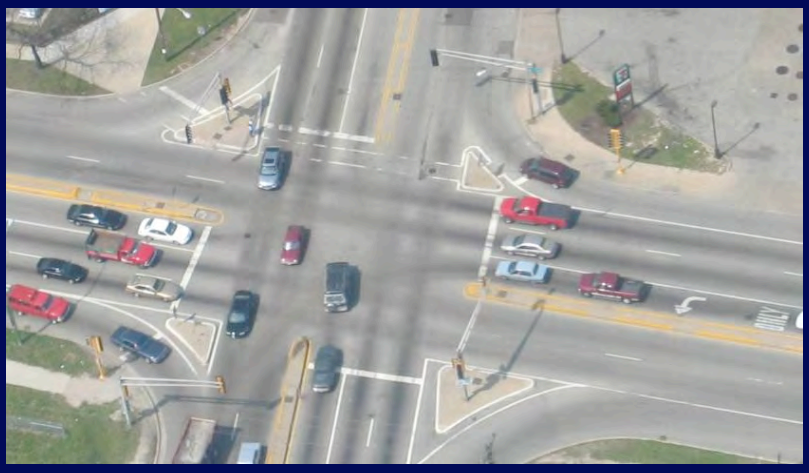
Signalized Intersections

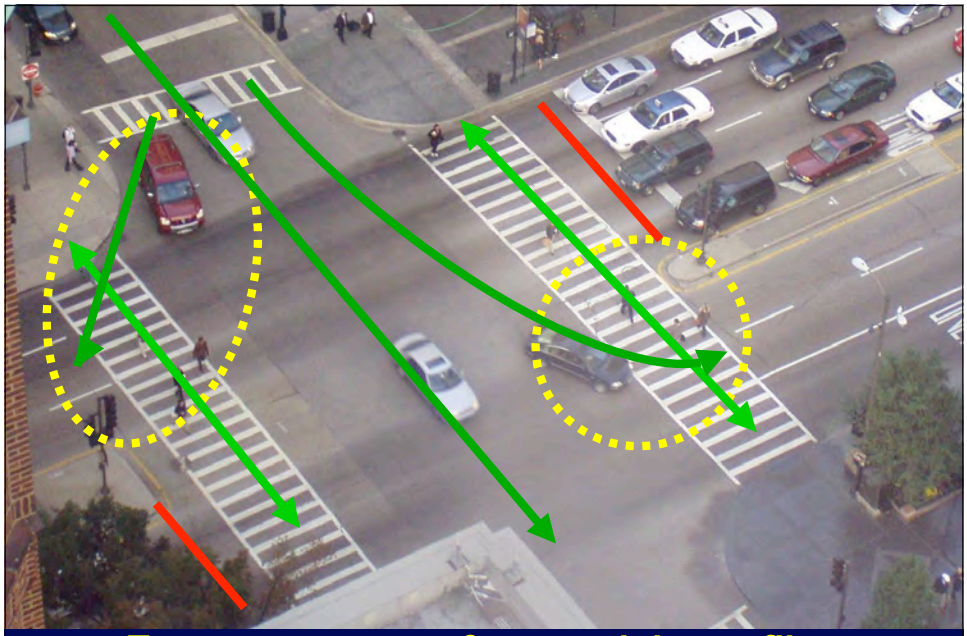
Signalized Intersections Can Be Improved For Pedestrians By:

- *Using good geometric design*
- *Placing islands to break up complex crossings*
- *Placing crosswalks in logical locations*
- Providing pedestrian signal heads
- Placing push-buttons in convenient locations
- Timing signals to minimize ped delay & conflicts
  - *1, 2 & 3 addressed in earlier module*

Traffic signals assign the of right of way, regulate the flow of traffic and create gaps



Traffic signals do not guarantee safety – in fact, signalized intersections have more crashes than non-signalized



