Pedestrian Signs and Signals

Pedestrian Signs and Signals

- Pedestrians require information that is specifically directed to their own needs because their sight lines, viewpoints, and travel speeds are substantially different from motorists

Changes in Traffic and Traffic Control Affect Pedestrian Travel

- Right turn on red
- Wide streets
- Actuated traffic signals, turn lanes and arrows
- Quieter cars and aggressive drivers

Changes in Traffic and Traffic Control Affect Pedestrian Travel

- Skewed intersection layout
- Low traffic volumes
- Diagonal curb ramps
- Free flow turn lanes

Changes Have Particularly Affected Pedestrians Who Are Blind

- As you watch the following videotape, think about the possible difficulties for travelers with low vision or for wheelchair users (viewed earlier in the Access Board videotapes)

Videotape

Intersection Design and
Street-Crossing Strategies for Blind
Pedestrians: Then and Now

(edited version 25 minutes)

Questions

What were the major problems with the pedestrian crossing system in the video?

Do sighted pedestrians and wheelchair users have some of the same problems mentioned for the pedestrians who are blind?

Pedestrian Signs and Signals

- Most pedestrians use visual cues to obtain information about traveling safely.
- For example:
  - Intersection configuration
  - Traffic signals
  - Street signs
  - Informational or tourist signs

Question

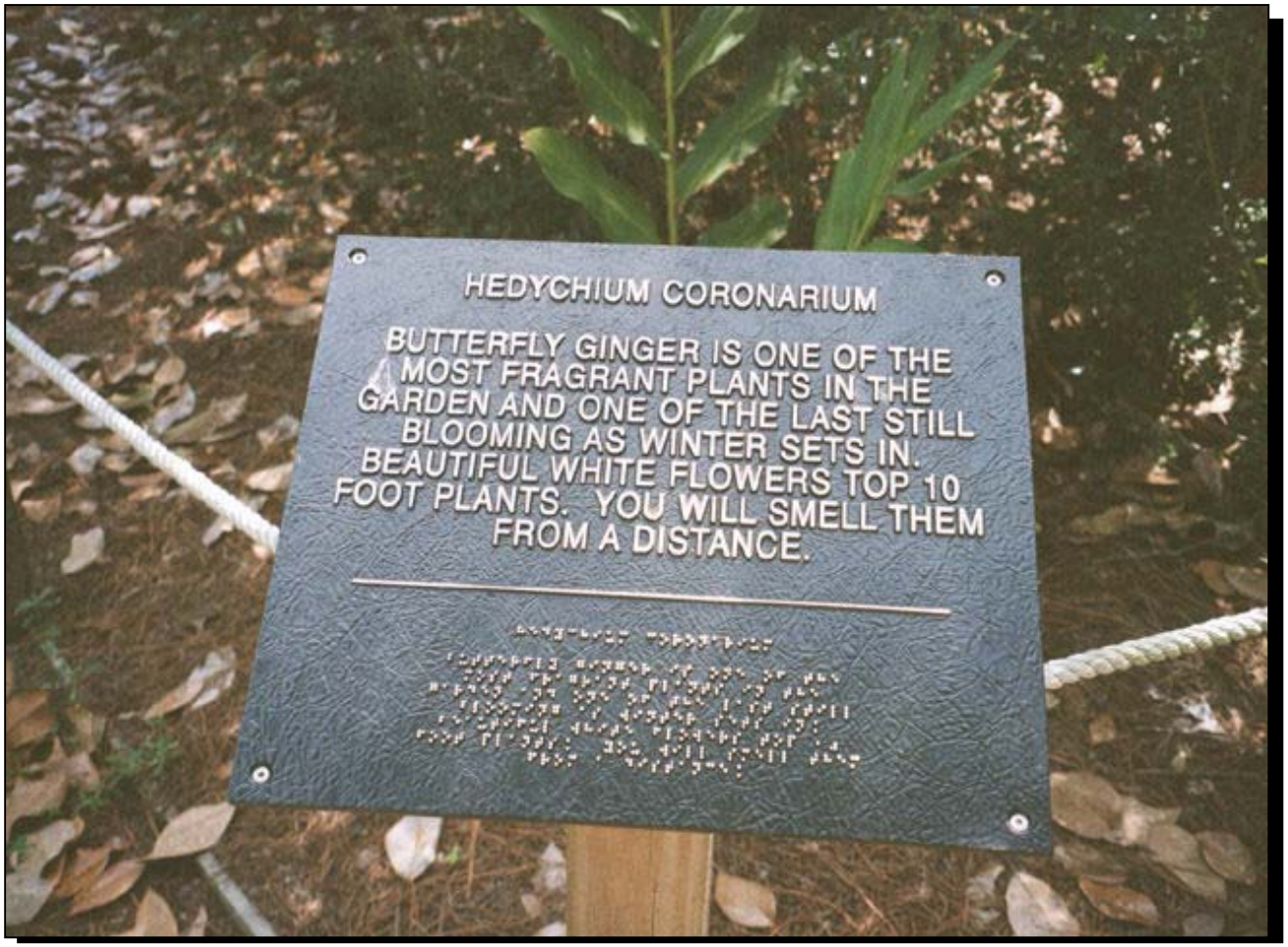
How do pedestrians with visual impairments gather information and travel independently?

