

Engineering Treatments and Strategies



Creating safe routes with engineering

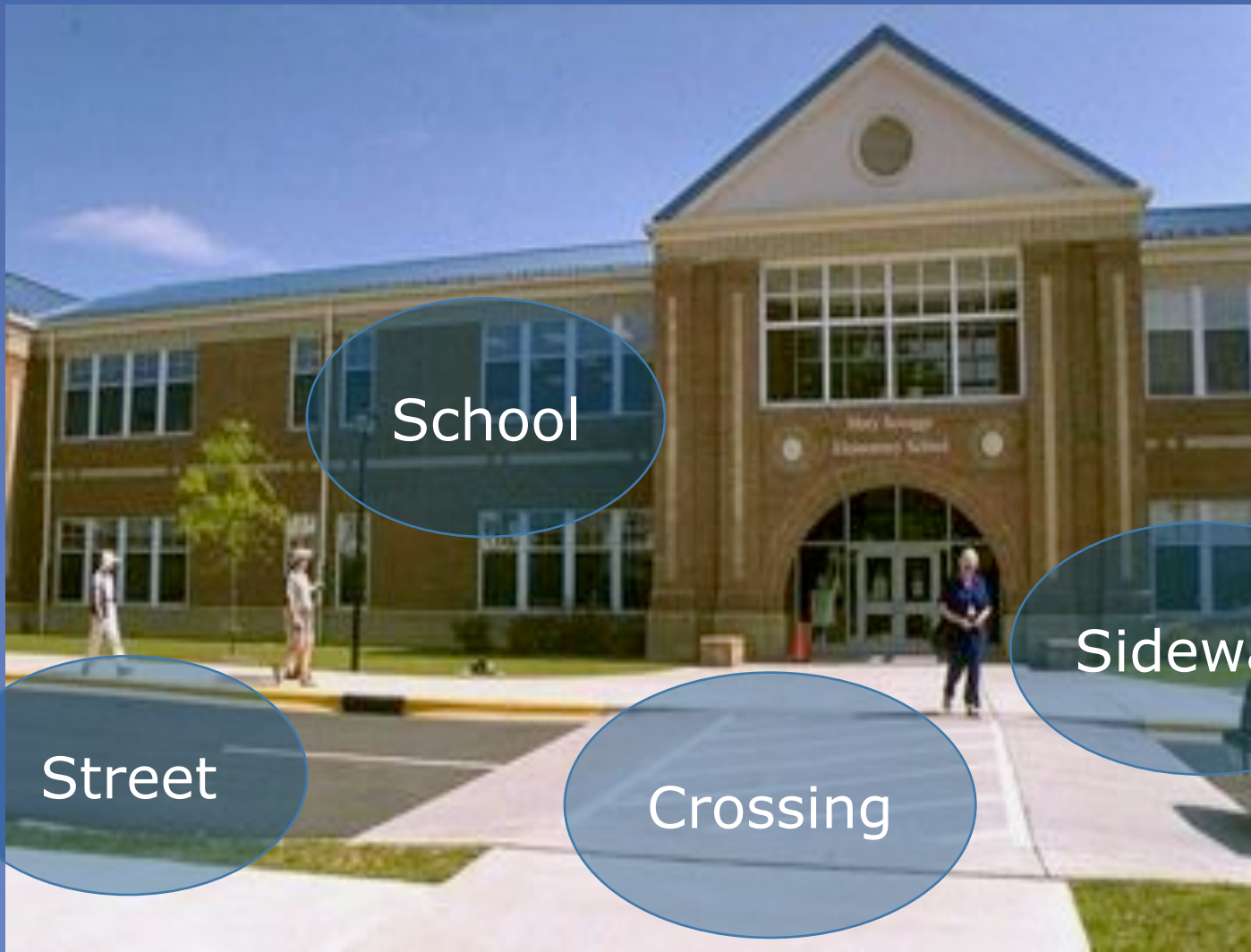
- Improve children's safety
- Encourage more bicycling and walking



Walkways and crossings: Prerequisites for walking



Relationships are everything



Focus on low cost, easy to implement solutions



What's wrong with this picture?



What's wrong with this picture?



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What's wrong with this picture?



What's wrong with this picture?



Engineering topic outline

- **Around the School**
- Along the School Route
- Crossing the Street
- Slowing Down Traffic

School enrollment boundary



Walking and Biking to School, Physical Activity and Health Outcomes

Proximity of homes and schools is the most important influence on walking and biking to school.

