


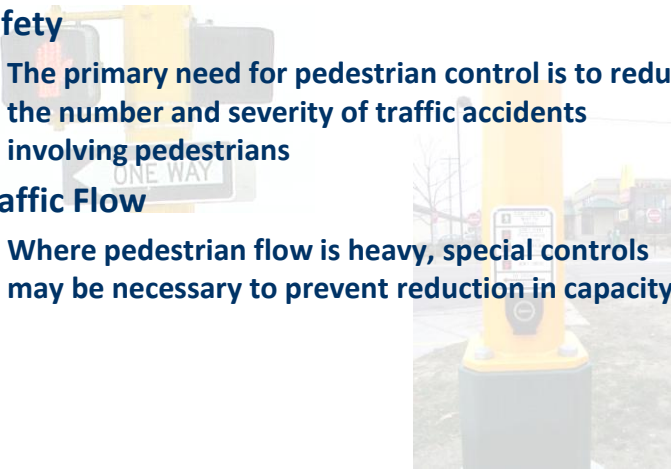




TOPIC 9: PEDESTRIAN

<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Office of Traffic, Safety &amp; Technology</p> 	 <h2 style="text-align: center;">Traffic Signals 101</h2> <h3 style="text-align: center;">Topic 9 Pedestrian</h3>	<p>In this topic you will be introduced to the movement of pedestrians at signalized intersections.</p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Office of Traffic, Safety &amp; Technology</p> 	<h2 style="text-align: center;">Pedestrian</h2> <h3>➤ Need for Pedestrian Control</h3> <ul style="list-style-type: none"> <li>- Safety             <ul style="list-style-type: none"> <li>• The primary need for pedestrian control is to reduce the number and severity of traffic accidents involving pedestrians</li> </ul> </li> <li>- Traffic Flow             <ul style="list-style-type: none"> <li>• Where pedestrian flow is heavy, special controls may be necessary to prevent reduction in capacity</li> </ul> </li> </ul> 	<p><b>Safety.</b> Pedestrians are slow and fragile as compared to motor vehicles; a collision between a vehicle and a pedestrian almost always results in at least an injury, often a fatality. The pedestrian population includes many people who are not familiar with traffic laws (one does not need to pass an examination to become a pedestrian).</p> <p><b>Traffic Flow.</b> At unsignalized intersections a steady stream of pedestrians preempting crosswalks may reduce vehicular capacity considerably. At signalized intersections lacking special pedestrian signals, conflicts between vehicular movements and pedestrians may cause congestion.</p>

<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Office of Traffic, Safety &amp; Technology</p> 	<h2 style="text-align: center;">Pedestrian</h2> <p>➤ <b>Pedestrian Timing Requirements</b></p> <ul style="list-style-type: none"> <li>– The pedestrian timing requirements include:             <ul style="list-style-type: none"> <li>• The Walk Interval</li> <li>• Flashing Don't Walk Interval (Pedestrian Clearance)</li> </ul> </li> </ul>	<p>Pedestrian timing includes the Walk time (defined on slide 4 below) and the Flashing Don't Walk time (defined on slide 5 on the next page).</p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Office of Traffic, Safety &amp; Technology</p> 	<h2 style="text-align: center;">Pedestrian</h2> <ul style="list-style-type: none"> <li>– <b>Pedestrian Timing Requirements</b> <ul style="list-style-type: none"> <li>• <i>Walk</i>: The walk interval is typically 4 to 7 seconds. This allows pedestrians adequate time to leave the curb and begin crossing</li> <li>• MnDOT typically uses 7 seconds, based on MN MUTCD Guidance</li> <li>• Under special circumstances, such as at a school crossing with numerous pedestrians, walk times may need to exceed 7 seconds</li> </ul> </li> </ul>	<p>The Walk interval is the time given to allow the pedestrian to leave the curb and begin crossing the street.</p> <p>Mn/DOT typically uses 7 seconds.</p> <p>The MN MUTCD, Chapter 4E guidance is to use 7 seconds. The MN MUTCD indicates this option:</p> <p>“If pedestrian volumes and characteristics do not require a 7-second walk interval, walk intervals as short as 4 seconds may be used.”</p>



## Pedestrian

### – Pedestrian Timing Requirements

- **Flashing Don't Walk (FDW) or pedestrian clearance** is the time provided for a pedestrian crossing in a crosswalk, after leaving the curb or shoulder, to travel to the far side of the traveled way or to a median (D = Distance)
- The calculation of the flashing don't walk (pedestrian clearance) is:

$$FDW = D / R$$

R = Walking Rate, 3.5 feet per second according to MN MUTCD

The Flashing Don't Walk is calculated as the amount of time required to cross the street. This should allow pedestrians adequate time to cross the roadway safely. It is based on the Distance to cross (D) and the rate at which a pedestrian walks (R).

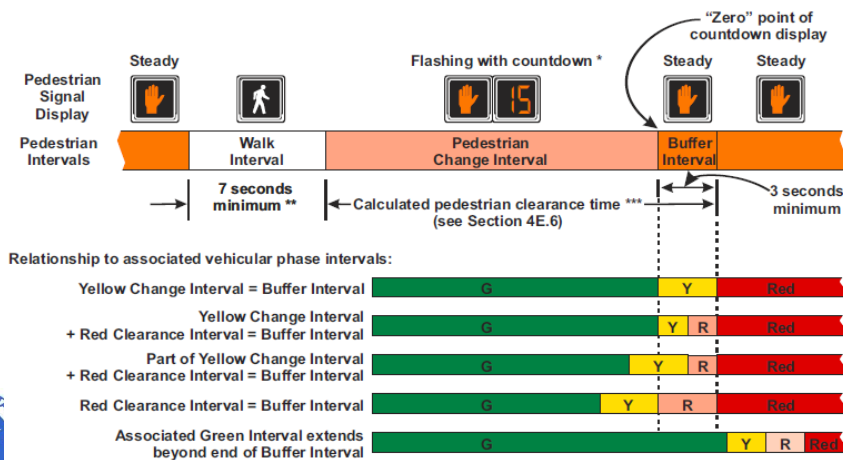
The MN MUTCD specifies a walking rate of 3.5 feet per second. There is an option to use a walking rate of 4.0 feet per second IF there is an extended push button feature or passive pedestrian detection.

