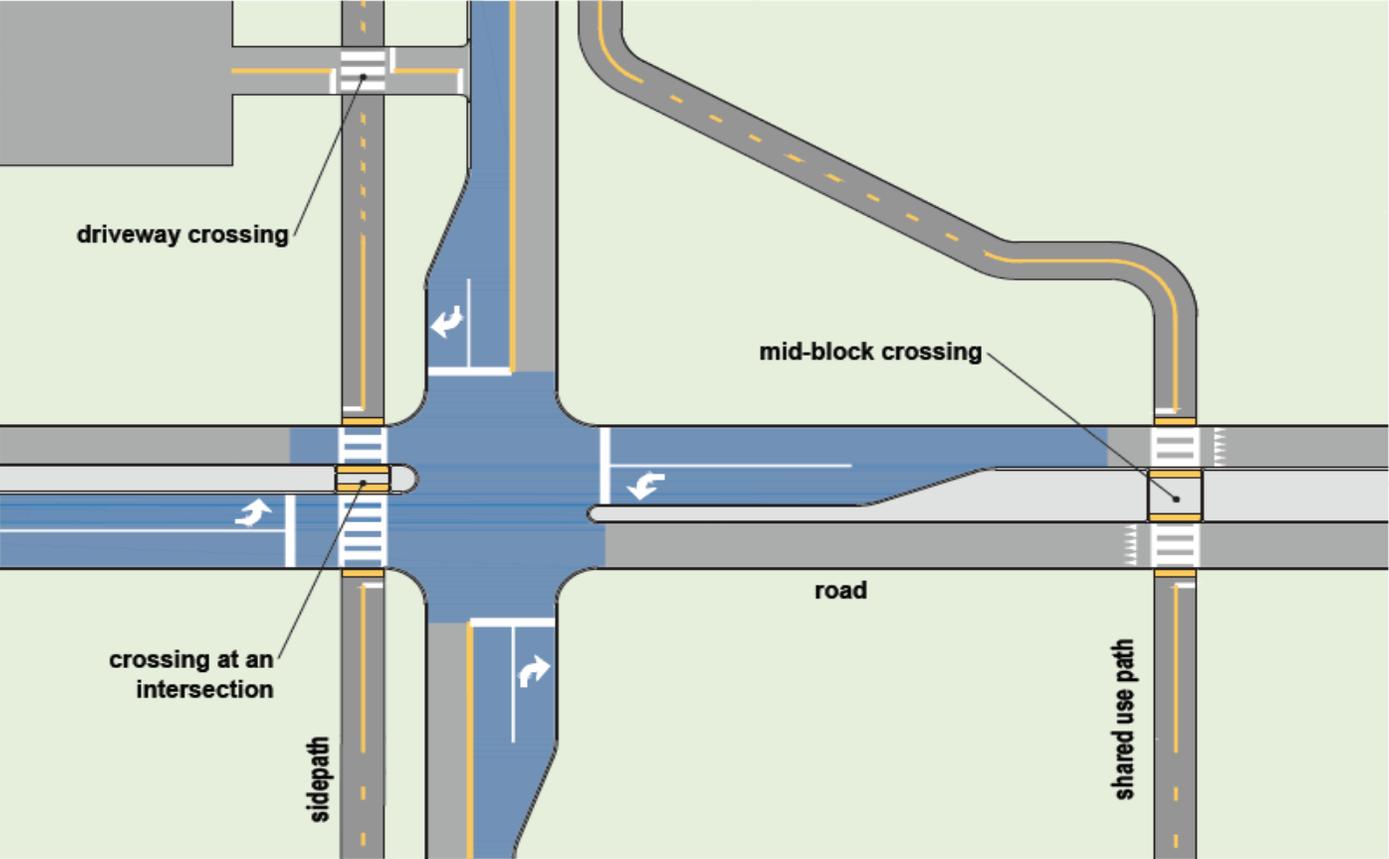
Chicago, IL

# Shared Use Paths – Safety and Clearance (17-2.03(c-1))

- ▶ 10 ft minimum paved width
- ▶ 10 ft minimum vertical clear (*des.*)
- ▶ 10 mph design speed option added (for intersection approaches)
- ▶ >7 ft from EOP traffic lane (or barrier separated)
- ▶ Paths cross at intersections in “sidewalk fashion”
- ▶ 5% maximum grades (or match grade of roadway)



# Shared Use Paths (17-2.03)



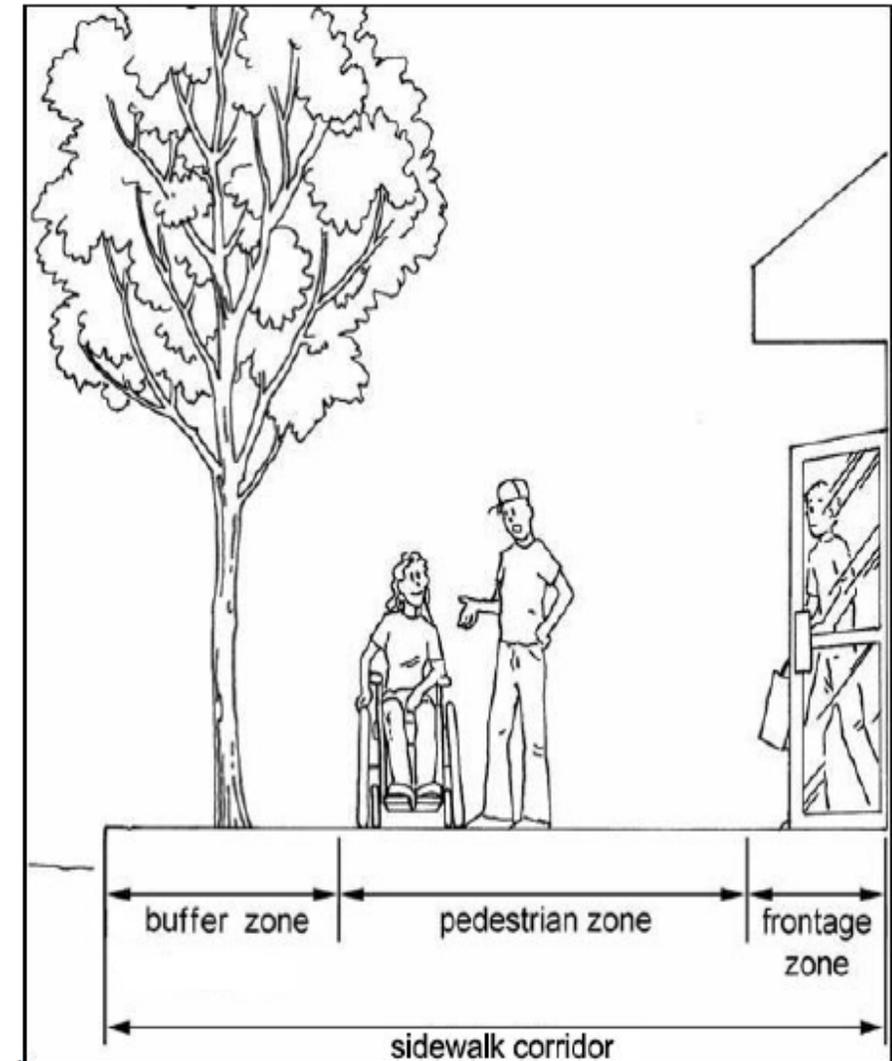
- legend**
- functional area of intersection
  - road and driveway
  - path
  - median

