# ACCESSIBLE PEDESTRIAN SIGNALS

*The MUTCD and Future Issues*

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# ACCESSIBLE PEDESTRIAN SIGNALS

A devise that communicates information about pedestrian timing in non-visual format such as audible tones, verbal messages, and/or vibrating surfaces.

# ACCESSIBLE PEDESTRIAN SIGNALS

History

- Audible indicators available more than 30 years
- NCUTCD Signals Technical Committee (STC) discussed and tried to deal with “Audible Pedestrian Signals” for over 20 years
- Non agreement on need among STC, NCUTCD & Visually Impaired Community
- 1997 STC finally decided to move forward and assigned issue to Pedestrian Task Force

# ACCESSIBLE PEDESTRIAN SIGNALS

History (continued)

- Americans with Disabilities Act – requires access to public right-of-way for people with disabilities
- 1998 - TEA 21; US Access Board commissioned paper by Dr. Billie (Beezy) Louise Bentzen
- June 1998 four members of PTF met with reps of various org. for the interests of visually impaired
- January 1999 – After 19 hours, PTF and groups hammered out proposed wording
- Result – Wording that developed into sections of 2000 MUTCD

# ACCESSIBLE PEDESTRIAN SIGNALS

The Problem Today

- Traffic volumes increased substantially in 20 yrs
- Increased background noise from traffic
- Streets widened with multiple thru & turn lanes
- Signal phasing more complex
- Right/Left Turn On Red

# ACCESSIBLE PEDESTRIAN SIGNALS

Format of 2000 MUTCD (2003 OMUTCD)

- **Standard – a statement of required, mandatory, or specifically prohibitive practice regarding a TCD; (shall)**
- Guidance – a statement of recommended, but not mandatory, practice in typical situations w/deviations allowed based on eng. judgment or eng. Study; (should)
- Option – a statement of practice that is a permissive condition and carries no requirement or recommendation; may contain allowable modifications to Standard or Guidance; (may)
- Support – an informational statement that does not carry any degree of mandate, recommendation, authorization, prohibition or enforceable condition

# ACCESSIBLE PEDESTRIAN SIGNALS

2000 MUTCD (2003 OMUTCD)

- Section 4E.06 Accessible Pedestrian Signals
  - Audible tones
  - Verbal messages
  - Vibrotactile
- Section 4E.08 Accessible Pedestrian Signal Detectors
  - Locator tones

STC recommendations to NCUTCD deliberately chose to avoid standardization on devices, and instead standardized on methods of dealing with the problem, allowing agencies to explore the new technologies coming on the market.

# ACCESSIBLE PEDESTRIAN SIGNALS

## Accessible Device examples



# ACCESSIBLE PEDESTRIAN SIGNALS

## 2003 MUTCD (2005 OMUTCD) Changes

- In 4E.08 Pedestrian Detectors - an Option was added

"At signalized locations with a demonstrated need and subject to equipment capabilities, pedestrians with special needs may be provided with additional crossing time by means of an extended pushbutton press"

# ACCESSIBLE PEDESTRIAN SIGNALS

## 2003 MUTCD (2005 OMUTCD) Changes

- In 4E.09 Accessible Pedestrian Detectors - a Support statement was changed to a Standard for emphasis

**"An accessible pedestrian signal detector shall be defined as a device designated to assist the pedestrian who has visual or physical disabilities in activating the pedestrian phase"**