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## Pedestrian

### ➤ MN MUTCD Figure 4E-2



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The Figure illustrates the pedestrian intervals and their possible relationships with associated vehicular signal phase intervals.

<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Office of Traffic, Safety &amp; Technology</p> 	<h2 style="background-color: #4a86e8; color: white; padding: 5px;">Pedestrian</h2> <p>➤ <b>Ped Timing Recommended Practice</b></p> <ul style="list-style-type: none"> <li>– For a single roadway or a divided roadway with a median island less than 6 feet wide, the pedestrian is provided time to cross the entire intersection, without stopping in the middle             <ul style="list-style-type: none"> <li>• WALK = 7 seconds (this may be reduced to 4 seconds if it is necessary to minimize pedestrian timing considering the other factors)</li> </ul> </li> </ul>	<p>More details on Mn/DOT's recommended timing practice can be found in the Traffic Signal Timing and Coordination Manual.</p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Office of Traffic, Safety &amp; Technology</p> 	<h2 style="background-color: #4a86e8; color: white; padding: 5px;">Pedestrian</h2> <p>➤ <b>Ped Timing Recommended Practice</b></p> <ul style="list-style-type: none"> <li>• <math>FDW = (D/R)</math></li> <li>• (time should not be less than WALK time and the time may be reduced by the yellow interval <b>IF</b> it is necessary to minimize pedestrian timing considering other factors)</li> </ul>	<p>D is the distance across, from curb to the far side of the farthest travel lane.</p> <p>R is the walking rate in feet per second. Guidance is to use 3.5 feet/second, but where pedestrians who walk slower than 3.5 feet per second, or pedestrians who use wheelchairs, routinely use the crosswalk, a walking speed of less than 3.5 feet per second should be considered in determining the pedestrian clearance time.</p>



## Pedestrian

### – Divided Roadways (with Median)

- Option 1 - Cross to Median Only  
(for divided roadways with median islands over 6 feet wide with pedestrian indications and button in the median)
- Option 2 - Cross Completely

For Option 1, the crossing distance should be determined by using the longest distance from one side to the median.

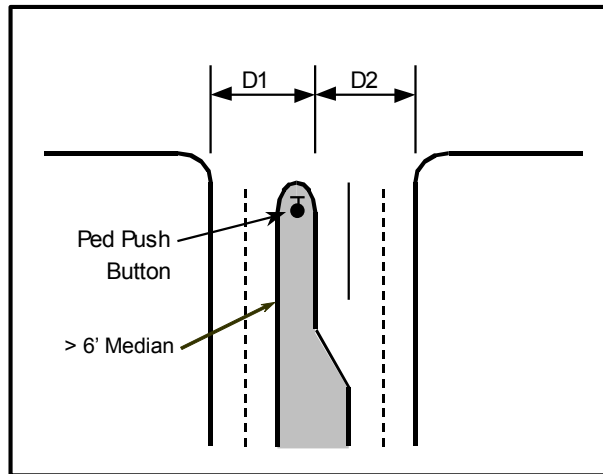
For Option 2, the timing is sufficient to allow a pedestrian who starts to cross on the beginning of Walk, to cross the entire roadway. A pedestrian, who begins to cross later, may have to stop in the median, press the ped button, and wait for the next Walk.

- Walk =  $D1/R$
- Flashing DON'T Walk =  $(D2/R)$

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## Pedestrian



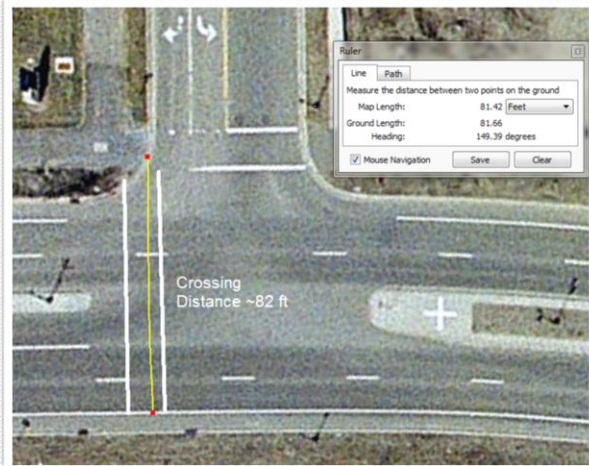
This graphic shows the measurements of D1 and D2.

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# Pedestrian

## ➤ Pedestrian Timing Requirements Example



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Pedestrian timing requirement example. For this example a pedestrian is required to cross in the north-south direction (82 feet). In this example, the distance D is used as 82 feet.

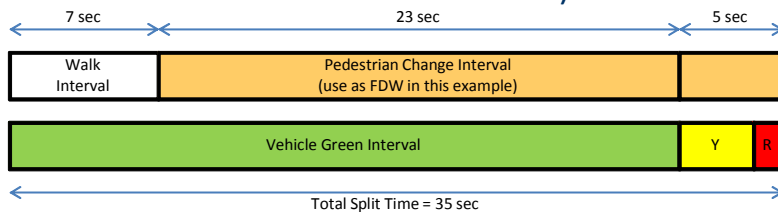


# Pedestrian

Excel

## ➤ Pedestrian Timing Requirements Example

- Assume a walking speed of 3.5 feet per second with no special pedestrian requirements
- The flashing don't walk would then be:
  - $FDW = 82 \text{ feet} / 3.5 \text{ feet per second} = 23 \text{ seconds}$
- Total Split Time (given vehicle yellow = 4 seconds and all-red = 1 second) is 35 seconds



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In this example the pedestrian would typically be given a 7 second Walk preceding the Don't Walk.

