U.S. Department of Transportation
Federal Highway Administration

Pedestrian and Bicycle Information Center

Designing for Pedestrian Safety

Interchanges

Presented by:

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Interchanges Learning Outcomes

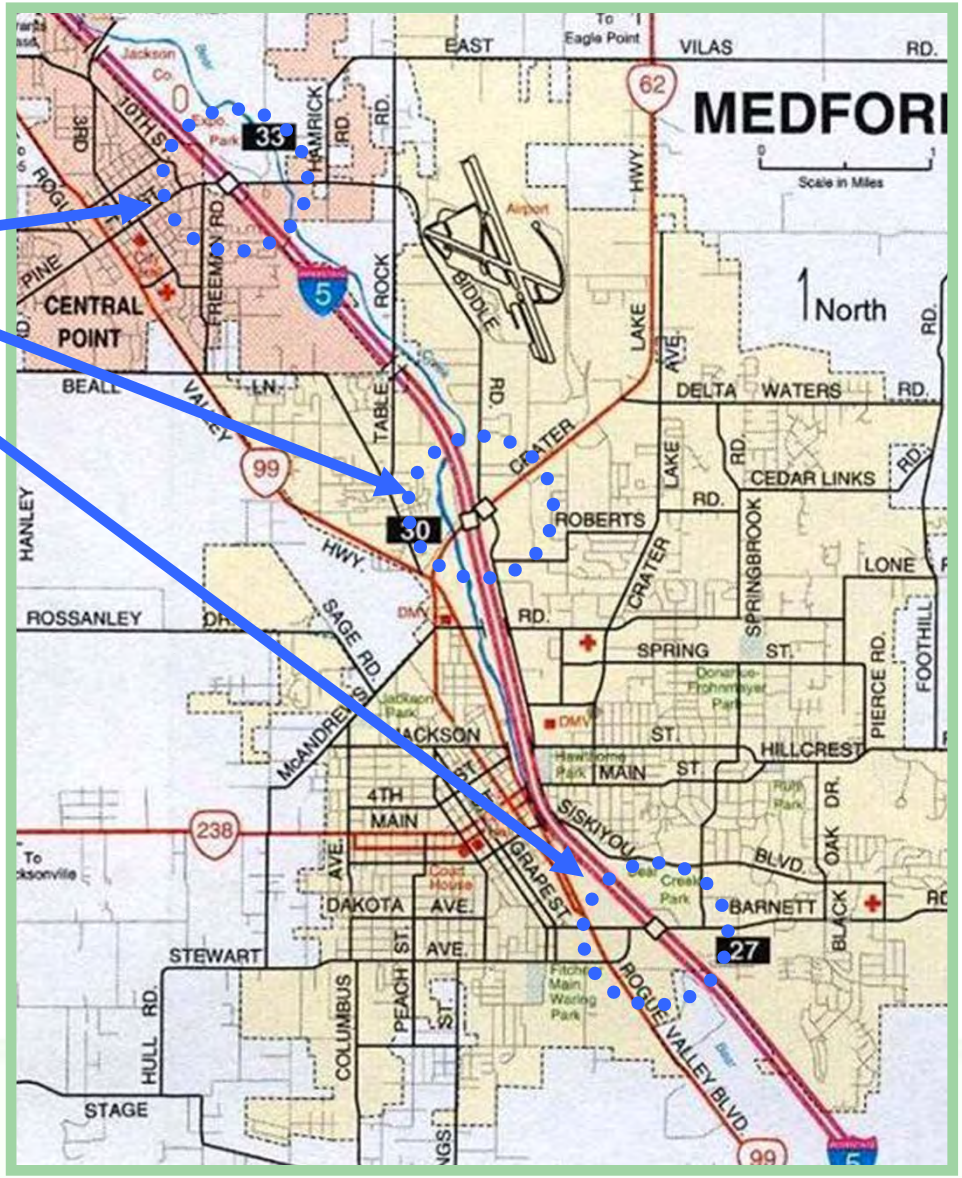
At the end of this module, you will be able to:

- **Identify how land uses around freeway interchanges create pedestrian trips**
- **Explain how and why pedestrian crashes occur at interchanges (driver expectation of pedestrians is very low; high-speed, free-flow movements)**
- **Select slow-speed, right-angle urban designs**

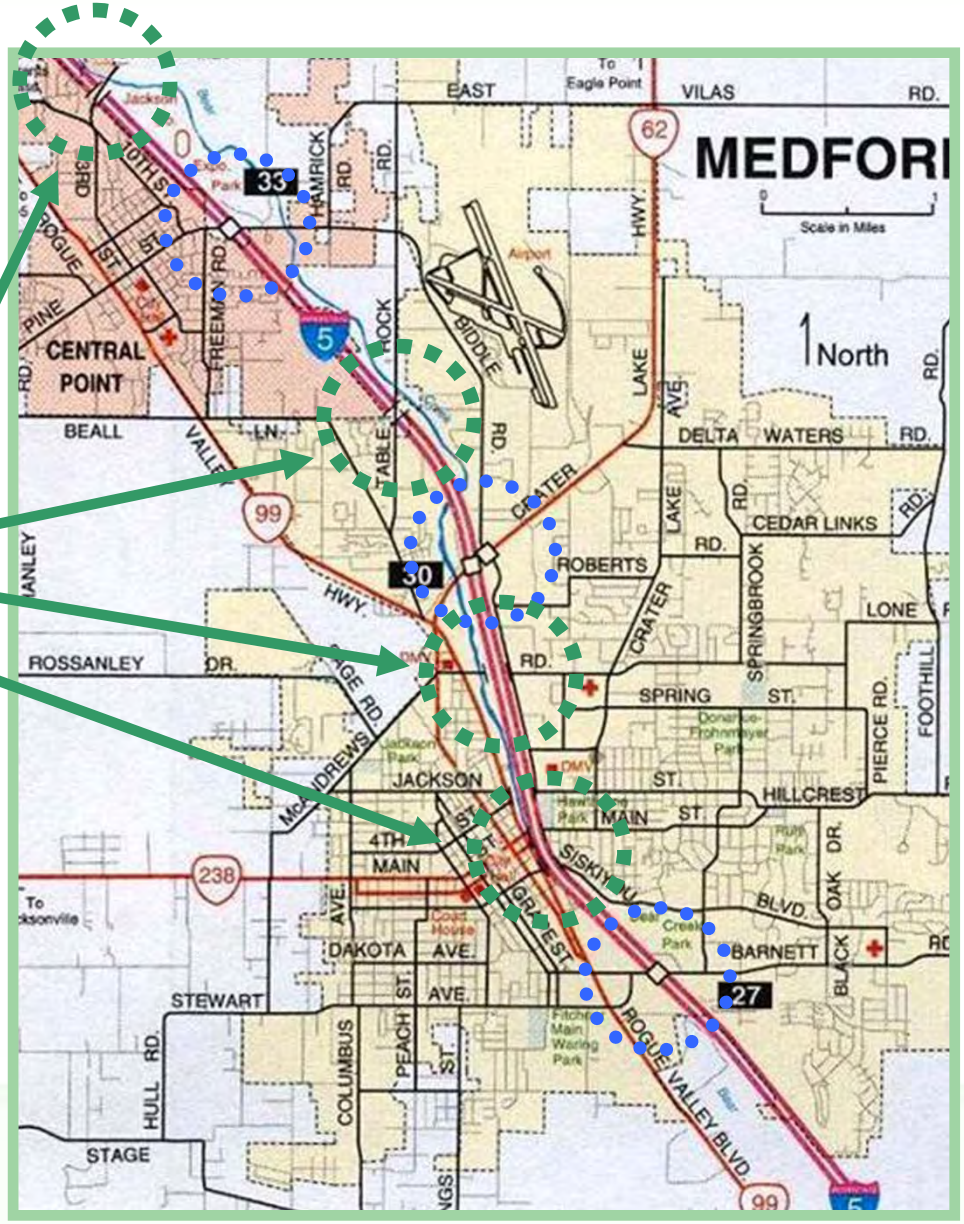
Land Use, Vehicles and Pedestrians

- Large commercial tracts generate traffic
- Employees walk to jobs at retailers, restaurants, service stations, & hotels
- Visitors walk to and from restaurants and hotels
- Pedestrians must cope with vehicles entering and exiting the freeway

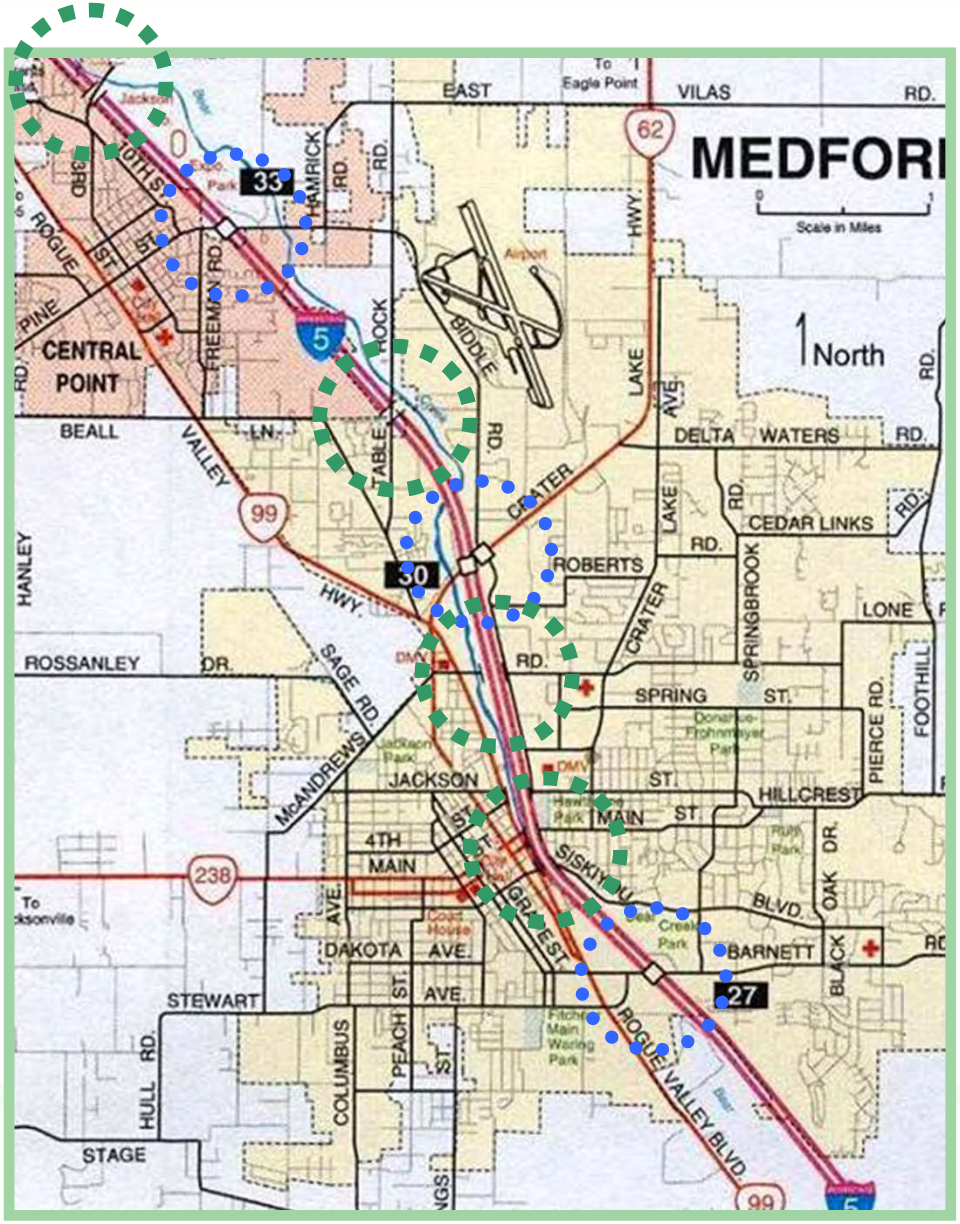
- **Typical city has a few freeway interchanges**



- Typical city has a few freeway interchanges
- And some non-interchange crossings