# BDE Complete Streets Policy (Pedestrians)

- ▶ 17-4 PEDESTRIAN ACCOMMODATIONS
  - ▶ 17-4.01 General
  - ▶ 17-4.02 Pedestrian Warrants - Needs Assessment
  - ▶ 17-4.03 Sidewalk Design Considerations
  - ▶ 17-4.04 Sidewalks on Highway Structures
  - ▶ 17-4.05 Intersection Crosswalks
  - ▶ 17-4.06 Midblock Crosswalks
  - ▶ 17-4.07 Safety Railings and Handrails
  - ▶ 17-4.08 Documentation
  - ▶ 17-4.09 Pedestrian Accommodations During Construction
  - ▶ 17-4.10 Maintenance and Jurisdiction

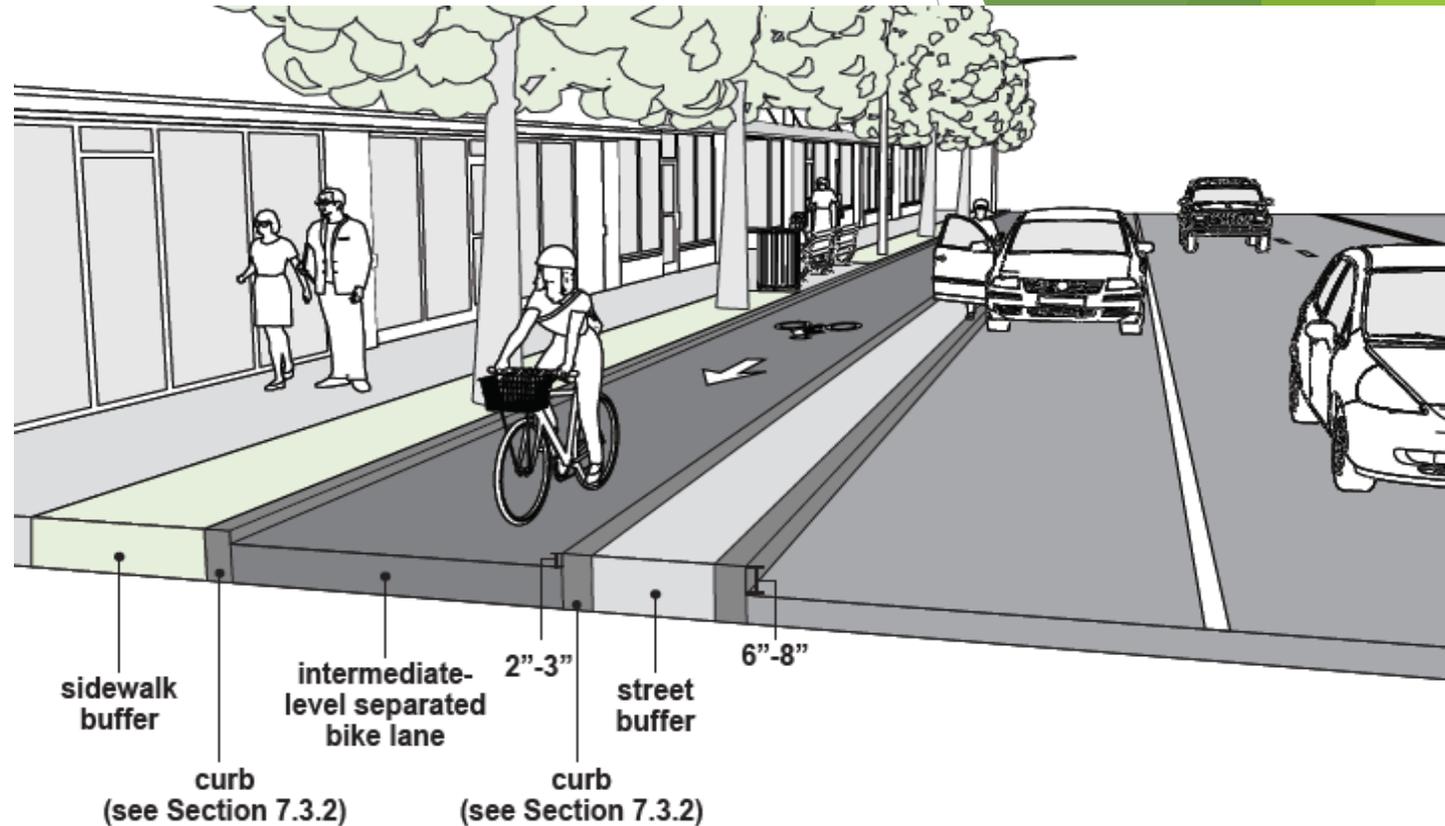
# Pedestrian Warrants and Design (17-4.01 - 4.03)

- ▶ Pedestrians are *typically* a design user in all contexts except Rural
- ▶ Accommodate pedestrians on *both sides*\* and at intersections (they will cross)
- ▶ \*But *one side* is better than none (suburban, rural town contexts)



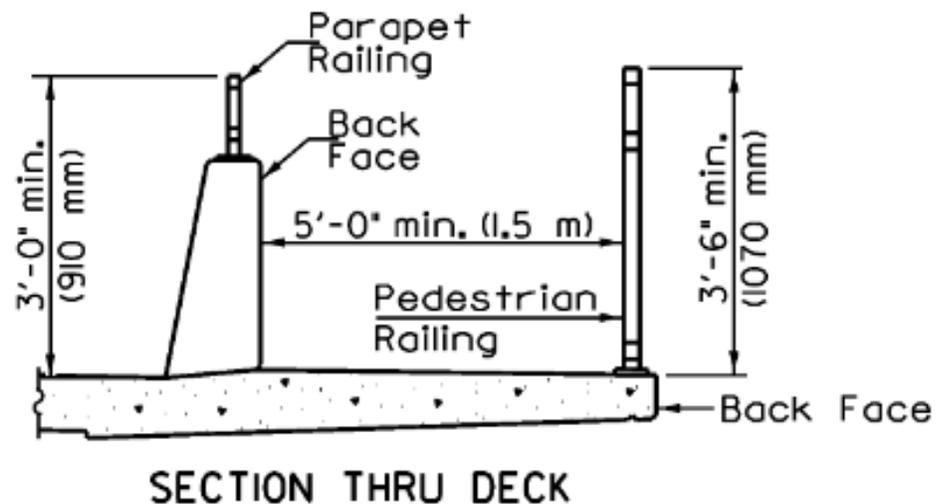
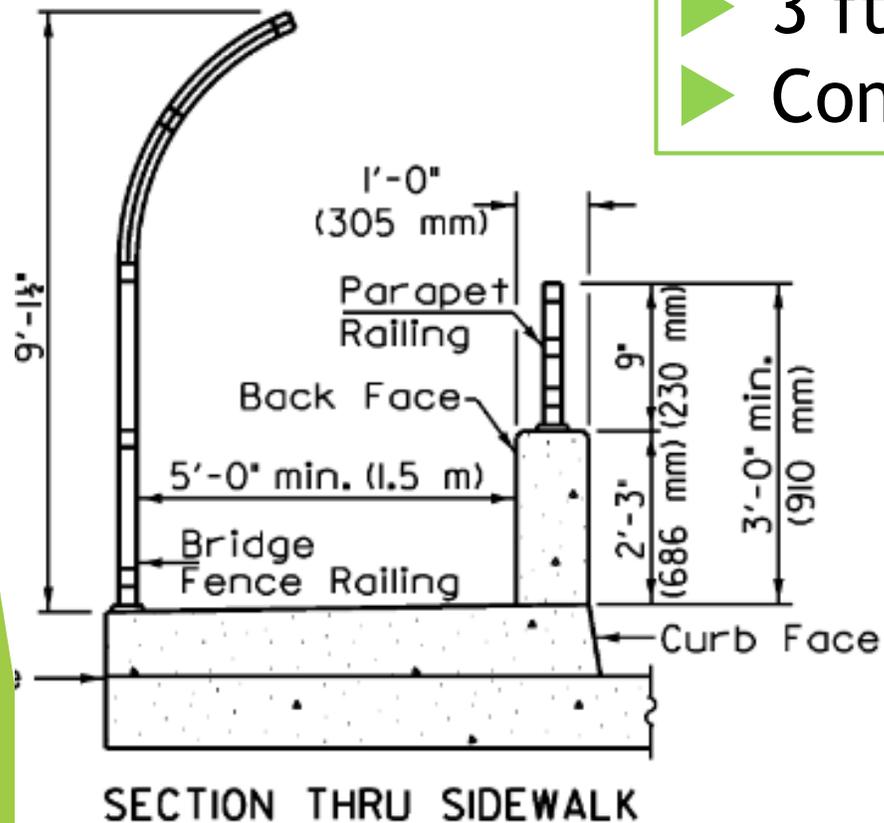
# Pedestrian Warrants and Design (17-4.01 - 4.03)

