Street Crossings

Part 2: Countermeasures

Basic Street Crossing Techniques

- Crosswalks
- Illumination
- Signs
- Striping
- Medians/pedestrian islands
- Signals
- Over/undercrossings

Crosswalks

Crosswalk FAQ's:

1. Why are they marked?
2. Where should they be marked?
3. Do marked crosswalks increase safety, or provide a "false sense of security?"

1. Why are crosswalks markings provided?

- To indicate to pedestrians where to cross
- To indicate to drivers where to expect pedestrians
- At mid-block locations, crosswalk markings legally establish the crosswalk

2. How to determine where to mark a crosswalk?

- Crosswalk markings are commonly used to guide pedestrians and alert other road users of pedestrians at signalized locations and approaches controlled by STOP or YIELD signs
- An engineering study should be performed before crosswalk markings are installed at locations away from traffic signals or STOP signs. (MUTCD Section 3B.18

2. How to determine where to mark a crosswalk? Consider origins and destinations

In this case, apartments across from bus stop & stores

Many Locations are not Suitable for a Marked Crosswalk

Not a good location for a marked crosswalk:
No consistent place where pedestrians cross

Not a good location for a marked crosswalk:
Poor sight distance

Many Locations are Suitable for a Marked Crosswalk

Suitable location for a marked crosswalk:
Two-lane, high use, driver expectancy

Suitable location for a marked crosswalk:
Slow speed, high use, driver expectancy

3. Do marked crosswalks increase safety, or encourage people to cross without looking?

Study Results

1. Median reduces crashes by 40%

Pedestrians over 65 are over-represented in crosswalk crashes

Pedestrians are not less vigilant in marked crosswalks:

Looking behavior <u>increased</u> after crosswalks installed

Study Results

4. Crashes correlate with ADT & number of travel lanes.

Raised Medians And Islands

Significant crash reductions:

Marked crosswalks

- **CMF = 0.54 (CRF = 46%)**

Unmarked crosswalks

- **CMF = 0.61 (CRF = 39%)**

Study Recommendations

OK to mark crosswalks on 2-lane roadways

On multi-lane roadways, marked crosswalks <u>alone</u> are not recommended on roadways with:

ADT > 12,000 w/o median

ADT > 15,000 w/ median*

Speeds greater than 40 mph

Use raised medians to reduce risk

Signals or other treatments should be considered where many young and/or elderly pedestrians

** Note: effect of advance stop bar not studied (none at any observed sites)*

Increase Effectiveness Of Crosswalks With:

- Proper location
- High Visibility Markings
- Illumination
- Signing
- Advance Stop Bars
- Median Islands
- Curb Extensions
- Signals

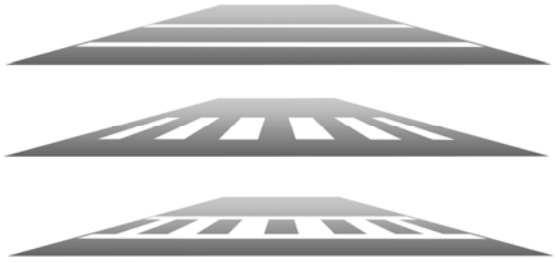
Marked crosswalk must be visible to the DRIVER

What the pedestrian sees

Marked crosswalk must be visible to the DRIVER

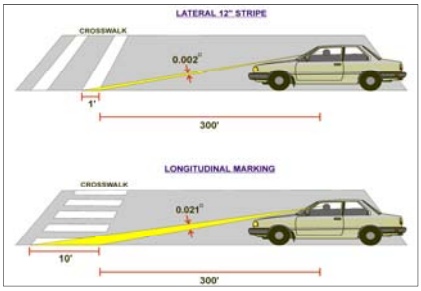
What the driver sees (same crosswalk)

Crosswalk Visibility



Crosswalk Marking Types

Crosswalk Visibility



Longitudinal markings are more visible to driver from afar

Place longitudinal markings to avoid wheel tracks, reducing wear & tear & maintenance

Staggered markings improve visibility from afar

Textured crosswalks: how effective are they?

In theory, more visible. Reality?

What the pedestrian sees

What the driver sees

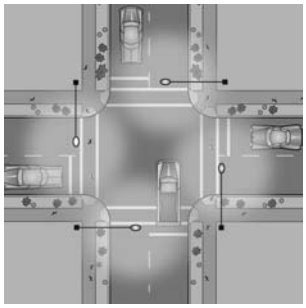
Brick crosswalks: prone to failure, difficult for wheelchair users

Illumination – Essential For Any Crossing

Marked crosswalk?