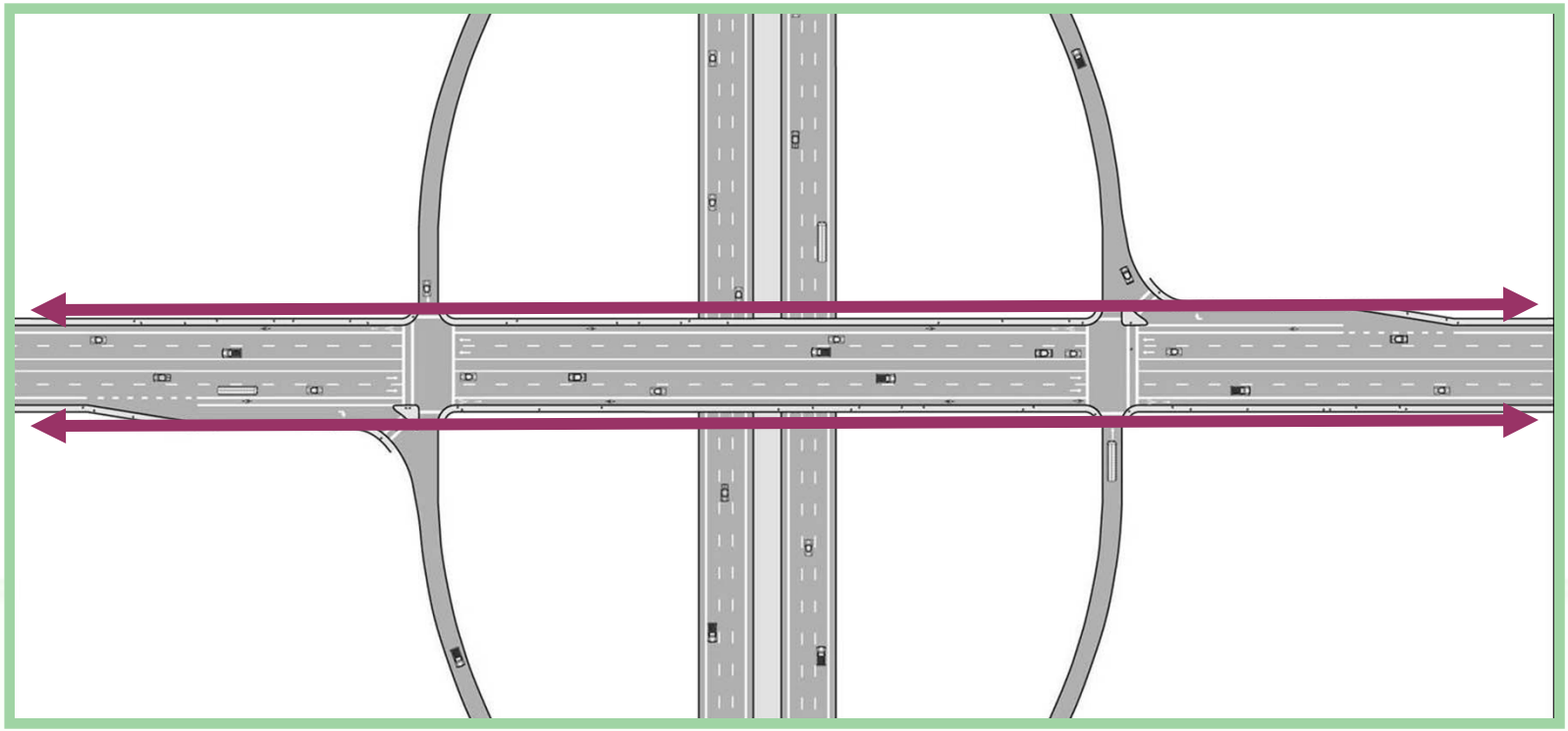


- Typical city has a few freeway interchanges
- And some non-interchange crossings
- Non- interchange crossings are easier for pedestrians
- Interchanges have many conflicts



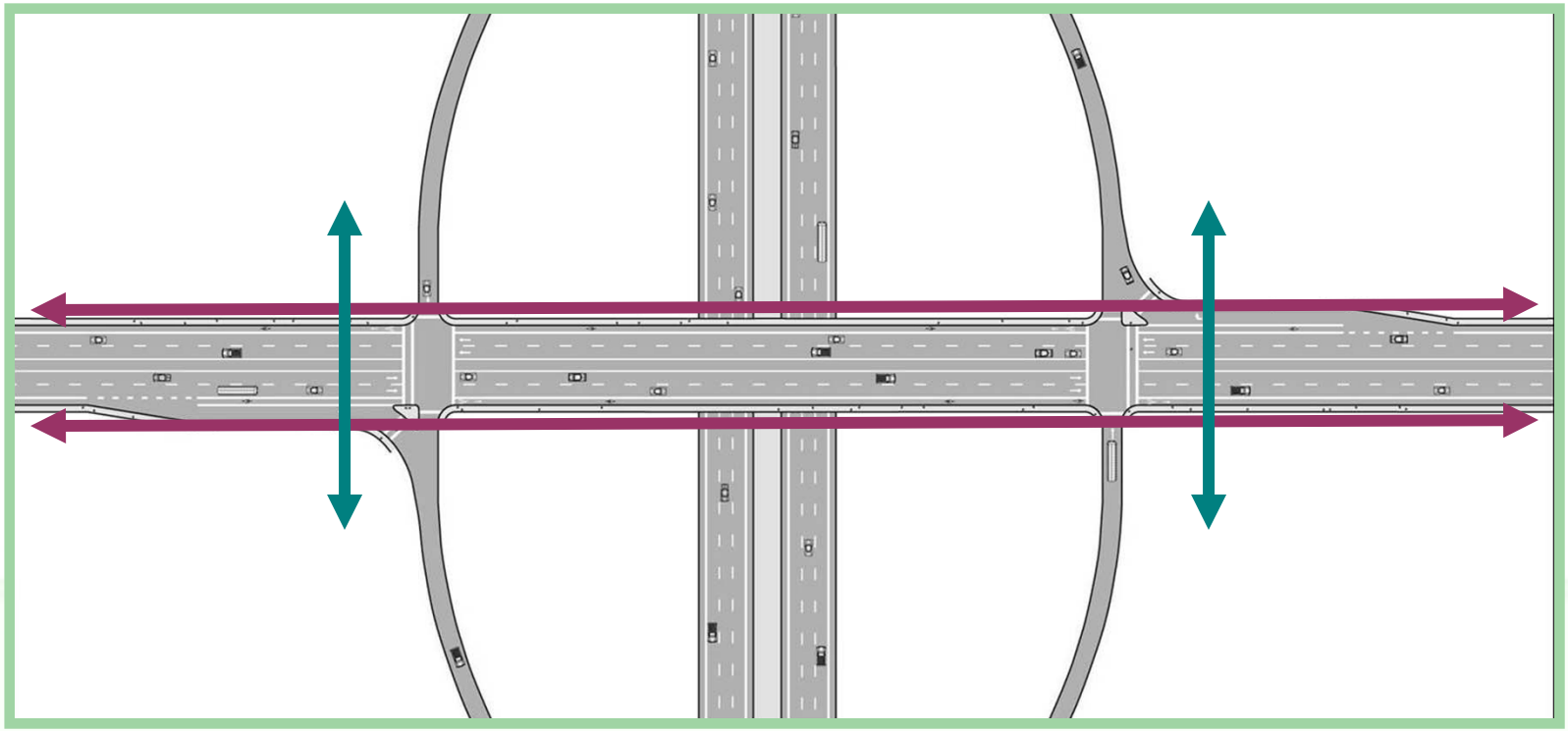
Accommodate all pedestrian movements:

1. Through interchange (east-west along arterial)

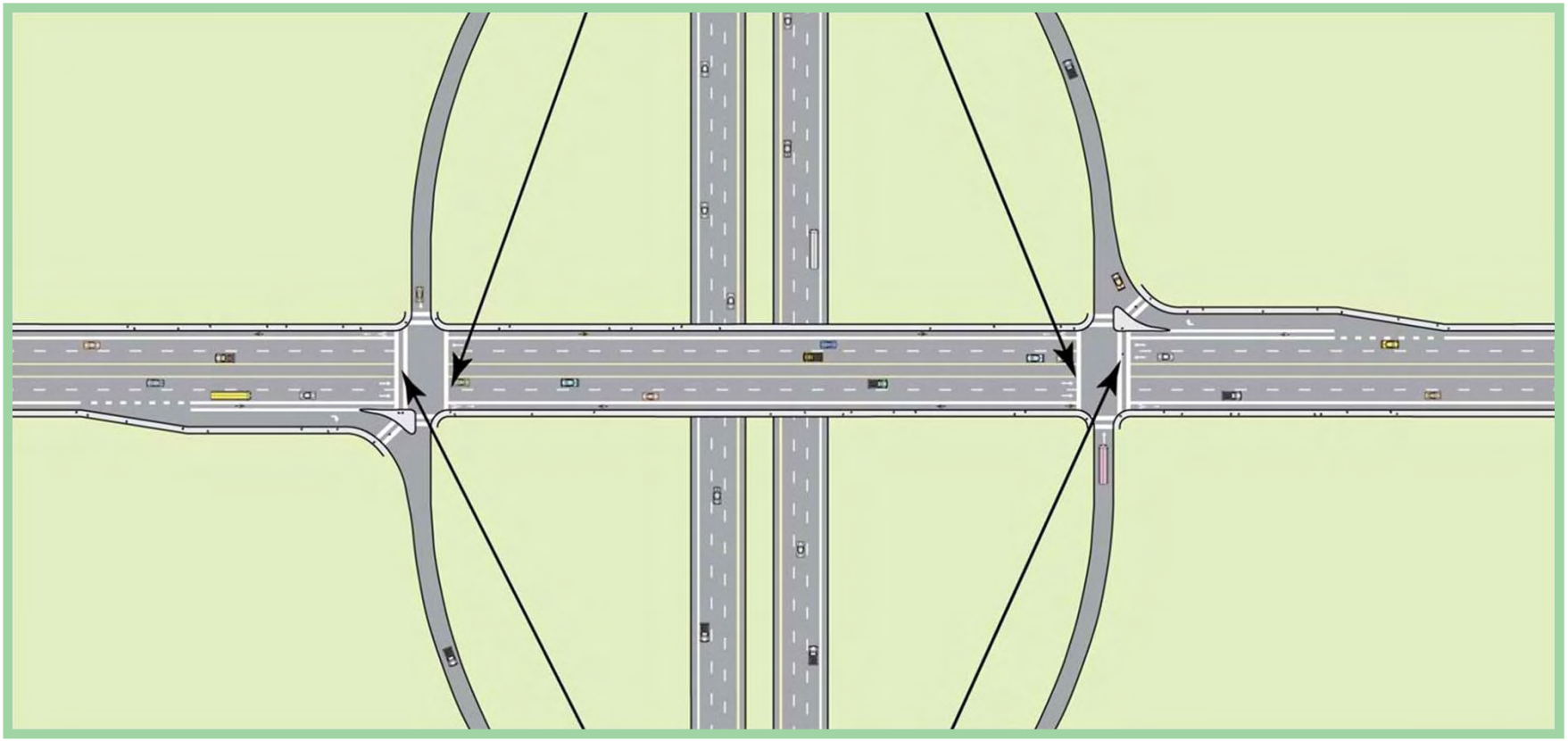


Accommodate all pedestrian movements:

1. Through interchange (east-west along arterial)
2. Across the arterial (north-south)

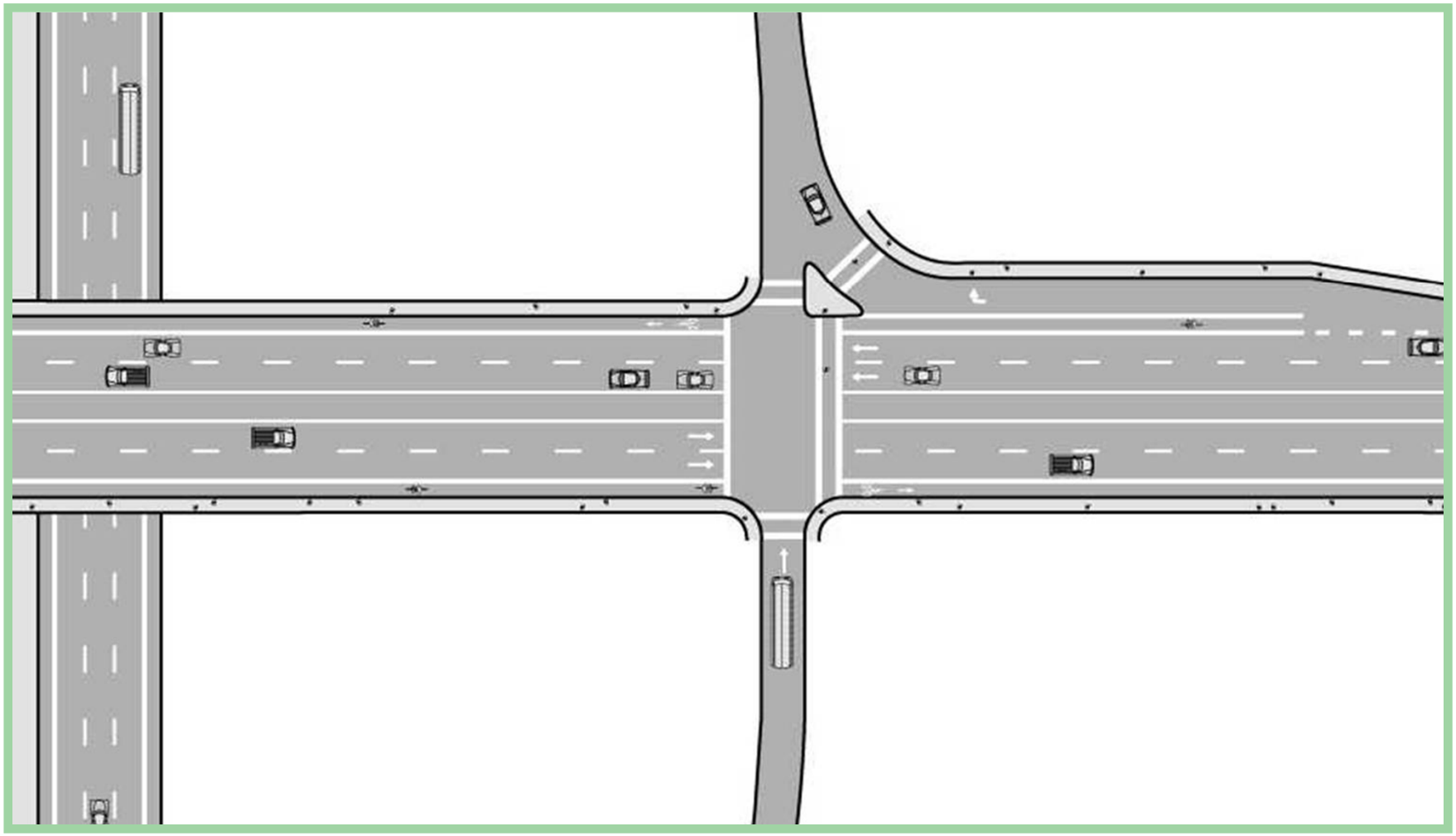


These crosswalks may be closed



These crosswalks must be open

Design interchanges to look like an intersection, then drivers are more likely to expect pedestrians