- ▶ Make facilities *fully accessible*
- ▶ Consider ‘enhanced lateral offset’ for features in the pedestrian zone
- ▶ Network considerations may lead to extensions beyond initial project limits



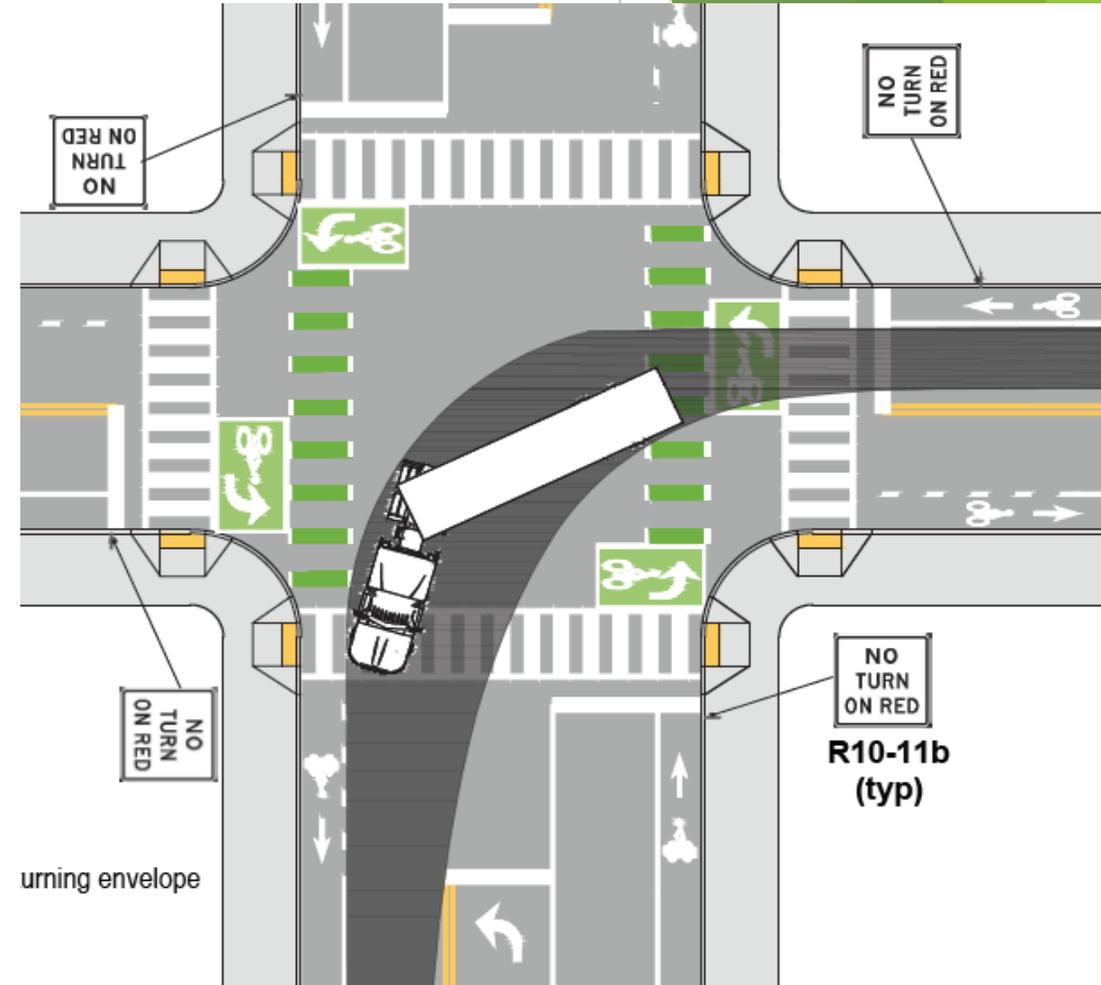
# Pedestrian Accommodations on Structures (17-4.04)

- ▶ Use Vertical Barriers for > 40 mph and for areas of safety concern at lower speeds
- ▶ 3 ft - 0 in. min height for traffic separation
- ▶ 3 ft - 6 in. min height at structure edge
- ▶ Consider future and retrofit issues