Active Living Research, May 2009

School walk zone

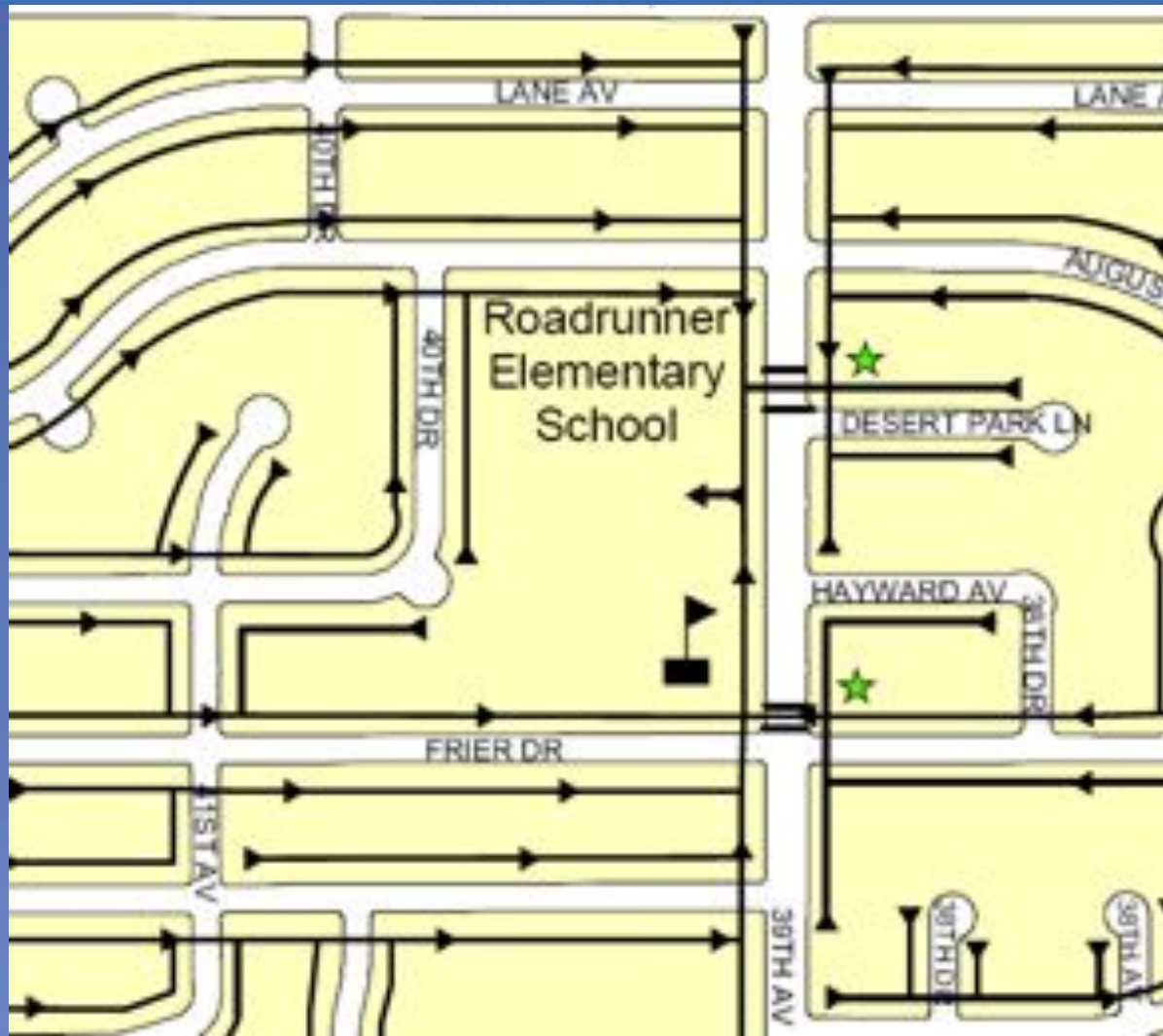


School zone



Safest route to school walking map

Mapas de rutas más seguras a la escuela



School area speed limit signing



School crosswalk signs and advance warning signs



Parking regulations



Sample school traffic control plan



Engineering topic outline

- Around the School
- **Along the School Route**
 - **Sidewalks**
 - **On-street bicycling**
 - **Pathways**
 - **Connectivity**
- Crossing the Street
- Slowing Down Traffic

Sidewalks are essential



Sidewalk design criteria

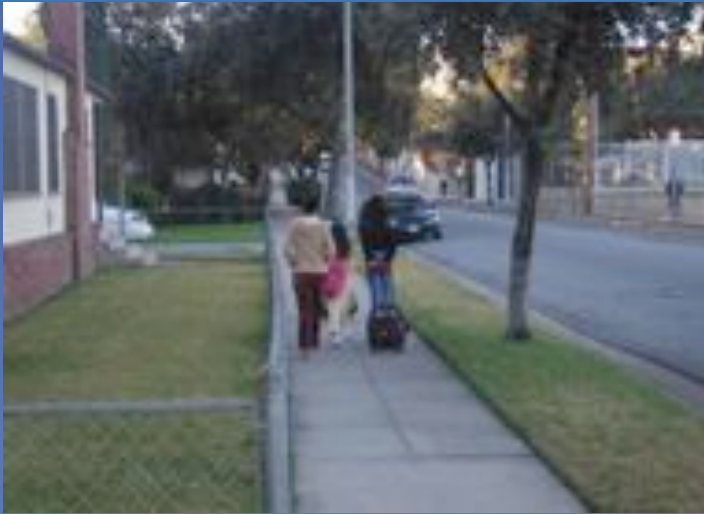


Connect all sidewalks in the school walking route



Accommodate pedestrian desire lines outside of splash zones

Provide sidewalk buffers



No sidewalk buffer



Good sidewalk buffer





Provide wide enough sidewalks

- Recommended minimum: 5'
- Preferred min: 6'
- At schools: 8'-10'