- **Light it.**

Up to 50% of ped crashes occur at night

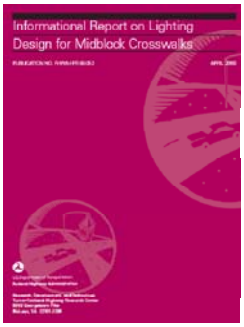


Lighting reduces the odds of pedestrian fatalities:
by 42% at midblock locations
by 54% at intersections

Ped shows up well in well-lit crosswalk

Informational Report on Lighting Design for Midblock Crosswalks

FHWA-HRT-08-053
April 2008



Sample Illustrations from New FHWA Report

Fig 11. Traditional midblock crosswalk lighting layout

Fig 12. New design for midblock crosswalk lighting layout

Recommended lighting level: 20 lux at 5' above pavement

Available at http://www.tfhrc.gov/safety/pubs/08053/08053.pdf

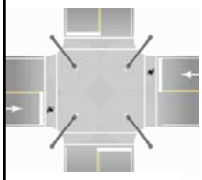


Fig 13. Traditional intersection lighting layout

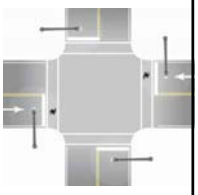


Fig 14. New design for intersection lighting layout for crosswalks

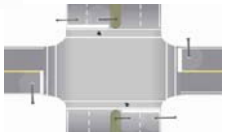


Fig 15. New design for wide roadway intersection lighting layout for crosswalks

Ped crossing signs: old vs. new MUTCD standards

Old

New

2009 MUTCD Sec. 2C.50 & Fig. 2C-10

Placement

Pedestrian crossing sign with flashing beacon

Improves visibility of sign and crosswalk; CMF/CRF unknown

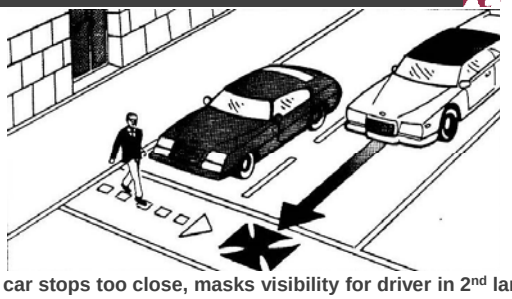
Rectangular Rapid Flash LED Beacon

- Not in MUTCD – received Interim approval from FHWA in July 2008
- Studies indicate motorist yield rates increased from about 20% to 80%
- Beacon is yellow, rectangular, and has a rapid "wig-wag" flash
- Beacon located between the warning sign and the arrow plaque
- Must be pedestrian activated (pushbutton or passive)

Advance Stop or Yield Line:

Reduces Multiple-threat Crashes

One explanation of higher crash rate at marked crosswalks: multiple-threat crash

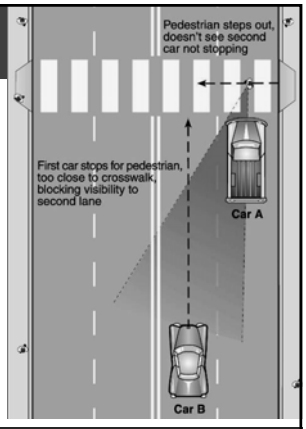


1st car stops too close, masks visibility for driver in 2nd lane

Multiple Threat Crash Problem

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

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

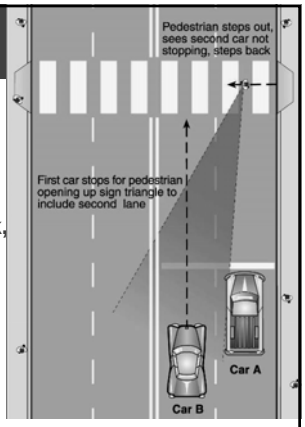


Multiple Threat Crash Solution

Advance stop or yield line

1st car stops further back, opening up sight lines

2nd car can be seen by pedestrian



R1-5

R1-5a

(Use where local law says yield to pedestrians)