Pedestrian Signs

Redundant signage:

- Multiple formats help pedestrians assimilate the information by multiple senses
- Increases the likelihood that all users, including people with visual and cognitive impairments, will make informed, safe travelling decisions

Braille and Raised Print



Pedestrian Signs

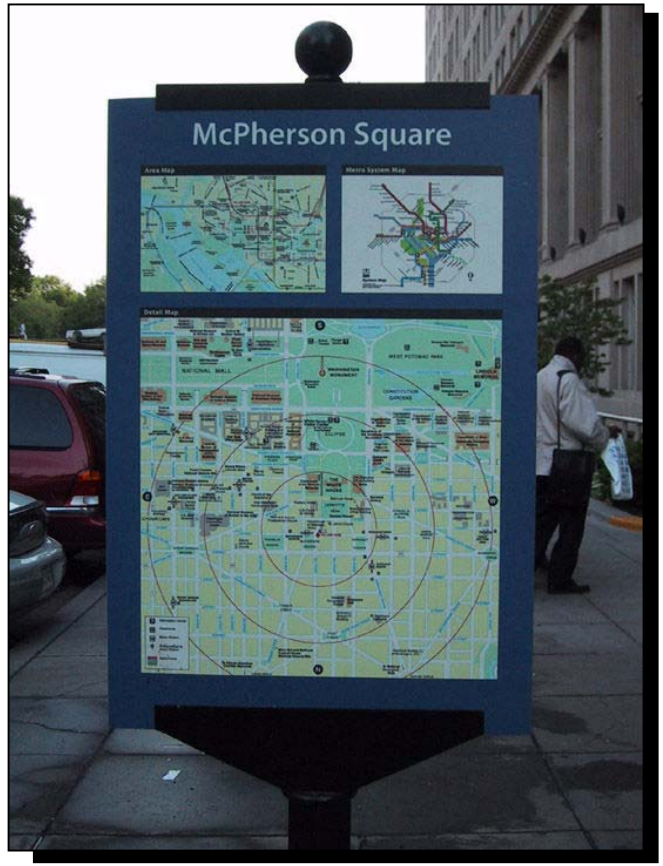
- Consistent placement enables people with low vision and cognitive impairments to locate the sign
- High legibility with a consistent format may enable people with both low vision and cognitive impairments to utilize the information

Pedestrian Street Sign

Consistent location and format

Pedestrian Signs

- Format and location standards should be established statewide (locally at minimum)
- Sign specifications are provided in proposed ADAAG 703



These signs do not provide information in an accessible format

Pedestrian Signals
Developing Technology

- Remote Audible Infrared Signage is an option to provide wayfinding information for pedestrians who are blind or visually impaired
- Verbal messages transmitted from buses, kiosks, or other signs are received by blind or visually impaired persons when they point receiver in direction of transmitter
- Other types of GIS and GPS systems are being developed

Pedestrian Signals

- Pedestrians signals can be fixed timed or actuated
  - Fixed timed signals include a pedestrian phase in each cycle
  - Actuated signals may require the pedestrian to take action – to push a button - to call the pedestrian phase