Turn movements often result in conflicts

Chicago IL

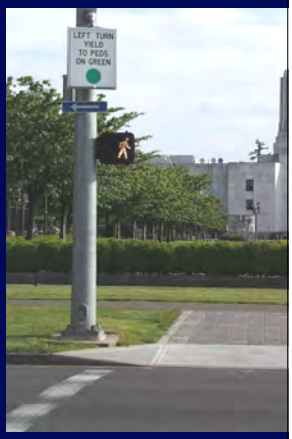
Traffic signals don't ensure protection

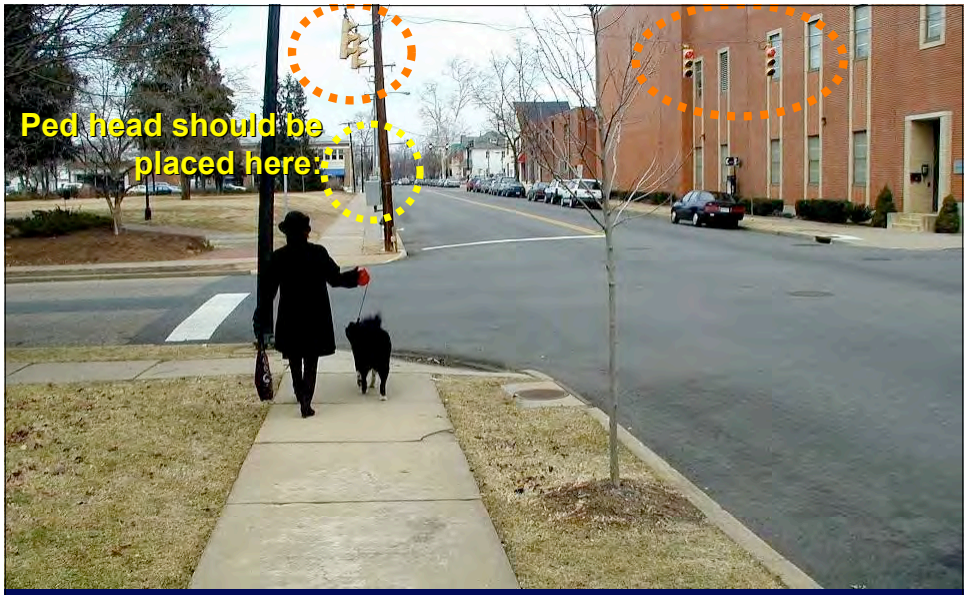
Peds routinely ignore the light *(usually quite safely)*

Traffic signals don't ensure protection

Pedestrians are at risk ***when crossing with the light***

Pedestrian Signals at Signalized Intersections
(AKA Ped Heads/Pedestrian Indicators)
Need and Placement



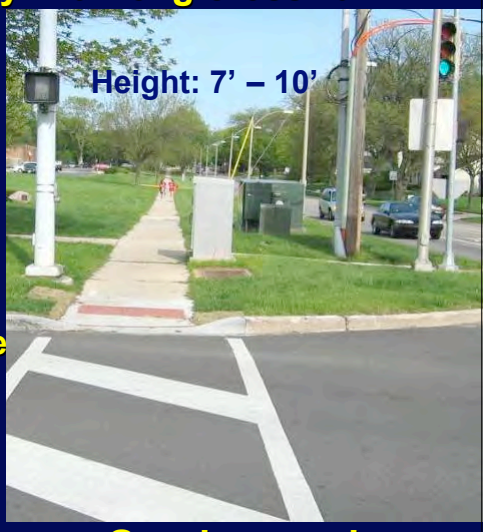


Pedestrian signals should be provided, Otherwise pedestrians don't know when to cross

Lack of pedestrian signals on one way street: The pedestrian may not notice the signal

