Mid-block Crosswalks

Law, Planning, Design & Liability

Prepared by

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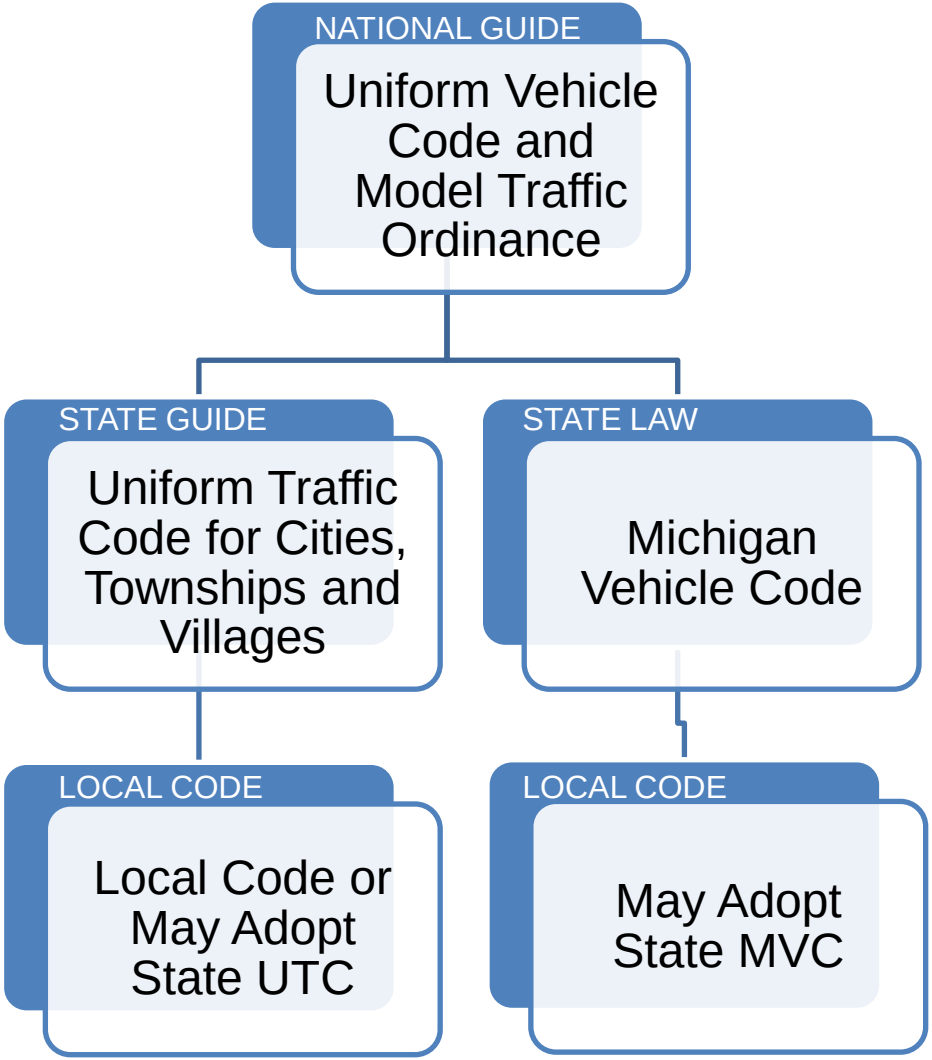
What is a Mid-block Crosswalk?

- Technically, a marked crosswalk located away from an intersection
- In practice, a marked crosswalk located away from a signalized or stop controlled intersection
- Provides guidance to pedestrians on an appropriate place to cross the road
- Warning to motorists to expect pedestrians and take appropriate actions

What is the Law?

- The National Uniform Vehicle Code provides guidance on traffic laws with the goal of creating national consistency
- Michigan splits the information in the National Uniform Vehicle Code into two separate documents:
  - Uniform Traffic Code for Cities, Townships and Villages
  - Michigan Vehicle Code
- These may be adopted by communities



Some communities adopt the UTC and then make amendments to certain sections

Michigan Vehicle Code

- Michigan Vehicle Code (MVC) is modeled after the National Uniform Vehicle Code
  - But does not include everything in the National Uniform Vehicle Code
- It specifically does not address right-of-way in a crosswalk – just the definition of a crosswalk

257.10 “Cross-walk” defined.

Sec.10 “Cross-walk” means:

(a) That part of a roadway **at an intersection** included within the connections of the lateral lines of the sidewalk on opposite sides of the highway measured from the curbs, or in the absence of curbs from the edges of the traversable highway.

(b) Any portion of a highway **at an intersection or elsewhere distinctly indicated for pedestrian crossing** by lines or other markings on the surface.

At the intersection of two roads, where sidewalks are present on opposite sides, a crosswalk technically exists between those sidewalks even if it is not marked.

Uniform Traffic Code for Cities, Townships and Villages

- Most local municipalities are modeled after or adopt Michigan's UTC
- Rule 706 of Michigan's UTC grants fewer rights than the national guide
  - A pedestrian is required to yield to vehicles at marked mid-block crosswalks
  - The national guide only requires this at unmarked mid-block crosswalks

R 28.1702 Rule 702. Pedestrians; right-of-way in crosswalk; violation as civil infraction

(1) When traffic-control signals are not in place or are not in operation, the driver of a **vehicle shall yield** the right-of-way, slowing down or stopping if needed be to so yield, **to a pedestrian crossing the roadway within a crosswalk** when the pedestrian is **on the half on the roadway on which the vehicle is traveling** or when the pedestrian is approaching so closely from the opposite half of the roadway as to be in danger, but a pedestrian shall not suddenly leave a curb or other place of safety and walk or run into a path of a vehicle that is so close that it is impossible for the driver to yield.

R 28.1706 Rule 706. Pedestrians; yielding right-of-way; violation as civil infraction.

(1) Every pedestrian who crosses a roadway **at any point other than within a marked crosswalk at an intersection shall yield the right-of-way to all vehicles on the roadway.**

R 28.1709 Rule 709. Pedestrians; crossing between adjacent intersections; violation as civil infraction.

(1) Where traffic-control signals are in operation, **pedestrians shall not cross the roadway except in a marked crosswalk**.

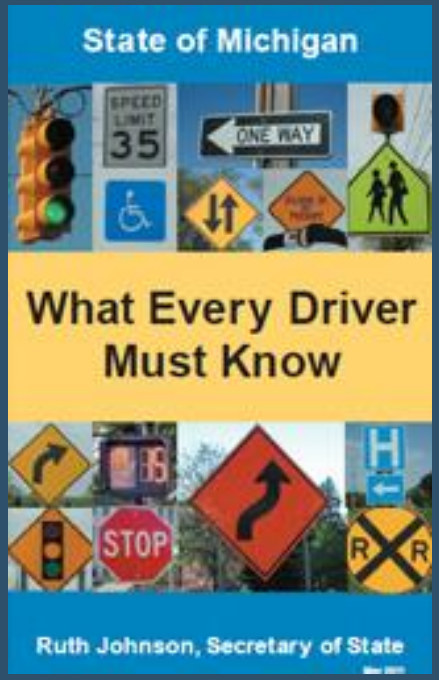
So What Defines “within” a Crosswalk?

- Basically a body part extending past the curb line
- To test yield rates, a person places one foot in the travel lane (just past the edge of the curb) at the stopping sight distance for the posted speed
- Some communities promote extending an arm into the crosswalk to signal intent to cross the roadway and officially become “within” a crosswalk

Can a motorist really tell from 250 or 360’ away if a pedestrian is waiting at the edge of the road vs. having their foot or arm extended in the road?

What Every Drive Must Know

- This is all very confusing, how does the Secretary of State explain things given the varying local codes?



Tips for Sharing the Road when Driving

"As a driver, watch out and **always yield the right-of-way to people walking, jogging, biking, crossing a street in the middle of a block**, or darting from between parked vehicles. Watch for them entering a street from a driveway or alley, at stop signs, traffic signals, roundabouts, crosswalks, and intersections."

"Even if traffic lights or crosswalks are not present, drivers must yield the right-of-way to a pedestrian crossing the roadway. Never attempt to pass any vehicle that has stopped to allow a pedestrian to cross. **Drivers must take every possible precaution to avoid a collision with pedestrians."**

"Motorists are cautioned that pedestrians are likely to cross in the middle of the block, whether or not a crosswalk is present."

"Mid-block crosswalks provide pedestrians with safe crossing along roadways at places, other than intersections. A yield line is sometimes used to indicate the location where drivers should stop for pedestrians in the crosswalk."

In A Nut Shell..

- Even with all of the convoluted language in the MVC & UTC and local law variance…
- You must yield to and/or stop for a pedestrian in a crosswalk when they are on your side of the road or getting close
- Splitting hairs about someone being at or within a crosswalk is not the real issue
- Making sure pedestrians in a crosswalk are not run down by motorists is the real issue

No motorist wants to hit a pedestrian and no pedestrian wants to be hit by a vehicle

So the real issue is making sure they see each other and understand each other

Locating Crosswalks & Determining Demand

- Existing Crossing Activity
  - May be time sensitive
- Map out complementary land use on opposite sides of a road
  - Housing and Retail
  - Office and Restaurants
- Transit stops
  - look for shelters
- School routes
- Bike routes
- Local road connectors
- Trail crossings

Don’t only rely on existing activity when looking at guidelines. Some traffic is so intimidating that it inhibits trips. Evaluate the latent demand. Look at a road as it were a river and locate the crosswalk as you would locate a bridge.