Maintain landscaping to provide clear walkways and sight distances



Remove obstacles from sidewalks



Install street lighting



Meet ADA requirements for universal design



Curb ramp design

- Two ramps per corner
- Eight ramps per intersection



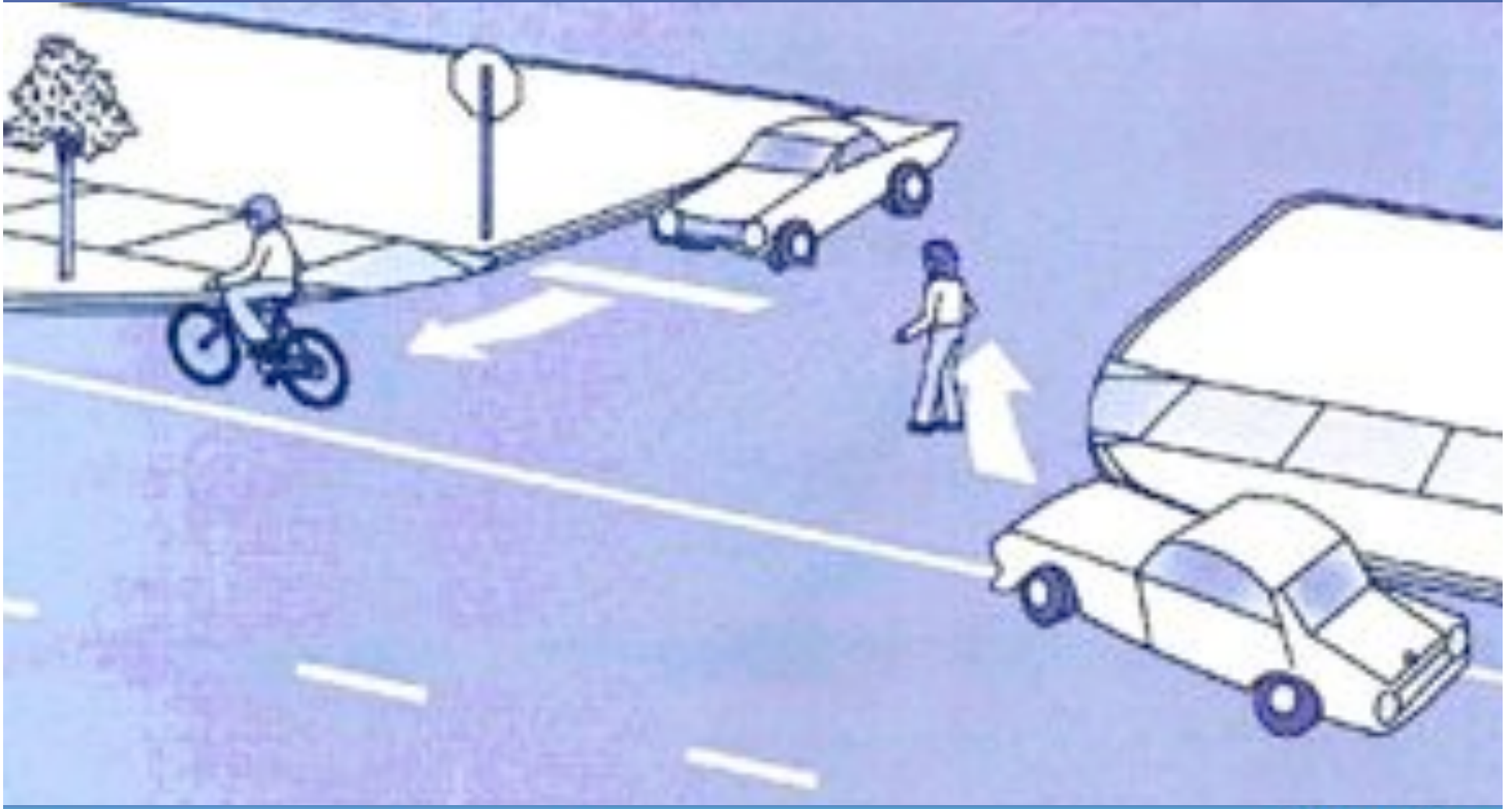
Limit driveway crossings



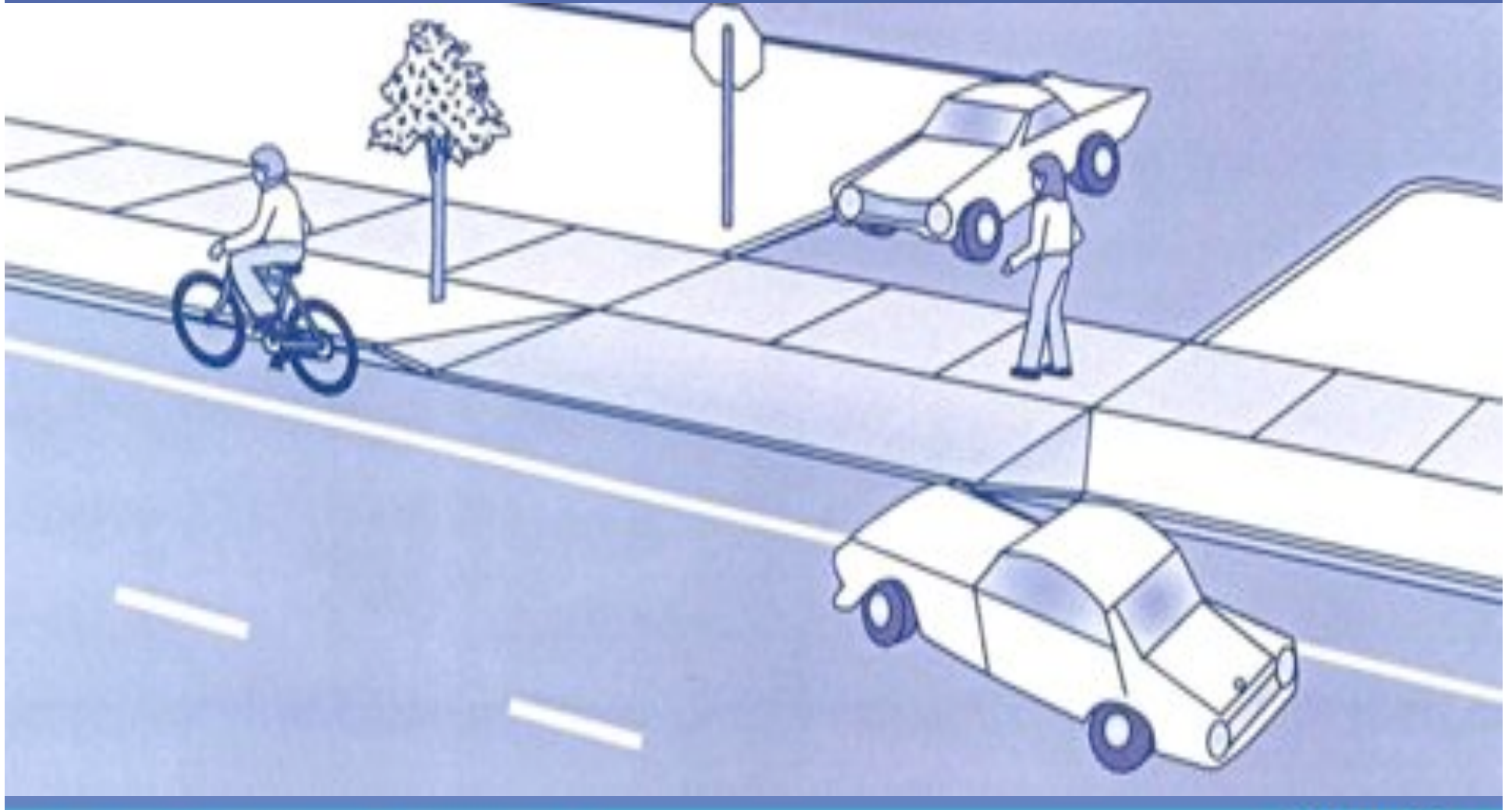
Connections to the school



Don't build driveways like intersections



Build driveways like driveways



Along the school route: Bikeways

- Local streets
- Bike lanes
- Shoulders
- Pathways



Local streets – where most kids ride



Bicycle lanes



Shoulders benefit cyclists and motorists



Along the school route: Pathways



Yes – high school students will bike given the opportunity



Install bicycle racks

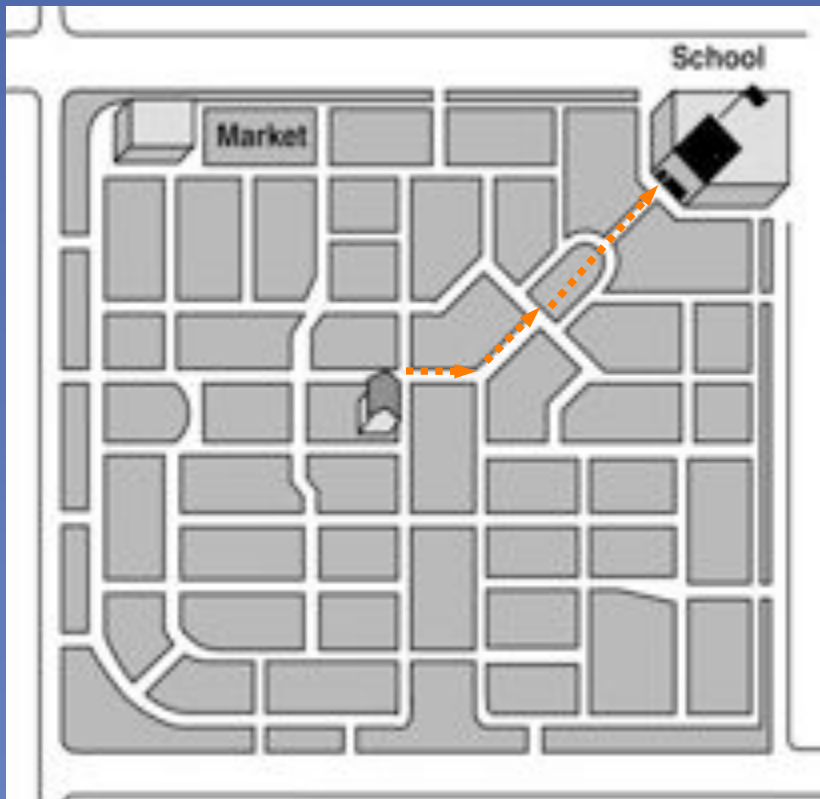