Consider each terminus as ½ an urban intersection

Avoid free-flow movements…

…they are difficult for pedestrians to cross

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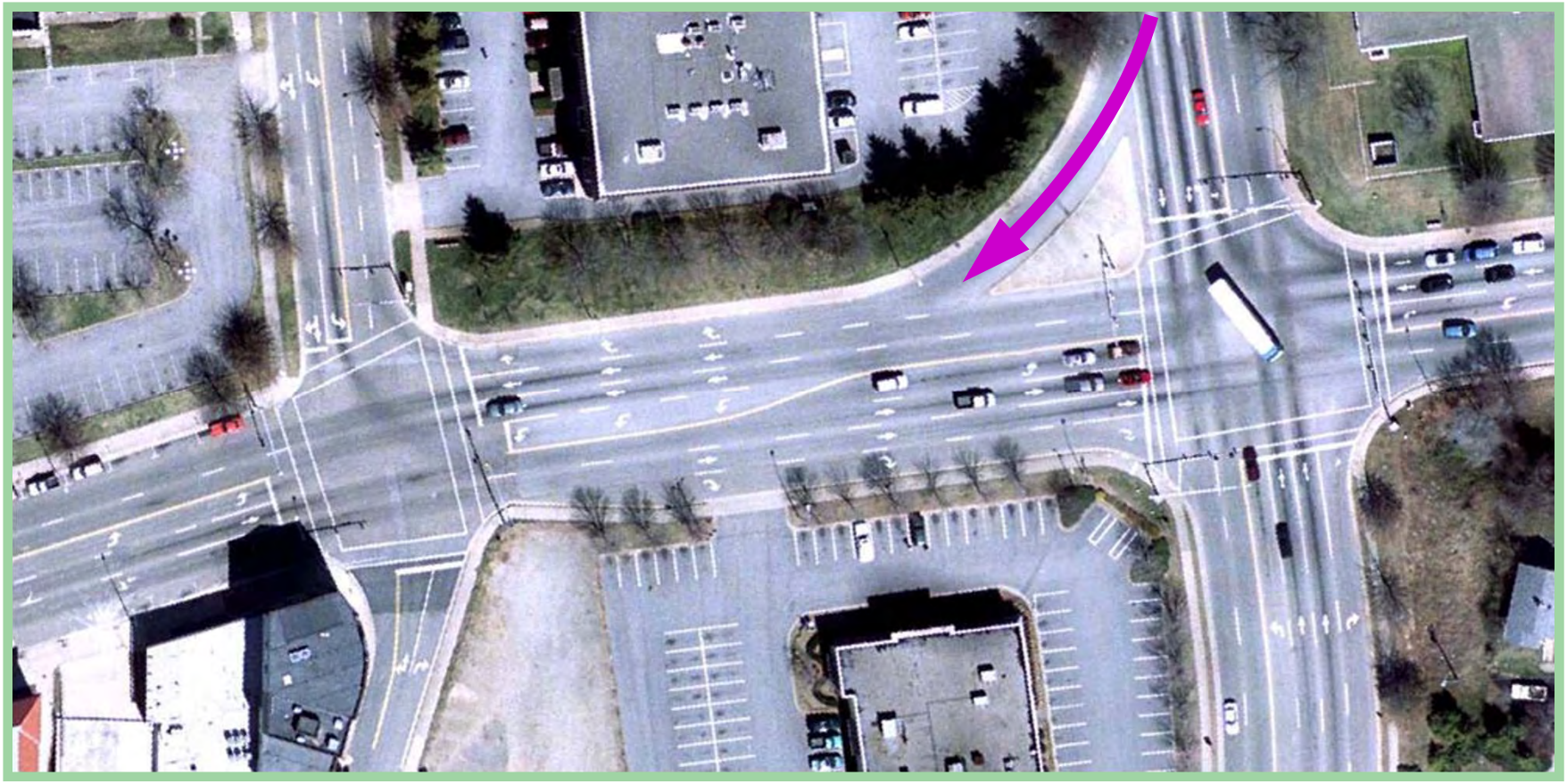

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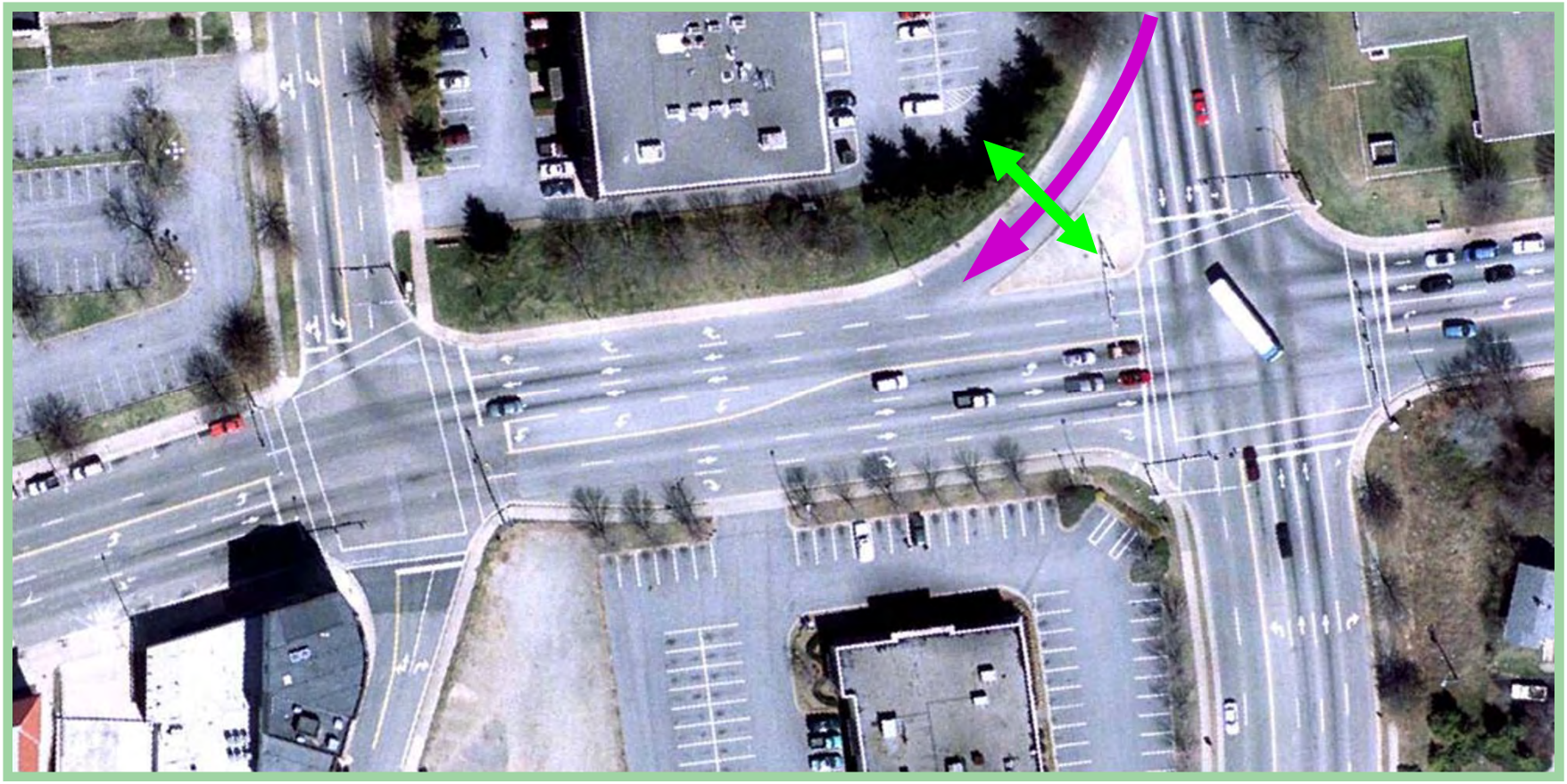


…they are difficult for pedestrians to cross

Positive Example: Reconfigured Ramp Terminus

- ⇨ Flat angle = wide crossing & high-speed turns
- ⇨ Tight angle = short crossing & slow speed turns

Positive Example: Reconfigured Ramp Terminus

- Yellow line = old crosswalk
- Green line = new crosswalk

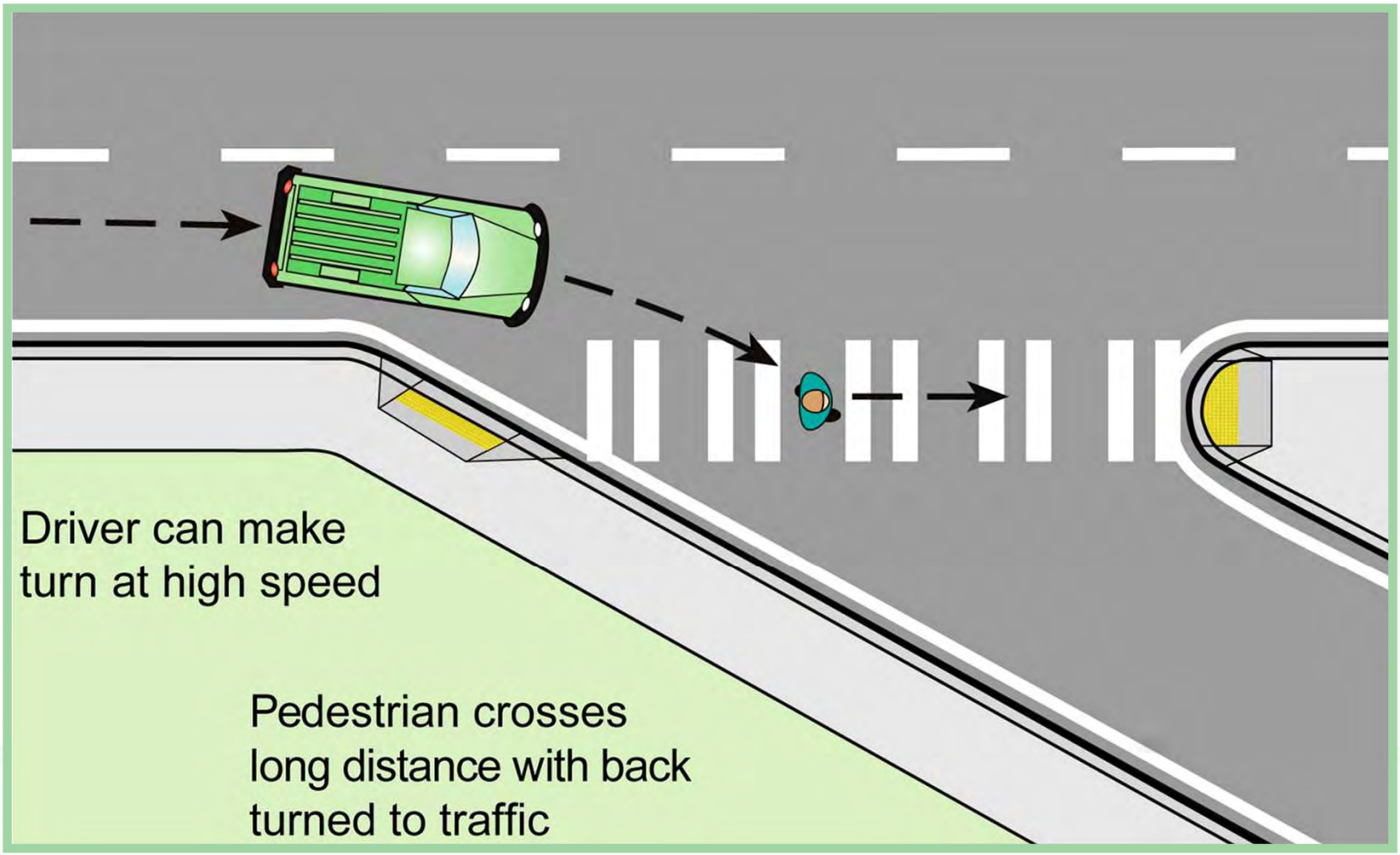
Where free-flow ramps are used (least desirable)
Crosswalk should be placed where it's visible

Where free-flow ramps are used (least desirable)
Crosswalk should be placed where it's visible