# ACCESSIBLE PEDESTRIAN SIGNALS

## 2003 MUTCD (2005 OMUTCD) Changes

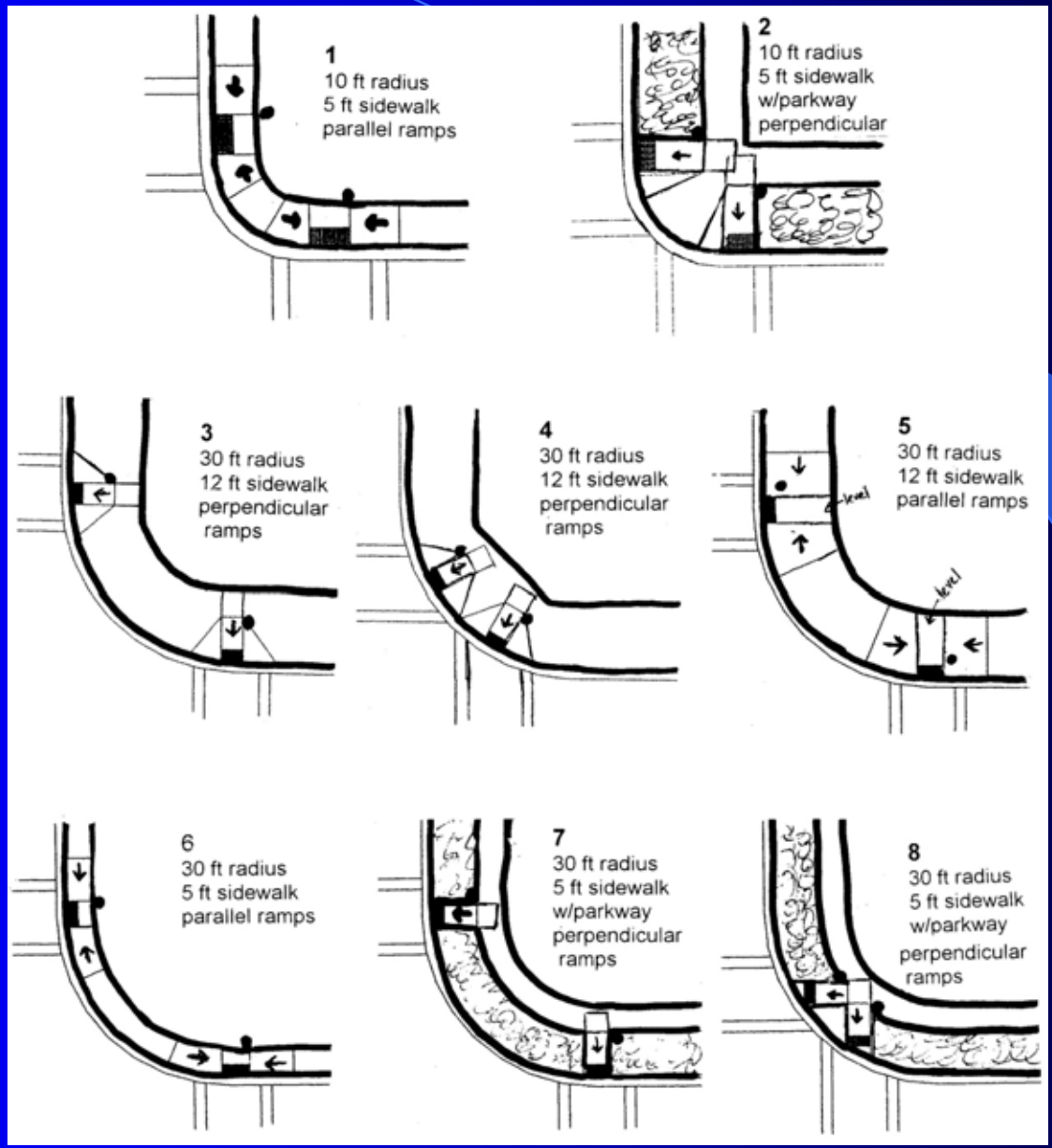
- In 4E.09 Accessible Pedestrian Detectors – clarified APS pushbutton location

Pushbuttons for accessible pedestrian signals should be located as follows:

- Adjacent to a level all-weather surface;
- Within 5 feet of the crosswalk extended;
- Within 10 feet of the edge of the curb, shoulder, or pavement, and;
- Parallel to the crosswalk to be used.