Connectivity creates a pedestrian-friendly street system

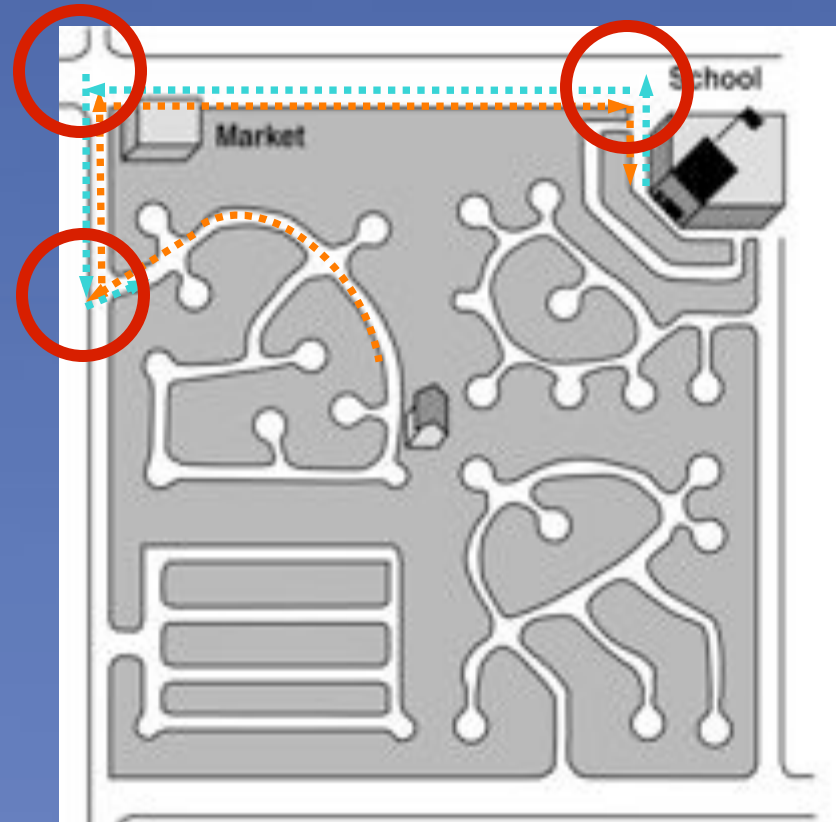
- Reduces walking distance
- Offers more route choices – disperses traffic
- Less traffic = more pedestrian friendly



Connectivity can reduce walking distances and crossings required



Connected streets



Lollipop pattern

Engineering topic outline

- Around the School
- Along the School Route
- **Crossing the Street**
 - Introduction
 - Shortening crossing distances
 - Marking crosswalks
 - Creating visible crossings
 - Using stop signs and traffic signals
- Slowing Down Traffic

Principles for creating safe crossings

- Establish a school crossing
- Reduce crossing distance
- Use appropriate traffic control
 - Marked crosswalks
 - Warning signs or flashers
 - Stop signs and traffic signals
 - Crossing guards
- Slow vehicle speeds