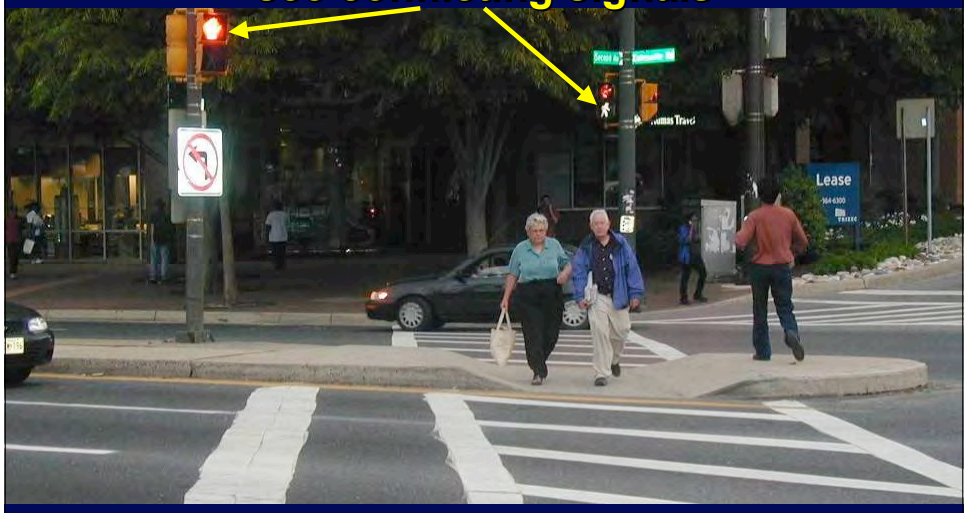
Ped head placement: close to crosswalk, visible to pedestrians, especially with long crosswalk

Poor example



Good example

Two-step signals: ensure pedestrians don't see conflicting signals

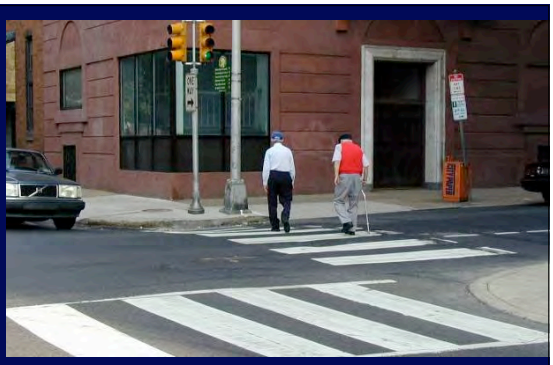


These pedestrians kept walking, against light

Are ped heads always needed?

In general, YES

Possible exceptions:



- Narrow street
- High ped use
- Simple intersections/simple signal phasing
- Appropriate vehicular signal heads are readily visible in both directions
- Ped clearance time can be accommodated by vehicular yellow plus all-red

Countdown pedestrian signal tells pedestrians how much crossing time is left

Countdown pedestrian signal research results:

1. Pedestrians understand how it works
2. More people start crossing during clearance phase, but…
3. Fewer people initiate walk late in clearance phase
4. No pedestrians left in crosswalk in steady don't walk
5. Drivers don't take a cue and accelerate to beat the light

What about crash reduction?

Results from San Francisco study are promising:
CRF = 25% after countdown signals installed

Proposed Change for 2009 MUTCD

- Countdown displays required for all new pedestrian signals
- Why? Significant reductions in pedestrian-vehicle crashes, as well as all types of crashes