For normal conditions, 3.5 feet per seconds is used as the crossing speed. This speed may need to be reduced under special circumstances.

For this example, the pedestrian clearance time will be set to equal the controller FDW. The "buffer" or solid don't walk is equal to the Yellow and All-Red for the vehicle phase.

Total time needed for the concurrent vehicle phase is 35 seconds.

# Pedestrian

## – Pedestrian Information Sign

	<b>START CROSSING</b> Watch For Vehicles
 FLASHING	<b>DON'T START</b> Finish Crossing If Started
	<b>PEDESTRIANS SHOULD NOT BE IN CROSSWALK</b>

**Sign Specifications:** 6 x 6 inches  
Black legend on white background,  
Except the DON'T WALK is orange.

WAIT  
HERE

PUSH  
BUTTON  
FOR  
WALK  
SIGNAL

in medians

PUSH  
BUTTON  
FOR  
WALK  
SIGNAL

CROSS TO  
CENTER

at corners

### Pedestrian Information Sign

- To provide pedestrians with more information at the traffic signal
- The pedestrian informational sign shall be used on all traffic signal installations that have pedestrian indications.



## **Handout**

**Excerpts from MN MUTCD (Page 4E-1 to 4E-11)**

**For the latest version of the MN MUTCD, please visit:**

**[www.dot.state.mn.us/trafficeng/publ/mutcd/index.html](http://www.dot.state.mn.us/trafficeng/publ/mutcd/index.html)**

## PART 4. HIGHWAY TRAFFIC SIGNALS

### Chapter 4E. Pedestrian Control Features

#### 4E.1 Pedestrian Signal Heads

##### SUPPORT:

Pedestrian signal heads provide special types of traffic signal indications exclusively intended for controlling pedestrian traffic. These signal indications consist of the illuminated symbols of a WALKING PERSON (symbolizing WALK) and an UPRAISED HAND (symbolizing DONT WALK).

##### GUIDANCE:

Except when required by this manual, engineering judgment should determine the need for separate pedestrian signal heads (see Section 4D.3) and accessible pedestrian signals (see Section 4E.6).

##### SUPPORT:

Chapter 4F contains information regarding the use of pedestrian hybrid beacons and Chapter 4N contains information regarding the use of In-Roadway Warning Lights at unsignalized marked crosswalks.

#### 4E.2 Meaning of Pedestrian Signal Head Indications

##### STANDARD:

Pedestrian signal head indications shall have the following meanings:

- A. A steady WALKING PERSON (symbolizing WALK) signal indication means that a pedestrian facing the signal indication is permitted to start to cross the roadway in the direction of the signal indication, possibly in conflict with turning vehicles. The pedestrian shall yield the right-of-way to vehicles lawfully within the intersection at the time that the WALKING PERSON (symbolizing WALK) signal indication is first shown.
- B. A flashing UPRAISED HAND (symbolizing DONT WALK) signal indication means that a pedestrian shall not start to cross the roadway in the direction of the signal indication, but that any pedestrian who has already started to cross on a steady WALKING PERSON (symbolizing WALK) signal indication shall proceed to the far side of the traveled way of the street or highway, unless otherwise directed by a traffic control device to proceed only to the median of a divided highway or only to some other island or pedestrian refuge area.

- C. A steady UPRAISED HAND (symbolizing DONT WALK) signal indication means that a pedestrian shall not enter the roadway in the direction of the signal indication.
- D. A flashing WALKING PERSON (symbolizing WALK) signal indication has no meaning and shall not be used.

#### 4E.3 Application of Pedestrian Signal Heads

##### STANDARD:

Pedestrian signal heads shall be used in conjunction with vehicular traffic control signals under any of the following conditions:

- A. If a traffic control signal is justified by an engineering study and meets either Warrant 4, Pedestrian Volume or Warrant 5, School Crossing (see Chapter 4C);
- B. If an exclusive signal phase is provided or made available for pedestrian movements in one or more directions, with all conflicting vehicular movements being stopped;
- C. At an established school crossing at any signalized location; or
- D. Where engineering judgment determines that multi-phase signal indications (as with split-phase timing) would tend to confuse or cause conflicts with pedestrians using a crosswalk guided only by vehicular signal indications.

##### GUIDANCE:

Pedestrian signal heads should be used under any of the following conditions:

- A. If it is necessary to assist pedestrians in deciding when to begin crossing the roadway in the chosen direction or if engineering judgment determines that pedestrian signal heads are justified to minimize vehicle-pedestrian conflicts;
- B. If pedestrians are permitted to cross a portion of a street, such as to or from a median of sufficient width for pedestrians to wait, during a particular interval but are not permitted to cross the remainder of the street during any part of the same interval; and/or
- C. If no vehicular signal indications are visible to pedestrians, or if the vehicular signal indications that are visible to pedestrians starting a crossing provide insufficient guidance for them to decide when to begin crossing the roadway in the chosen direction, such as on one-way streets, at T-intersections, or at multi-phase signal operations.

### 4E.4 Size, Design, and Illumination of Pedestrian Signal Head Indications

**STANDARD:**

All new pedestrian signal head indications shall be displayed within a rectangular background and shall consist of symbolized messages (see Figure 4E-1), except that existing pedestrian signal head indications with lettered or outline style symbol messages shall be permitted to be retained for the remainder of their useful service life. The symbol designs that are set forth in the Federal "Standard Highway Signs and Markings" book (see Section 1A.11) shall be used. Each pedestrian signal head indication shall be independently displayed and emit a single color.