Wide, multi-lane roads are barriers



School walking routes and big roads do not mix



Pedestrian and bicycle bridges

- Expensive
- Often not used
- Consider topography and circumstances



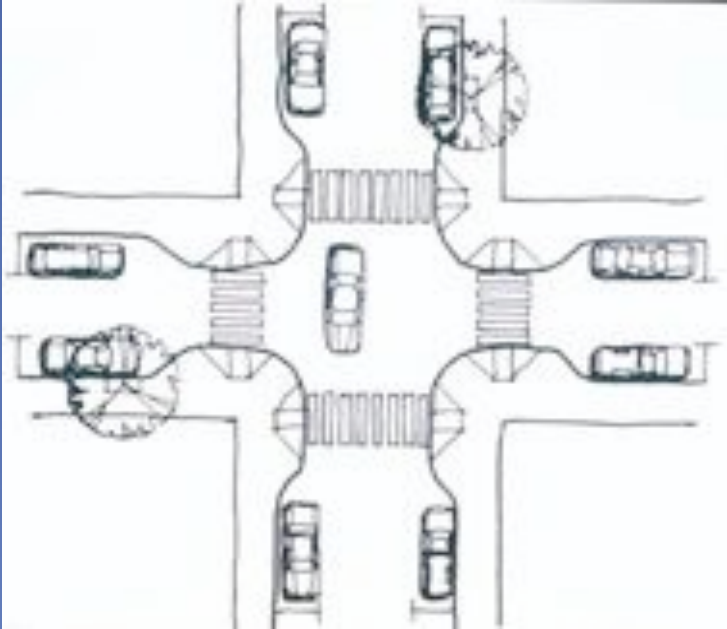
Pedestrian underpasses and bridges



Tools to reduce crossing distance



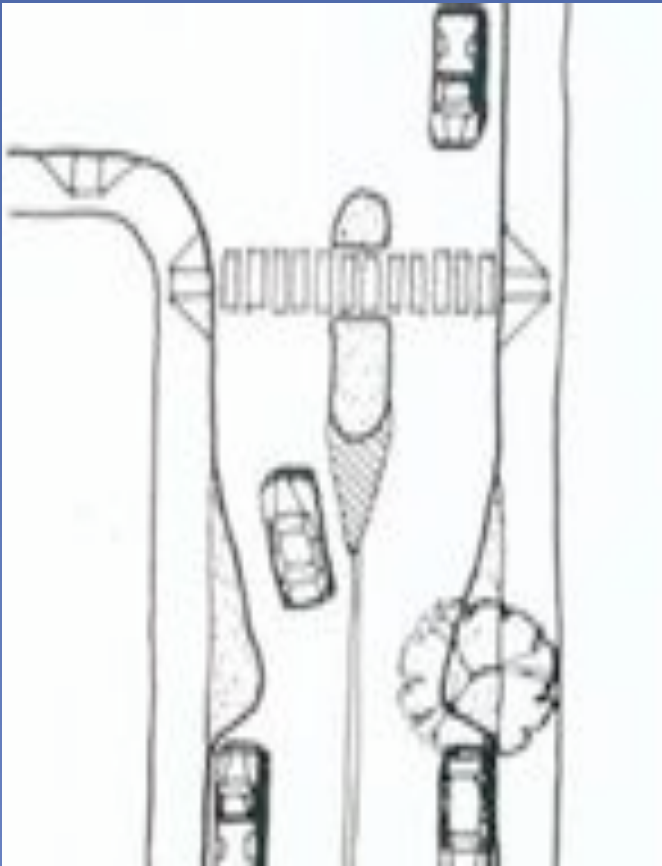
Curb extensions at crossings



Reduce the crossing distance



Crossing islands



Two-stage crossing island



Road diet – watch it happen



Road diet – watch it happen



Road diet – watch it happen

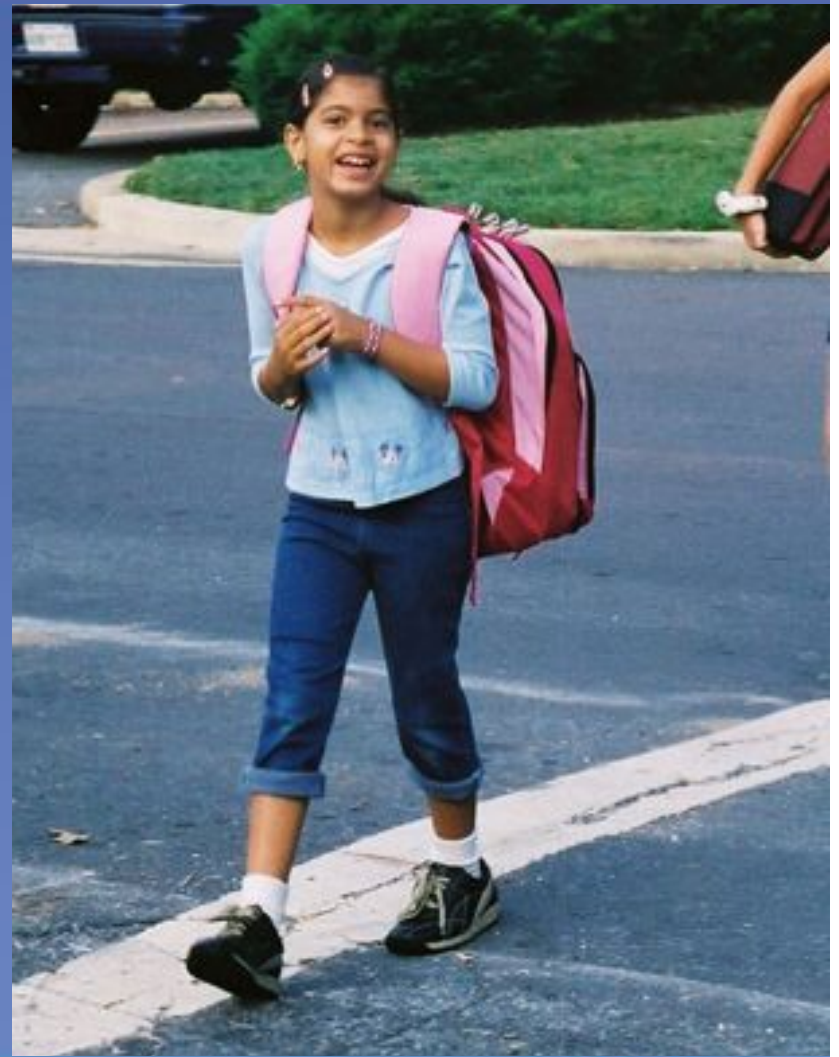


Marking crosswalks



Why install marked crosswalks?

- Indicate a preferred pedestrian crossing location
- Alert drivers to an often-used pedestrian crossing
- Indicate school walking routes



This crosswalk meets guidelines



This one doesn't meet guidelines



Install high-visibility markings



Ladder-style is easier to see.