R1-5b

R1-5c

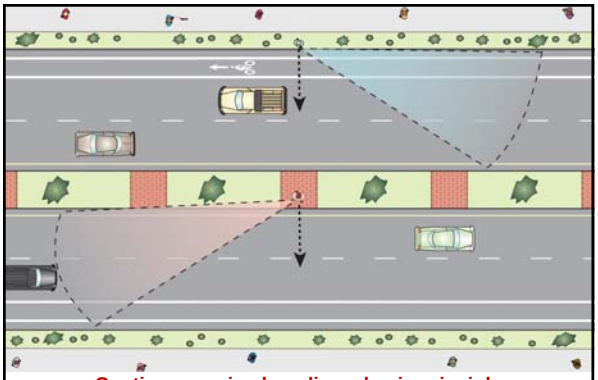
(Use where local law says stop for pedestrians)

MUTCD Sec. 2B.11 and Figure 2B-2

Advance yield line (shark's teeth) & sign

Advance stop line and sign

- 20' to 50' setback (30' preferred for effectiveness)
- Prohibit parking between line and crosswalk



Continuous raised median – basic principle:
Breaks long complex crossing into two simpler crossings

Step 1: look at traffic on left

Step 2: cross first half

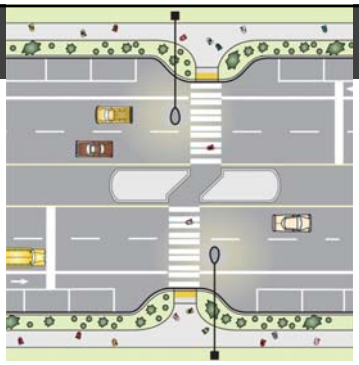
Step 3: look at traffic on right

Step 4: cross second half

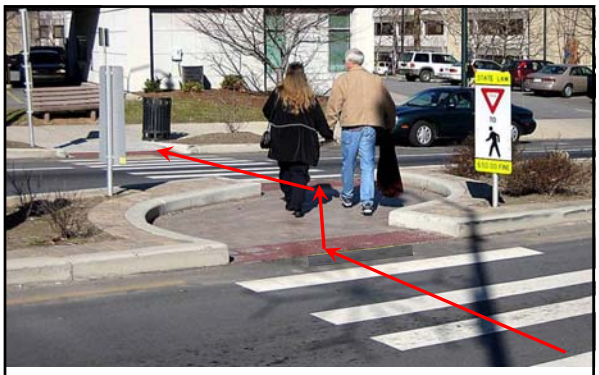
People figure out on their own how to use a median to cross in two steps

A flush median is not a refuge

Add a raised island



Crossing island at marked crosswalk - same principle:
Breaks long complex crossing into two simpler crossings



Pedestrian Signal

MUTCD signal warrants

1. Eight-hour vehicle volume
2. Four-hour vehicle volume
3. Peak hour
4. Pedestrian volume*
5. School crossing*
6. Coordinated signal system
7. Crash experience*
8. Roadway network
9. Intersection near a grade (rail) crossing

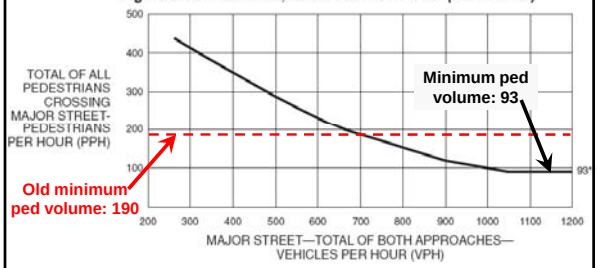
* = potential ped warrant

Very difficult to meet pedestrian volume warrant

You need many pedestrians

2009 MUTCD Pedestrian Volume Warrant for Speeds Greater than 35 mph

Figure 4C-8. Warrant 4, Pedestrian Peak Hour (70% Factor)



Provide a HOT response

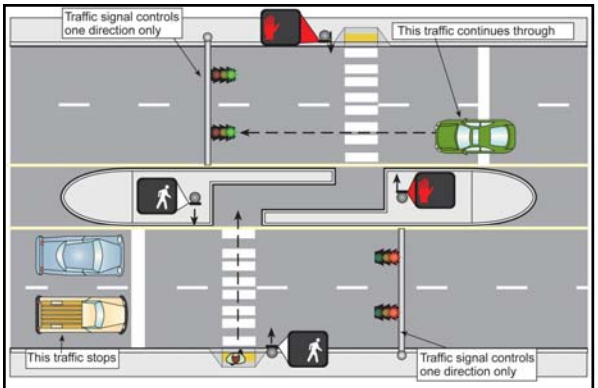
Otherwise pedestrians won't wait for the light