Signal Timing To Minimize Pedestrian Delay & Conflicts

Chinatown, NYC

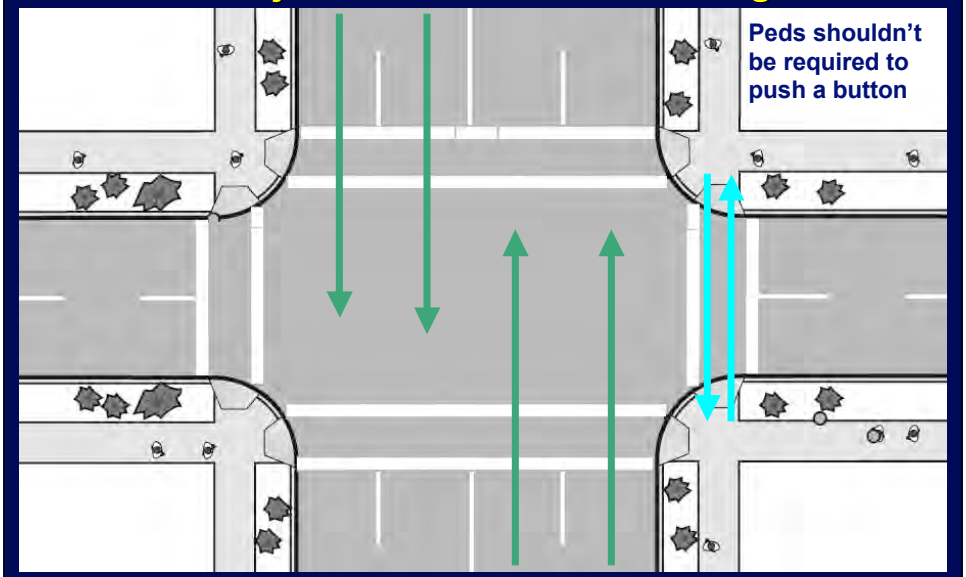
Use Short Signal Cycle Length

Long wait causes stacking: pedestrians wait in street, or don't wait and cross against the signal