If a two-section pedestrian signal head is used, the UPRAISED HAND (symbolizing DONT WALK) signal section shall be mounted directly above the WALKING PERSON (symbolizing WALK) signal section. If a one-section pedestrian signal head is used, the symbols shall be either overlaid upon each other or arranged side-by-side with the UPRAISED HAND symbol to the left of the WALKING PERSON symbol, and a light source that can display each symbol independently shall be used.

The WALKING PERSON (symbolizing WALK) signal indication shall be white, conforming to the publication entitled "Pedestrian Traffic Control Signal Indications" (see Section 1A.11), with all except the symbol obscured by an opaque material.

The UPRAISED HAND (symbolizing DONT WALK) signal indication shall be Portland orange, conforming to the publication entitled "Pedestrian Traffic Control Signal Indications" (see Section 1A.11), with all except the symbol obscured by an opaque material.

When not illuminated, the WALKING PERSON (symbolizing WALK) and UPRAISED HAND (symbolizing DONT WALK) symbols shall not be readily visible to pedestrians at the far end of the crosswalk that the pedestrian signal head indications control.

For pedestrian signal head indications, the symbols shall be at least 150 mm (6 in) high.

The light source of a flashing UPRAISED HAND (symbolizing DONT WALK) signal indication shall be flashed continuously at a rate of not less than 50 nor more than 60 times per minute. The displayed period of each flash shall be a minimum of 1/2 and a maximum of 2/3 of the total flash cycle.

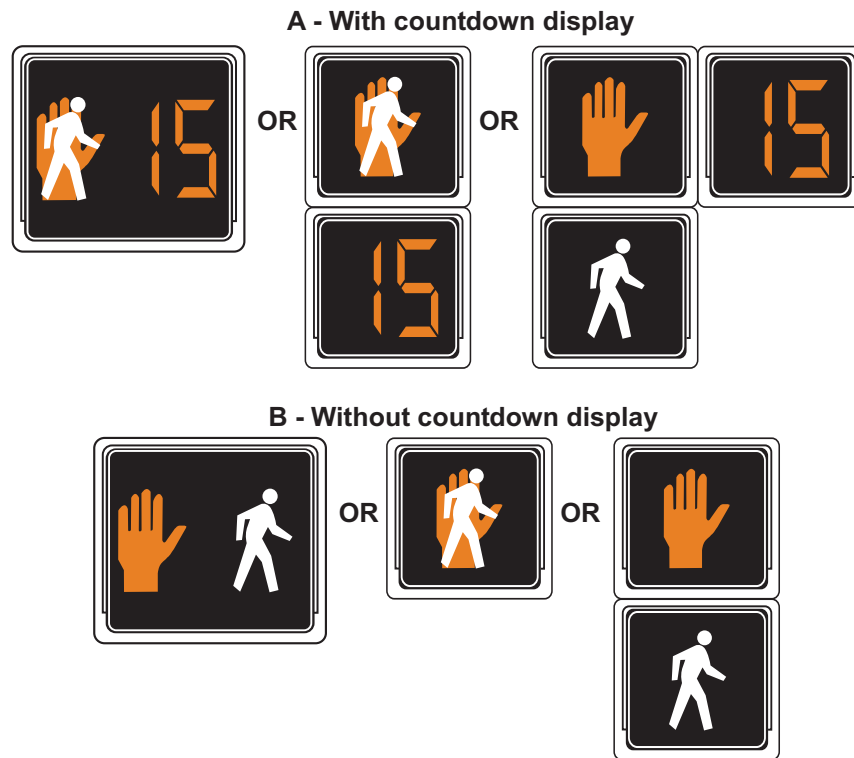


Figure 4E-1. Typical Pedestrian Signal Indications

**GUIDANCE:**

Pedestrian signal head indications should be conspicuous and recognizable to pedestrians at all distances from the beginning of the controlled crosswalk to a point 10 feet from the end of the controlled crosswalk during both day and night.

For crosswalks where the pedestrian enters the crosswalk more than 100 feet from the pedestrian signal head indications, the symbols should be at least 9 inches high.

If the pedestrian signal indication is so bright that it causes excessive glare in nighttime conditions, some form of automatic dimming should be used to reduce the brilliance of the signal indication.

**4E.5 Location and Height of Pedestrian Signal Heads**

**STANDARD:**

Pedestrian signal heads shall be mounted with the bottom of the signal housing including brackets not less than 2.1 m (7 ft) nor more than 3 m (10 ft) above sidewalk level, and shall be positioned and adjusted to provide maximum visibility at the beginning of the controlled crosswalk.

If pedestrian signal heads are mounted on the same support as vehicular signal heads, there shall be a physical separation between them.

**4E.6 Pedestrian Intervals and Signal Phases**

**STANDARD:**

At intersections equipped with pedestrian signal heads, the pedestrian signal indications shall be displayed except when the vehicular traffic control signal is being operated in the flashing mode. At those times, the pedestrian signal indications shall not be displayed.

When the pedestrian signal heads associated with a crosswalk are displaying either a steady WALKING PERSON (symbolizing WALK) or a flashing UPRAISED HAND (symbolizing DON'T WALK) signal indication, a steady or a flashing red signal indication shall be shown to any conflicting vehicular movement that is approaching the intersection or mid-block location perpendicular or nearly perpendicular to the crosswalk.

When pedestrian signal heads are used, a WALKING PERSON (symbolizing WALK) signal indication shall be displayed only when pedestrians are permitted to leave the curb or shoulder.

A pedestrian change interval consisting of a flashing UPRAISED HAND (symbolizing DON'T WALK) signal indication shall begin immediately following the WALKING PERSON (symbolizing WALK) signal

indication.

Following the pedestrian change interval, a buffer interval consisting of a steady UPRAISED HAND (symbolizing DON'T WALK) signal indication shall be displayed for at least 3 seconds prior to the release of any conflicting vehicular movement. The sum of the time of the pedestrian change interval and the buffer interval shall not be less than the calculated pedestrian clearance time (see the following paragraphs starting with the first Guidance paragraph and ending with the second Standard paragraph). The buffer interval shall not begin later than the beginning of the red clearance interval, if used.