Importance of Direct Travel Routes

- Most walking trips for personal business are about ¼ to ½ mile (5 to 10 minutes walk)
- Think of out of direction travel as a percentage of the total trip distance and walking time
- Thus a 10% detour for a ½ mile walking trip is 264’ (less than a city block)
- A catchment area for bus stops are even less, typically ¼ mile – must be able to get to stops on both sides of the road

Signs and barriers have little impact on changing people’s behaviors

Have to accept that 85% of the people will not go out of their way to cross at a signalized crosswalk

Redirect to a Signalized Intersection?

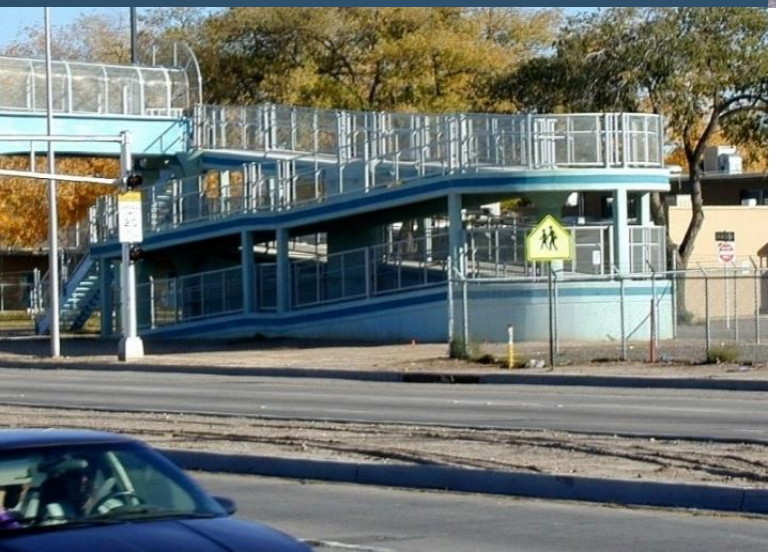
- Too often the default choice without analysis
- Is the signalized intersection really a safer option?
  - Generally more lanes
  - Many turning movements
  - Many things vying for the drivers attention
  - Typically lots of pedestrian crashes
- Is the route to the intersection safe and accessible?

In many cases a unsignalized mid-block crossing may be the safer alternative

Have you ever heard that a traffic signal should be removed because a pedestrian was hit in the signalized crosswalk?

Go Overhead?

- Overpasses are often a poor allocation of limited resources
- Ramps add a lot of distance to a trip and are challenging for those with mobility impairments
- Many people are afraid to use them



You can put in about 30 crossing islands for the cost of one overpass

These can work well when the grade of the walkway is above the roadway such as with a rail-trail

Basic Mid-block Crosswalk Design Considerations

- Visibility and telegraphing intent are key
- An approach to the crosswalk places a pedestrian such that their intent to cross the road is communicated to motorists
- Keep sightlines free of vegetation
- Yield markings set back from crosswalk and coordinate with sign locations – don't want bumper of car at the edge of the crosswalk

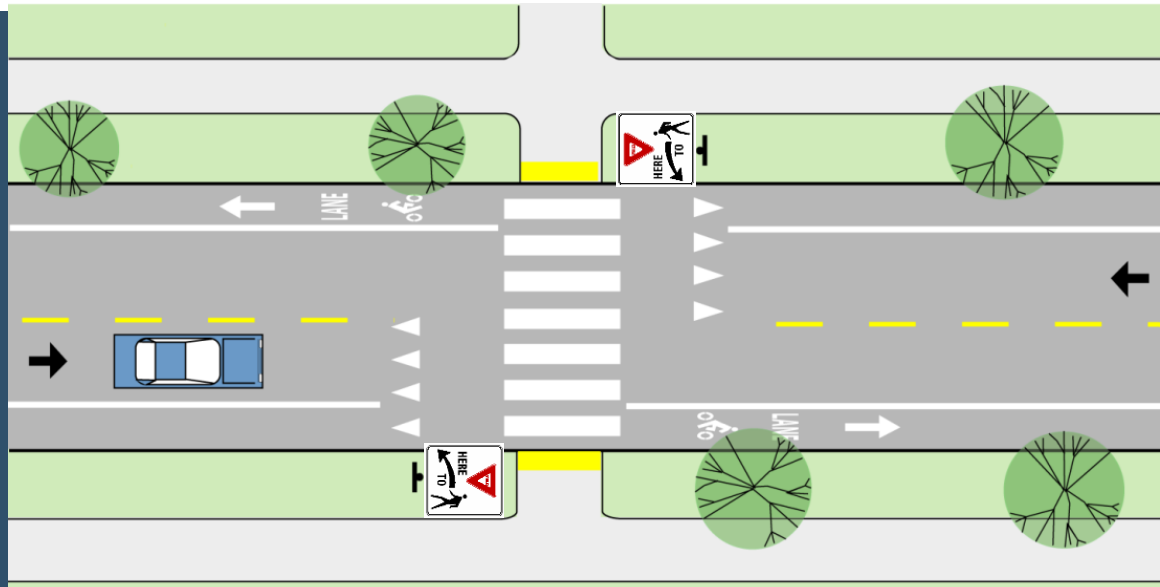


Illustration: The Greenway Collaborative, Inc.

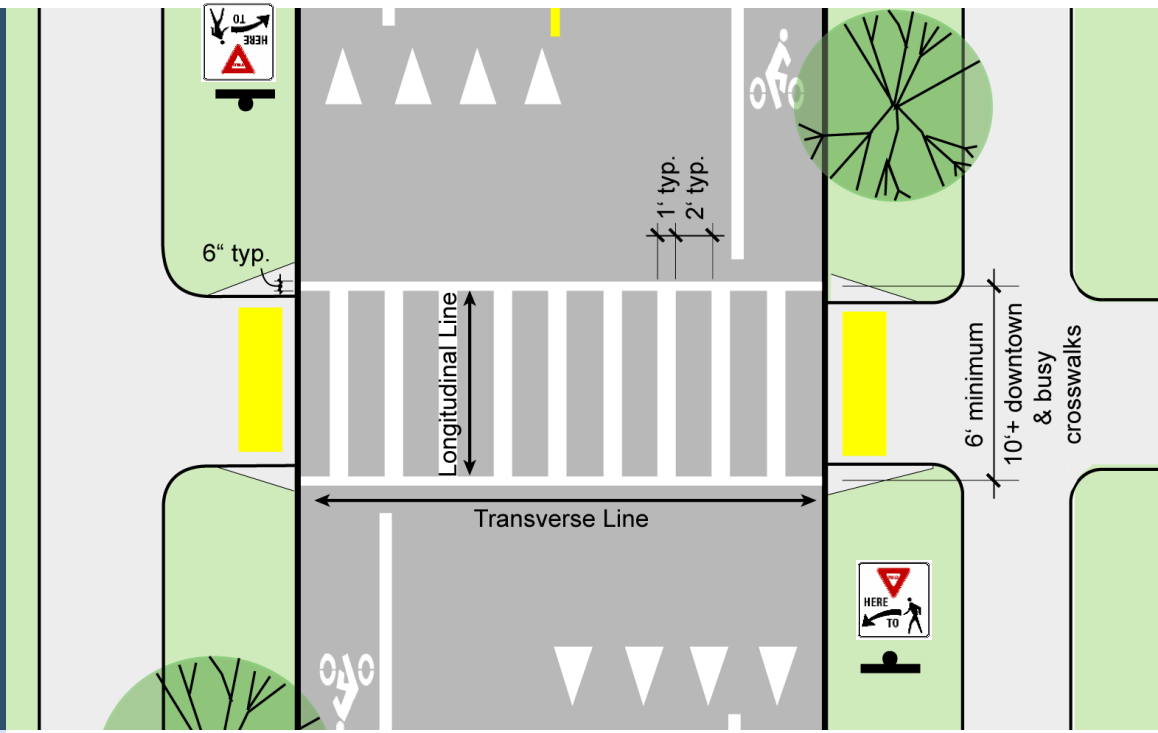
Two Essential Engineering Studies:

A "gap study" to see if pedestrians have reasonable opportunities to cross both lanes

A "stopping sight distance" study to make sure that motorists have the ability to see and then stop in time for a pedestrian in the crosswalk

Basic Pavement Marking Considerations

- Two thin transverse lines are barely visible to a driver on primary roads
- Keep longitudinal lines to 1’ wide to minimize slip hazard and use slip resistant materials
- Traverse lines help those with vision impairments



Always use a detectable warning strip

What Signs to Use?