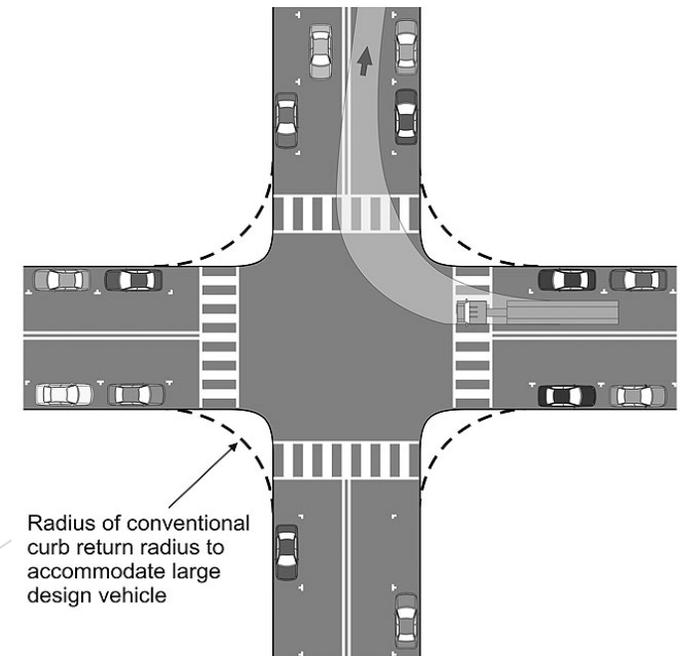
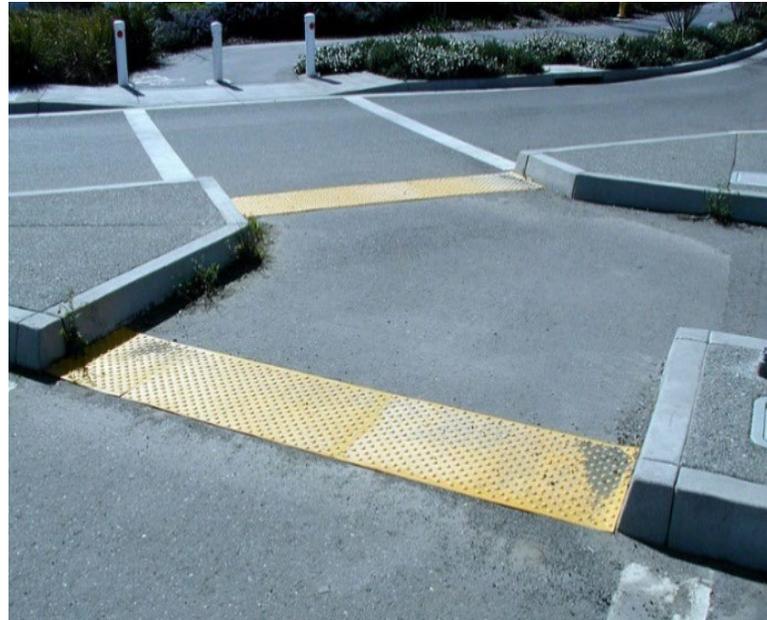
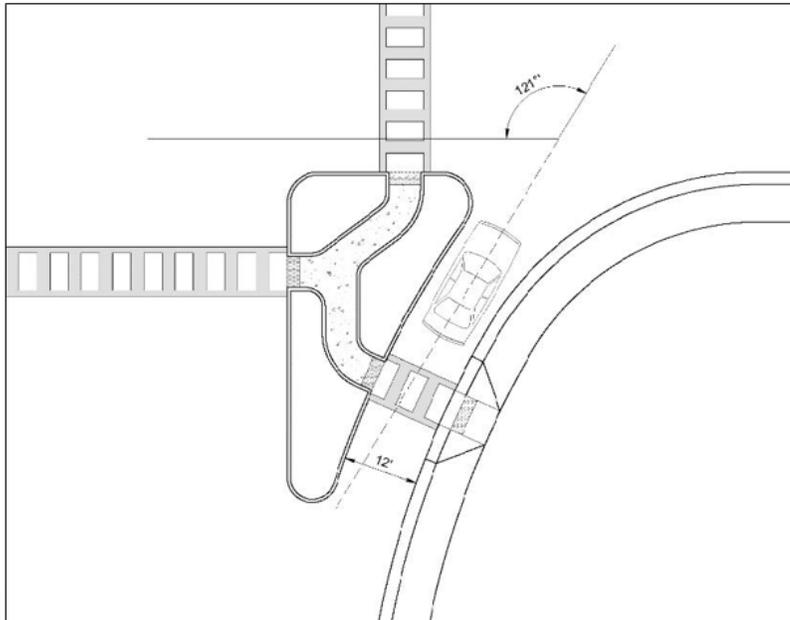
# Pedestrian Crosswalks at Intersections (17-4.05)

- ▶ Cut-through refuge areas (6 ft min face-face) can reduce exposure
- ▶ Lead Pedestrian Interval signals elevate safety versus vehicle ops
- ▶ Longitudinal markings are appropriate for select high-use crosswalks  
(use Engineering Judgement)



# Pedestrian Refuges and Visibility - Intersections

- ▶ Substantial refuge areas & right angle crosswalks
- ▶ Pushbuttons and ped signal heads for each crosswalk
- ▶ Tighter curb radii can improve safety performance and curb ramp design



# LPI

- ▶ Expanding implementation of LPI in urban/suburban contexts with substantial pedestrian activity
- ▶ Operations Policy (late 2019) will help identify appropriate conditions for LPI