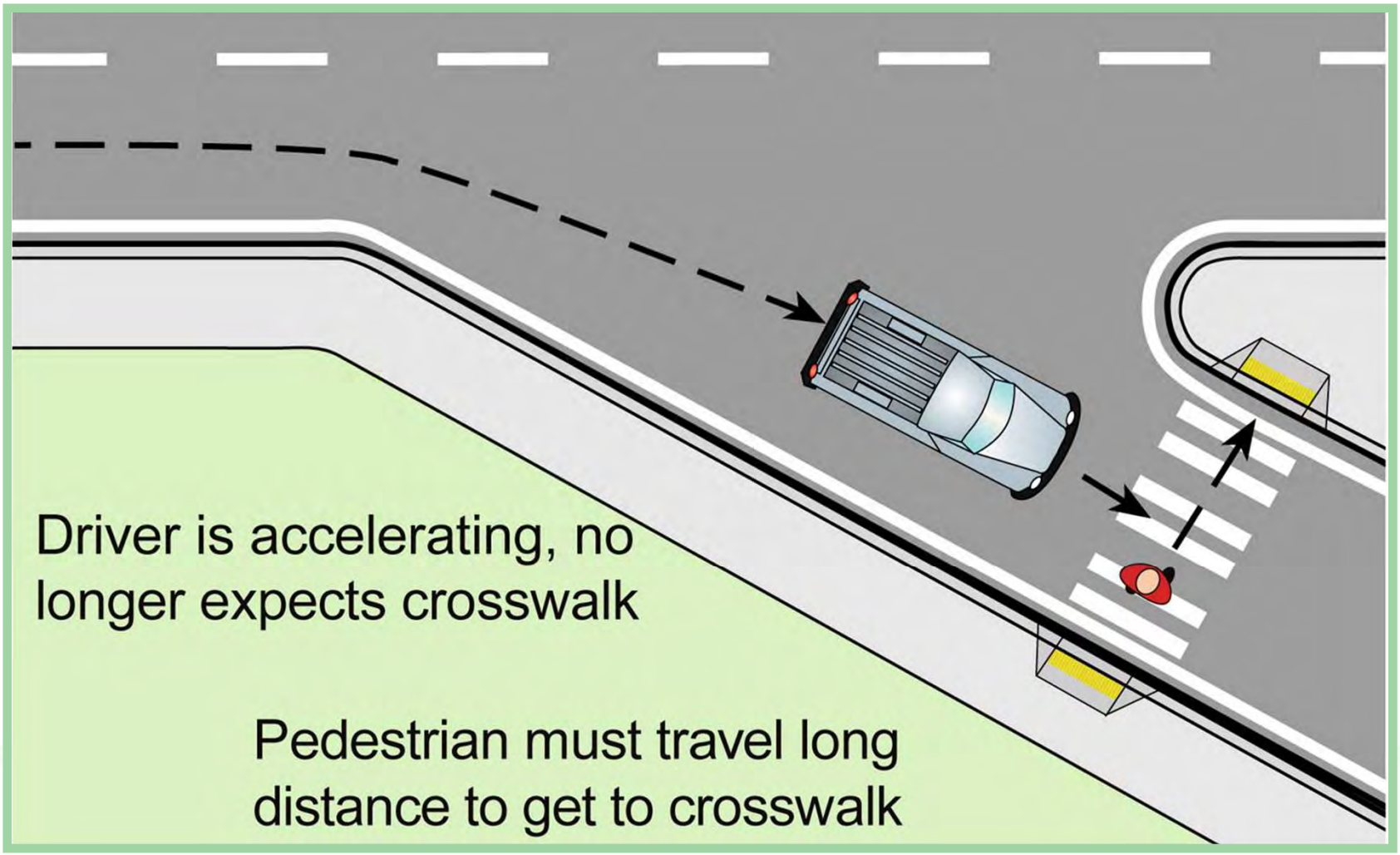
Barrier should not obscure crosswalk

- **Choosing the best crosswalk placement where it's not clear what's most logical for the driver or the pedestrian:**
- **3 choices:**
  - **Most direct route**
  - **Shortest crosswalk**
  - **"Compromise" - midway solution**

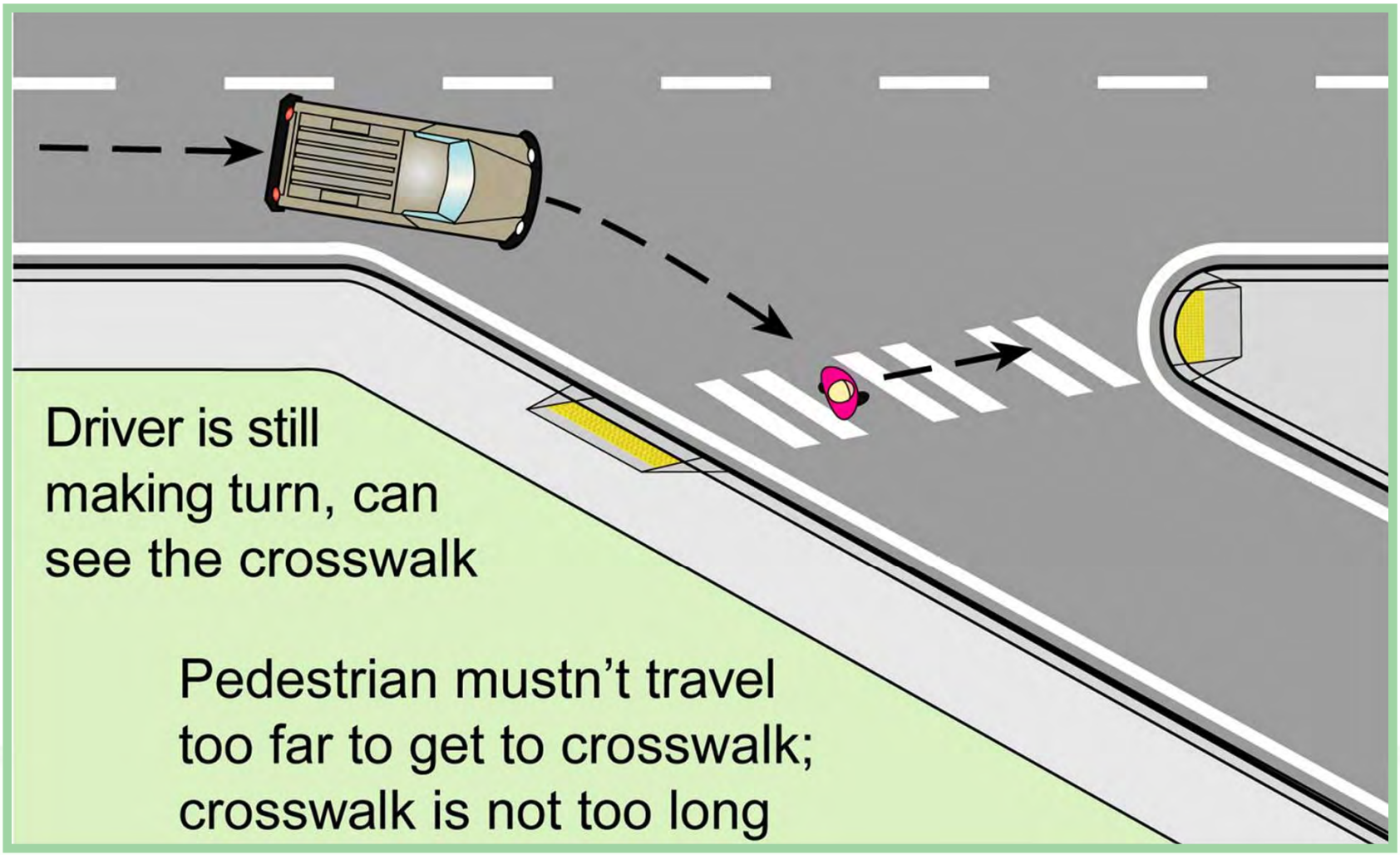
Most Direct Route



Shortest Crosswalk



Midway Solution



Where to place crosswalk?

Observe pedestrians

- ⇨ **Younger woman takes direct route (looks over shoulder)**
- ⇨ **Older man seeks crosswalk**
- ⇨ **Midway would be used by both**
- ⇨ **YIELD TO PED signs indicate a problem**

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Single Point Urban Interchange (SPUI)

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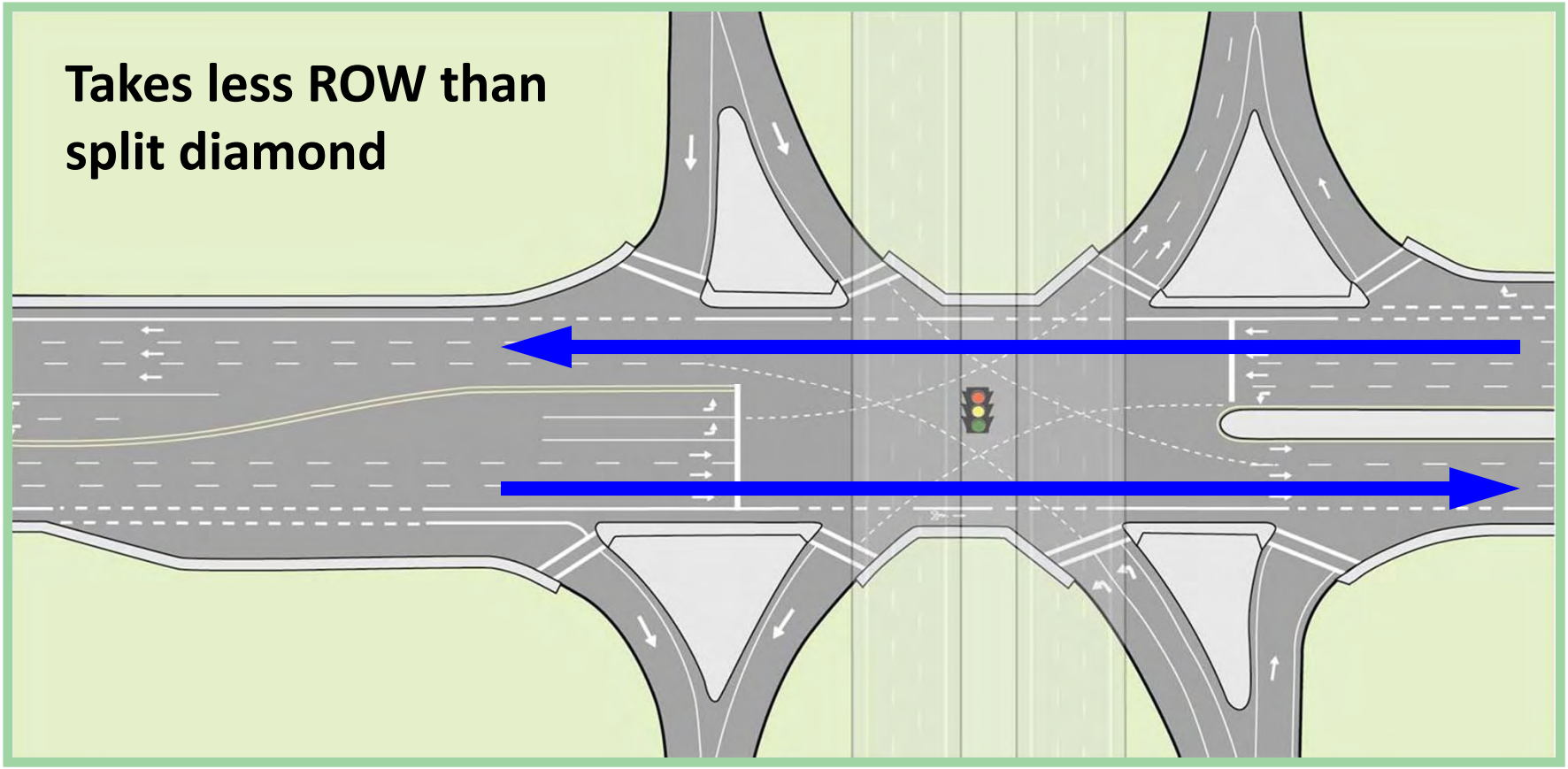
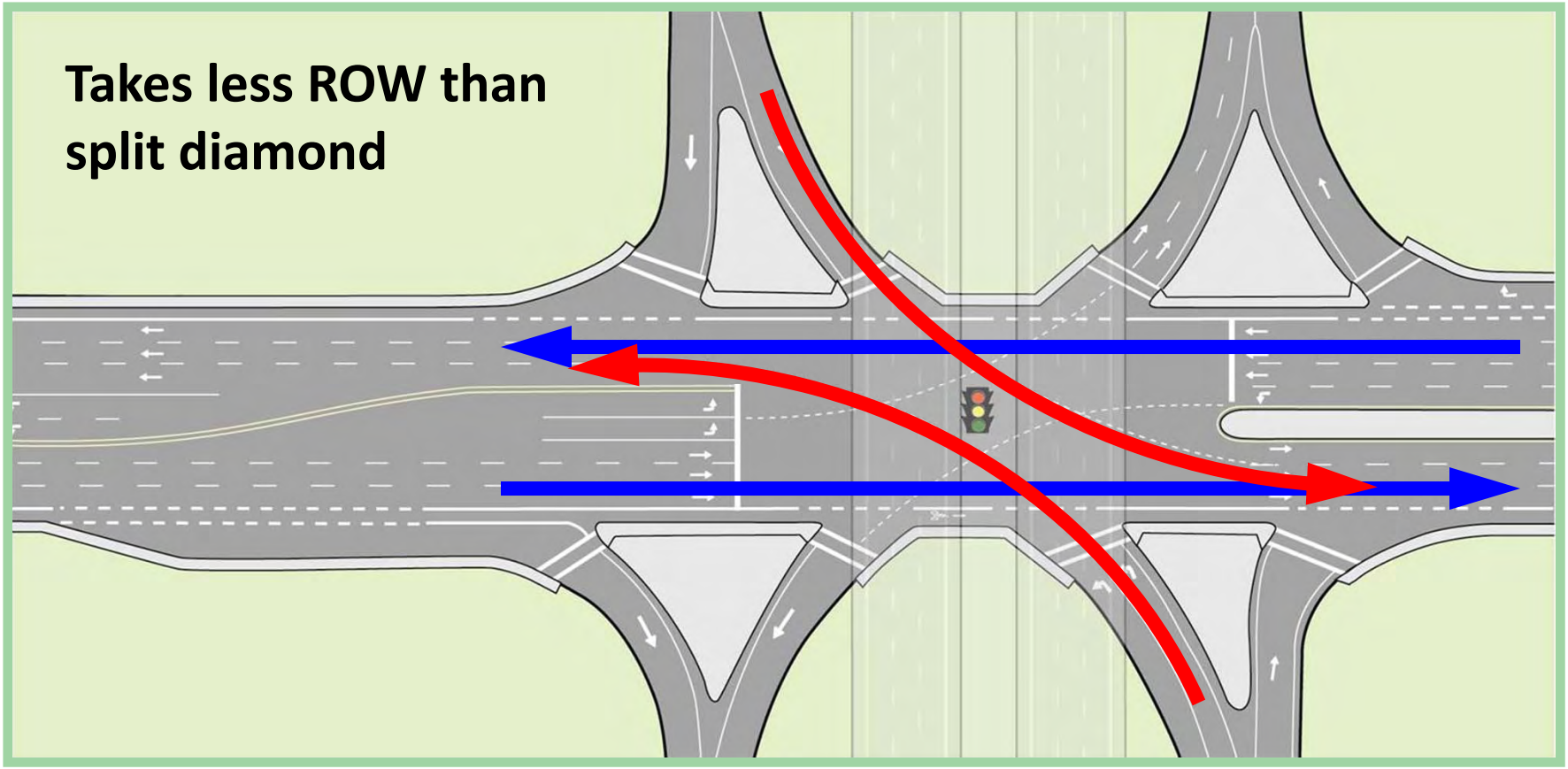