# ACCESSIBLE PEDESTRIAN SIGNALS

Proposed Pole Locations



# ACCESSIBLE PEDESTRIAN SIGNALS

Recommended Pushbutton Locations (MUTCD & OMUTCD)

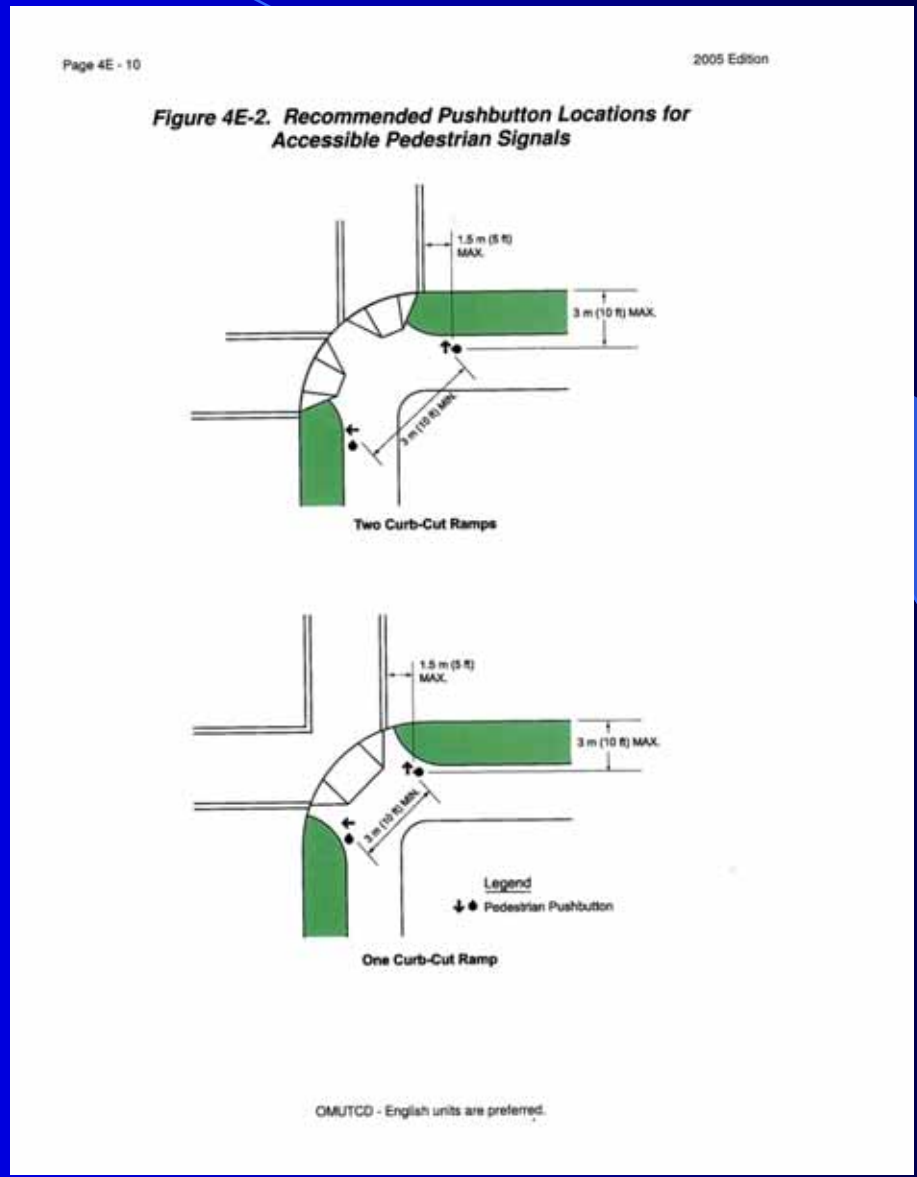


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*Figure 4E-2. Recommended Pushbutton Locations for Accessible Pedestrian Signals*



OMUTCD - English units are preferred.