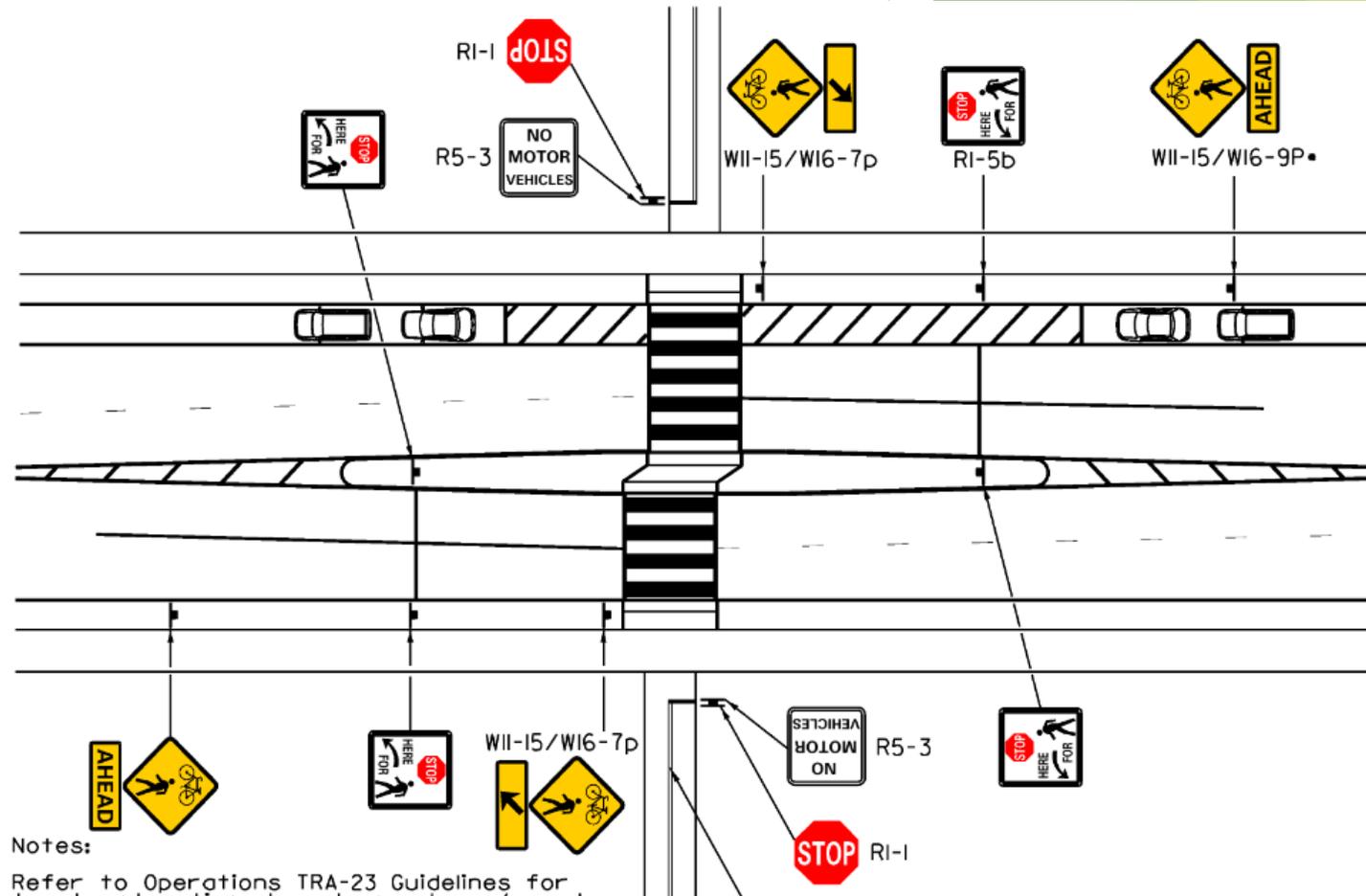


Springfield, IL

# Pedestrian Crosswalks at Midblock (17-4.06)

- ▶ Operations policy TRA-23
- ▶ Longitudinal markings
- ▶ Bump-outs and refuges (sight lines, crossing distances, exposure)
- ▶ Beacons (rural), RRFBs, PHBs - all ped-activated

72% of pedestrian fatalities occur at non-intersection locations



Notes:

Refer to Operations TRA-23 Guidelines for treatment options based on volumes/speeds.

General illustration of 'Treatment 3' with refuge is shown.

Refer to MUTCD for dimensions.

Restrict parking and consider curb bump-outs to provide adequate sight distance.

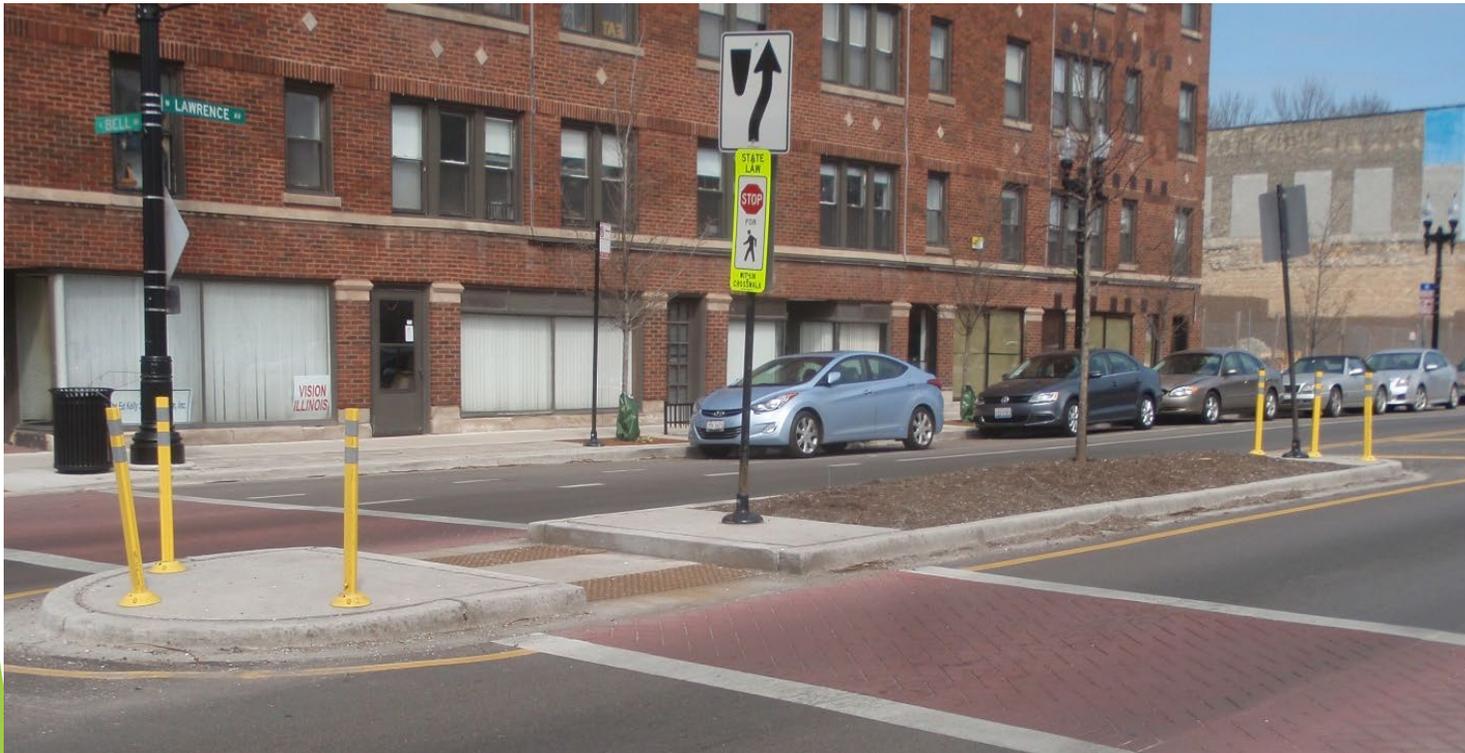
Optional centerline striping on approach