What the pedestrian sees



What the driver sees (same crosswalk)



In-street signing



In-pavement flashing crosswalks



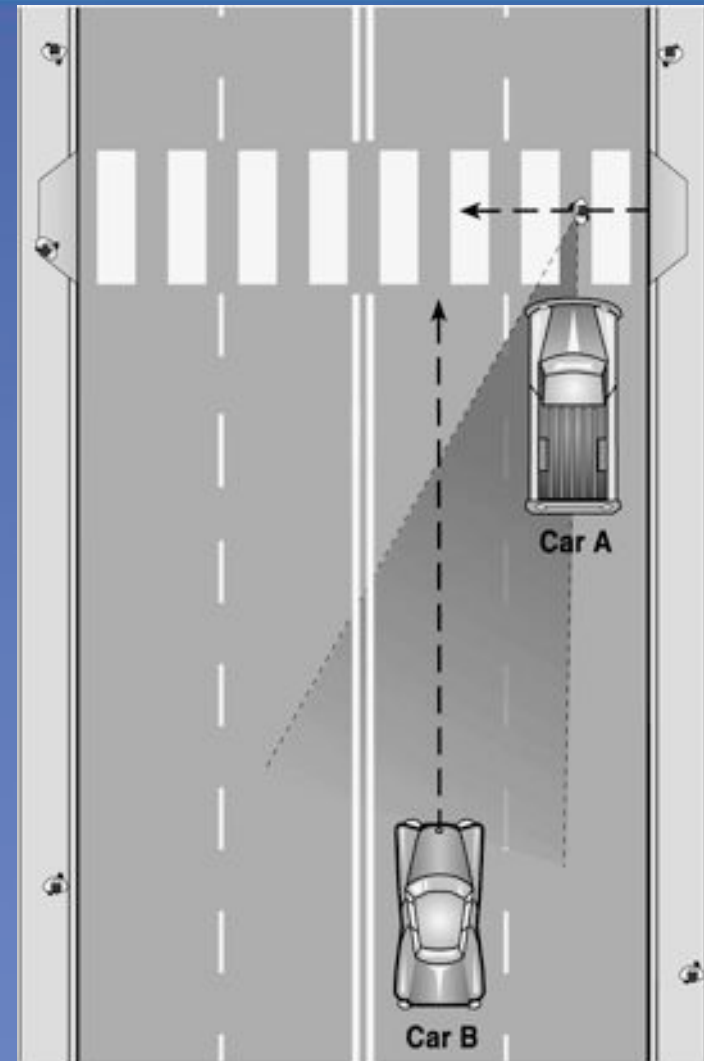
- Possible maintenance problems
- Visible primarily at night
- Unknown crash effects
- Expensive treatment



“Multiple threat” crashes

1st car stops to let pedestrian cross, blocking sight lines

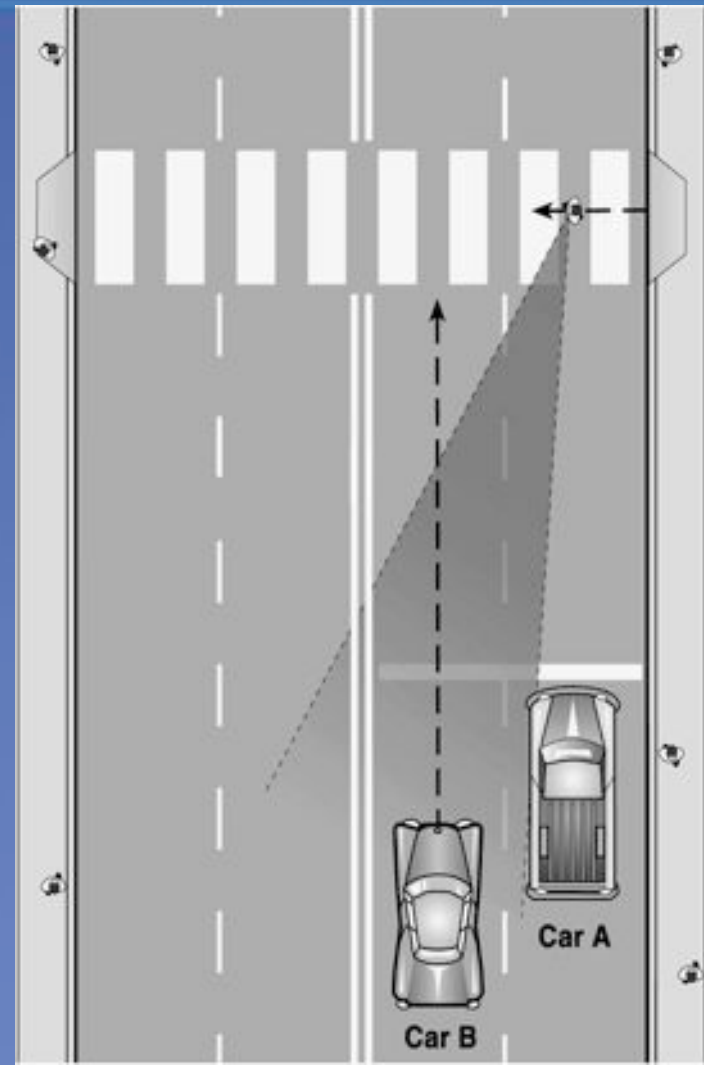
2nd car doesn't stop, hits pedestrian at high speed



Solution: Advance stop/yield line

1st car stops further back,
opening up sight lines

2nd car can be seen by
pedestrian



Parking restrictions at corners

Better visibility for both drivers and pedestrians



Modify traffic signal timing



Traffic signal guidelines

- Mark all crosswalks where pedestrians cross
- Pedestrian signals in all directions
- Adequate crossing time for pedestrians
- Stop bars for vehicles on all approaches