Portland OR

At high-use crosswalks, pedestrians should get a signal at every cycle

Set pedestrians to recall to WALK when major street is set to recall to green

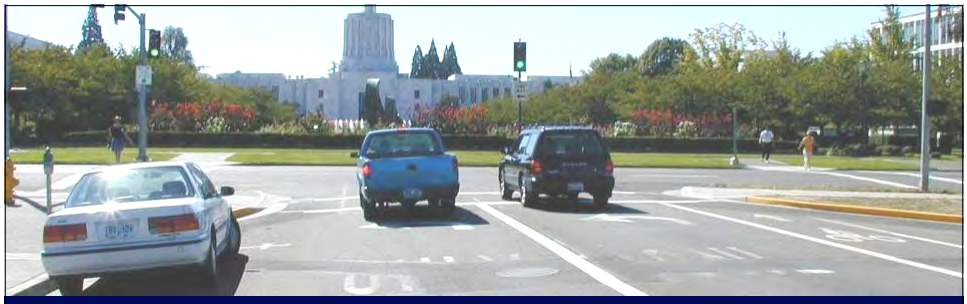


LPI

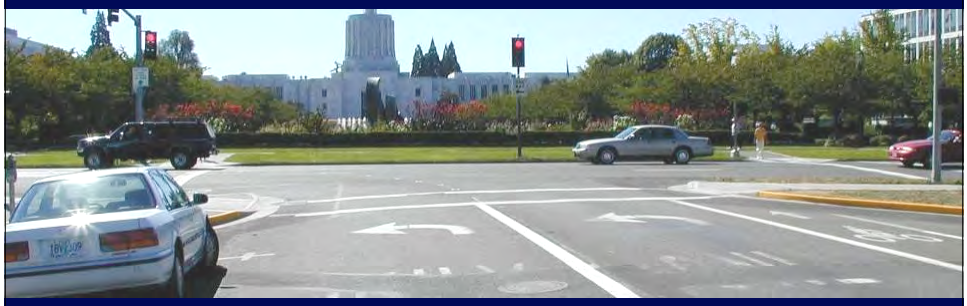
LPI = Lead Pedestrian Interval

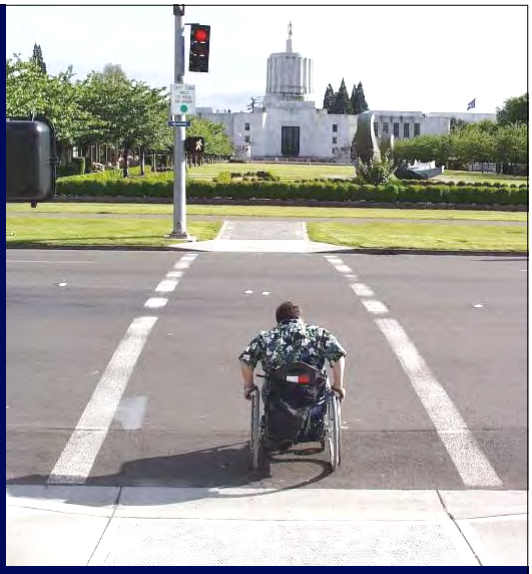
LPI gives pedestrians a head start

Looks like a regular signal to drivers



Looks like a regular signal to drivers: *green-yellow-red*

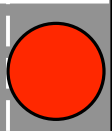


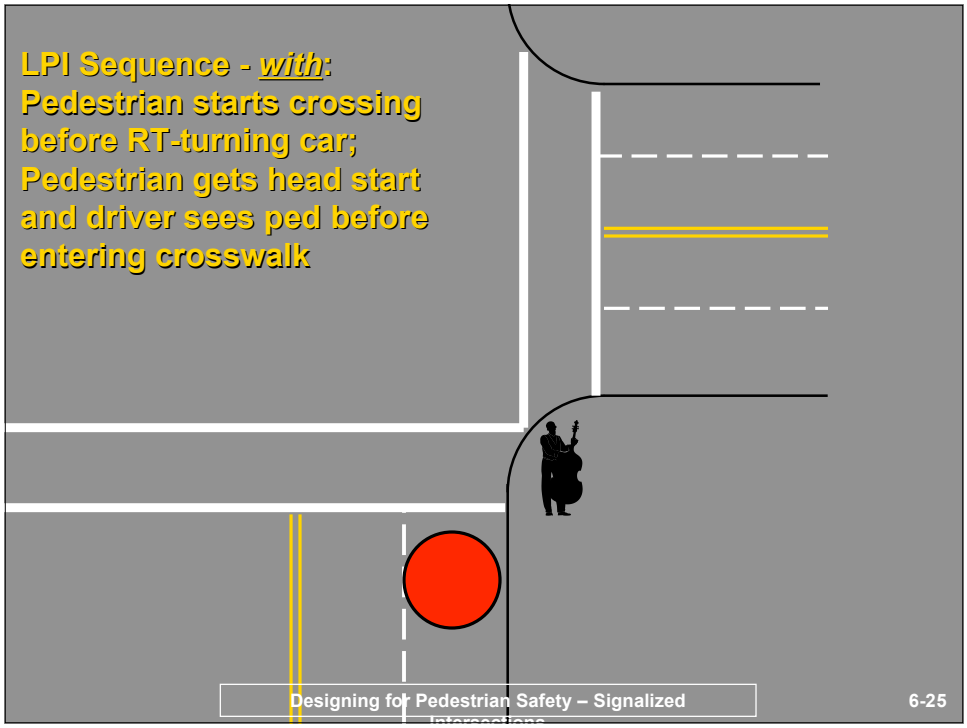


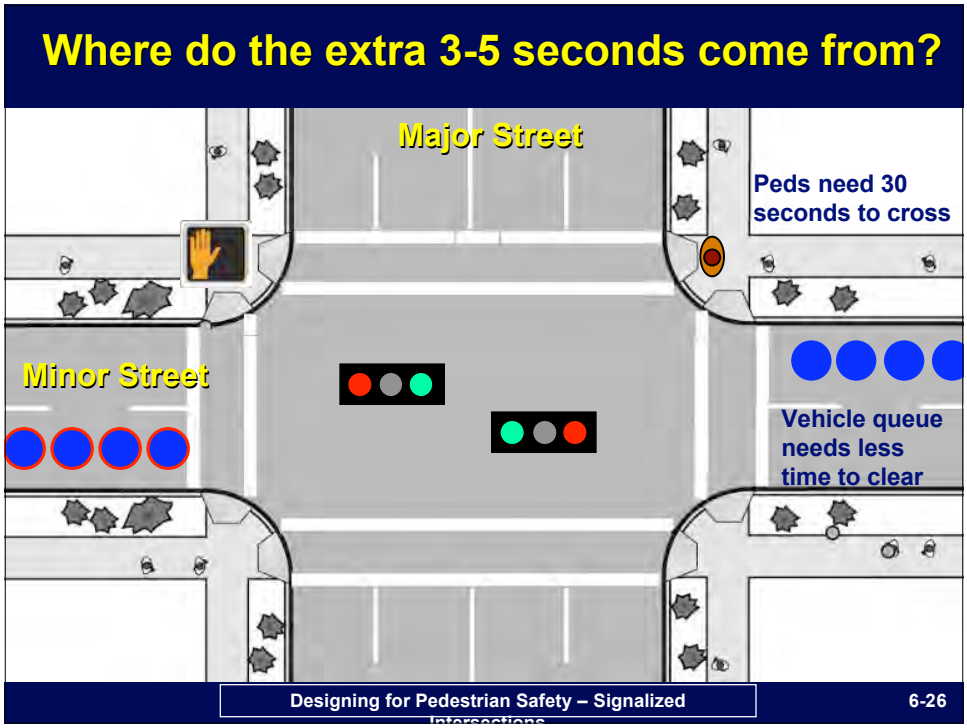
LPI : *WALK comes on 2 to 5 seconds prior to the vehicular green; pedestrians enter crosswalk before turning vehicles arrive there.*

LPI Sequence - without:

Pedestrian starts crossing at same time as RT-turning car; Pedestrian and car on collision course




LPI Sequence - *with*:
Pedestrian starts crossing before RT-turning car;
Pedestrian gets head start and driver sees ped before entering crosswalk
Designing for Pedestrian Safety – Signalized Intersections
6-25


Where do the extra 3-5 seconds come from?
Major Street
Peds need 30 seconds to cross
Minor Street
Vehicle queue needs less time to clear
Designing for Pedestrian Safety – Signalized Intersections
6-26

These peds waited 3 cycles before turning drivers let them cross *as legally required.* LPI would give them a head start.

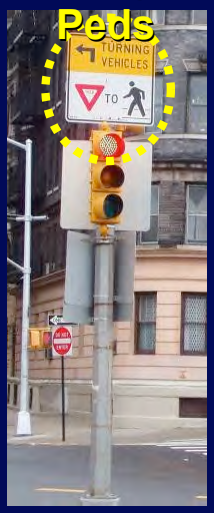
CRF: 5%

Simple & Innovative Ideas To Minimize Pedestrian Conflicts

Signs: Remind Turning Drivers to Yield to Peds

Revised R10-15 in draft 2009 MUTCD

Local variations, using MUTCD-approved lettering and symbols:

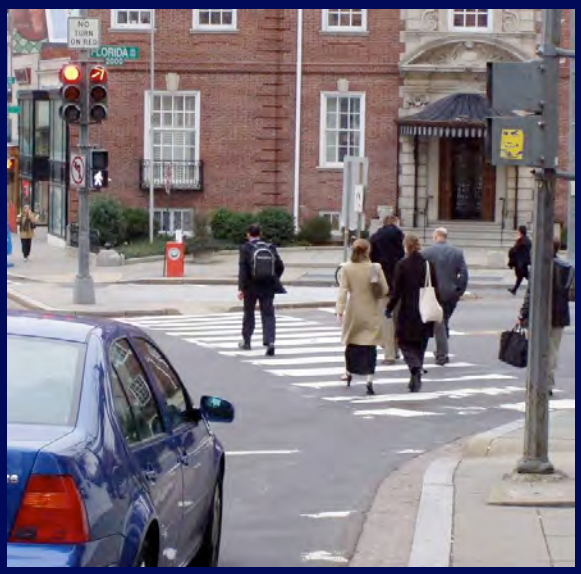


New York

Alaska

Restricting Right Turns on Red:

1. At all times



Restricting Right Turns on Red

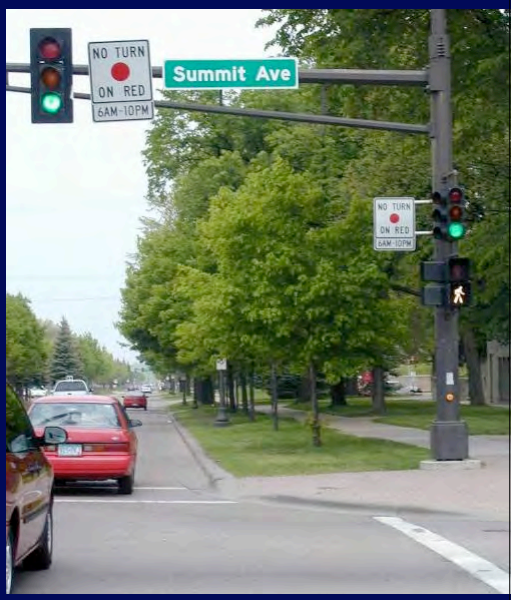
2. When pedestrians are present

Difficult to enforce

Restricting Right Turns on Red:

3. By time of day

Limits most RTOR



Restricting Right Turns on Red:

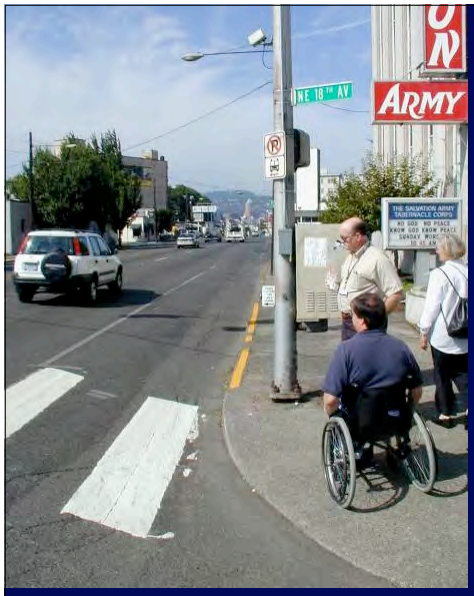
4. When ped pushes button or as set by controller

Note: An on-demand NTOR sign can be used to improve the effectiveness of a Lead Pedestrian Interval

Using ITS to Help Pedestrians

- In this example a high-tech signal was used to help slower pedestrians cross the street with minimal delay to traffic.
- A slower crossing speed would delay traffic significantly

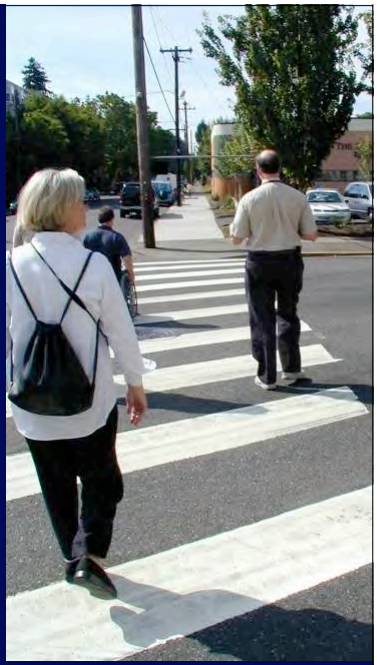
Microwave sensors are aimed at the crosswalks to track pedestrians



Pedestrian clearance is timed @ 4 ft/sec

The sensor tracks peds as they cross the street

- The controller adds 4 seconds crossing time if pedestrian hasn't finished crossing (8 seconds maximum)
- In this case, the walk phase was prolonged in 20% of crossings, reducing unnecessary traffic delay the other 80% of crossings.



Questions?

For more information see archived TRB Webinar:
Accommodating Pedestrians at
Signalized Intersections
https://www1.gotomeeting.com/register/622595628