# Pedestrian Refuges and Visibility - Midblock

- ▶ Consider all sight lines
- ▶ Apply site-specific lighting design



Evanston, IL



Chicago, IL

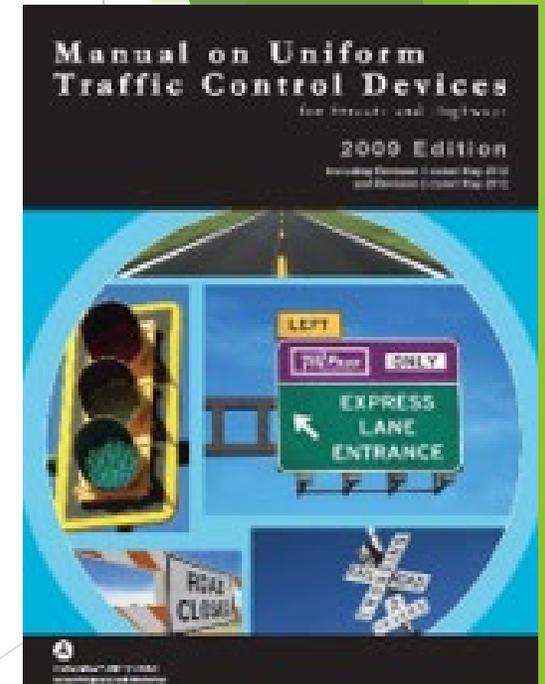
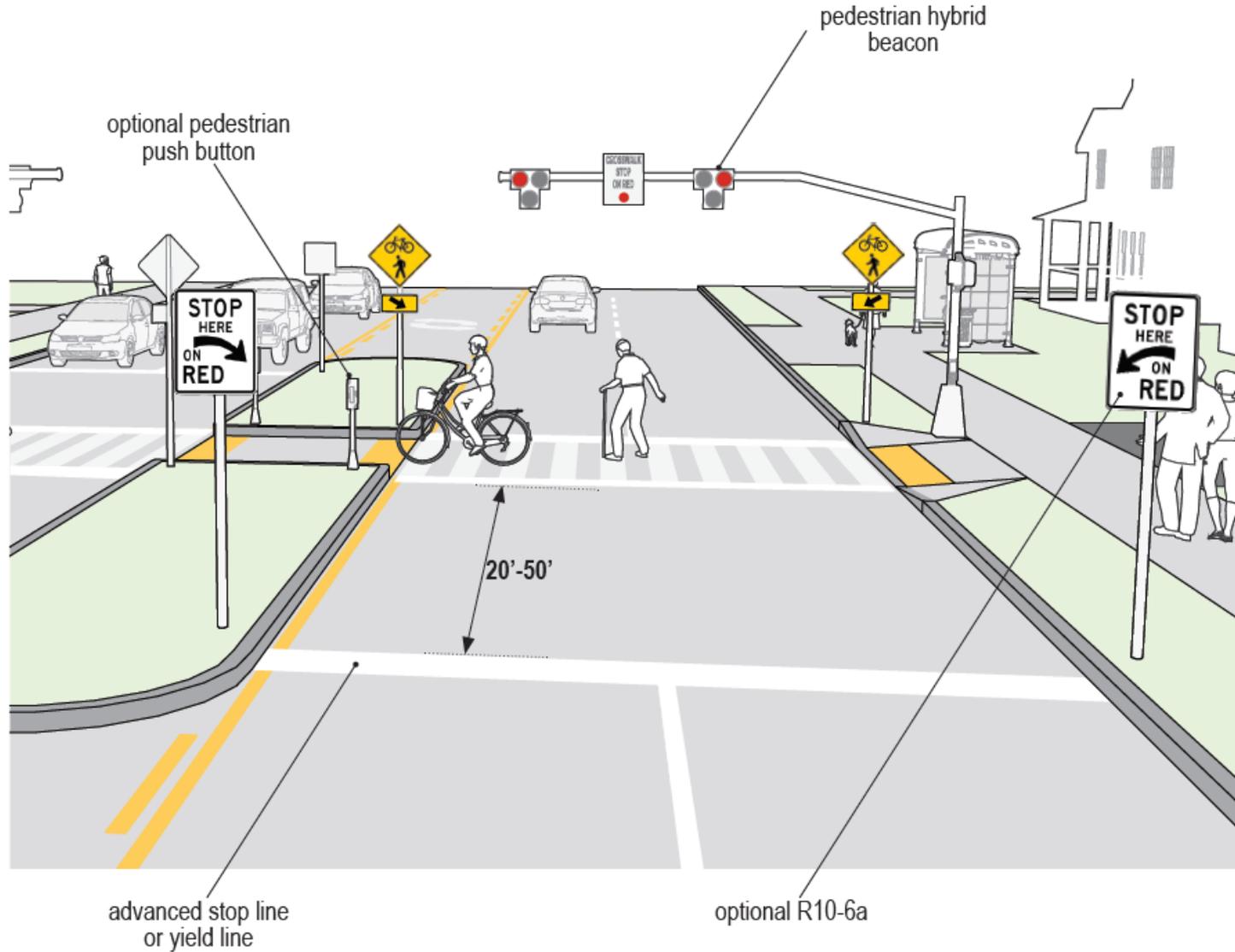


# RRFB

- ▶ Statewide *Interim Approval*
- ▶ Several locations proposed using Illinois' Safe Routes to School funding (2019)
- ▶ Improves driver recognition of crosswalk locations and pedestrian activity



# PHB



# PHB

- ▶ For higher-speed, higher volume, multilane situations
- ▶ An option between a flashing beacon/RRFB and a full pedestrian traffic signal
- ▶ Included in both Operations and Design policies in 2019
- ▶ IDOT is finalizing review of U.S. PHB use and experience, will adjust policy



Pekin, IL

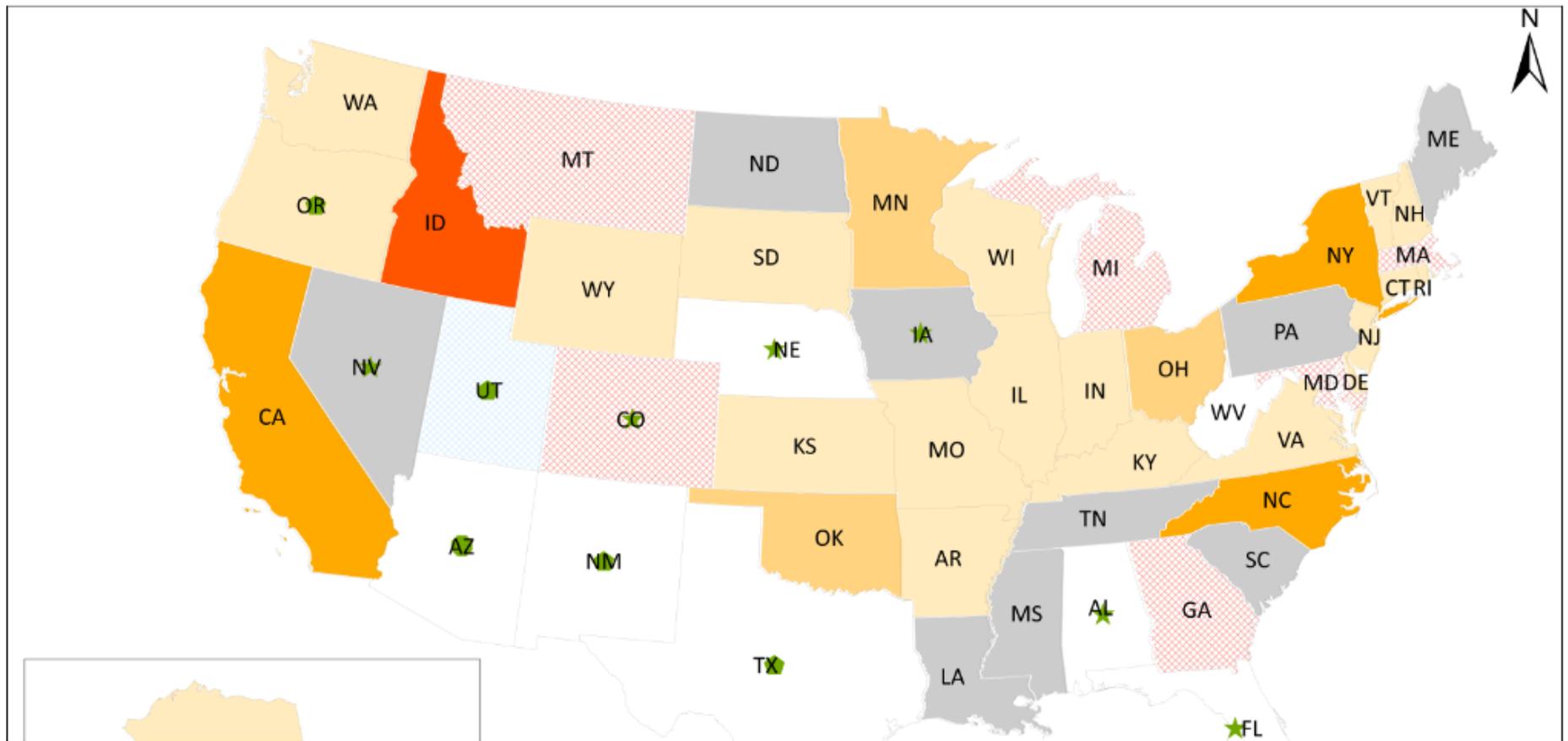


R1-5b



R1-5c

# PHB use in the USA



## Legend

### Official Data (Installed By State DOT/On State System)

- 0 (10 States)
- 1-7 (19 States)
- 8-13 (3 States)
- 14-50 (3 States)
- More than 50 (1 State)
- Official Data Unavailable (14 States)