If wait is too long, pedestrians will seek gaps

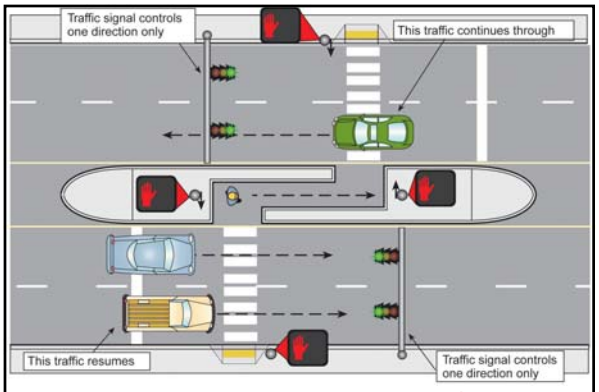
And then traffic waits for no reason

Pedestrian Signal:

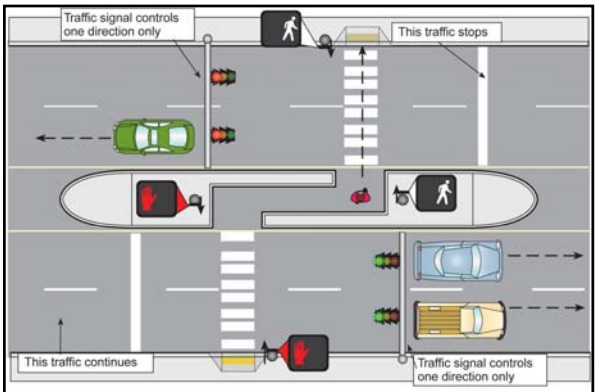
2-stage crossing increases effectiveness and disrupts traffic less



1. Ped pushes button, waits, crosses to island



2. Ped crosses to island, proceeds to 2nd button



3. Ped on island – pushes button to finish crossing

Stage 1: Ped stops traffic in one direction

Stage 1: Ped crosses to median island

Stage 1 over: Traffic in one direction resumes

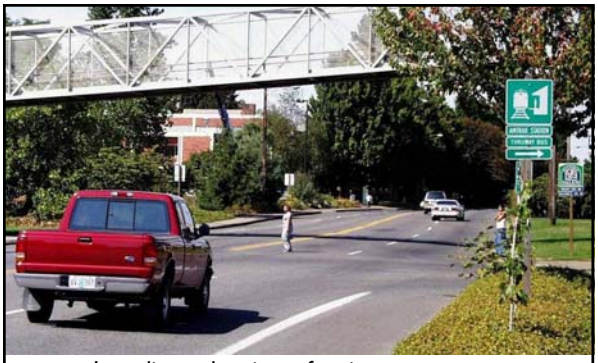
Stage 2: Ped stops traffic in other direction

Stage 2 over: Traffic resumes

Detail 1: Requires ped push button on island

Detail 2: Fences force peds to walk against on-coming traffic

Over & Undercrossings



In reality, pedestrians often ignore structures
Placing themselves in greater danger

Why don't they get used? Longer travel distance

Sometimes fences are needed to direct users

Grade separation is more useful for purposes beyond simply crossing from sidewalk to sidewalk

To connect buildings

To connect land uses

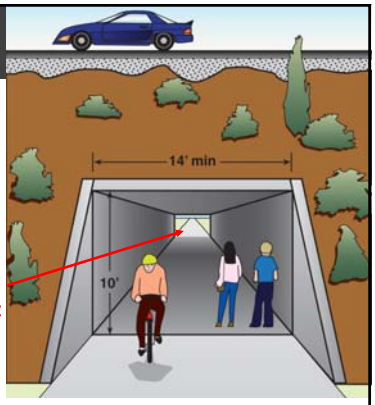
To cross freeways

Light rail stations

Overcrossings are expensive because of their height, which requires long ramps

Undercrossings require generous dimensions to be attractive: security is the main issue

Good design practice: Users must see light at the end of the tunnel



Undercrossing must not intimidate potential user

Undercrossings work best if roadway is elevated, even if it is just a small amount

Elevated roadway allows open, airy undercrossing

Undercrossings work best if well lit & attractive

Questions?