- Trying to both warn motorists and inform them of what to do
- “Yield/Stop” informs and has shown to be intuitive
  - But visibility issues with small text and graphics
- “In-street signs ” have been shown to be very effective
  - Especially when set up as a “gateway”
  - Winter & maint. issues
- “Warning signs” are highly visible at a distance but message not clear

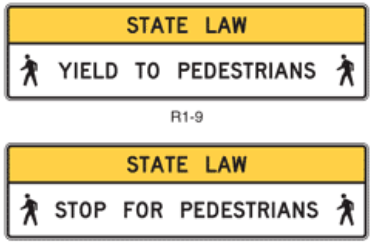
Practice is All Over the Place

Placed on the side of the road these signs inform motorists what to do and where

Placed in the middle of the road:

on an island / between lanes

overhead

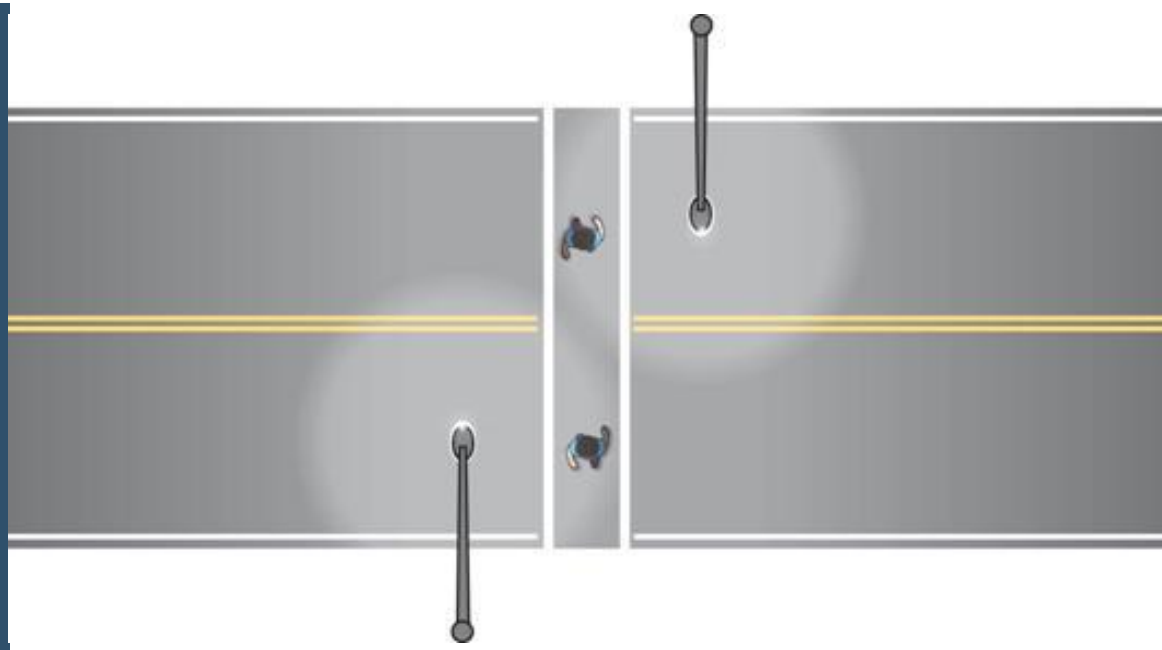


In advance of a crosswalk on side of the road

At the crosswalk on the side of the road

Crosswalk Lighting

- Directly overhead lighting does little to illuminate someone in the crosswalk
- Position lighting such that it illuminates the side of the person facing traffic and approach area
- Off-set lighting can be used in combination with reflective bollards and reflective sign posts to increase the visibility of a crossing island
- Can combine overhead lighting with overhead crosswalk signs



Mid-block with On-Street Parking

- Curb extensions places pedestrian into the sightlines on oncoming vehicles
- Reduces the potential of “dart-out” type crashes
- Areas simply marked off for no-parking often become default loading zones

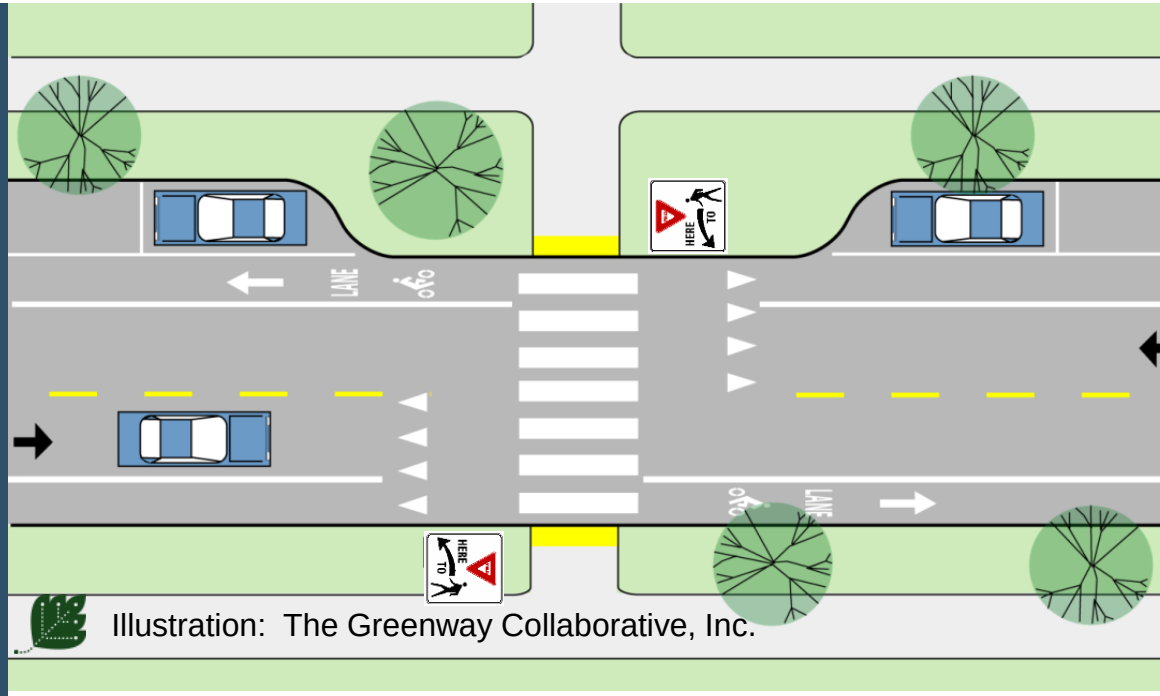


Illustration: The Greenway Collaborative, Inc.

Speed Table Crosswalks

- Generally used on relatively low-volume, low speed roads, right-turn by-passes (pork chop islands) and roundabouts
- Reduce speed of motor vehicle so that if a crash occurs, the injuries are minimal
- Typically a 6’ long approach ramp raising 4” to a level top with a crosswalk
- Forces issue where signs are ineffective or lots of things happening

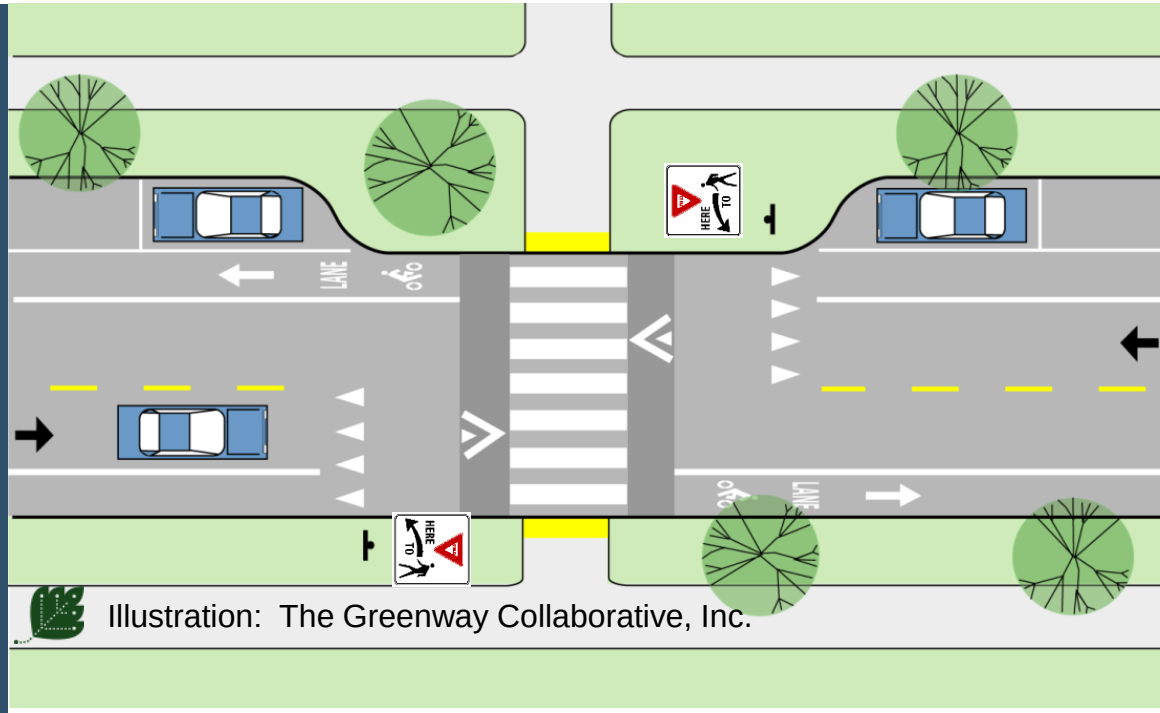
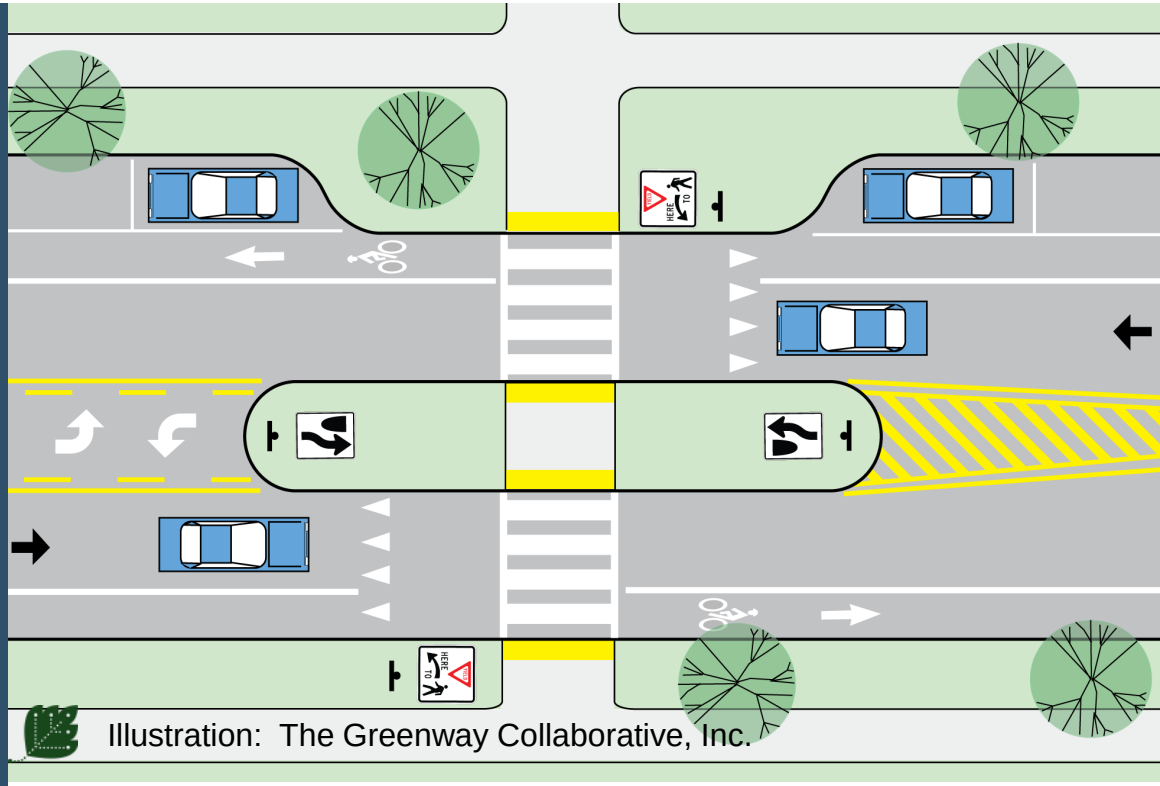
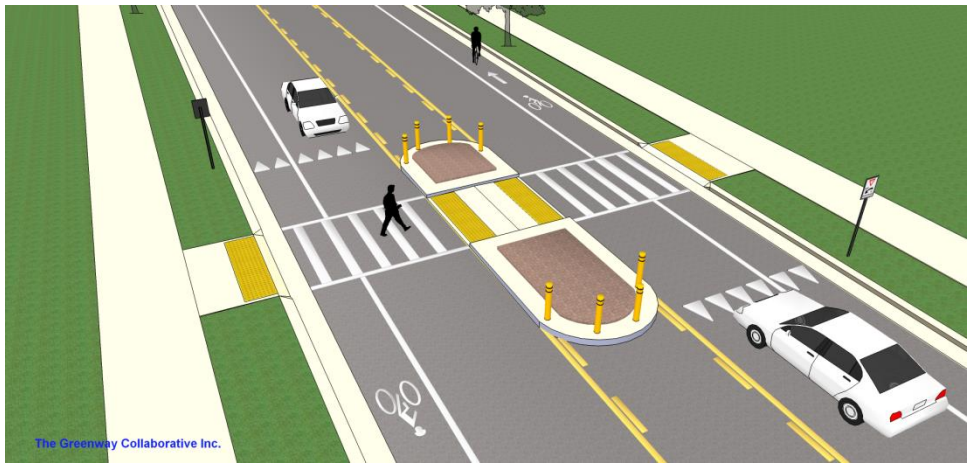