**OPTION:**

During the yellow change interval, the UPRAISED HAND (symbolizing DON'T WALK) signal indication may be displayed as either a flashing indication, a steady indication, or a flashing indication for an initial portion of the yellow change interval and a steady indication for the remainder of the interval.

**SUPPORT:**

Figure 4E-2 illustrates the pedestrian intervals and their possible relationships with associated vehicular signal phase intervals.

**GUIDANCE:**

Except as provided above, the pedestrian clearance time should be sufficient to allow a pedestrian crossing in the crosswalk who left the curb or shoulder at the end of the WALKING PERSON (symbolizing WALK) signal indication to travel at a walking speed of 3.5ft per second, to at least the far side of the traveled way or to a median of sufficient width for pedestrians to wait.

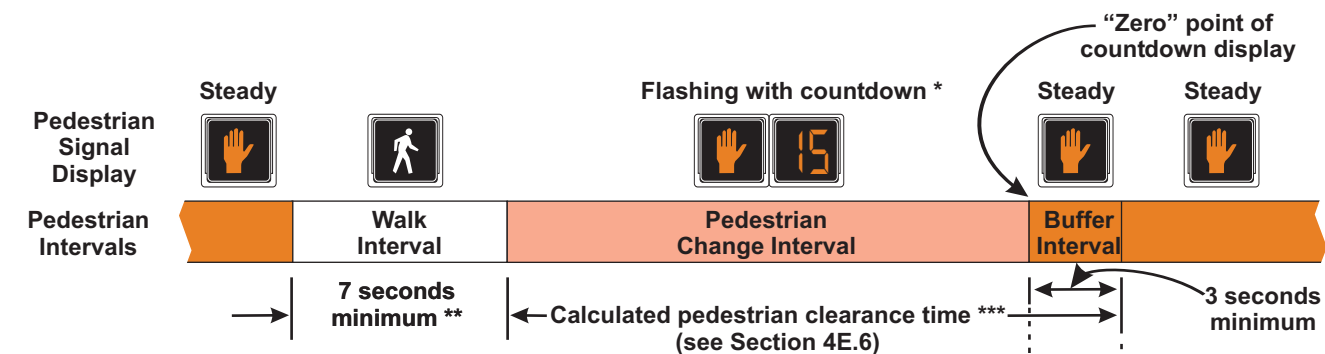
**OPTION:**

A walking speed of up to 4 feet per second may be used to evaluate the sufficiency of the pedestrian clearance time at locations where an extended pushbutton press function has been installed to provide slower pedestrians an opportunity to request and receive a longer pedestrian clearance time. Passive pedestrian detection may also be used to automatically adjust the pedestrian clearance time based on the pedestrian's actual walking speed or actual clearance of the crosswalk.

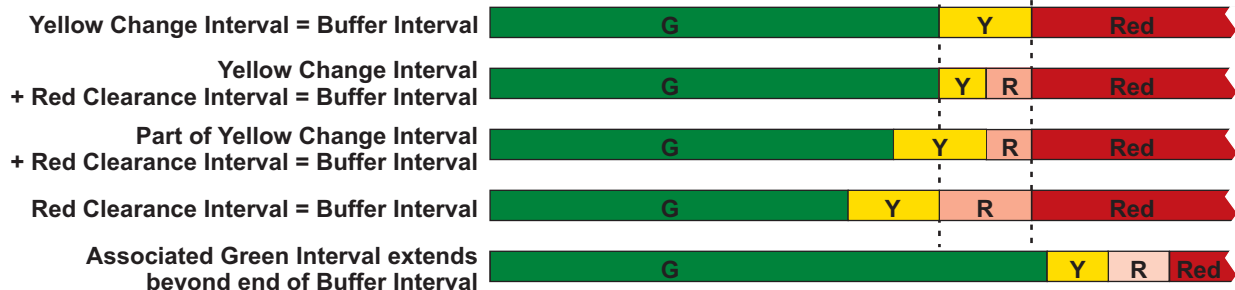
The additional time provided by an extended pushbutton press to satisfy pedestrian clearance time needs may be added to either the walk interval or the pedestrian change interval.

**GUIDANCE:**

Where pedestrians who walk slower than 3.5 ft per second, or pedestrians who use wheelchairs, routinely use the crosswalk, a walking speed of less than 3.5 ft per second



Relationship to associated vehicular phase intervals:



- \* The countdown display is optional for Pedestrian Change Intervals of 7 seconds or less.
- \*\* The Walk Interval may be reduced under some conditions (see Section 4E.6).
- \*\*\* The Buffer Interval, which shall always be provided and displayed, may be used to help satisfied the calculated pedestrian clearance time, or may begin after the calculated pedestrian clearance time has ended.

**Legend**  
 G = Green Interval  
 Y = Yellow Change Interval (of at least 3 seconds)  
 R = Red Clearance Interval  
 Red = Red because conflicting traffic has been released

Figure 4E-2. Pedestrian Intervals

should be considered in determining the pedestrian clearance time.

Except as provided in below, the walk interval should be at least 7 seconds in length so that pedestrians will have adequate opportunity to leave the curb or shoulder before the pedestrian clearance time begins.

**OPTION:**

If pedestrian volumes and characteristics do not require a 7-second walk interval, walk intervals as short as 4 seconds may be used.

**SUPPORT:**

The walk interval is intended for pedestrians to start their crossing. The pedestrian clearance time is intended to allow pedestrians who started crossing during the walk interval to complete their crossing. Longer walk intervals are often

used when the duration of the vehicular green phase associated with the pedestrian crossing is long enough to allow it.