Signal timing; 3 movements are run through one signal

1. Through movements
2. Left turns in one direction
3. Left turns in other direction

Single Point Urban Interchange



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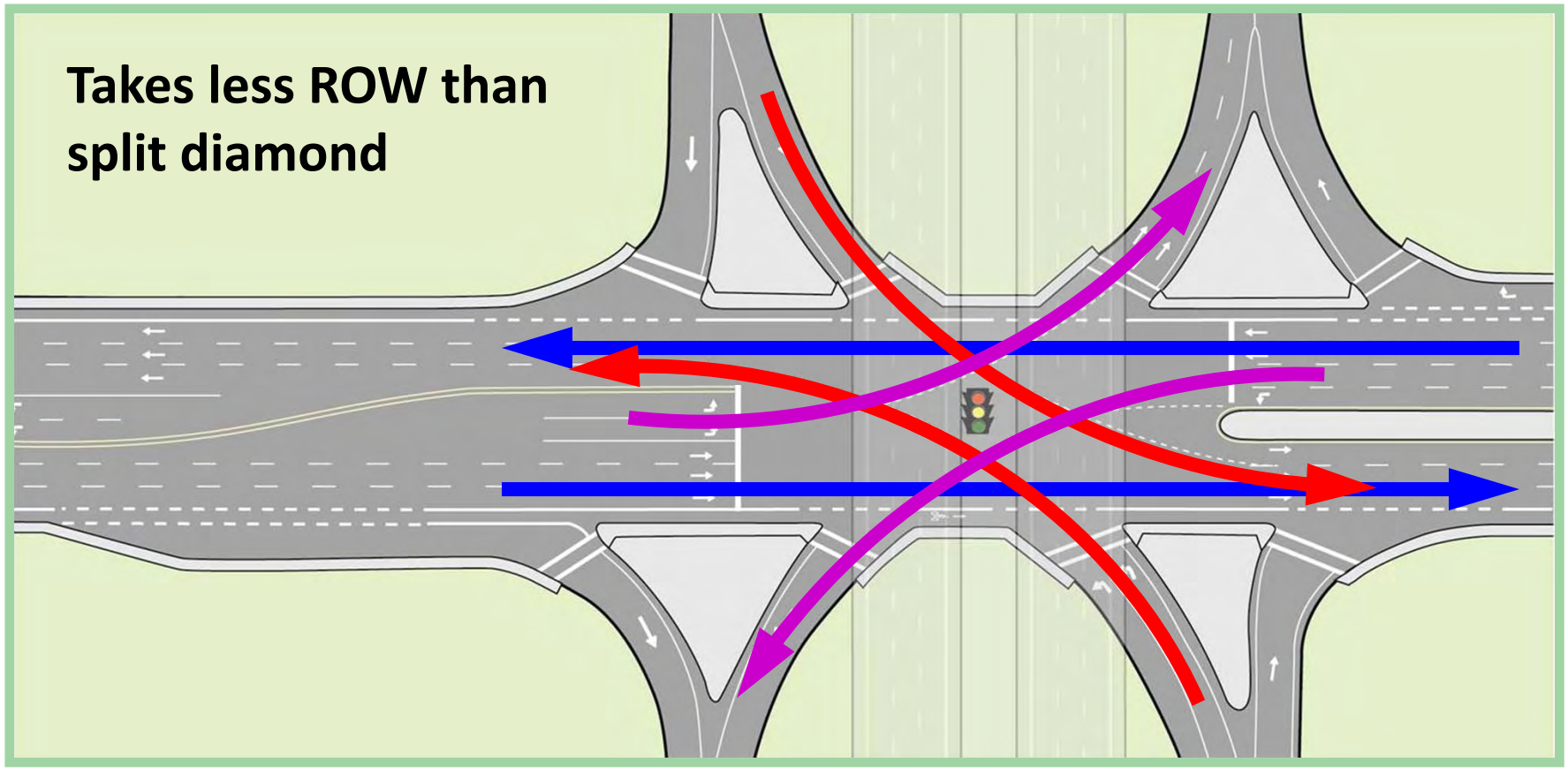

Signal timing; 3 movements are run through one signal

1. Through movements
2. Left turns in one direction
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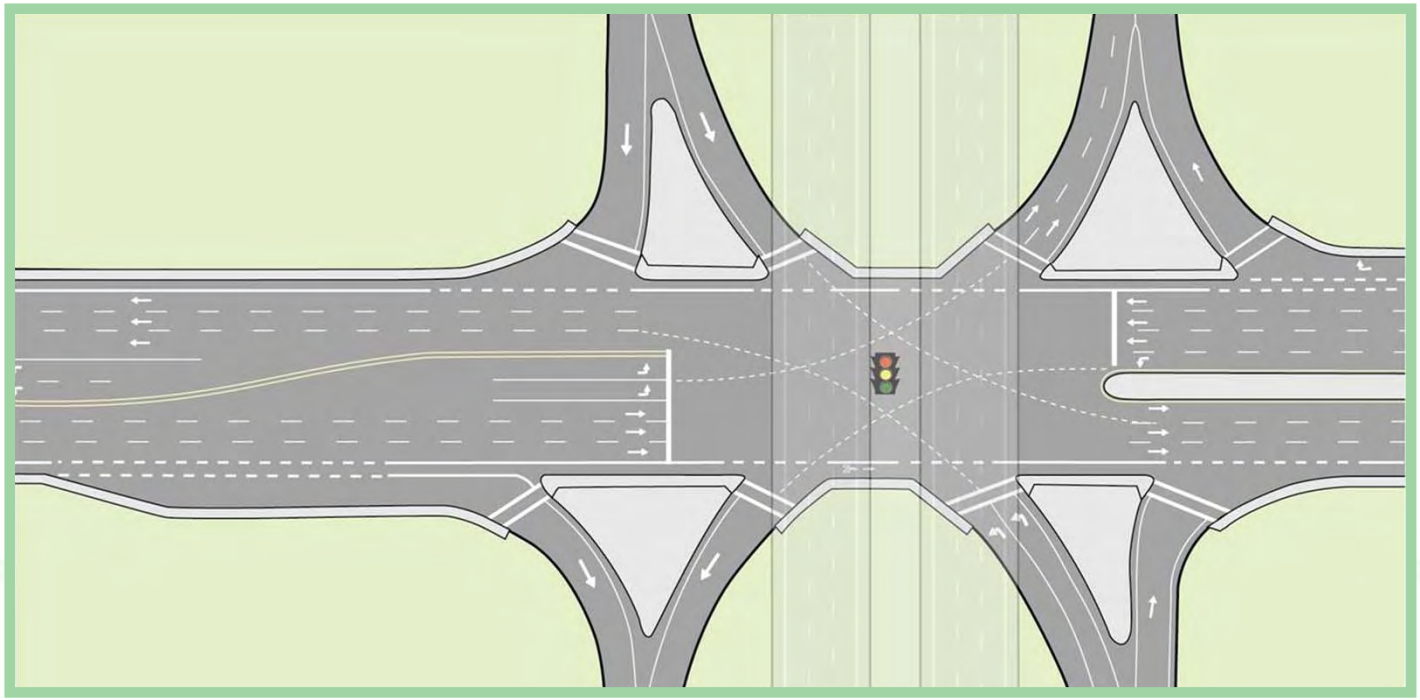
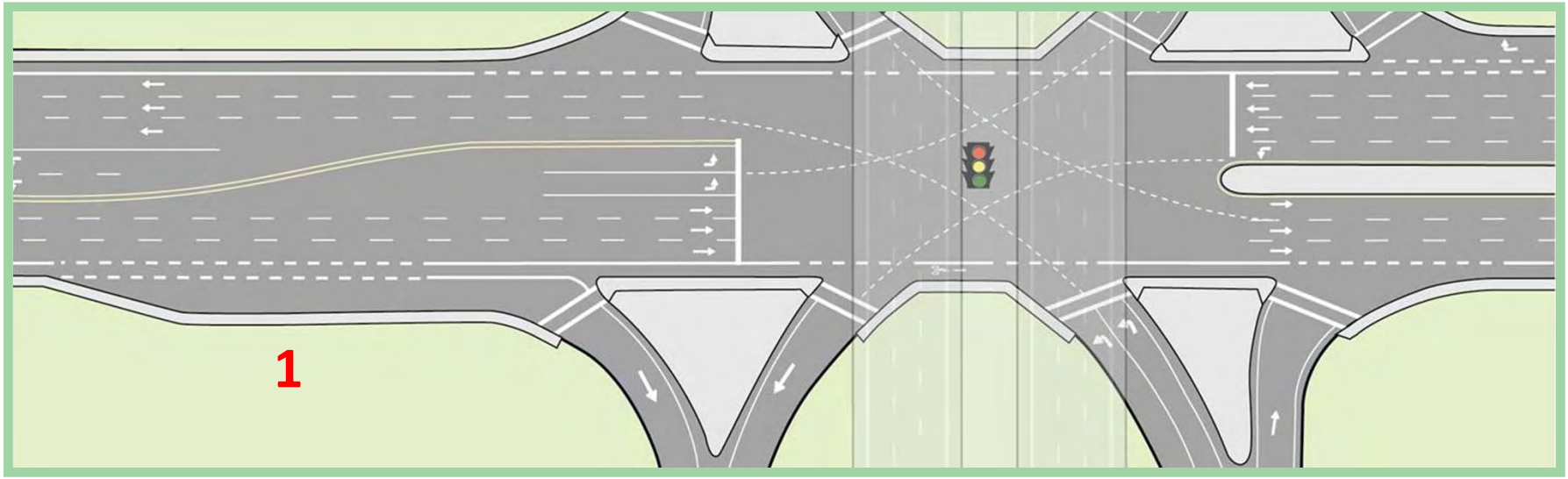
How to make SPUI work for pedestrians:

- Provide continuous sidewalks
- Break up crossings into several small steps
- Use good geometry; create tight, right-angle crossings;
- Make it clear to drivers where to expect pedestrians