Illustration: The Greenway Collaborative, Inc.

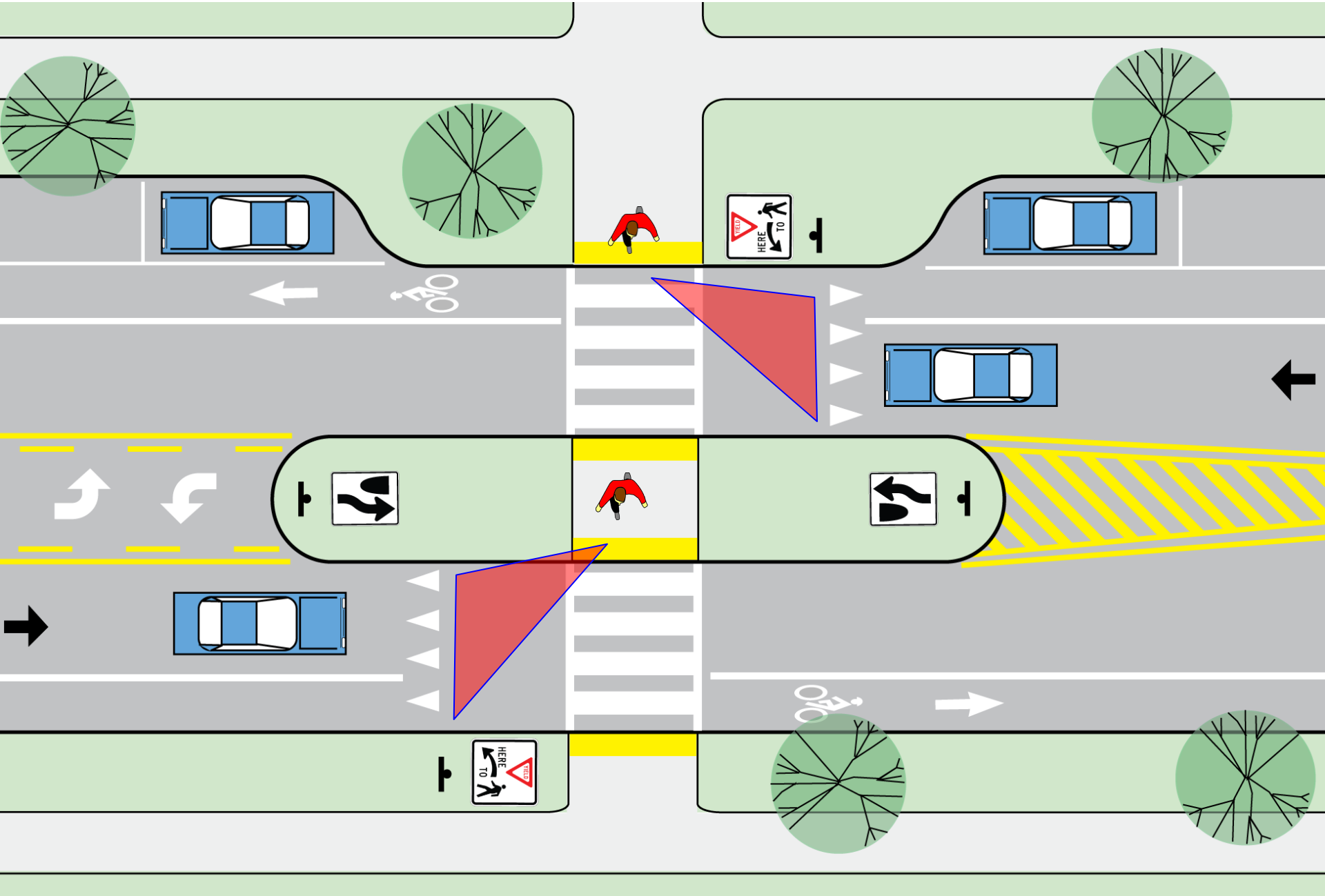
Crossing Islands

- Cross street in two stage
- Only requires a gap in traffic from one direction at a time
- Presence of island in street makes crossing more prominent
- Islands reduce pedestrian crashes by 40%
- FHWA Proven Safety County Measure
- Use whenever possible on roads with more than two lanes