Pedestrian Signals

- Pedestrians often misunderstand the signal messages
- Three signal intervals:
  - WALK: pedestrians to start crossing
  - Flashing DONT WALK (Clearance): pedestrians who are already crossing should complete their crossing; pedestrians should not start crossing
  - DONT WALK: signals pedestrians not to cross

Problems Related to Pedestrian Signals

- Knowing if a pushbutton is there
- Locating the pushbutton
- Accessing the pushbutton
- Pushing the pushbutton, particularly for those with limited hand function

Problems Related to Pedestrian Signals

- Knowing which street the pushbutton controls
- Seeing the pedestrian signal indications
- Knowing when the walk interval begins

What Makes These Pushbuttons Inaccessible?

Pushbuttons Should Be Accessible and Usable by Everyone

Find the Pushbutton

(Click photo to locate pushbutton)

Pushbutton Locations

- Is the pushbutton easy to use?
- Is location conveniently near the crosswalk?

MUTCD guidance, section 4E.07:

"When pedestrian actuation is used, pedestrian pushbutton detectors should be easy to use and conveniently located near each end of the crosswalks."

What Would Make It Easier?

- Pushbutton within sidewalk or at the edge of the sidewalk
- Pushbutton in line with crosswalk line
- Located 5 feet maximum from the top of the curb ramp
- With a Locator tone

Easier to Find and Use Here

Easier to Find and Use Here

What's a Pushbutton Locator Tone?

MUTCD 2000, Section 4E.08:

- Repeating sound that informs approaching pedestrians that they are required to push a button to actuate pedestrian timing
  - Enables visually-impaired pedestrians to locate the pushbutton
  - Alerts pedestrians that there is a pushbutton

Pushbutton Locator Tone

Sound comes from the pushbutton location

- Sound less than 0.15 seconds in duration
- 1 tone per second
- Loud enough to be heard within 10 to 12 feet

Locator Tone

(Click photo to play tone)

Locator Tone

(Click photo to play tone)

Locator Tone

(Click photo to play tone)

Recommendations for Pushbuttons - Size

Person with limited hand function cannot push this button

Recommendations for Pushbuttons

At Least 2 Inches in Diameter

Provide audible and visual confirmation of button press

Recommendations for Pushbuttons

- Actuation force requirement of no more than 3.5 lbs – operable with closed fist
- Visual contrast of at least 70%
- Locator tone

Recommendations for Pushbuttons

Mounted Height: Maximum of 42 Inches

Inaccessible for many wheelchair users when mounted above 42 inches

APS Pushbutton Location

MUTCD 4E.08 Accessible Pedestrian Signal Detectors provides more specifications for locations for APS pushbuttons:

- Adjacent to a level all-weather surface… and where there is an all-weather surface, wheelchair accessible route to the ramp
- Within 5 feet (1.5m) of the crosswalk extended

APS Pushbutton Location

MUTCD 4E.08 Accessible Pedestrian Signal Detectors provides more specifications for locations for APS pushbuttons:

- Within 10 feet (3m) of the edge of the curb, shoulder, or pavement; and
- Parallel to the crosswalk to be used
- APS should be separated by at least 10 feet (3m)

APS Pushbutton Location

If two APS are on the same pole, WALK indication for the two streets can be confused

- Separate the sounds by installing speakers on different poles beside the crosswalk (at least 10 foot separation)
- Use a speech message which includes the street name to provide the WALK indication

Passive Pedestrian Detection

- Passive detection technologies such as microwave or infrared systems may solve some problems with pushbuttons and can be used to extend the crossing time

HOWEVER…

- Pedestrians may not always be within the detection area when waiting to cross, and crossing, and may not be reliably detected
- Pedestrians may not realize that they have been detected

Determining When to Cross

Three methods:

- Visual pedestrian signal
- Listening to traffic
- Accessible pedestrian signals

Find the Visual Pedestrian Signal

(Click photo to locate signal)

What Would Make It Easier?