### Unofficial Data (Installed By State DOT/On State System)

- 1-7 (6 States)
- More than 8 (1 State)

### Unofficial Data (Installed By Local Agency)

- 1-7 (6 States)
- 8-28 (4 States)
- More than 190 (1 State)

1,050 1,400 Miles

# Facility Reports: Layout and Structure

## ► Volume 1 - Overall Findings

- Summary of overall findings on various treatments
- Facility Summaries & Application Matrices
- Appendix - Data Collection Tools, CMF, etc.

## ► Volume 2 - Bicycle Facility Reports

- Bicycle Lanes
- Shared Roadways
- Markings
- Signals

## ► Volume 3 - Pedestrian Facility Reports

- Geometric Improvements
- Signal Improvements
- Others



# Facility Reports: Infrastructure Measures

| Bicycle        |                       |    | Pedestrian         |                                    |    |
|----------------|-----------------------|----|--------------------|------------------------------------|----|
| Category       | Facility              | #  | Category           | Facility                           | #  |
| Bicycle Lanes  | Conventional          | 1  | Geometrics         | Median Refuge Islands              | 11 |
|                | Buffered              | 2  |                    | Raised Crosswalks                  | 12 |
|                | Contra-Flow           | 3  |                    | Curb Bump Outs                     | 13 |
|                | Left-Side             | 4  | Signals            | Pedestrian Hybrid Beacons          | 14 |
|                | Separated             | 5  |                    | Rectangular Rapid Flashing Beacons | 15 |
| Shared Roadway | Bicycle Boulevards    | 6  | Lighted Crosswalks | 16                                 |    |
|                | Widened Shoulders     | 7  | Signal Phasing     | 17                                 |    |
|                | Road Diets            | 8  | Pedestrian Signals | 18                                 |    |
| Markings       | Intersection Markings | 9  | Other              | Red Light Cameras                  | 19 |
| Signals        | Bicycle Signal Heads  | 10 |                    | Crosswalk Enhancements             | 20 |

# Facility Reports: Facility Summaries

## Example

Summary Description

**Facility Summary**  
ILLINOIS DEPARTMENT OF TRANSPORTATION, DISTRICT ONE, BICYCLE & PEDESTRIAN ACCOMMODATIONS STUDY

**Pedestrian Hybrid Beacon**

A pedestrian hybrid beacon (PHB), which includes the crossing device known as a High-Intensity Activated crosswalk (HAWK) signal, was designed by engineers in Arizona to aid pedestrians in crossing streets and raise motorist awareness. PHBs remain dormant until they are activated by a pedestrian. Once activated, the PHB has a sequence of five displays indicating what the motorist or pedestrian must do. Motorists are not obligated to stop unless the signal is activated by a pedestrian. PHBs are an FHWA approved device governed by Chapter 4F of the 2009 MUTCD. They can be installed midblock or at an intersection.

| 2L    | 3L     | ML   |
|-------|--------|------|
| INT   |        | MBLK |
| L     | C      | A    |
| R     | S      | U    |
| <10K  | 10-25K | >25K |
| ≤\$30 | 35-45  | ≥50  |



Figure 1 - PHB at a shared use path crossing in Pekin, Illinois

| Benefits   | Considerations  |
|--|---|
| <ul style="list-style-type: none"> <li>Increases pedestrian/crosswalk visibility for road users</li> <li>Reduces vehicle/pedestrian crashes</li> </ul> | <ul style="list-style-type: none"> <li>May increase certain crash types at roundabouts although current research is inconclusive</li> </ul> |

Impact Summary Table

Facility Picture

**Facility Summary** **Rectangular Rapid Flashing Beacons**

ILLINOIS DEPARTMENT OF TRANSPORTATION, DISTRICT ONE, BICYCLE & PEDESTRIAN ACCOMMODATIONS STUDY

A rectangular rapid flashing beacon, or RRFB, is a pedestrian-activated warning beacon designed to aid pedestrians in crossing streets, and is an innovative alternative to traditional flashing beacons. These beacons are installed in conjunction with and to supplement standard pedestrian or school crossing signs located at a marked crosswalk. They can be installed at midblock or uncontrolled intersections and at roundabouts, and in areas with heavy pedestrian and school traffic. When activated, the LED lights flash rapidly in an irregular, alternating pattern, alerting motorists to pedestrians attempting to cross the street. RRFBs have increased motorist yielding rates at every location studied.

| 2L    | 3L     | ML   |
|-------|--------|------|
| INT   |        | MBLK |
| L     | C      | A    |
| R     | S      | U    |
| <10K  | 10-25K | >25K |
| ≤\$30 | 35-45  | ≥50  |



Figure 1 - Midblock RRFB located on Madison Street between Millennium Park and the Art Institute in Chicago

|                    | Benefits  | Considerations   |
|--------------------|---|--|
| <b>SAFETY</b>      | <ul style="list-style-type: none"> <li>Increases awareness of pedestrians</li> <li>Can alert motorists to unsignaled crossings, midblock crossings, or crossings that are otherwise not expected</li> <li>Improves motorist compliance rates</li> </ul> | <ul style="list-style-type: none"> <li>Overuse may reduce effectiveness</li> </ul>   |
| <b>OPERATIONS</b>  | <ul style="list-style-type: none"> <li>Can reduce pedestrian wait times through improved motorist stopping compliance</li> <li>Does not increase motorist delay</li> <li>Can be used at roundabouts with minimal delay changes</li> </ul>               | <ul style="list-style-type: none"> <li>Motorists may be unfamiliar with these beacons due to their relative newness in Illinois</li> </ul> |
| <b>MAINTENANCE</b> | <ul style="list-style-type: none"> <li>Low cost</li> <li>Minimal maintenance</li> <li>Solar powered and independent of electrical grid</li> </ul>   | <ul style="list-style-type: none"> <li>Enhanced pedestrian detection systems may require additional upkeep</li> </ul>                      |

Facility Type Icon

**Facility Summary**

ILLINOIS DEPARTMENT OF TRANSPORTATION, DISTRICT ONE, BICYCLE & PEDESTRIAN ACCOMMODATIONS STUDY

**Median Refuge Islands**

Median refuge islands are intended to make street crossings safer and easier. They separate crossings into two phases so the pedestrian has only one direction of traffic to cross at a time. The island provides a safe and visible place to wait. Median refuge islands are ideal on roadways with high traffic volumes and wide street widths, and also higher speeds in certain situations. They can also be used at signalized intersections to allow pedestrians with disabilities, seniors, children, and other pedestrians who cannot cross the entire crosswalk in one phase to make a partial crossing then safely wait for the next cycle to complete their crossing. They can facilitate bicycle crossings as well, especially on bicycle boulevards, and shared use path or trail crossings.