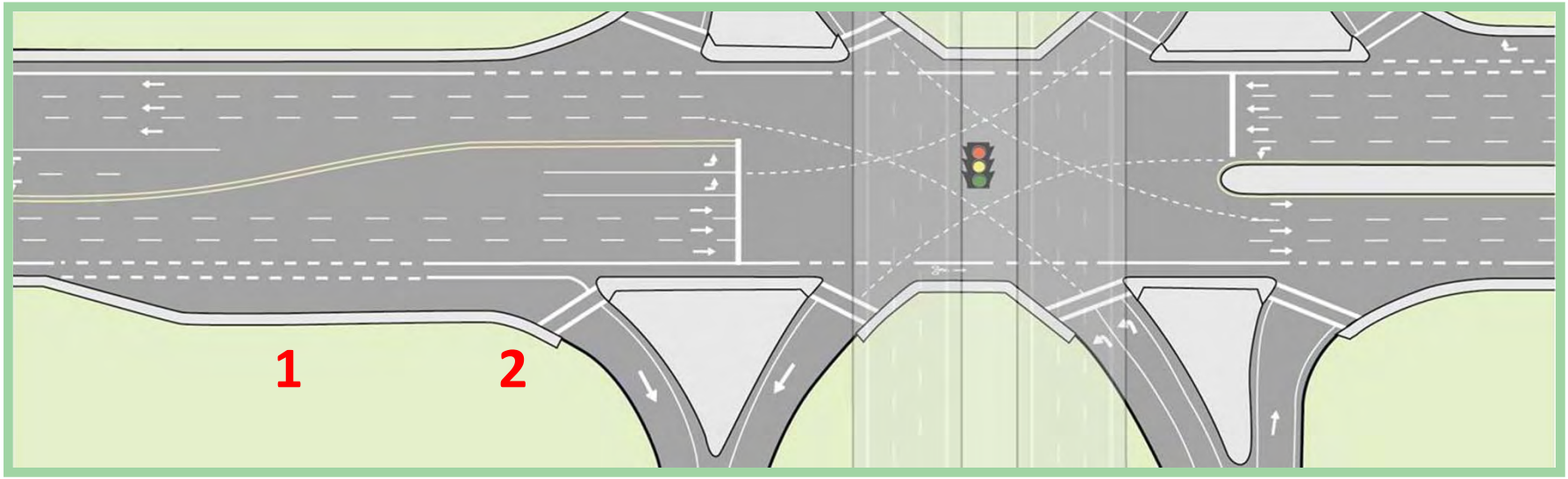


SPUI Pedestrian crossing sequence:



1. **Ped walks next to well defined right-turn lane (RTL)**

SPUI Pedestrian crossing sequence:



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2. Ped crosses RTL at a point with good visibility; drivers yield to peds

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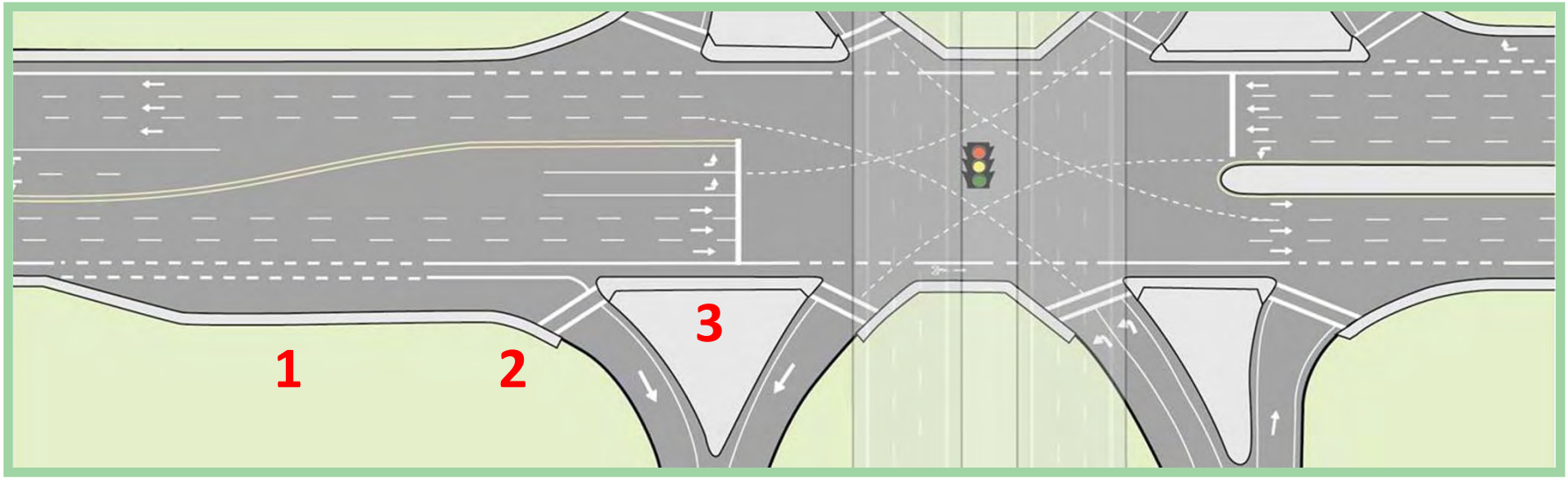

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3. Ped proceeds on island

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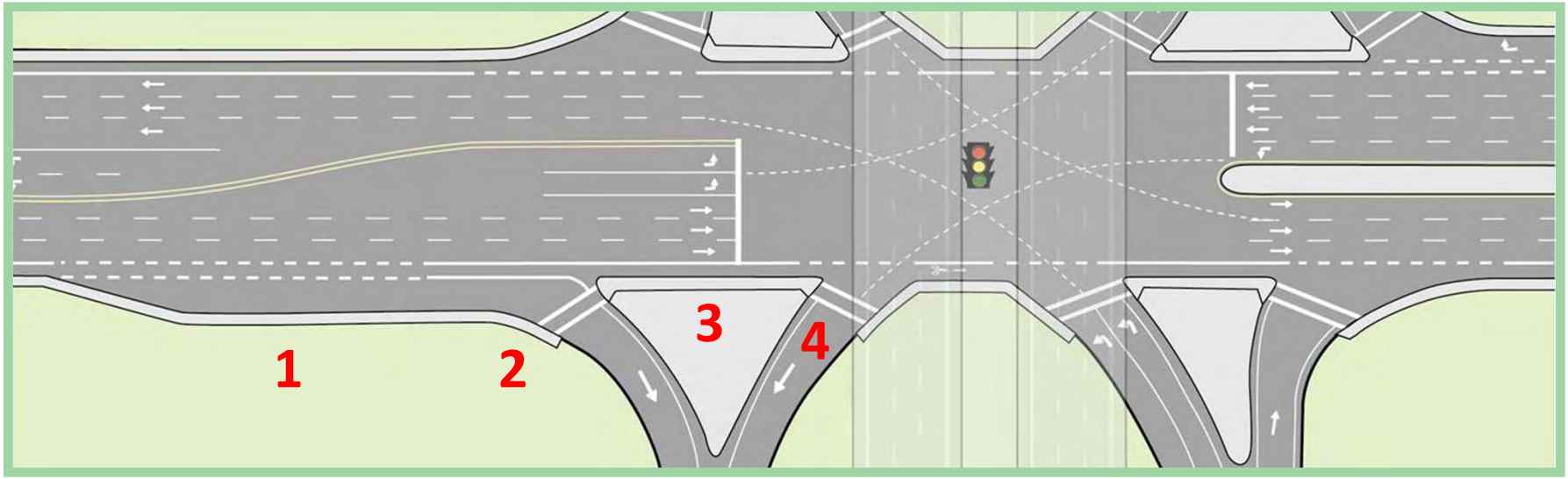

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4. Ped crosses entry lane; signal controlled

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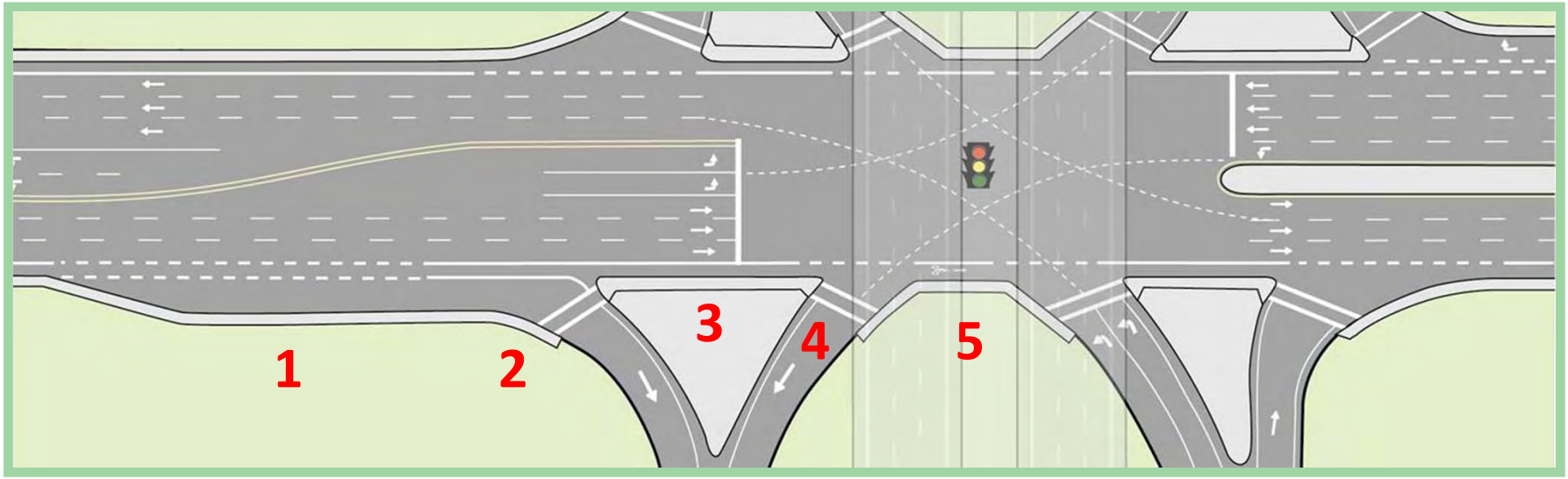

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5. Ped proceeds on sidewalk on or under bridge

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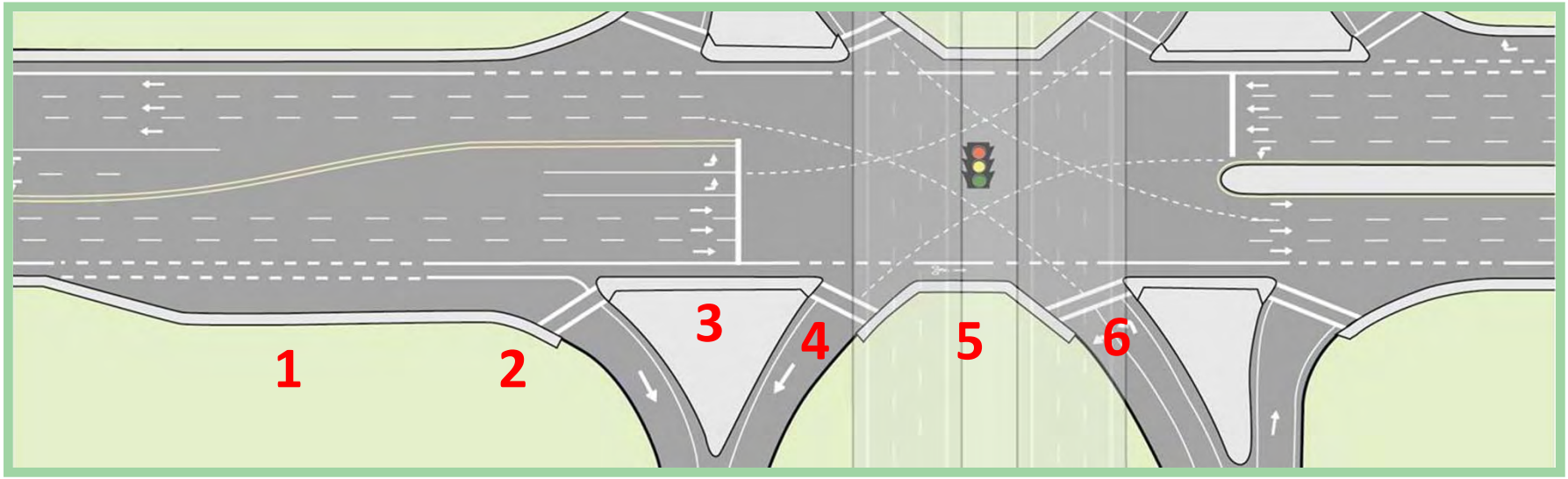

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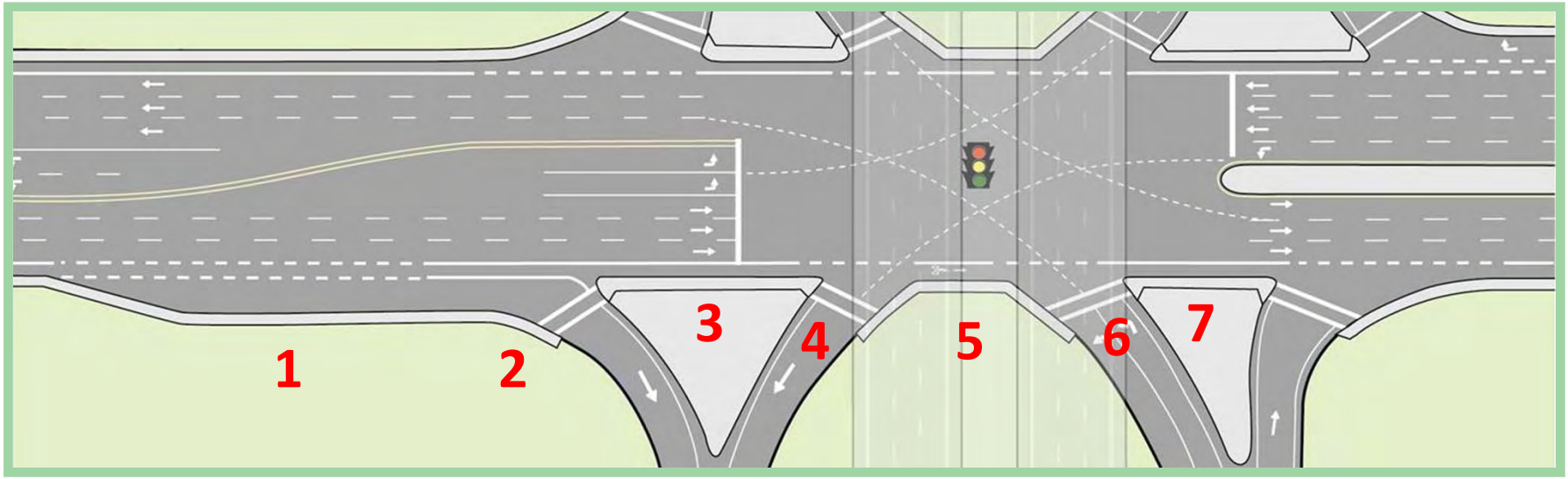