- Pedestrian signal head within the crosswalk lines
- Lack of visual clutter and glare near the pedestrian signal head
- Signal mounted between 7 and 10 feet above surface

Easier to See

Determining When to Cross

Non-visually by listening to traffic IF:

- Traffic movement is predictable
- There is a surge of cars starting and traveling parallel to crosswalk

Determining When to Cross

Accessible Pedestrian Signals (APS)

- APS Indicate WALK interval by providing:
  - Tone which can be the same as locator tone with a more rapid repetition rate, or cuckoo/chirp bird calls, or other tones
  - Speech message
  - Vibrating surface

Pedestrian Crossing Time MUTCD Recommendations

Pedestrian clearance interval (Flashing Don't Walk):

"Where pedestrians who walk slower than normal or pedestrians who use wheelchairs routinely use a crosswalk, a walking speed of less than 4 feet/sec should be considered."

Pedestrian Crossing Time PROWAAC Recommendations

- For pedestrian signal phase timing, use 3.5 feet per second pedestrian walking speed
- Include the length of the crosswalk and one curb ramp for calculating crossing distance

Accessible Pedestrian Signals (APS)

- All pedestrians benefit from receiving information in multiple formats, especially persons with visual and cognitive disabilities, as well as children
- Audible, tactile, and vibrotactile information can be provided as part of the APS
- APS increase the efficiency of pedestrian timing
- APS make pedestrian actuated devices accessible and usable by all pedestrians

APS Use by Blind Pedestrians

- APS information is combined with listening skills and other mobility skills
- Travelers who are blind hear the APS, then also must listen for turning cars or cars that are running the light
- The sound of cars traveling parallel to their path is used to maintain alignment while crossing

Accessible Pedestrian Signals (APS)

- Intersection complexity has created a demand for APS by pedestrians who are blind
- New types of APS have become available in the U.S. in recent years

Types of Accessible Pedestrian Signals

Accessible pedestrian signals (APS) provide information in a variety of formats, including audible, broadcast, tactile, and receiver-based systems:

- Pedhead mounted audible signals
- Pedestrian pushbutton integrated signals
- Combination systems with pedhead speaker and locator tone at pushbutton
- Transmitted message signals
- Vibrotactile

Pedhead Mounted APS

- Most common type of APS in the US to date
- Sound comes from a speaker mounted on or in the pedestrian signal head
- Typically a buzz, tone, or bird call ("cuckoo" and "chirp") to alert pedestrians to the WALK interval

Pedhead Mounted APS

As traditionally installed in US, no locator tone, only walk interval tone

(Click each photo to play tones)

Pedhead Mounted APS

- Often use:
  - Cuckoo to indicate North/South directional crossings
  - Chirp to indicate East/West crossings

  (confusion has been reported)

Pedhead Mounted APS

- The use of a loud volume intended to provide guidance across the street, has not been successful:
  - Sound bounces and echoes
  - Far side sound is masked by near side signal
  - Signal of APS masks traffic sounds

Pushbutton Integrated APS

- Speaker and a vibrating surface or arrow located at the pedestrian button
- Locator tone to inform pedestrians that a button must be pushed to call the pedestrian phase

Pushbutton Integrated APS

- Sound comes from the pedestrian pushbutton housing
- Walk interval may be indicated by
  - Same tone as the locator tone at a faster repetition rate,
  - Speech message, or
  - Other tones including bird calls

Pushbutton Integrated APS

Locator tone followed by walk tone from pushbutton location

(Click each photo to play tones)

Pushbutton Integrated APS

Locator tone followed by speech walk message from pushbutton location

(Click photo to play tone)

Combination APS

- Combine features of pedhead mounted and pushbutton mounted APS
  - Typically WALK indication comes from speaker mounted on pedhead – speaker may be aimed down at pedestrian waiting location or across street
  - Locator tone is from separate speaker usually mounted near pushbutton, but can be mounted higher

Combination APS

Locator tone speaker in this installation is mounted on pole; WALK indication comes from speaker above the pedhead, rather than at pushbutton

(Click photo to play tone and locate speakers)

Transmitted Message APS

- Message transmitted by infrared or LED technology from pedhead to a personal individual receiver
- Person who is blind or visually impaired points receiver at pedhead to receive message

Transmitted Message APS

- These devices may also give other types of information, including information about name of streets or shape of intersection

Transmitted Message APS

Vibrotactile Alone: APS

Problems:

- Must be located very precisely at the departure curb to be useable
- Pedestrian may not know it is there (no locator tone)
- Vibrotactile feature location varies on various manufacturers' buttons
- Pedestrian has to have hand on button to recognize the walk indication (a problem in crowded areas)

APS Recommendations

Public Rights-of-Way Access Advisory Committee (PROWAAC) recommended:

- That transmitted message APS with personal receiver ONLY BE USED IN COMBINATION with directly audible APS
- That vibrotactile WALK indication SHOULD NOT BE USED ALONE; recommended its use in combination with audible indication

APS Recommendations

PROWAAC recommended that APS:

- Identify specific crosswalk and identify start of WALK phase with audible and vibrotactile indication
- WALK indication and locator tone sound at a quiet volume, only audible within 10 to 12 feet of the pushbutton, except when optional 'audible beaconing' is used
- Activate only the crosswalk being used

APS Recommendations

MUTCD and PROWAAC recommend:

- Signal volume between 2 to 5dB over ambient noise level, audible within 6 to 12 feet of the pushbutton, or the building line (whichever is closer)
- Ambient volume adjustment
- Tactile arrow aligned in the direction of travel on the crosswalk
- Pushbutton Locator tone

Accessible Pedestrian Signal Features

APS now may have additional features:

- Tactile arrow
- Vibrating surface
- Pushbutton message
- Tactile map
- Audible beaconing
- Pushbutton activation of additional features

Tactile Arrow

- Raised arrow should be aligned with direction of crosswalk of street which is controlled by the pushbutton
- Arrow may be on the pushbutton or on part of the device above the pushbutton
- Arrow is the part that vibrates during the walk interval on some devices

Vibrotactile Arrow on on APS

Vibrating Surface

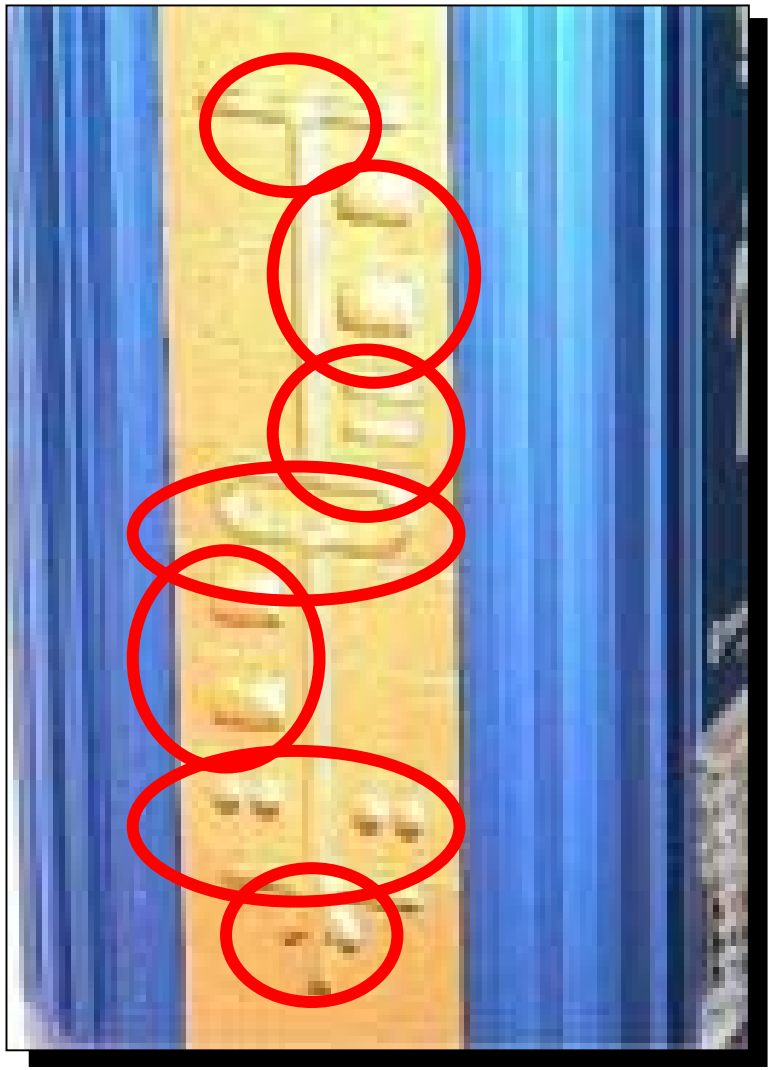
- Vibrating surface communicates information to pedestrians with both hearing and visual impairments, or when traffic sounds mask the APS audible component
- The vibrotactile component vibrates during the WALK interval
- May be part of the actual pushbutton or on the pushbutton housing