Engineering topic outline

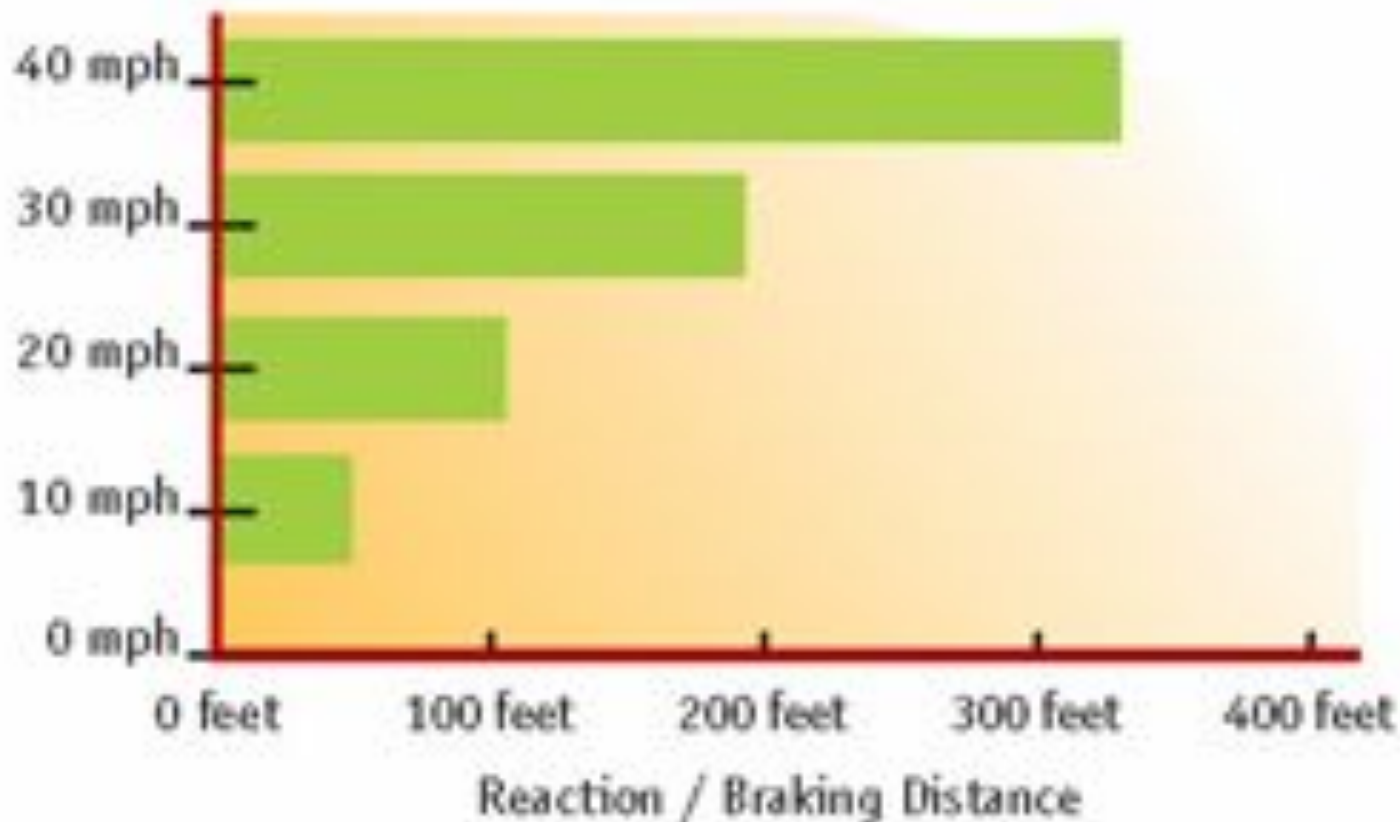
- Around the School
- Along the School Route
- Crossing the Street
- **Slowing Down Traffic**