# ACCESSIBLE PEDESTRIAN SIGNALS

## 2003 MUTCD (2005 OMUTCD) Changes

- In 4E.10 Pedestrian Intervals and Signal Phases – the Guidance was changed for calculating the pedestrian clearance time

**" The pedestrian clearance time should be sufficient to allow a pedestrian crossing in the crosswalk who left the curb or shoulder during the WALKING PERSON signal indication to travel at a walking speed of 1.2 m (4ft) per second, to at least the far side of the traveled way or to a median of sufficient width for pedestrians to wait."**

# APS - Future Issues

TRB research – NCHRP 03-62 (May 2001)

*Guidelines for Accessible Pedestrian Signals*

- NCUTCD - STC Representation: Steve Jewell – Chair, Dave Kuemmel
- Objective – To develop guidelines and training materials for implementation of accessible pedestrian signals (APS) and to determine standards for sounds/indicators for both visually & hearing impaired

# APS - Future Issues

## Recent Research Outcomes

- TRB Paper: APS – The effect of Pushbutton Location and Audible WALK indications on Pedestrian Behavior
  - Speed in locating the pushbutton appears to be significantly influenced by relationship between pushbutton location and geometry at each corner
  - If two pushbuttons are on a single pole, verbal WALK messages resulted in better accuracy than different sounds
  - For two pushbuttons on one corner, mounted on two poles, a *rapid tick* sound works best

# APS - Future Issues

Recent Research Outcomes

- Primary APS Features
  - Pushbutton Locator Tone
  - Tactile Arrow
  - Actuation Identification
  - Audible WALK Indication
  - Vibrotactile WALK Indication
  - Responsive to Ambient Sound
- Secondary APS Features
  - Audible Beaconing

# APS - Future Issues

## NCUTCD Recommended Changes

- In 4E.06 Accessible Pedestrian Signals – research outcomes - *APS **shall** be meet all of the following:*

- ***APS shall have both audible & vibrotactile WALK indications.***
- ***APS shall have audible walk indication during walk interval only.***
- ***APS shall not provide audible pedestrian change interval indication.***
- ***Audible walk indication shall be a percussinve tone.***
- ***Vibrotactile walk shall be by tactile arrow on Pushbutton.***

# APS - Future Issues

## NCUTCD Recommended Changes

- In 4E.09 Accessible Pedestrian Detectors – stengthened APS pushbutton location requirements

*When pedestrian actuation is used*, pushbuttons ***shall*** *be located to meet all of the following:*

- ***Unobstructed &*** **Adjacent to a level all-weather surface;**
- **Within 5 feet of the crosswalk extended;**
- ***Between 1.5 & 6 feet*** **of the edge of the curb, shoulder, or pavement;**
- **Parallel to the crosswalk to be used, and;**
- ***At a maximum mounting height of 4 feet above sidewalk*.**

# APS - Future Issues

NCUTCD Recommended Changes

- In 4E.06 Accessible Pedestrian Signals – research outcomes – Audible Beaconing

- Audible Beaconing is the use of an audible signal in such a way that blind pedestrians can home in on the signal.
- Not all crosswalks at an intersection need audible beaconing; beaconing can actually cause confusion if used at all crosswalks.

Audible beaconing should only be considered following an engineering study at:

- Crosswalks longer than 70 feet; skewed; multiple legs.

# APS - Future Issues

## Intersection Rating Worksheet for Accessible Pedestrian Signals
### Intersection Form (NCHRP 3-62 Draft)

| | | |
|---|---|---|
| **Location:** | **Intersection Form Score:** | |
| | **Crosswalk A Score:** | |
| **Evaluator:** | **Crosswalk B Score:** | |
| | **Crosswalk C Score:** | |
| **Evaluation Date:** | **Crosswalk D Score:** | |
| | **Crosswalk E Score:** | |

**Sketch:** *See instructions for information to include. Label crosswalks as A, B, C, D, etc.*

| **Configuration** | Points | Score |
|---|---|---|
| 4-leg | 0 | |
| 4-leg offset/skewed | 3 | |
| 3-leg (T or Y) | 3 | |
| 5 or more legs | 4 | |
| Midblock location | 5 | |

| **Signalization** | Points | Score |
|---|---|---|
| Pre-timed | 0 | |
| Semi-actuated | 2 | |
| Fully-actuated | 4 | |
| Split phasing | 6 | |
| Exclusive ped phase | 10 | |