Pushbutton Message

- Pushbutton message to provide intersection information
- Plays when pushbutton is pressed for 3 seconds or more

(Click photo to play message)

Crosswalk Map



Tactile Map of Crosswalk

Symbols:

- Down curb ramp
- Bike lane
- 2 lanes of cars from left
- Median/island
- Rail line
- 2 lanes of cars from right
- And up curb ramp

(Click photo to locate each symbol)

APS Features: Audible Beaconing

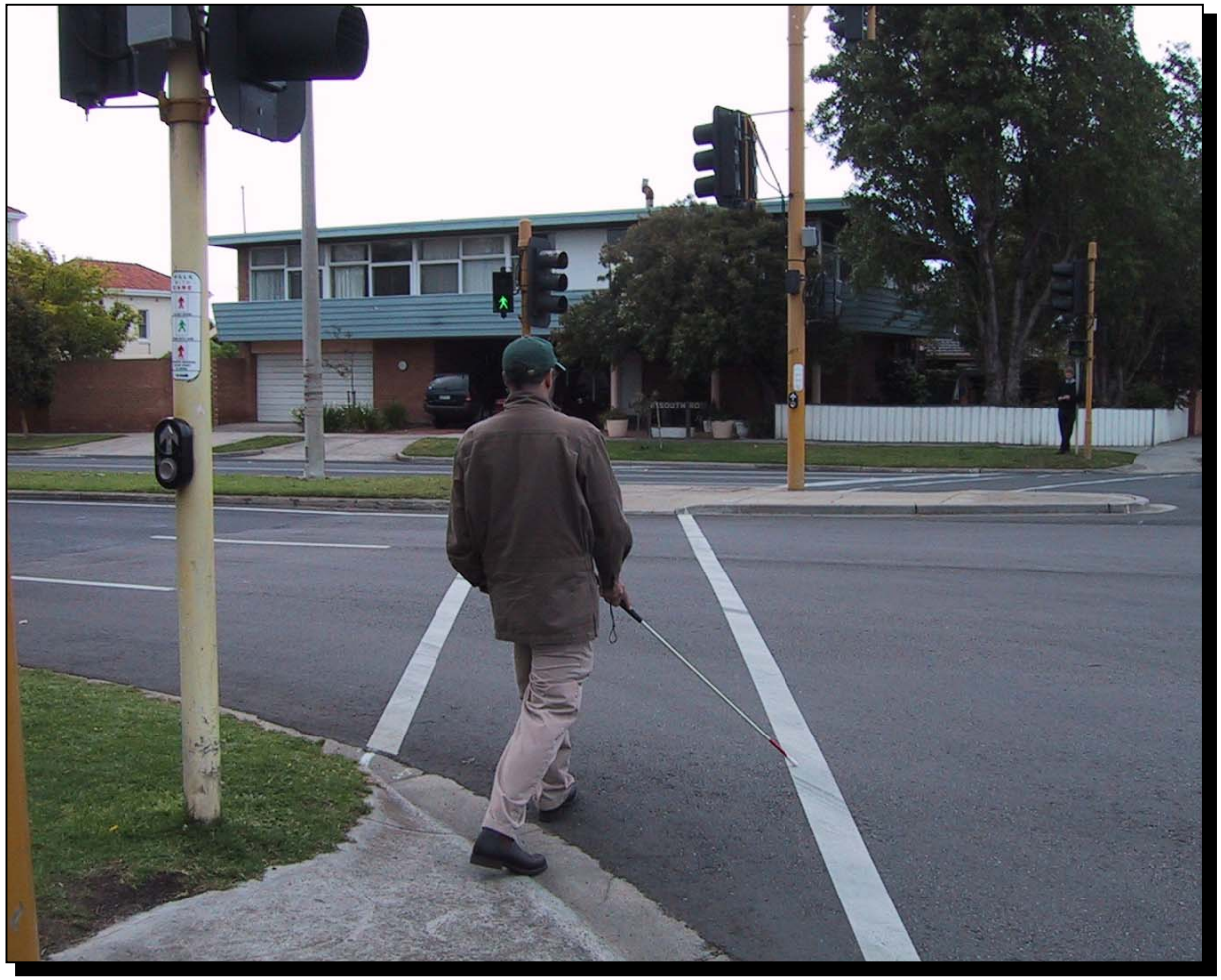
- Sound from the opposite side of the street is used to provide directional guidance during street crossing; is needed at a minority of crosswalks
- Can be provided for a single cycle when a pedestrian holds the pushbutton in for a longer period of time