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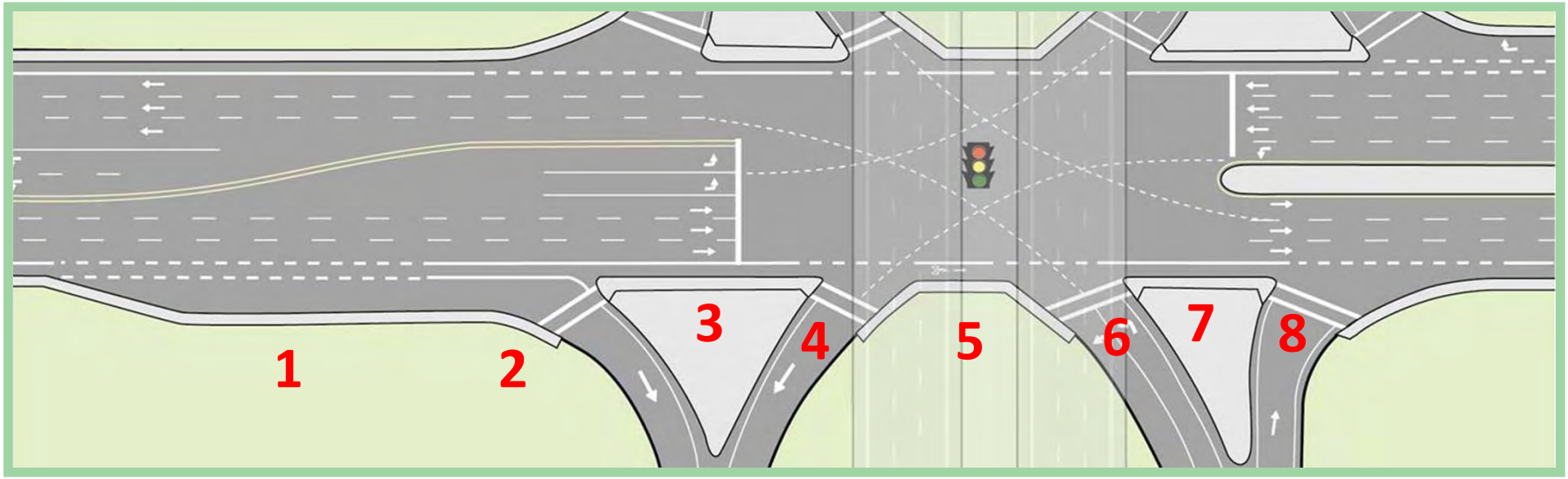

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8. Ped crosses exit lane; stop controlled; drivers yield to peds

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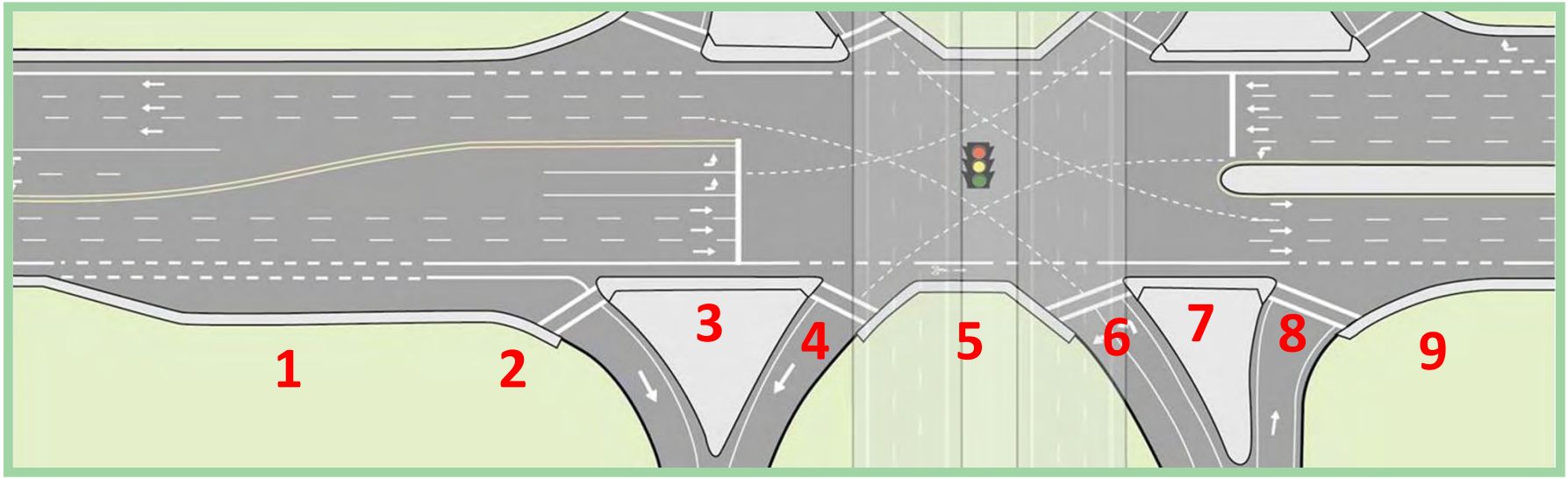

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8. Ped crosses exit lane; stop controlled; drivers yield to peds
9. Ped continues on his merry way

SPUI: Aerial view of ped sequence

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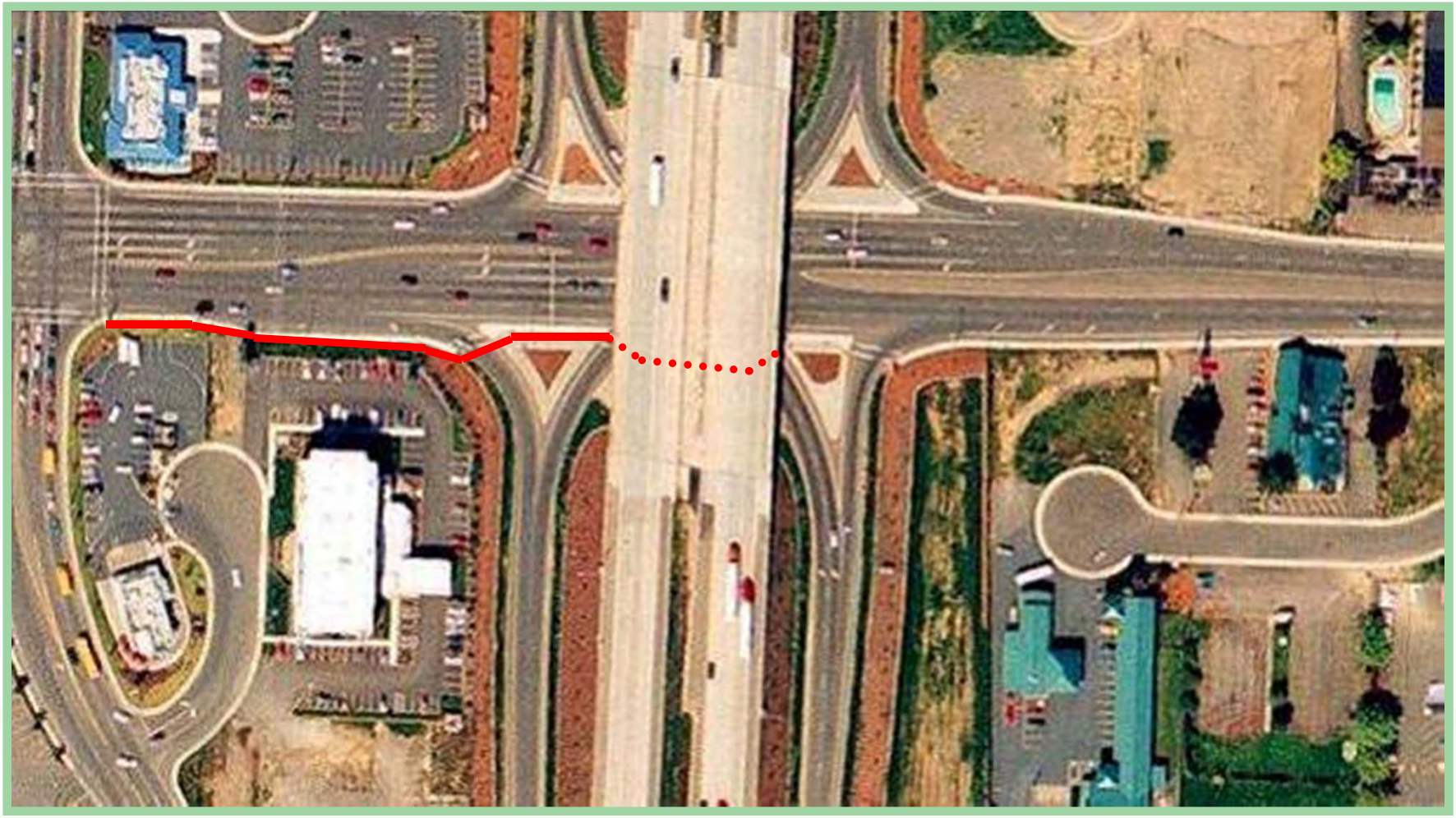