**GUIDANCE:**

The total of the walk interval and pedestrian clearance time should be sufficient to allow a pedestrian crossing in the crosswalk who left the pedestrian detector (or, if no pedestrian detector is present, a location 6 feet from the face of the curb or from the edge of the pavement) at the beginning of the WALKING PERSON (symbolizing WALK) signal indication to travel at a walking speed of 3 feet per second to the far side of the traveled way being crossed or to the median if a two-stage pedestrian crossing sequence is used. Any additional time that is required to satisfy the conditions of this paragraph should be added to the walk interval.

**OPTION:**

On a street with a median of sufficient width for pedestrians to wait, a pedestrian clearance time that allows the pedestrian to cross only from the curb or shoulder to the median may be provided.

**STANDARD:**

Where the pedestrian clearance time is sufficient only for crossing from the curb or shoulder to a median of sufficient width for pedestrians to wait median-mounted pedestrian signals (with pedestrian detectors if actuated operation is used) shall be provided (see Sections 4E.8 and 4E.9) and signing such as the R10-3d sign (see Section 2B.52) shall be provided to notify pedestrians to cross only to the median to await the next WALKING PERSON (symbolizing WALK) signal indication.

**GUIDANCE:**

Where median-mounted pedestrian signals and detectors are provided, the use of accessible pedestrian signals (see Sections 4E.09 through 4E.13) should be considered.

**OPTION:**

During the transition into preemption, the walk interval and the pedestrian change interval may be shortened or omitted as described in Section 4D.27.

At intersections with high pedestrian volumes and high conflicting turning vehicle volumes, a brief leading pedestrian interval, during which an advance WALKING PERSON (symbolizing WALK) indication is displayed for the crosswalk while red indications continue to be displayed to parallel through and/or turning traffic, may be used to reduce conflicts between pedestrians and turning vehicles.

**GUIDANCE:**

If a leading pedestrian interval is used, the use of accessible pedestrian signals (see Sections 4E.09 through 4E.13) should be considered.

**SUPPORT:**

If a leading pedestrian interval is used without accessible features, pedestrians who are visually impaired can be expected to begin crossing at the onset of the vehicular movement when drivers are not expecting them to begin crossing.

**GUIDANCE:**

If a leading pedestrian interval is used, it should be at least 3 seconds in duration and should be timed to allow pedestrians to cross at least one lane of traffic or, in the case of a large corner radius, to travel far enough for pedestrians to establish their position ahead of the turning traffic before the turning traffic is released.

If a leading pedestrian interval is used, consideration should be given to prohibiting turns across the crosswalk during the leading pedestrian interval.

**SUPPORT:**

At intersections with pedestrian volumes that are so high that drivers have difficulty finding an opportunity to turn across the crosswalk, the duration of the green interval for a parallel concurrent vehicular movement is sometimes intentionally set to extend beyond the pedestrian clearance time to provide turning drivers additional green time to make their turns while the pedestrian signal head is displaying a steady UPRAISED HAND (symbolizing DONT WALK) signal indication after pedestrians have had time to complete their crossings.

**4E.7 Countdown Pedestrian Signals**

**STANDARD:**

All pedestrian signal heads used at crosswalks where the pedestrian change interval is more than 7 seconds shall include a pedestrian change interval countdown display in order to inform pedestrians of the number of seconds remaining in the pedestrian change interval.

**OPTION:**

Pedestrian signal heads used at crosswalks where the pedestrian change interval is 7 seconds or less may include a pedestrian change interval countdown display in order to inform pedestrians of the number of seconds remaining in the pedestrian change interval.

**STANDARD:**

Where countdown pedestrian signals are used, the countdown shall always be displayed simultaneously with the flashing UPRAISED HAND (symbolizing DONT WALK) signal indication displayed for that crosswalk.

Countdown pedestrian signals shall consist of Portland orange numbers that are at least 6 inches in height on a black opaque background. The countdown pedestrian signal shall be located immediately adjacent to the associated UPRAISED HAND (symbolizing DONT WALK) pedestrian signal head indication (see Figure 4E-1).

The display of the number of remaining seconds shall begin only at the beginning of the pedestrian change interval (flashing UPRAISED HAND). After the countdown displays zero, the display shall remain dark until the beginning of the next countdown.

The countdown pedestrian signal shall display the number of seconds remaining until the termination of the pedestrian change interval (flashing UPRAISED HAND). Countdown displays shall not be used during the walk interval or during the red clearance interval of a concurrent vehicular phase.

**GUIDANCE:**

If used with a pedestrian signal head that does not have a concurrent vehicular phase, the pedestrian change interval (flashing UPRAISED HAND) should be set to be approximately 4 seconds less than the required pedestrian clearance time (see Section 4E.6) and an additional clearance interval (during which a steady UPRAISED HAND is displayed) should be provided prior to the start of the conflicting vehicular phase.

For crosswalks where the pedestrian enters the crosswalk more than 100 feet from the countdown pedestrian signal display, the numbers should be at least 9 inches in height.

Because some technology includes the countdown pedestrian signal logic in a separate timing device that is independent of the timing in the traffic signal controller, care should be exercised by the engineer when timing changes are made to pedestrian change intervals.

If the pedestrian change interval is interrupted or shortened as a part of a transition into a preemption sequence (see Section 4E.6), the countdown pedestrian signal display should be discontinued and go dark immediately upon activation of the preemption transition.

**Operational requirements -**

**Compliance Date: December 22, 2006**

**Hardware -**

**Compliance Date: December 22, 2013**

**4E.8 Pedestrian Detectors**

**OPTION:**

Pedestrian detectors may be pushbuttons or passive detection devices.

**SUPPORT:**

Passive detection devices register the presence of a pedestrian in a position indicative of a desire to cross, without requiring the pedestrian to push a button. Some passive detection devices are capable of tracking the progress of a pedestrian as the pedestrian crosses the roadway for the purpose of extending or shortening the duration of certain pedestrian timing intervals.