**Transit Facilities within a block (~ 1/8 mile) of the intersection - all legs**

| | Points | Score |
|---|---|---|
| 1-2 stops/single route | 1 | |
| 1-2 stops/multiple routes | 2 | |
| 3+ stops/single routes | 3 | |
| 3+stops/multiple routes | 4 | |
| transit mall/rail station | 5 | |

| **Requests for APS** | Points | Score |
|---|---|---|
| No requests | 0 | |
| 1 person | 4 | |
| 2 persons | 8 | |
| 3+ persons | 12 | |

**Other Intersection Level Issues**

| **Crossing frequency by blind pedestrians** | Points | Score |
|---|---|---|
| None | 0 | |
| Infrequently (< once/week) | 6 | |
| Occasionally (1 – 5 times/week) | 8 | |
| Frequently (> 5 times/week) | 10 | |

| **Distance to:** | **Visually Impaired Facility** | | **Major Pedestrian Attraction** | |
|---|---|---|---|---|
| | Points | Score | Points | Score |
| > 2600 ft (~1/2 mile) | 2 | | 1 | |
| < 2600 ft (~1/2 mile) | 4 | | 2 | |
| < 1300 ft (~1/4 mile) | 6 | | 3 | |
| < 650 ft (~1/8 mile) | 8 | | 4 | |
| < 300 ft | 10 | | 5 | |

Recent Research Outcomes

# APS - Future Issues

## Intersection Rating Worksheet for Accessible Pedestrian Signals
### Crossing Form (NCHRP 3-62 Draft)

| | | |
|---|---|---|
| **Crosswalk Identifier (as labled in the sketch):** | **Crossing Form Score:** | |
| **Evaluator:** | | |
| | **Intersection Form Score:** | |
| **Evaluation Date:** | | |
| | **Total Crosswalk Score:** | |

| **Crossing Width** | Points | Score |
|---|---|---|
| 40 - 59 ft | 1 | |
| 60 - 79 ft | 2 | |
| 80 - 99 ft | 3 | |
| 100- 119 ft | 4 | |
| ≥ 120 ft | 5 | |

| **Operating Speed - 85th %tile (street being crossed)** | Points | Score |
|---|---|---|
| 21 - 30 mph | 1 | |
| 31 - 35 mph | 2 | |
| 36 - 40 mph | 3 | |
| 41 - 45 mph | 4 | |
| ≥ 45 mph | 5 | |

| **Approach/Crossing Geometrics** | Points | Score |
|---|---|---|
| Skewed crossing | 4 | |
| Curb radius> 25 ft (either corner) | 4 | |
| Misaligned curb ramps (either corner) | 4 | |
| Sight distance obstructions (either corner) | 4 | |
| Islands or medians (painted, raised or cut-through) | 3 | |
| Transverse slope on crosswalk | 2 | |

| **Crosswalk Signalization (features/timing impacting the crosswalk of interest)** | Points | Score |
|---|---|---|
| Leading Pedestrian Interval (with parallel street green) | 10 | |
| Timed for crossing to median crossing island | 10 | |
| Signalized channelized right turn lane | 10 | |
| Push button actuation required for WALK signal | 4 | |
| RT-only phase (on parallel street) | 4 | |
| Leading protected left-turn phase (on parallel street) | 4 | |
| RTOR permitted (on parallel street) | 2 | |

| **Traffic Presence (at least 2 vehicles present on parallel street to provide surge cue)** | Points | Score |
|---|---|---|
| Constant (≥ 90 percent of cycles) | 1 | |
| Heavy (70 - 80 percent) | 2 | |
| Moderate (50 – 60 percent) | 3 | |
| Light (30 – 40 percent) | 4 | |
| Occasional (< 30 percent) | 5 | |
| None (i.e., no through lanes present to create surge noise - e.g., stem of T-intersection) | 6 | |

**Other Crossing Level Issues**

| **Distance to Alternative Accessible Crossing (with APS)** | Points | Score |
|---|---|---|
| < 300 ft | 0 | |
| < 650 ft (~ 1/8 mile) | 1 | |
| < 1300 ft (~ 1/4 mile) | 2 | |
| < 2600 ft (~ 1/2 mile) | 3 | |
| ≥ 2600 ft (~ 12 mile) | 4 | |

| **Pedestrian Pushbutton Location (either corner)** | Points | Score |
|---|---|---|
| Located > 10 ft from curb | 5 | |
| Located > 5 ft from the CW extd. | 5 | |