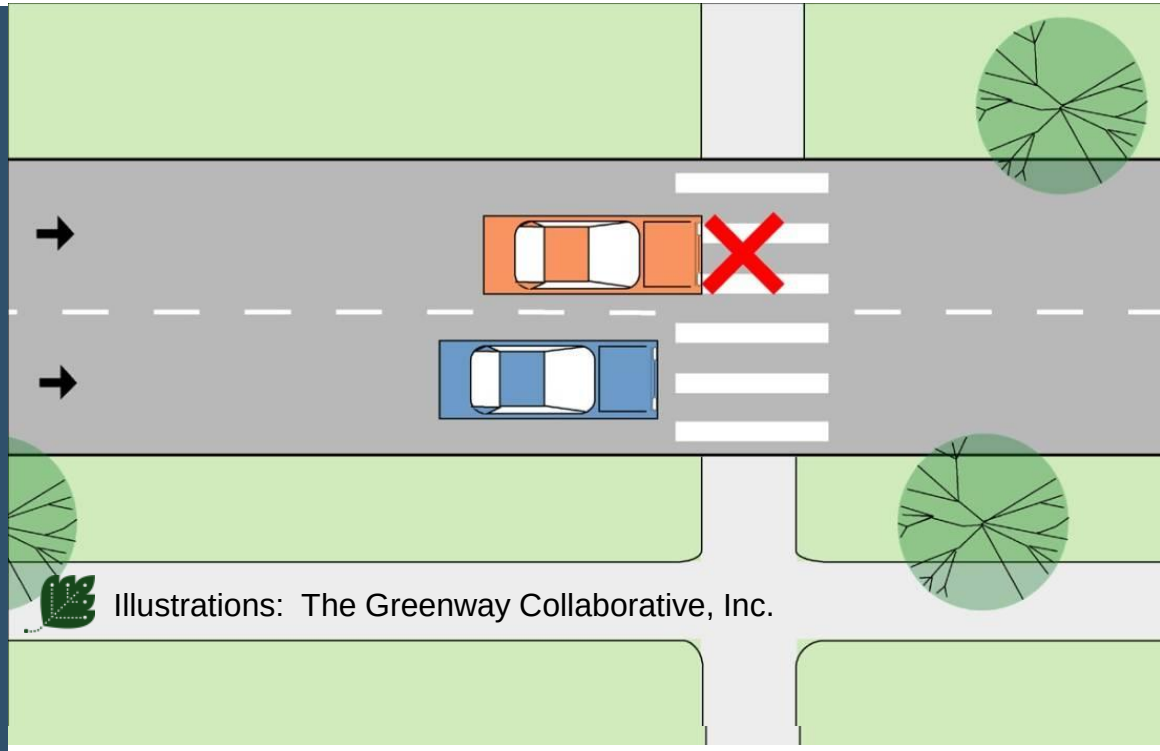


Splitting the trip into two phases

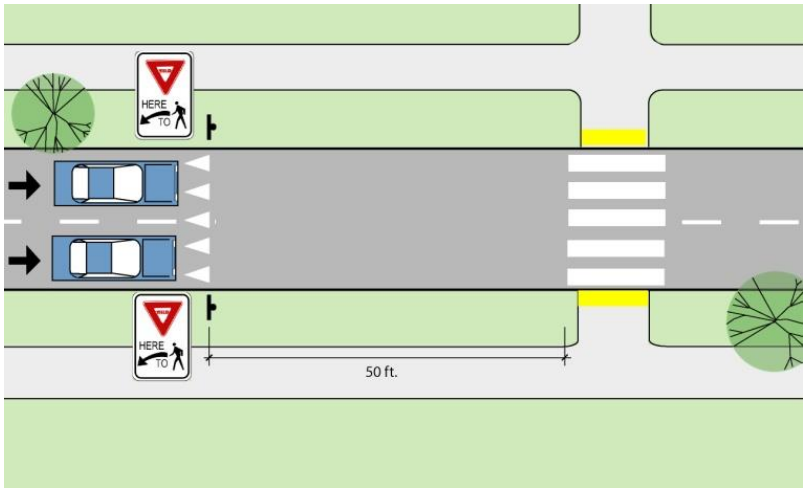


Addressing the Double Threat Crash

- An issue where there are two lanes of traffic going in the same direction
- The first car that stops for a pedestrian can hide the pedestrian from a car in the adjacent lane
- Solution is to pull the yield or stop bar back to open up view and/or stager the stop bars
- If Yield to Pedestrian sign is set far back you may place crosswalk warning sign at crosswalk itself

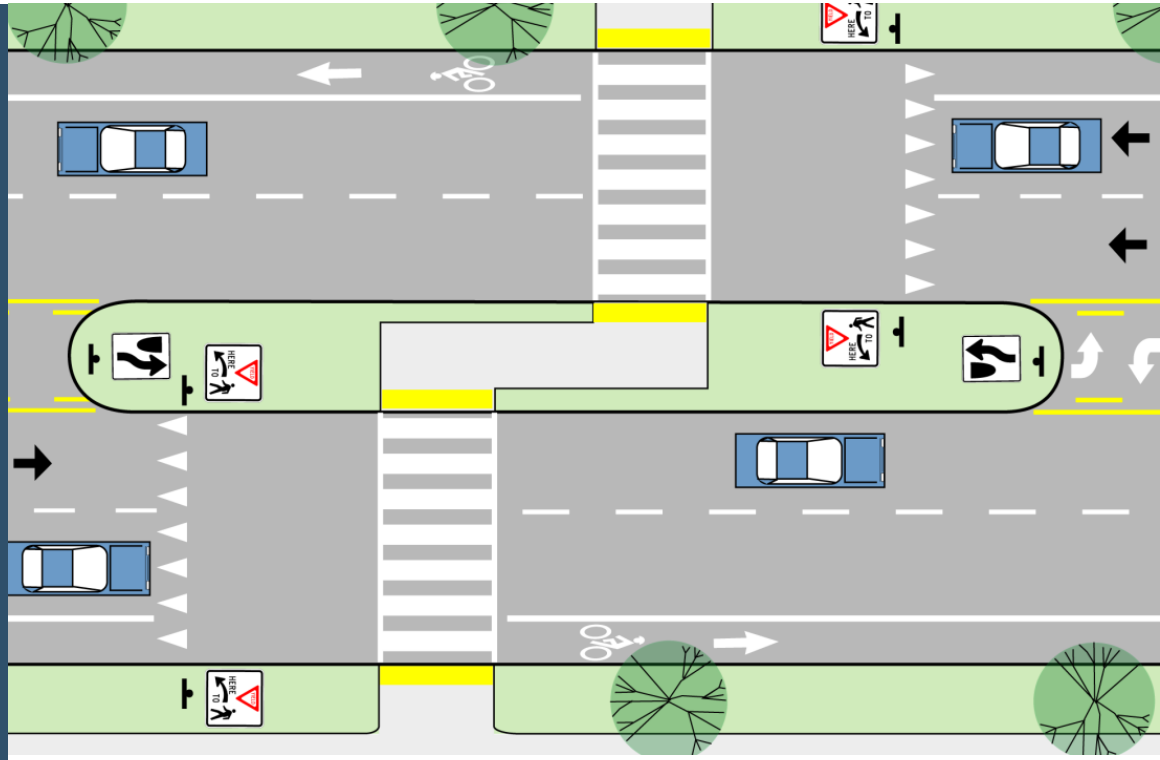


Illustrations: The Greenway Collaborative, Inc.



Zig-Zag Crossing Islands

- Pedestrians on island walk towards oncoming traffic
- Larger refuge area provides room for multiple users and longer vehicles such tandems and bike trailers – helpful with trail crossings



Rectangular Rapid Flash Beacon (RRFB)

- High intensity LED flashers are paired with crosswalk signs to get motorists attention when crosswalk is in use
- Push-button or passively activated (automatic detection)
- Can be linked to advanced warning signs with LED flashers
- Solar powered option
- Potential issue when flashers stop and peds are still in the crosswalk

Can be used by themselves on two lanes roads or in conjunction with crossing islands on roads with 3 or more lanes

May be posted to side of street or overhead

Rectangular Rapid Flash Beacon Yield Rates

- Yield rates in recent studies around 86%
  - Less in Michigan
- Higher posted speed limits associated with higher yield rates!
  - Very low yield rates at low speed roads
- Better yielding rates on one-way roadways
- Higher yield rates when used with crossing island
- Lower yielding rates at 45 mph vs. 35 to 40 mph

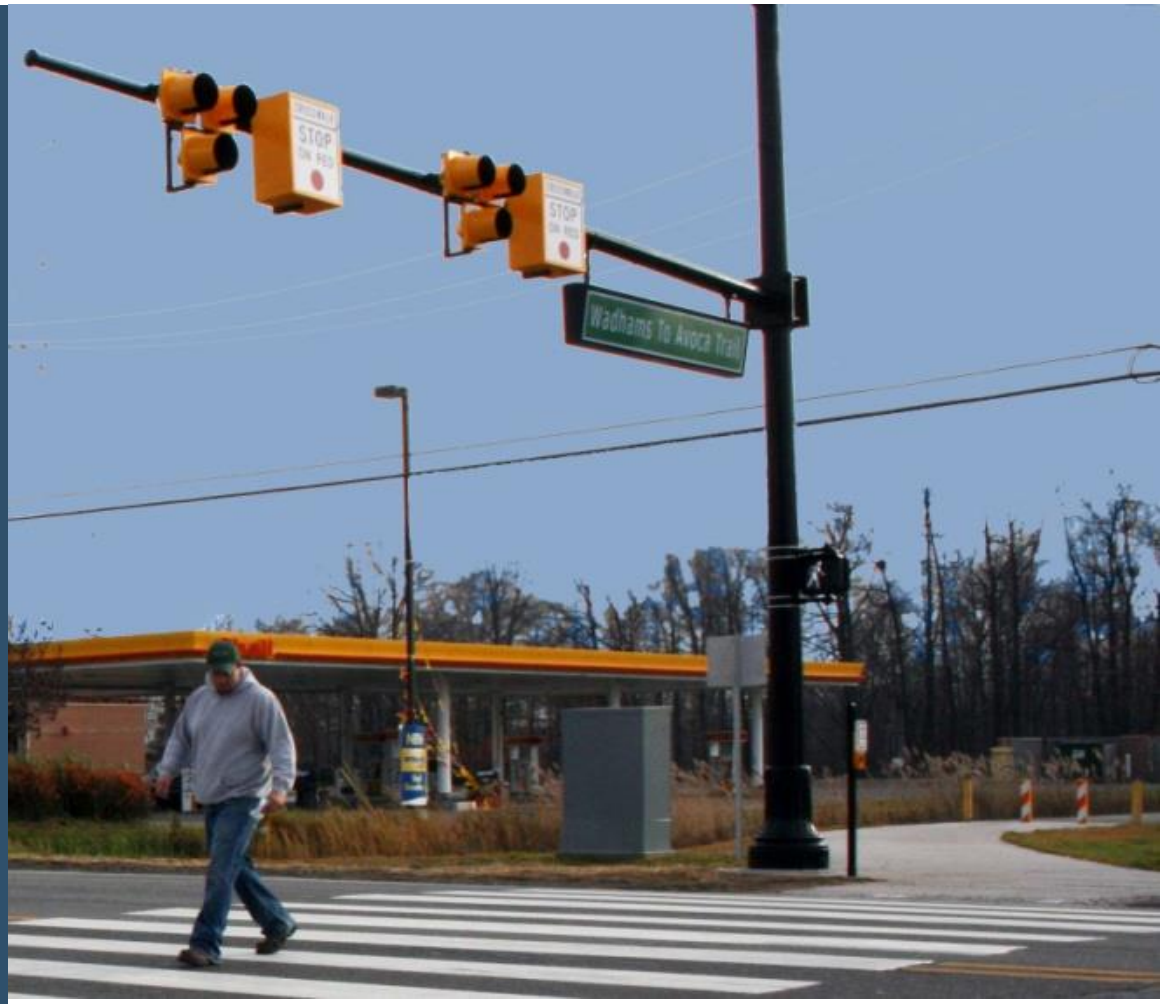
Drivers are only required to yield to a pedestrian on the same side of the road that they are on so multi-lane, two-way roads may have lower yield rates than the same number of lanes on a one-way road