APS Features: Pushbutton Activation of Options

A 3-second hold of pushbutton may be used to activate:

- Audible walk signal
- Message
- Audible beaconing feature
- Longer crossing time

Installing APS



PROWAAC Recommendations for APS Installation

APS should be installed at all new signals when any of the following exist:

- When the pedestrian walk phase is pedestrian activated (a button has to be pushed)

PROWAAC Recommendations for APS installation

- Where there is a leading pedestrian interval (LPI)
- Where the traffic signal is pre-timed (fixed timed) and pedestrian information is provided

Factors in Installing APS

From MUTCD 2000

Engineering study should consider the following factors:

1. Potential demand for accessible pedestrian signals
2. A request for accessible pedestrian signals

Factors in Installing APS

From MUTCD 2000 (continued)

Engineering study should consider the following factors:

- Traffic volumes during times when pedestrians might be present; including periods of low traffic volumes or high turn-on-red volumes
- The complexity of traffic signal phasing
- The complexity of intersection geometry

Factors in Installing APS

- MUTCD recognizes that confusion has resulted from installation of APS at some types of locations
- Care should be taken to avoid providing misleading or ambiguous information such as discussed in following slides

Choosing Audible Tones

Standard:

When choosing audible tones, possible extraneous sources of sounds (such as wind, rain, vehicle back-up warnings, or birds) shall be considered in order to eliminate potential confusion to pedestrians who have visual disabilities

Choosing Audible Tones

Support:

- Technology that provides different sounds for each non-concurrent signal phase has frequently been found to provide ambiguous information

Choosing Audible Tones

Carefully selected …when the following conditions exist:

1. Where there is an island that allows unsignalized right turns across a crosswalk…
2. Where multi-leg approaches or complex signal phasing require more than two pedestrian phases…

Choosing Audible Tones

Carefully selected …when the following conditions exist:

- At intersections where a diagonal pedestrian crossing is allowed, or where one street receives a WALK signal indication simultaneously with another street

Making Pedestrian Signals Usable

- Locate the visual pedestrian signal in line with the crosswalk
- Reduce visual clutter near the pedhead
- Install pushbuttons close to the crosswalk departure location
- Provide signs which clarify which street the pushbutton applies to

Making Pedestrian Signals Usable

- Install accessible pedestrian signals to provide walk interval information to pedestrians with visual disabilities
- Provide pedestrian lead time (lead pedestrian interval, LPI) and an accessible pedestrian signal so pedestrians, including those with vision impairments, can assert themselves in the crosswalk before motorists start making right and left turns

Making Pedestrian Signals Usable

- Increase crossing times so that people who walk slowly will have sufficient time to cross before the signal indication changes
- Provide passive pedestrian detection system that extends the crossing time if pedestrians are still in the crosswalk
- Provide a push button that will extend the crossing time

Collaboration

- Engineers and designers should work with pedestrians who are blind, and with orientation and mobility specialists, in making decisions about APS
- Need to understand what information is needed by pedestrians who have visual disabilities

Pedestrian Signs and Signals

Problems and Design Solutions Exercise

Pedestrian Signs and Signals Problems

- Identify the problems on the following three photographs
- Specify exactly how they may pose accessibility difficulties to pedestrians with disabilities