| 2L    | 3L     | ML   |
|-------|--------|------|
| INT   |        | MBLK |
| L     | C      | A    |
| R     | S      | U    |
| <10K  | 10-25K | >25K |
| ≤\$30 | 35-45  | ≥50  |

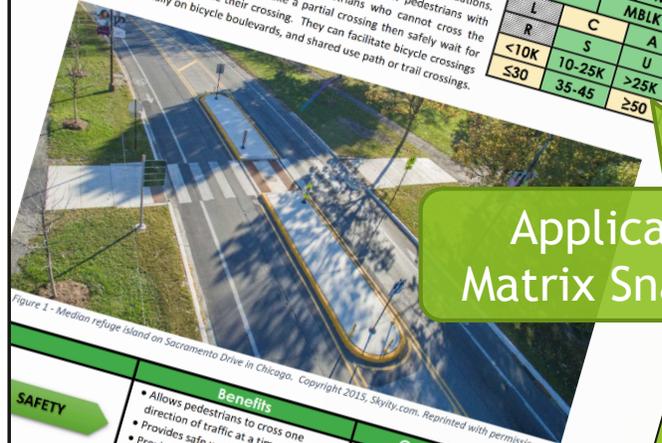


Figure 1 - Median refuge island on Sacramento Drive in Chicago. Copyright 2015, SkyCity.com. Reprinted with permission.

|                    | Benefits   | Considerations   |
|--------------------|--|--|
| <b>SAFETY</b>      | <ul style="list-style-type: none"> <li>Allows pedestrians to cross one direction of traffic at a time</li> <li>Provides safe waiting area in median</li> <li>Lighting at pedestrian crossings</li> <li>Reduces pedestrian crashes</li> </ul> | <ul style="list-style-type: none"> <li>Continuous medians may encourage higher vehicle speeds</li> <li>May induce a false sense of security in crossing pedestrians</li> </ul>   |
| <b>OPERATIONS</b>  | <ul style="list-style-type: none"> <li>Reduces the time a pedestrian has to wait to cross the road</li> </ul>  | <ul style="list-style-type: none"> <li>May interfere with truck and bus turns, depending on the road geometry</li> <li>May replace/eliminate a turn lane for vehicles</li> </ul> |
| <b>MAINTENANCE</b> |  | <ul style="list-style-type: none"> <li>May lead to increased maintenance costs for landscaping</li> </ul>  |

Application Matrix Snapshot

## Facility Summary

## Median Refuge Islands



ILLINOIS DEPARTMENT OF TRANSPORTATION, DISTRICT ONE, BICYCLE & PEDESTRIAN ACCOMMODATIONS STUDY

### SAFETY

- Allows pedestrians to cross one direction of traffic at a time
- Provides safe waiting area in median
- Provides space to potentially improve lighting at pedestrian crossings.
- Reduces pedestrian crashes

### Considerations

- Continuous medians may encourage higher vehicle speeds
- May induce a false sense of security in crossing pedestrians

### OPERATIONS

- Reduces the time a pedestrian has to wait to cross the road

- May interfere with truck and bus turns, depending on the road geometry
- May replace/eliminate a turn lane for vehicles

### MAINTENANCE

- May lead to increased maintenance costs for landscaping



Figure 1 - Median refuge island on Sacramento Drive in Chicago. Copyright 2015, Skyity.com. Reprinted with permission.



|                           | Benefits   | Considerations   |
|---------------------------|--|--|
| <p><b>SAFETY</b></p>      | <ul style="list-style-type: none"> <li>Increases pedestrian visibility</li> <li>Decreases pedestrian crossing distance</li> <li>Increases motorist compliance with state law requiring stopping for pedestrians within crosswalks</li> </ul>   | <ul style="list-style-type: none"> <li>May increase emergency vehicle response times</li> <li>May force bicyclists into the motorist travelled way if bicycle lane width reduced</li> </ul>  |
| <p><b>OPERATIONS</b></p>  | <ul style="list-style-type: none"> <li>Reduces traffic speeds</li> <li>Encourages slower vehicle turning speeds at intersections</li> <li>Discourages or prevents motorists from parking too close to an intersection/crosswalk and obstructing sight lines</li> <li>Decreases the length of the pedestrian phase</li> </ul> | <ul style="list-style-type: none"> <li>May cause traffic delays if number of lanes or lane widths are reduced</li> <li>May hinder travel for bicycles and emergency and transit vehicles</li> <li>May obstruct roadway surface drainage</li> </ul> |
| <p><b>MAINTENANCE</b></p> | <ul style="list-style-type: none"> <li>Minimal maintenance</li> <li>Can be used as a basin for storm water capture</li> </ul>  | <ul style="list-style-type: none"> <li>May impact street sweeping and snow removal operations</li> <li>May prompt utility relocations</li> </ul>   |

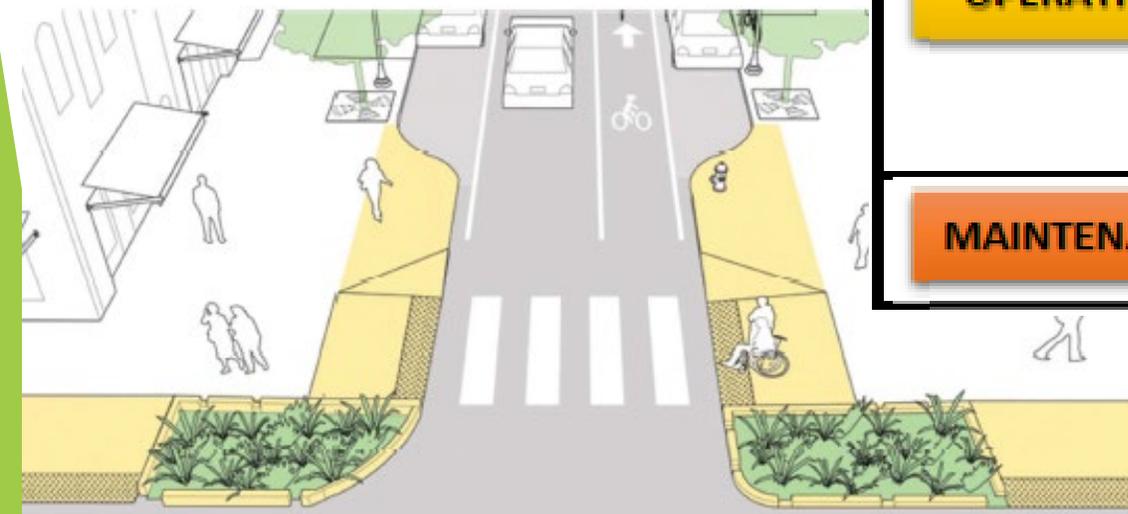


Figure 1 - Example of a curb bump out at an intersection. Image from Urban Bikeway Design Guide, by NACTO. Copyright © 2014 National Association of City Transportation Officials. Reproduced by permission of Island Press, Washington, D.C.

# National Direction and Illinois Pedestrian Policy

An Overview

Questions?  
Thank You!

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