Can use at road intersections

In many cases getting very similar yield rates at Pedestrian Hybrid Beacons at a much lower cost

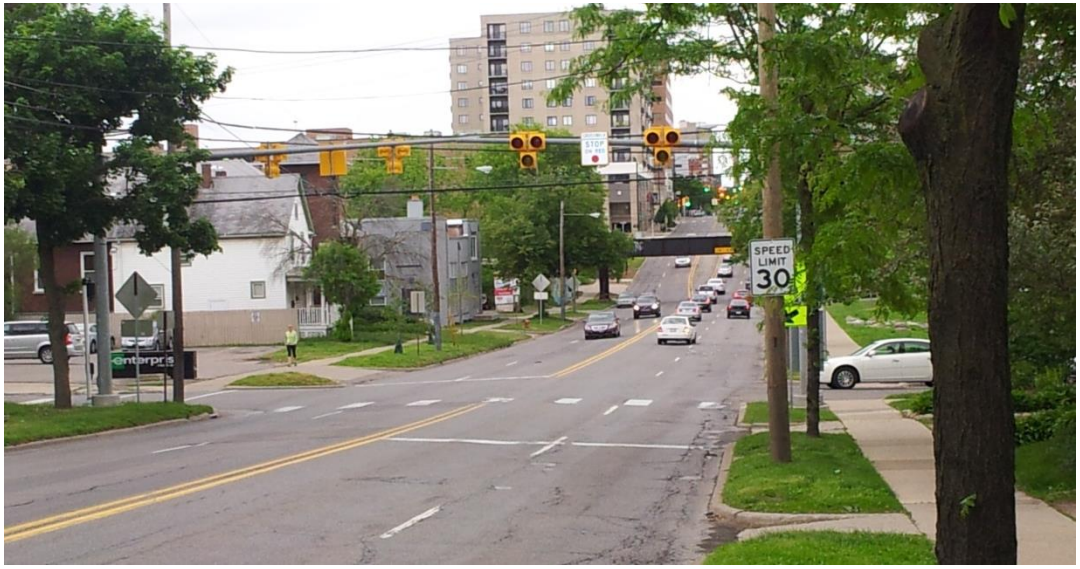
Pedestrian Hybrid Beacon

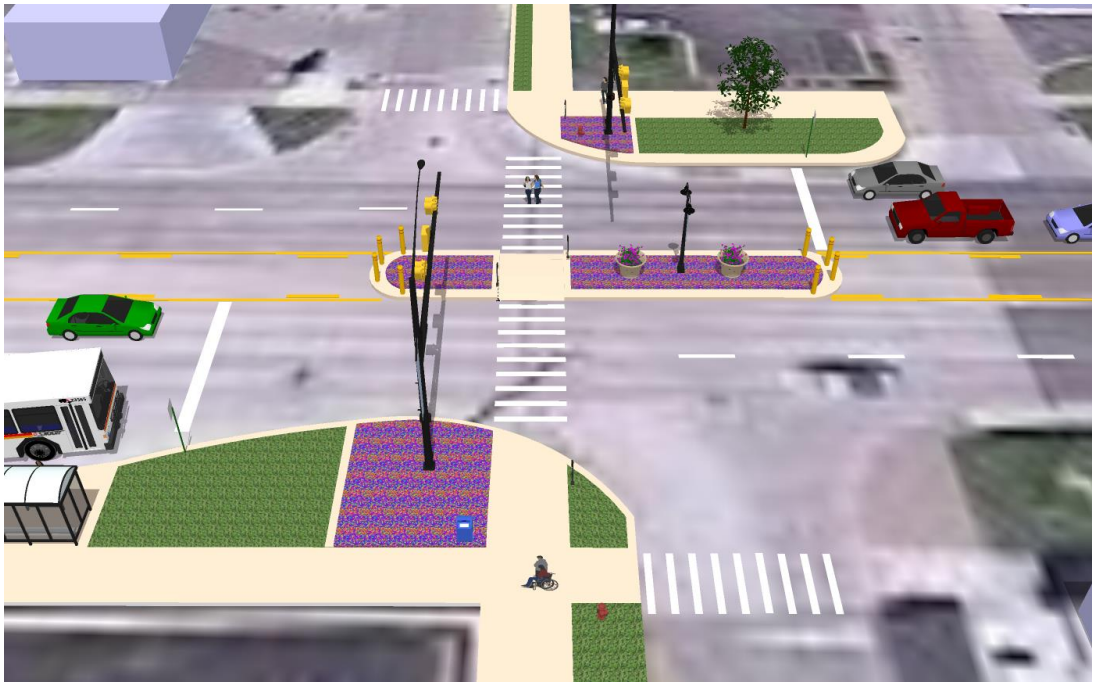
- Good for multi-lane crossings with limited gaps and higher speeds
- May be used with or without crossing islands
- 29% reduction in roadway crashes
- 69% reduction in pedestrian crashes
- Minimal delay to motorized vehicles
- FHWA Proven Safety County Measure
- Relatively new device – education important when installed



Pedestrian Hybrid Beacons at Intersections

- Not intended for use at intersections
- Motor vehicles tend to use pedestrian signal to cross road or make turn when pedestrians crossing the road
  - Conflicts with Pedestrians
  - Crashes between motorists
- When used at intersections should restrict through traffic and turns





Pedestrian Hybrid Beacon Yield Rates

- Yield rates in recent studies around 89%
  - But vary significantly from community to community
- Posted speed does not impact yield rates
- Yield rates remain high on wide, multi-lane roads
- Higher yield rates on one-way roads, even on 4 lane roads
- Efficacy of the PHB may depend on outreach, demographics, design and location

Yield rates in Michigan have been found to be much lower than other states – but more outreach appears to be associated with higher yield rates

The addition of a single in-street sign brought the yield rates up to levels of out-of-state studies – helps eliminate confusion on what to do

PHB and RRFB - Commonalities

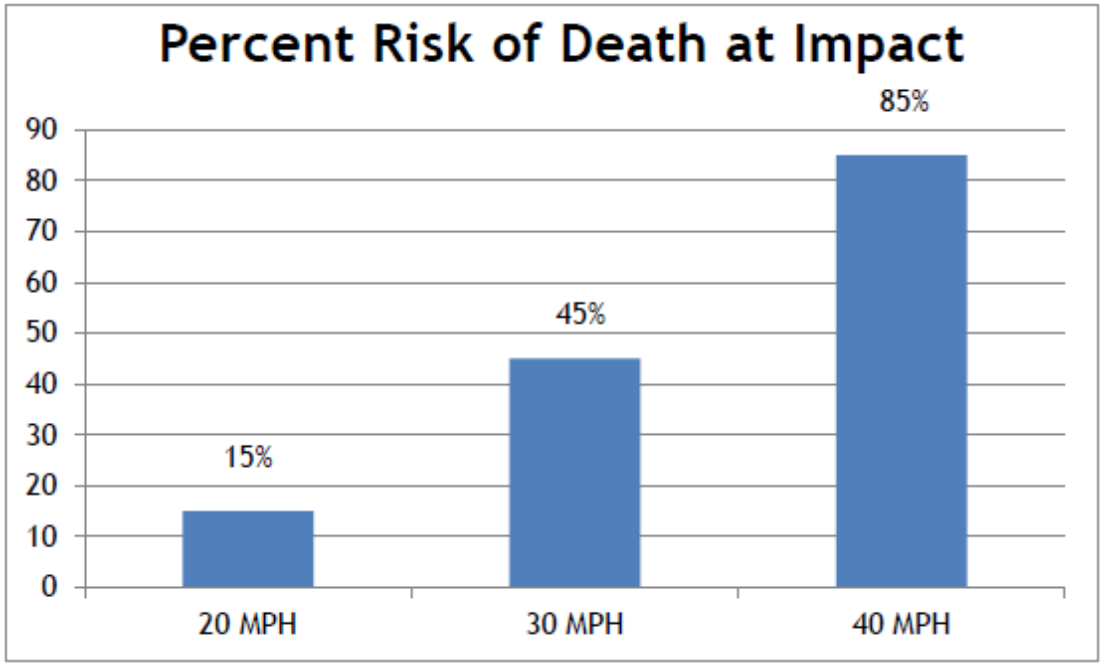
- Yield rates vary by city
  - Some cities use more of one device than another
  - A single device is an anomaly
  - Often used at challenging locations
  - Education and/or enforcement efforts vary by community
- The longer the device is present the higher the yield rate
- More devices in a community the greater yield rate

Driver Yielding at Traffic Control Signals, Pedestrian Hybrid Beacons, and Rectangular Rapid Flashing Beacons in Texas, Fitzpatrick et al, Texas A&M Transportation Institute

A school crossing vs. a standard crossing may have an impact on yield rates

Speed and Fatality Rates

- Chances of a pedestrian surviving a crash with a motorists drop off dramatically when the speed of the impact is over 20 mph
- Higher fatality rates for the most vulnerable pedestrians – young, old and disabled
- The single most important thing a community can do to improve pedestrian safety is to lower the speed on roadways where there is pedestrian traffic