Recent Research Outcomes

# APS - Future Issues

NCUTCD Changes Being Discussed

- 4E.10 Pedestrian Intervals and Signal Phases

  Walking Speed – 4.0 vs. 3.5 vs. 3.0 fps

**The pedestrian clearance time shall be sufficient to allow a pedestrian crossing in the crosswalk who left the curb or shoulder during the WALKING PERSON (symbolizing WALK) signal indication to travel at a walking speed of 1.1 m (3.5 ft) per second, to at least the far side of the traveled way or to a median of sufficient width for pedestrians to wait.**

# APS - Future Issues

## Walking Speed – 4.0 vs. 3.5 vs. 3.0 fps (cont.)

**In addition, the total of the WALK interval and pedestrian clearance times shall also be sufficient to allow a pedestrian crossing in the crosswalk who left the pedestrian detector at the beginning of the WALKING PERSON (symbolizing WALK) signal indication to travel at a walking speed of 0.9 m (3 ft) per second to the far side of the traveled way being crossed. Additional time required to satisfy the conditions of this paragraph shall be added to the subject phase pedestrian clearance time. See also the second Option, below.**

# APS - Future Issues

## Walking Speed – 4.0 fps vs. 3. 5 fps vs. 3.0 fps

NCUTCD
Ped Walking Speed Comparison Worksheet
3/12/2005 18:53

**Geometry of Street to be Crossed**

| | | |
|---|---|---|
| Number of through lanes | 6 | |
| Number of left-turn lanes | 2 | |
| Number of exclusive right-turn lanes | 0 | |
| Median width (enter 0 if no median) | 4 | feet |
| Through Lane Width | 12 | feet |
| Left-turn Lane Width | 12 | feet |
| Right-turn Lane Width | 12 | feet |
| Distance from curb to ped detector | 5 | feet |
| Curb-to-curb Distance | 100 | feet |
| Ped detector-to-far curb Distance | 105 | feet |

**Pedestrian Time Calculation Comparisons**

| | Current Walking Speed Scenario | Proposed Walking Speed Scenario | Total Available Crossing Time Check |
|---|---|---|---|
| Walking Speed (ft/sec) | 4.0 | 3.5 | 3.0 |
| Walk Interval Duration (sec) | 7.0 | 7.0 | 7.0 |
| Pedestrian Clearance Time (sec) | 25.0 | 28.6 | |
| Sum of Walk & Ped Clearance Times | 32.0 | 35.6 | |
| Total Crossing Time Required | | | 35.0 |
| Additional ped Clearance Needed | | none needed | |

Shaded cells contain calculated data -- do NOT input into shaded cells

| | |
|---|---|
| Current Walking Speed Scenario Column | Pedestrian clearance time is calculated from curb to curb, using the "Curb-to-curb" distance calculated and the walking speed input. |
| Proposed Walking Speed Scenario Column | Pedestrian clearance time is calculated from curb to curb, using the "Curb-to-curb" distance calculated and the walking speed input. |
| Total Available Crossing Time Check Column | The "total crossing time required" uses the "Ped-detector-to-far curb Distance" and the walking speed input. |

# APS - Future Issues

OMUTCD & MUTCD do not require signals to be accessible, but based on current discussions at federal agencies and NCUTCD, future changes are not just possible, but probable.

i.e. Draft PROWAG on APS requires APS where pedestrian signals are installed!

# APS - Future Issues

Recent Legal Settlement – Various Organizations for the Visually Impaired vs. San Francisco Municipal Transportation Agency

- Requires Installation of APS
- Dedicates $1.6 M Over next 2.5 Years for APS at Minimum of 80 Intersections
- Uses “Rapid Tick” sound with WALK display
- Includes Locator Tone, Vibrotactile, Extended press for Street Name Information
- Commits City to Seek Funding, Develop Policy for Requesting APS, Work with Community

# ACCESSIBLE PEDESTRIAN SIGNALS

**Thank you.**

*Questions?*