The provisions in this Section place pedestrian pushbuttons within easy reach of pedestrians who are intending to cross each crosswalk and make it obvious which pushbutton is associated with each crosswalk. These provisions also position pushbutton poles in optimal locations for installation of accessible pedestrian signals (see Sections 4E.09 through 4E.13). Information regarding reach ranges can be found in the "Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG)" (see Section 1A.11).

**GUIDANCE:**

If pedestrian pushbuttons are used, they should be capable of easy activation and conveniently located near each end of the crosswalks. Except as provided in the following 2 paragraphs, pedestrian pushbuttons should be located to meet all of the following criteria:

- A. Unobstructed and adjacent to a level all-weather surface to provide access from a wheelchair;
- B. Where there is an all-weather surface, a wheelchair accessible route from the pushbutton to the ramp;
- C. Between the edge of the crosswalk line (extended) farthest from the center of the intersection and the side of a curb ramp (if present), but not greater than 5 feet from said crosswalk line;
- D. Between 1.5 and 6 feet from the edge of the curb, shoulder, or pavement;
- E. With the face of the pushbutton parallel to the crosswalk to be used; and
- F. At a mounting height of approximately 3.5 feet, but no more than 4 feet, above the sidewalk.

Where there are constraints that make it impractical to place the pedestrian pushbutton adjacent to a level all-weather surface, the surface should be as level as feasible.

Where there are constraints that make it impractical to place the pedestrian pushbutton between 1.5 and 6 feet from the edge of the curb, shoulder, or pavement, it should not be farther than 10 feet from the edge of curb, shoulder, or pavement.

Except as provided in the following Option, where two pedestrian pushbuttons are provided on the same corner of a signalized location, the pushbuttons should be separated by a distance of at least 10 feet.

**OPTION:**

Where there are constraints on a particular corner that make it impractical to provide the 10-foot separation between the two pedestrian pushbuttons, the pushbuttons may be placed closer together or on the same pole

**STANDARD:**

Signs (see Section 2B. 52) shall be mounted adjacent to or integral with pedestrian pushbuttons, explaining their purpose and use.

**OPTION:**

At certain locations, a supplemental sign in a more visible location may be used to call attention to the pedestrian pushbutton.

**STANDARD:**

The positioning of pedestrian pushbuttons and the legends on the pedestrian pushbutton signs shall clearly

indicate which crosswalk signal is actuated by each pedestrian pushbutton.

If the pedestrian clearance time is sufficient only to cross from the curb or shoulder to a median of sufficient width for pedestrians to wait and the signals are pedestrian actuated, an additional pedestrian detector shall be provided in the median.

**GUIDANCE:**

The use of additional pedestrian detectors on islands or medians where a pedestrian might become stranded should be considered.

If used, special purpose pushbuttons (to be operated only by authorized persons) should include a housing capable of being locked to prevent access by the general public and do not need an instructional sign.

**STANDARD:**

If used, a pilot light or other means of indication installed with a pedestrian pushbutton shall not be illuminated until actuation. Once it is actuated, the pilot light shall remain illuminated until the pedestrian's green or WALKING PERSON (symbolizing WALK) signal indication is displayed.

If a pilot light is used at an accessible pedestrian signal location (see Sections 4E.09 through 4E.13), each actuation shall be accompanied by the speech message "wait."

**OPTION:**

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.

**STANDARD:**

If additional crossing time is provided by means of an extended pushbutton press, a PUSH BUTTON FOR 2 SECONDS FOR EXTRA CROSSING TIME (R10-32P) plaque (see Figure 2B-26) shall be mounted adjacent to or integral with the pedestrian pushbutton.

**4E.9 Accessible Pedestrian Signals and Detectors - General**

**SUPPORT:**

Accessible pedestrian signals and detectors provide information in non-visual formats (such as audible tones, speech messages, and/or vibrating surfaces).

The primary technique that pedestrians who have visual disabilities use to cross streets at signalized locations is to initiate their crossing when they hear the traffic in front of them stop and the traffic alongside them begin to move,

which often corresponds to the onset of the green interval. The existing environment is often not sufficient to provide the information that pedestrians who have visual disabilities need to cross a roadway at a signalized location.

**GUIDANCE:**

If a particular signalized location presents difficulties for pedestrians who have visual disabilities to cross the roadway, an engineering study should be conducted that considers the needs of pedestrians in general, as well as the information needs of pedestrians with visual disabilities. The engineering study, should consider the following factors:

- A. Potential demand for accessible pedestrian signals;
- B. A request for accessible pedestrian signals;
- C. Traffic volumes during times when pedestrians might be present, including periods of low traffic volumes or high turn-on-red volumes;
- D. The complexity of traffic signal phasing (such as split phases, protected turn phases, leading pedestrian intervals, and exclusive pedestrian phases); and
- E. The complexity of intersection geometry.

**SUPPORT:**

The factors that make crossing at a signalized location difficult for pedestrians who have visual disabilities include: increasingly quiet cars, right turn on red (which masks the beginning of the through phase), continuous right-turn movements, complex signal operations, traffic circles, and wide streets. Further, low traffic volumes might make it difficult for pedestrians who have visual disabilities to discern signal phase changes.

Local organizations, providing support services to pedestrians who have visual and/or hearing disabilities, can often act as important advisors to the traffic engineer when consideration is being given to the installation of devices to assist such pedestrians. Additionally, orientation and mobility specialists or similar staff also might be able to provide a wide range of advice. The U.S. Access Board's ([www.access-board.gov](http://www.access-board.gov)) provides technical assistance for making pedestrian signal information available to persons with visual disabilities (see Page i for the address for the U.S. Access Board).

**STANDARD:**

When used, accessible pedestrian signals shall be used in combination with pedestrian signal timing. The information provided by an accessible pedestrian signal shall clearly indicate which pedestrian crossing is served by each device.