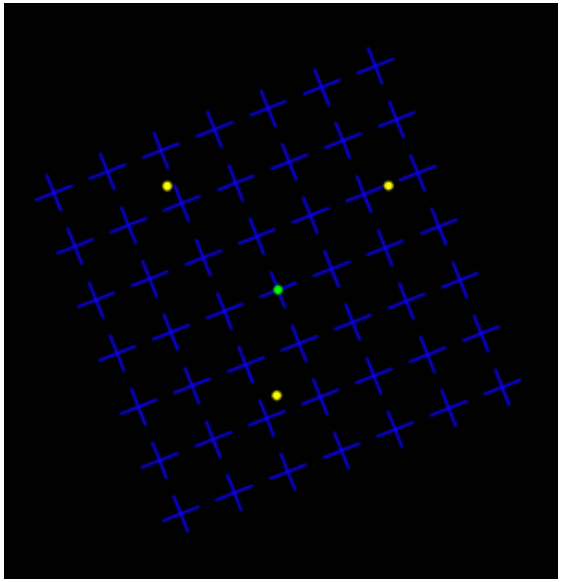


Even with the best countermeasures in place, crashes will likely continue to happen. The goal is to eliminate the fatalities and severe injuries

How to lower speeds is a whole topic unto itself

Motion Induced Blindness and Selective Attention

- An object away from a motorists focus of attention may disappear and reappear irregularly (Troxler's fading)
- This is compounded when with a moving background (Motion Induced Blindness)
- The Invisible Gorilla is a book that explores attention, perception, memory and reasoning
  - You are missing more than you think



When you look at the green dot and the blue grid moves the yellow dots disappear

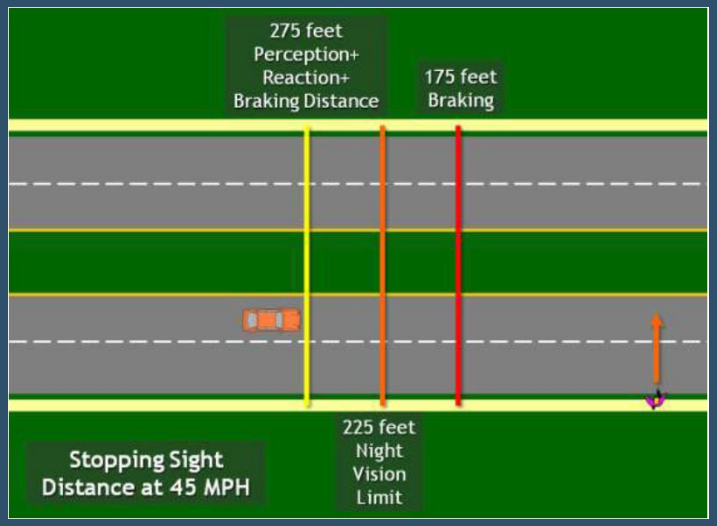
http://www.michaelbach.de/ot/mot-mib/index.html

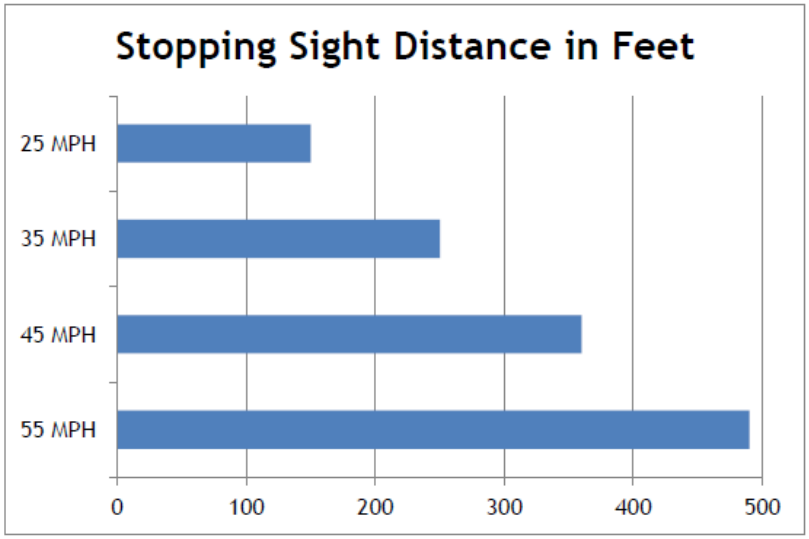
If you are paying attention to who is passing a basketball you may miss a gorilla walking through the center of things

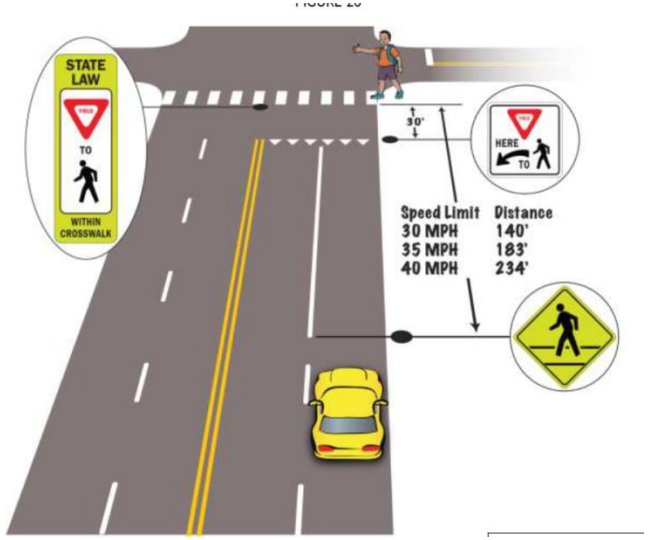
http://www.theinvisiblegorilla.com/

Influence of Speed on Ability to Stop

- The higher speed the greater distance required to see, react and stop a vehicle
- At night, at 45 mph you may not be able to see far enough in advance to react and stop in time







Bus Stop and Crosswalks

- People will cross the road at a bus stop even if a crosswalk is not provided
- Coordinate bus stops with crosswalk locations
- Place crosswalk behind bus stop

This bus obscures views of pedestrians in crosswalk

If bus stop and crosswalk are too close, it can be impossible to tell if a person is trying to cross the road or just waiting for a bus

Liability – Crosswalks are Legally Defendable

- Crosswalks are recognized as reasonable measures to address specific safety problems
- Most involve signs, signals or features outside the road bed surface
  - an island is not part of the roadway
- Empirically proven to make travel safer when done appropriately
- Individual employee liability slight – no gross negligence

Liability Limited to Vehicular Travel Lanes:

"The duty…extends only to the improved portion of the highway designed for vehicular travel and does not include sidewalks, trail ways, crosswalks, or any other installation outside of the improved portion of the highway designed for vehicular travel."

Grimes v MDOT (2006)

Applies to State and County Roads Only

Resource – City of Boulder Pedestrian Crossing Treatment Guide

- Criteria for Crossing Treatments at Uncontrolled Locations
- Looks at Number of Lanes, Roadway ADT and Posted Speed
- Categorizes Treatments:
  A. Marked crosswalk with enhanced road-side signs
  B. Marked crosswalk with enhanced road-side and in-roadway (bollard mounted) signs
  C. Marked crosswalk with enhanced signs and geometric improvements
  D. Pedestrian traffic signal or grade-separated crossing

Example:
3 Lane Road
35 MPH
12,000-15,000 ADT

Crossing Treatment: C

City of Boulder Pedestrian Crossing Treatment Installation Guide, November 2001

Resource – Unmarked vs Marked Crosswalks

- On two-lane roads at uncontrolled locations, no difference in pedestrian crash rate between marked and unmarked crosswalks
- On Multi-lane roads with >12,000 ADT, a marked crosswalk without other substantial improvements was associated with a higher pedestrian crash rate
- Raised medians provide significantly lower pedestrian crash rates on multi-lane roads

Safety Effects on Marked Vs Unmarked Crosswalks at Uncontrolled Locations: Final Report and Recommended Guidelines, Zeeger, C.V. and others, U.S. Department of Transportation, Federal Highway Administration, September 2005.

Safety Analysis of Marked Versus Unmarked Crosswalks in 30 Cities, Zeeger, C.V. and others, ITE Journal, January 2004

Resource – Pedestrian Facilities User Guide

- Provides information on walkable environments and engineering improvements for pedestrians
- Describes pedestrian crash types and countermeasures

4. Failure to Yield at Unsignalized Location

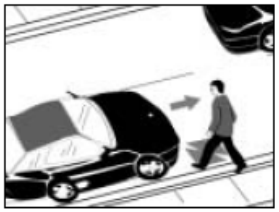
At an unsignalized intersection or midblock location, a pedestrian stepped into the roadway and was struck by a vehicle. The motorist failed to yield to the pedestrian and/or the pedestrian stepped directly into the path of the oncoming vehicle.

Possible Cause/Problem #1
Motorist fails to yield to pedestrian at two-lane, low-speed road crosswalk (or unmarked crossing).

General Countermeasures

a. Install raised intersection, raised crosswalk, speed table, or speed humps with truncated domes at both ends.
b. Install overhead CROSSWALK, school zone, or other warning signs.
c. Install curb extensions or choker.
d. Construct raised pedestrian crossing island.
e. Install traffic signal with pedestrian signals, if warranted.
f. Add chicane, use serpentine design or use special paving treatments along street to slow traffic.
g. Use landscaping that slows vehicle speeds without impeding sightlines.
h. Reduce curb radius to slow vehicle speeds.

Possible Cause/Problem #2
Pedestrian has difficulty crossing multi-lane road.