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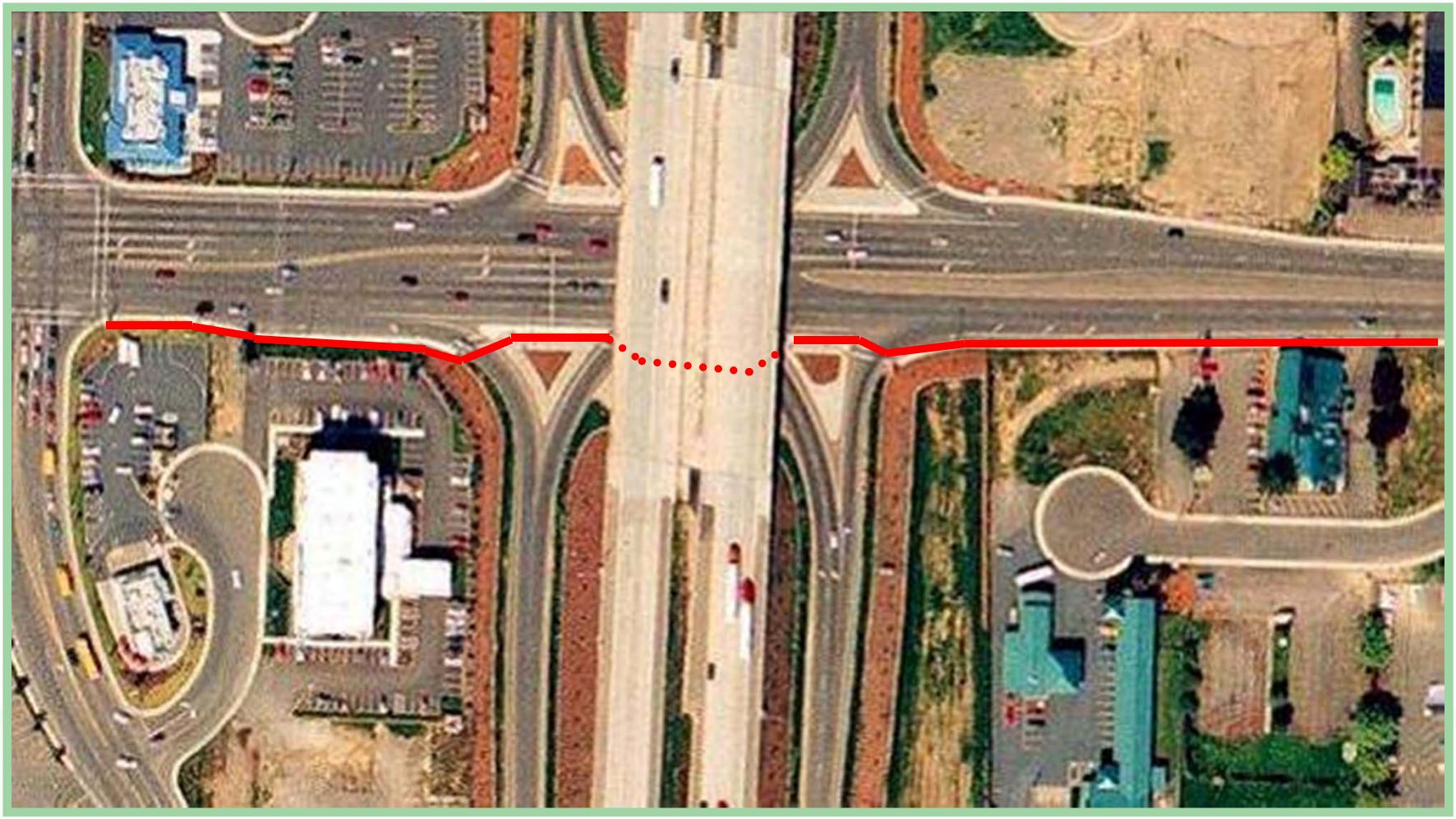
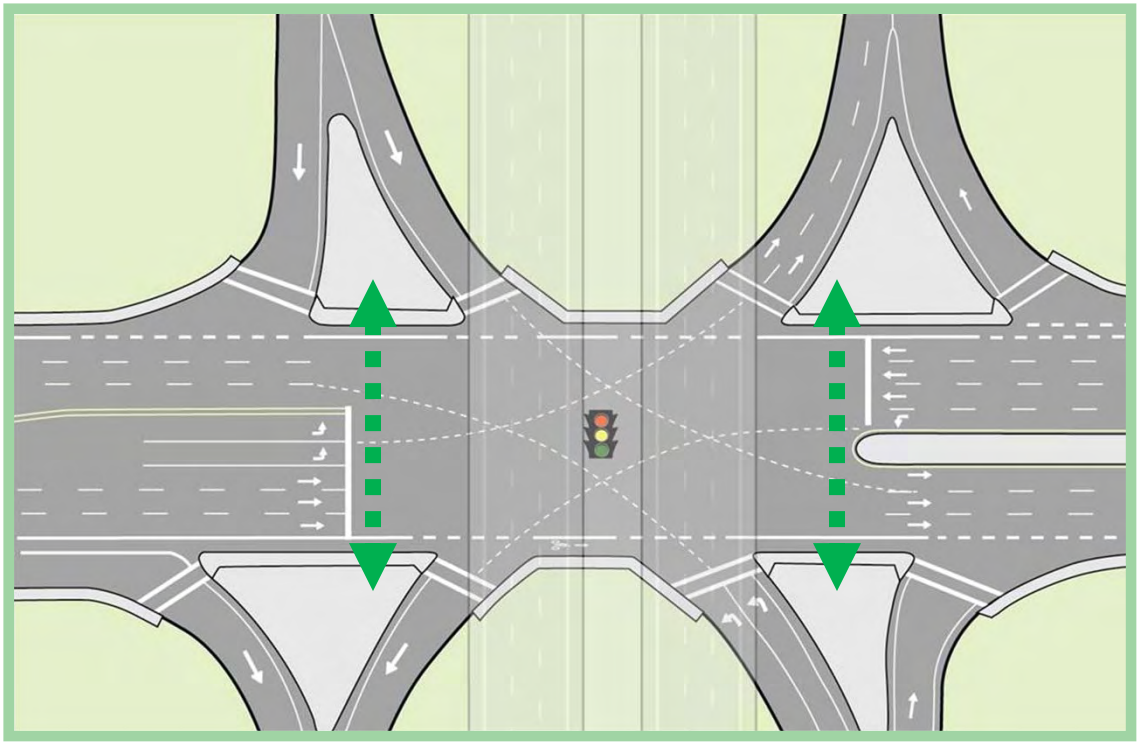


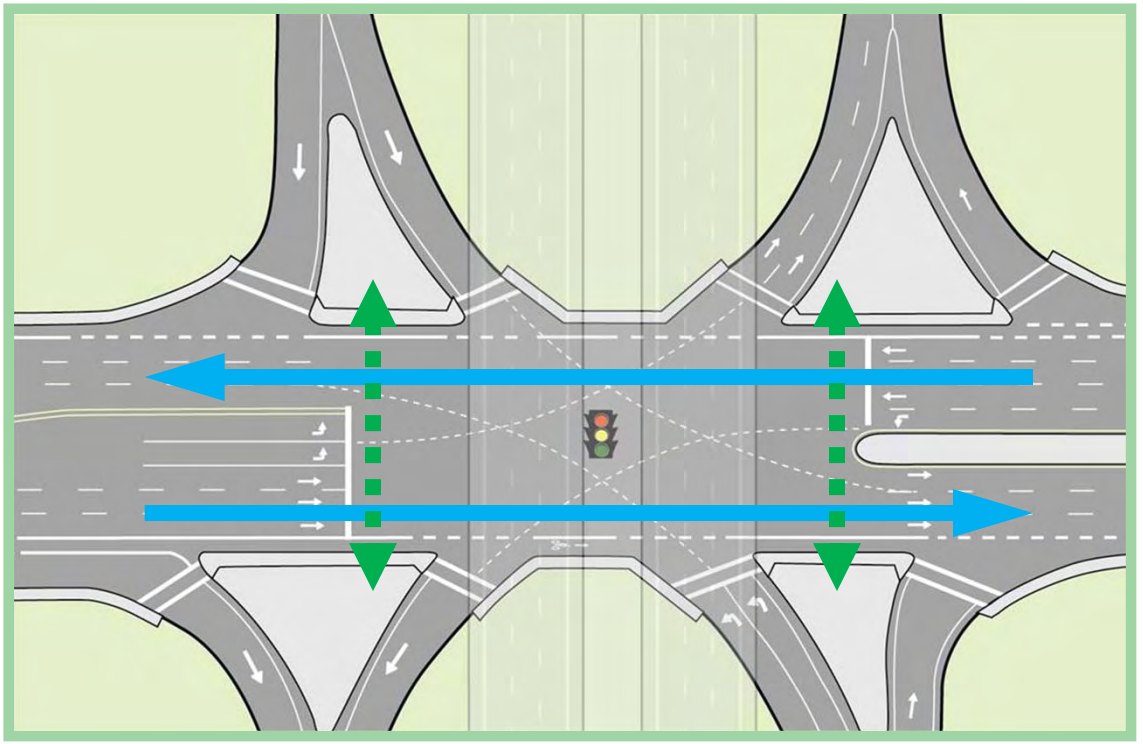
Possible ped crosswalks



With most SPUIs there is never a phase when pedestrians can cross the urban arterial without conflict

Possible ped crosswalks

Vehicle phase 1



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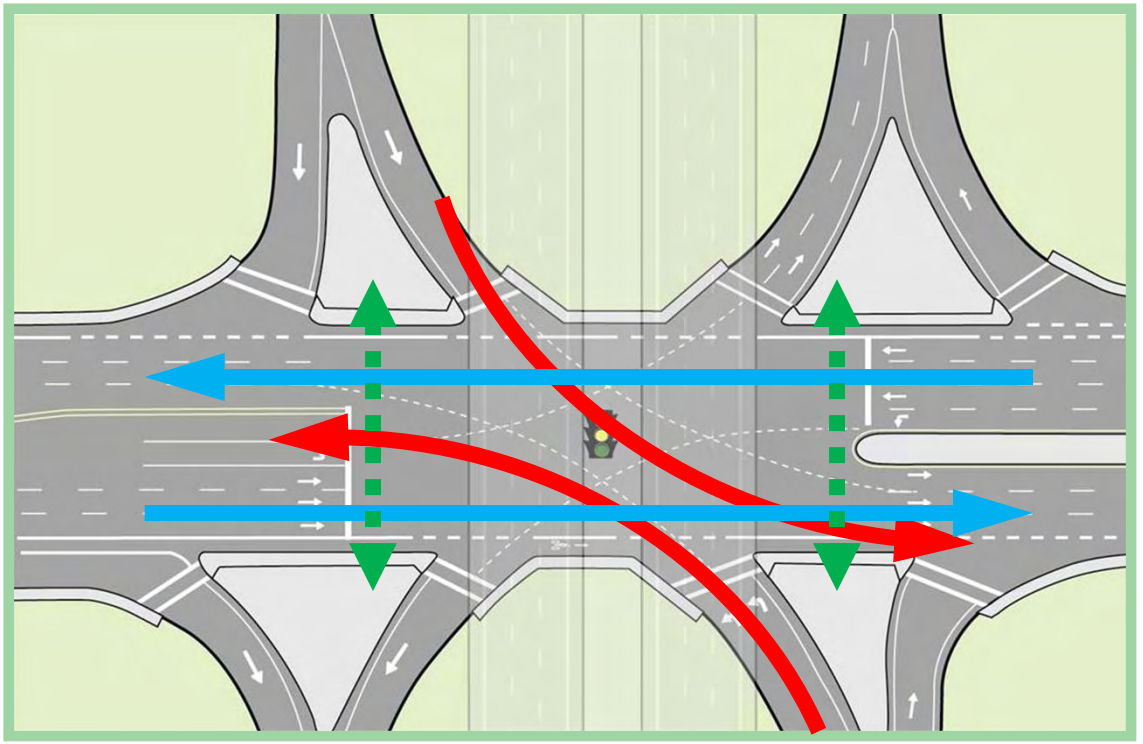
Possible ped crosswalks

Vehicle phase 1

Vehicle phase 2



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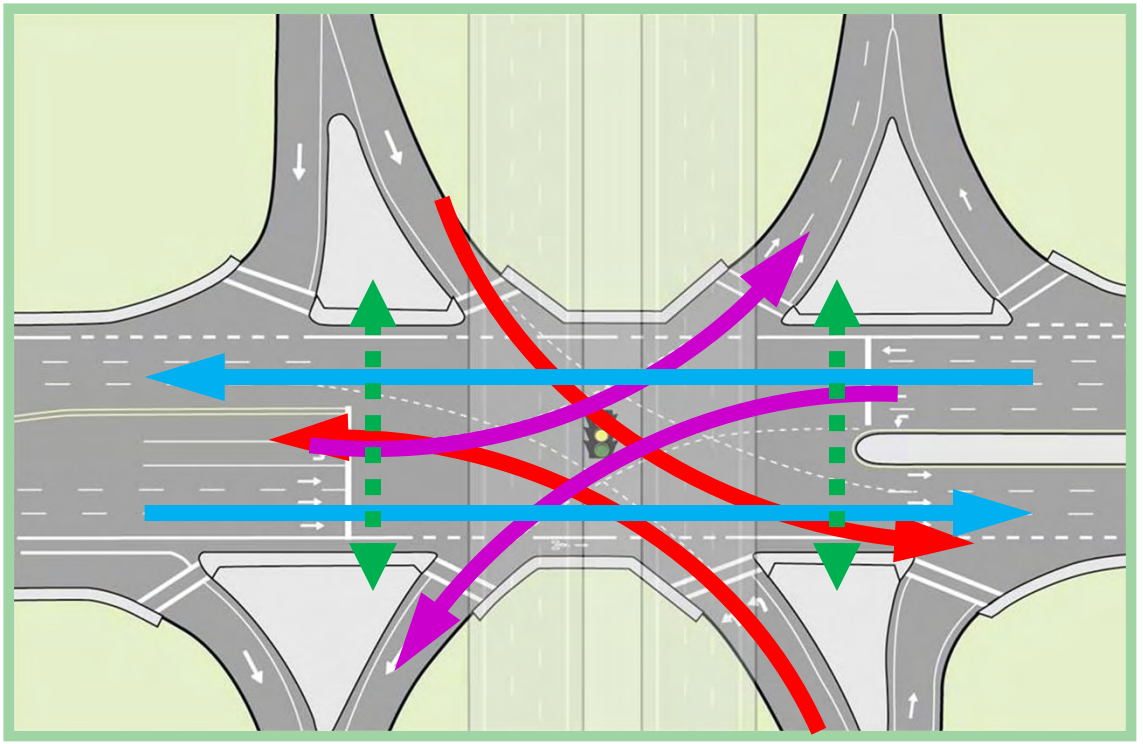
- ⇨ **Solution 1: Two-step crossing (one step during vehicle phase 2 and the other during vehicle phase 3)**

Possible ped crosswalks

Vehicle phase 1

Vehicle phase 2

Vehicle phase 3



With most SPUIs there is never a phase when pedestrians can cross the urban arterial without conflict

- ⇨ **Solution 1: Two-step crossing (one step during vehicle phase 2 and the other during vehicle phase 3)**
- ⇨ **Solution 2: Nearby midblock signalized ped crossing, or nearby signalized intersection with crosswalks**

Let's Recap

- Why is controlling land uses important?
- Why do ped crashes occur at freeway interchanges?
- What kind of movements should be avoided?
- How can one mitigate for these problems?

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  - They're driving fast
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- Why do ped crashes occur at freeway interchanges?
  - Driver expectation of pedestrians is very low
  - They're driving fast
- What kind of movements should be avoided?
  - High-speed, free-flow
- How can one mitigate for these problems?
  - With slow-speed, right-angle urban design
  - With improved crosswalk placement

Interchange Learning Outcomes

You should now be able to:

- ⇨ **Identify how land uses around freeway interchanges create pedestrian trips**
- ⇨ **Explain how and why pedestrian crashes occur at interchanges (driver expectation of pedestrians is very low; high-speed, free-flow movements)**
- ⇨ **Select slow-speed, right-angle urban designs**

Questions?