Slowing down traffic

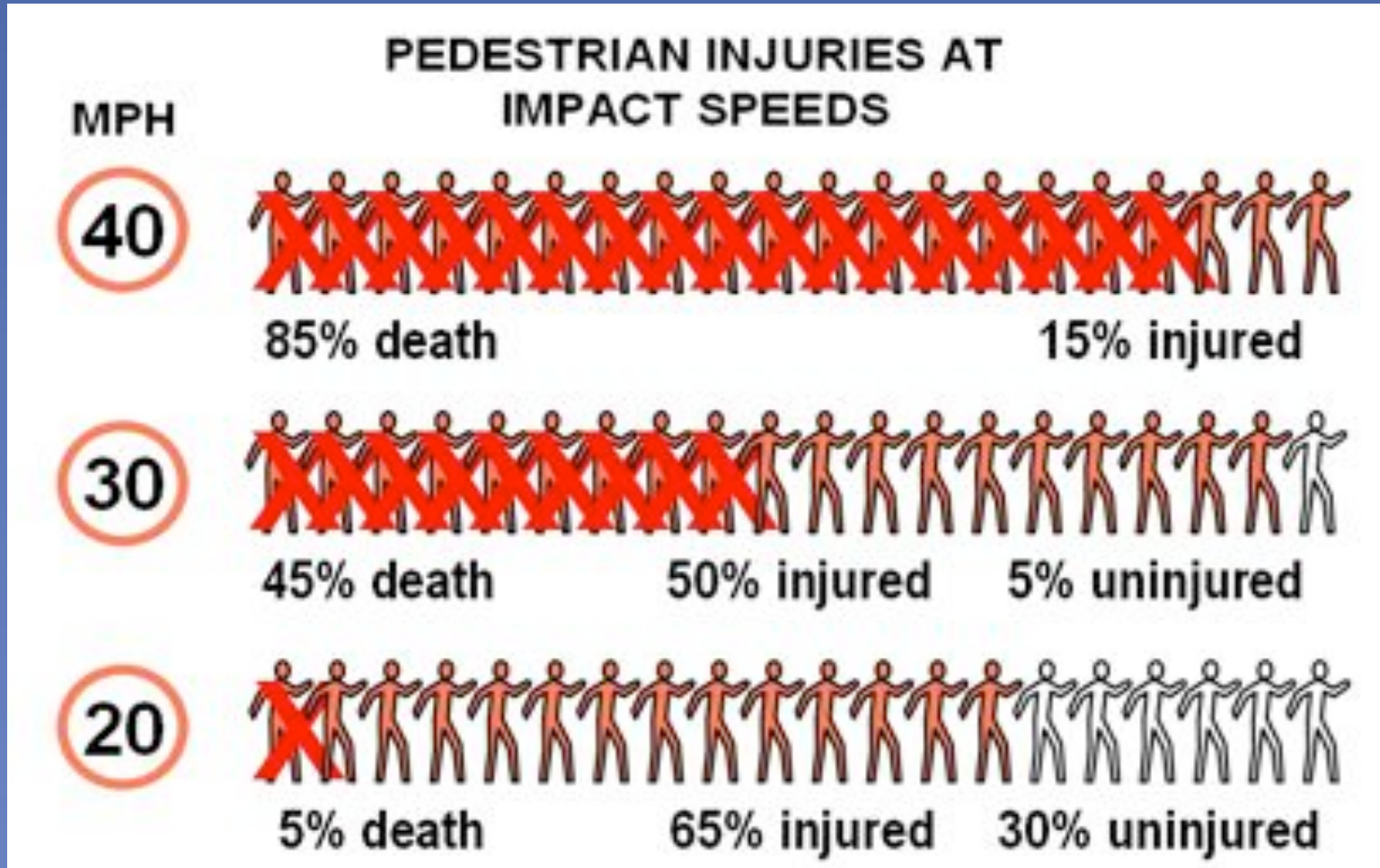


High speeds increase stopping distance

Travel Speed vs. Reaction and Braking Distance



High speeds increase ped injuries



Correct design invites correct use

Which street has lower speeds?



Narrow lanes reduce speeds



Use paint to
reduce lane width

Speed humps slow traffic on local streets



Raised pedestrian crosswalks



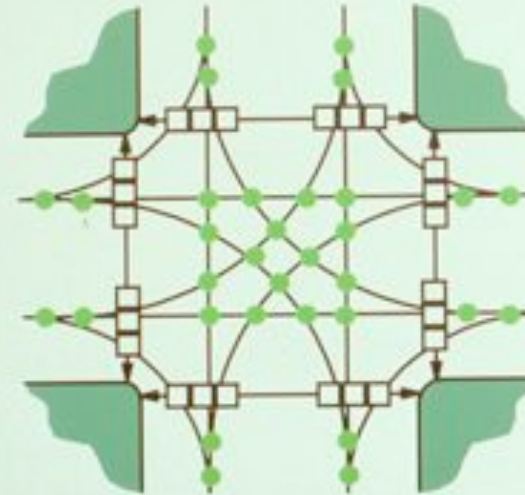
Raised crossings in school parking lot





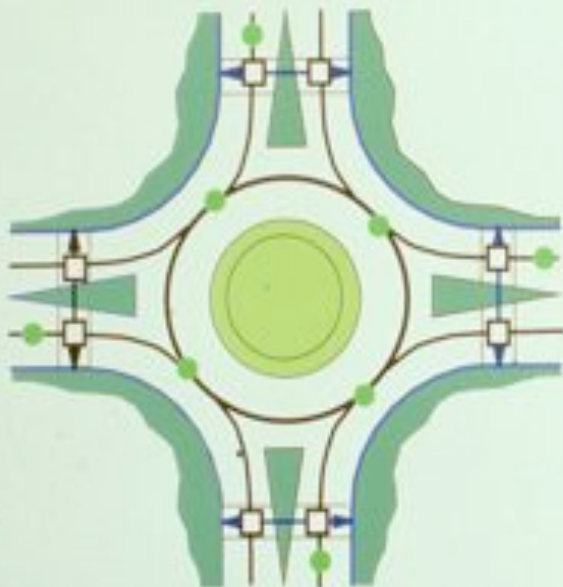
Roundabouts are safer

Conflicts At a Four-Way Intersection



- 32 vehicle-to-vehicle conflicts
- 24 vehicle-to-pedestrian conflicts

Conflicts At Roundabouts



- 8 vehicle-to-vehicle conflicts
- 8 vehicle-to-pedestrian conflicts

“Results of this study indicate that converting conventional intersections from stop sign or traffic signal control can produce substantial reductions in motor vehicle crashes.”

March 2000 Study by the Insurance Institute for Highway Safety

PED SAFE

PEDSAFE



Pedestrian Safety Guide and Countermeasure Selection System

[www.navigation.links](#)

The Pedestrian Safety Guide and Countermeasure Selection System is intended to provide practitioners with the latest information available for improving the safety and mobility of those who walk. The online tools provide the user with a list of possible engineering, education, or enforcement treatments to improve pedestrian safety and/or mobility based on user input about a specific location. [[read more](#)]

Resources:

Background – understand what is needed to create a viable pedestrian system.

Crash Statistics – learn about the factors related to the pedestrian crash problem.

Crash Analysis – learn how crash typing can lead to the selection of the most appropriate countermeasures.

Objectives – learn how selected treatments may address many requested improvements to the pedestrian environment.

Implementation – read about the necessary components for implementing pedestrian treatments.

More Info – access additional information through a variety of resources.

Downloads – access print versions of the guide and other relevant materials.

Available Tools:



Selection Tool – find appropriate countermeasures on the basis of desired objectives and specific location information.

Interactive Matrices – view the countermeasures associated with crash types and performance objectives.

Countermeasures – read descriptions of the 49 engineering, education, and enforcement treatments.

Case Studies – review real-world examples of implemented treatments.

Project sponsored by:



U.S. Department of Transportation
Federal Highway Administration

[site map](#)

This site is best viewed in [Mozilla 1.4+](#), [Netscape 7.0+](#), or [Internet Explorer 6.0+](#) browsers.

Summary

1. Focus first on easy-to-implement and low-cost solutions
2. Also identify and program longer-term improvement needs (e.g. sidewalks)
3. Match the treatment to the type of problem

Summary

4. Provide and maintain facilities along the school route:

- Sidewalks
- On-street bicycle facilities
- Paths
- Connections
- Pedestrian and bicycle bridges

Summary

5. Provide safe street crossings:

- Keep it simple
- Shorten crossing distances
- Carefully select crossing locations and marked crosswalks
- Create visible crossings

6. Slow down traffic speeds

Safe Routes: F.A.Q.

How do I deal with more rural or suburban schools?

- Wide shoulders or separate walking paths
- Manage parking/traffic flow
- Neighborhood access/multiple access points
- Enforcement