General Countermeasures

a. Install raised medians or pedestrian crossing islands.
b. Install traffic signal with pedestrian signals, if warranted.
c. Modify four-lane, undivided street to two lanes plus a two-way, left-turn lane (TWLTL) or median with turning pockets and bike lanes.
d. Install nighttime lighting.
e. Use police speed enforcement.
f. Use far-side bus stops.
g. Narrow lanes, reduce number of lanes, and/or install bike lanes.
h. Construct overpass or underpass.
i. Ensure that curb ramps are provided to make crossing easier for all pedestrians.

Pedestrian Facilities User Guide, Providing Safety and Mobility, Zeeger, C.V. and others, Federal Highway Administration publication number FHWA-RD-01-102, March 2002.

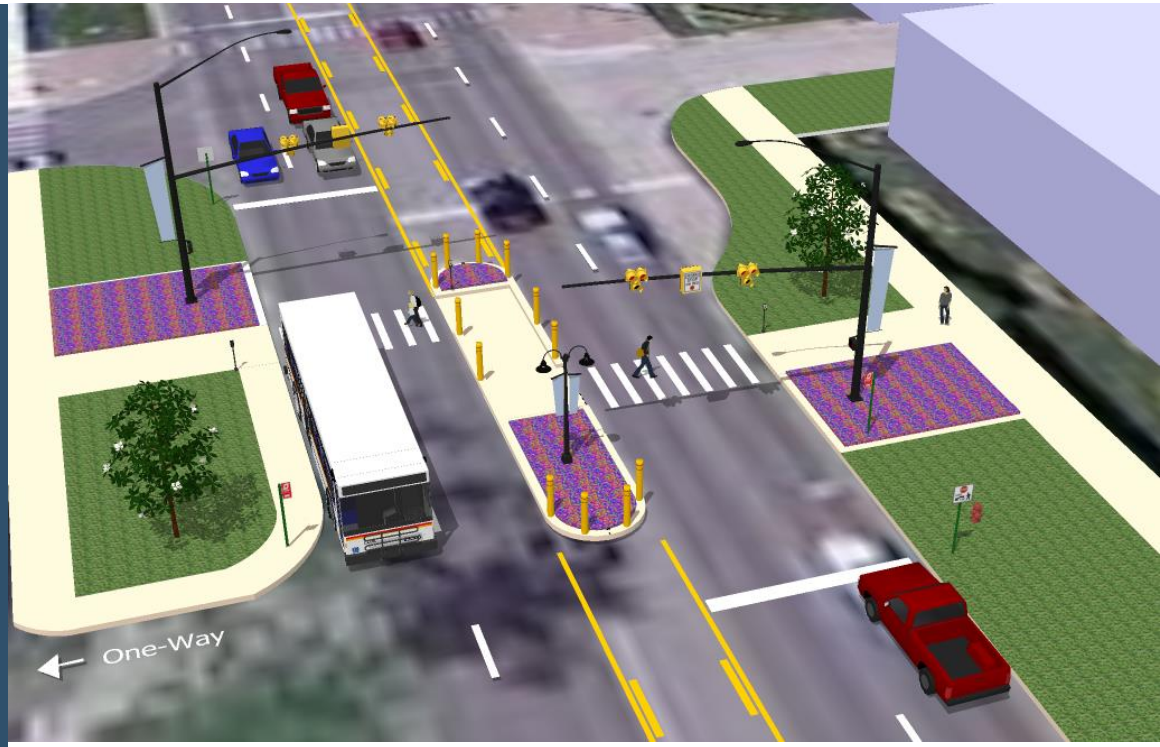
Resource – Improving Pedestrian Safety at Unsignalized Crossings

- Recommendations to improve safety for pedestrians at unsignalized locations on high-volume and high-speed roadways
- Red signal or beacon devices (HAWK, half signals, mid-block signals) had a compliance rate greater than 95%
- Number of Lanes and posted speed limit should be considered when determining the most appropriate treatment

Improving Pedestrian Safety at Unsignalized Crossings, Kay Fitzpatrick and others, Transit Cooperative Research Program Report 112 and National Cooperative Highway Research Program Report 562, 2006, 2006.

Resource – Effects of Advance Stop Lines and Sign Prompts

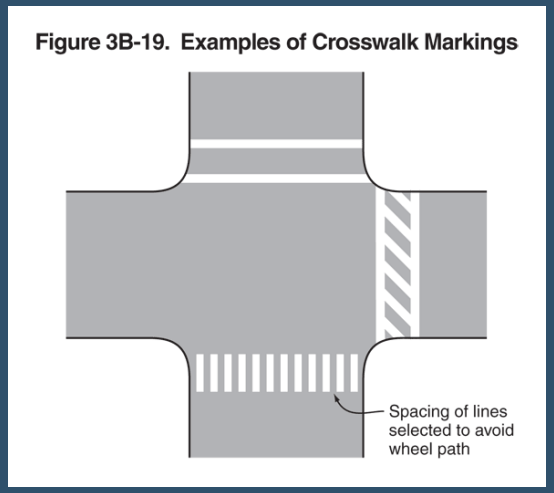
- Treatment did not produce a large increase in motorists yielding to pedestrians, but…
- The introduction of the stop for pedestrian sign and stop bar reduced motor vehicle-pedestrian conflicts by almost 80%
- Those who yield tend to do so further back from crosswalk

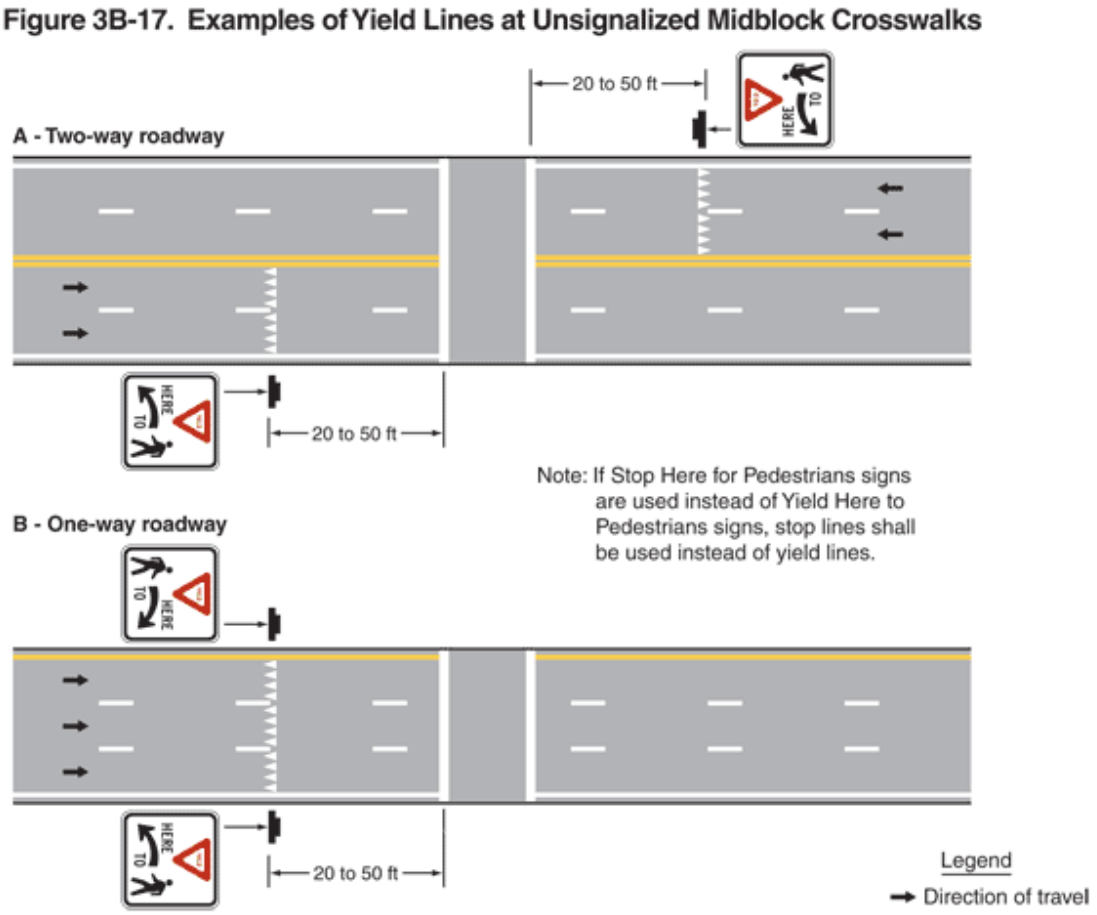


The Effects of Advance Stop Lines and Sign Prompts on Pedestrian Safety in a Crosswalk on a Multi-lane Highway, Van Houten, R., Journal of Applied Behavoir Analysis, Number 3, pages 245/251, Fall 1988.

Resource – Manual of Uniform Traffic Control Devices

- Much of what is studied in the resources is shown in the manual
- Manual doesn't necessarily indicate what type of facility to use but has many specifics on how to sign and mark a facility





[Michigan Manual on Uniform Traffic Control Devices](), 2011.

Conclusions

- Pedestrians will cross mid-block where there is demand – get over it
- Pedestrians and motorists have to see each other
- Consistency in how devices are used is key
- Context is important
- Need to clearly convey intent and what needs to happen
- Higher speeds, more lanes and more traffic volumes call for more countermeasures

In Michigan, pedestrian Crashes represent

< 1% of all crashes, but

about 15% of all fatal crashes

and over 8% of all incapacitating injury crashes

We are still learning

Mid-block Crosswalks

Law, Planning, Design & Liability

Questions?

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