Problem #1

Problem #2

Problem #3

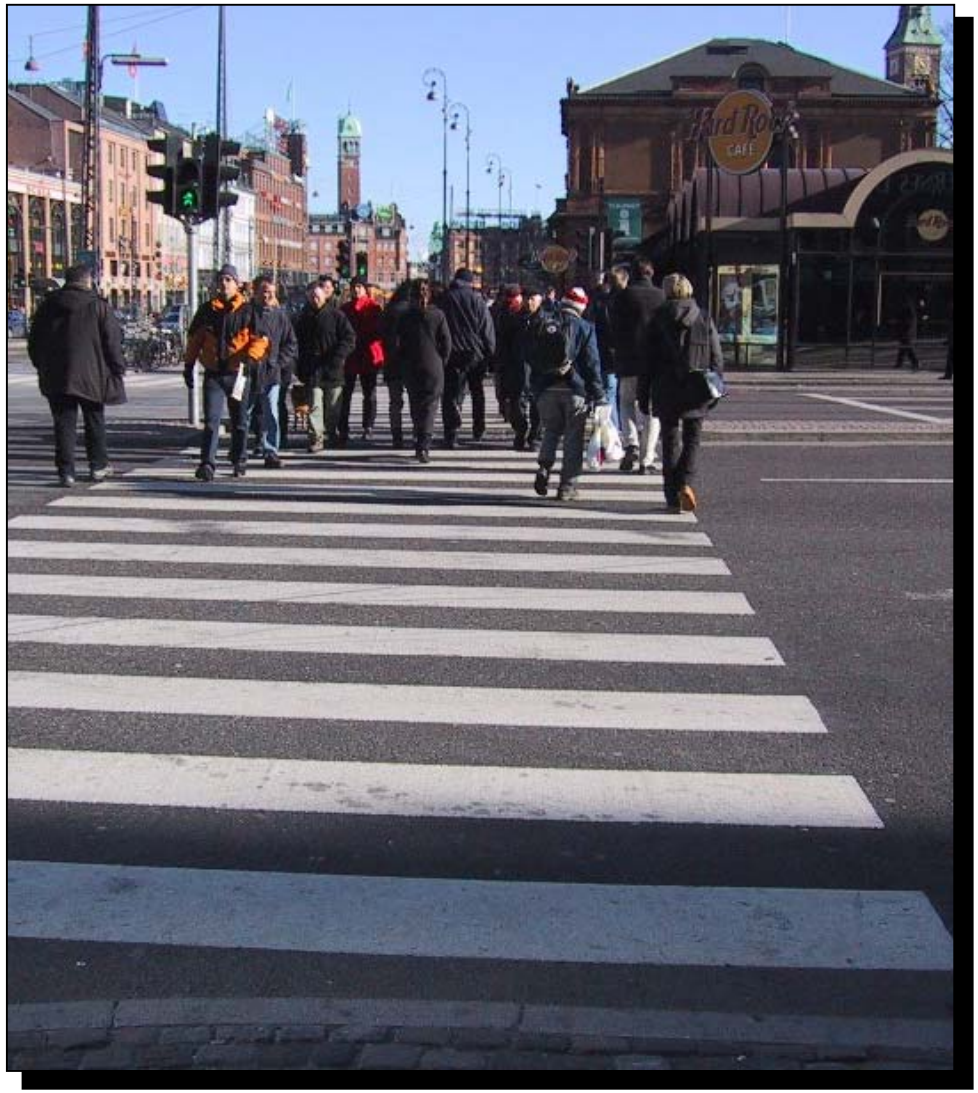
Solution #1: Provide physical barriers that direct pedestrians around the obstacle or construction

Solution #2:

Provide APS with locator tone
that will alert pedestrians
about the pushbutton and provide walk
interval information in audible and
vibrotactile formats

Solution #3:

Add a clearly marked crosswalk, an APS, a median refuge for peds who need more time, and a pushbutton on the median



Responsibility of Design and Planning Community

- While some pedestrians use adaptive devices and personal technologies, such as a white cane or motorized chair, these devices have limitations
- The design and planning community are responsible for understanding how the public facilities need to perform for the users
- This community is responsible for understanding the audience for which it designs

COURSE EVALUATION