Under stop-and-go operation, accessible pedestrian signals shall not be limited in operation by the time of day or day of week.

**OPTION:**

Accessible pedestrian signal detectors may be pushbuttons or passive detection devices.

At locations with pretimed traffic control signals or non-actuated approaches, pedestrian pushbuttons may be used to activate the accessible pedestrian signals.

**SUPPORT:**

Accessible pedestrian signals are typically integrated into the pedestrian detector (pushbutton), so the audible tones and/or messages come from the pushbutton housing. They have a pushbutton locator tone and tactile arrow, and can include audible beaconing and other special features.

**OPTION:**

The name of the street to be crossed may also be provided in accessible format, such as Braille or raised print. Tactile maps of crosswalks may also be provided.

**SUPPORT:**

Specifications regarding the use of Braille or raised print for traffic control devices can be found in the "Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG)" (see Section 1A.11).

**STANDARD:**

At accessible pedestrian signal locations where pedestrian pushbuttons are used, each pushbutton shall activate both the walk interval and the accessible pedestrian signals.

**4E.10 Accessible Pedestrian Signals and Detectors - Location**

**SUPPORT:**

Accessible pedestrian signals that are located as close as possible to pedestrians waiting to cross the street provide the clearest and least ambiguous indication of which pedestrian crossing is served by a device.

**GUIDANCE:**

Pushbuttons for accessible pedestrian signals should be located in accordance with the provisions of Section 4E.8 and should be located as close as possible to the crosswalk line furthest from the center of the intersection and as close as possible to the curb ramp.

**STANDARD:**

If two accessible pedestrian pushbuttons are placed less than 10 feet apart or on the same pole, each accessible pedestrian pushbutton shall be provided with the following features (see Sections 4E.11 through 4E.13):

- A. A pushbutton locator tone,

- B. A tactile arrow,
- C. A speech walk message for the WALKING PERSON (symbolizing WALK) indication, and
- D. A speech pushbutton information message.

If the pedestrian clearance time is sufficient only to cross from the curb or shoulder to a median of sufficient width for pedestrians to wait and accessible pedestrian detectors are used, an additional accessible pedestrian detector shall be provided in the median.

**4E.11 Accessible Pedestrian Signals and Detectors - Walk Indications**

**SUPPORT:**

Technology that provides different sounds for each non-concurrent signal phase has frequently been found to provide ambiguous information. Research indicates that a rapid tick tone for each crossing coming from accessible pedestrian signal devices on separated poles located close to each crosswalk provides unambiguous information to pedestrians who are blind or visually impaired. Vibrotactile indications provide information to pedestrians who are blind and deaf and are also used by pedestrians who are blind or who have low vision to confirm the walk signal in noisy situations.

**STANDARD:**

Accessible pedestrian signals shall have both audible and vibrotactile walk indications.

Vibrotactile walk indications shall be provided by a tactile arrow on the pushbutton (see Section 4E.12) that vibrates during the walk interval.

Accessible pedestrian signals shall have an audible walk indication during the walk interval only. The audible walk indication shall be audible from the beginning of the associate crosswalk.

The accessible walk indication shall have the same duration as the pedestrian walk signal except when the pedestrian signal rests in walk.

**GUIDANCE:**

If the pedestrian signal rests in walk, the accessible walk indication should be limited to the first 7 seconds of the walk interval. The accessible walk indication should be recalled by a button press during the walk interval provided that the crossing time remaining is greater than the pedestrian change interval.

**STANDARD:**

Where two accessible pedestrian signals are separated by a distance of at least 10 feet, the audible walk indication

shall be a percussive tone. Where two accessible pedestrian signals on one corner are not separated by a distance of at least 10 feet, the audible walk indication shall be a speech walk message.

Audible tone walk indications shall repeat at eight to ten ticks per second. Audible tones used as walk indications shall consist of multiple frequencies with a dominant component at 880 Hz.

**GUIDANCE:**

The volume of audible walk indications and pushbutton locator tones (see Section 4E.12) should be set to be a maximum of 5 dBA louder than ambient sound, except when audible beaconing is provided in response to an extended pushbutton press.

**STANDARD:**

Automatic volume adjustment in response to ambient traffic sound level shall be provided up to a maximum volume of 100 dBA.

**GUIDANCE:**

The sound level of audible walk indications and pushbutton locator tones should be adjusted to be low enough to avoid misleading pedestrians who have visual disabilities when the following conditions exist:

- A. Where there is an island that allows unsignalized right turns across a crosswalk between the island and the sidewalk.
- B. Where multi-leg approaches or complex signal phasing require more than two pedestrian phases, such that it might be unclear which crosswalk is served by each audible tone.
- C. At intersections where a diagonal pedestrian crossing is allowed, or where one street receives a WALKING PERSON (symbolizing WALK) signal indication simultaneously with another street.

**OPTION:**

An alert tone, which is a very brief burst of high-frequency sound at the beginning of the audible walk indication that rapidly decays to the frequency of the walk tone, may be used to alert pedestrians to the beginning of the walk interval.

**SUPPORT:**

An alert tone can be particularly useful if the walk tone is not easily audible in some traffic conditions.

Speech walk messages communicate to pedestrians which street has the walk interval. Speech messages might be either directly audible or transmitted, requiring a personal receiver

to hear the message. To be a useful system, the words and their meaning need to be correctly understood by all users in the context of the street environment where they are used. Because of this, tones are the preferred means of providing audible walk indications except where two accessible pedestrian signals on one corner are not separated by a distance of at least 10 feet.

If speech walk messages are used, pedestrians have to know the names of the streets that they are crossing in order for the speech walk messages to be unambiguous. In getting directions to travel to a new location, pedestrians with visual disabilities do not always get the name of each street to be crossed. Therefore, it is desirable to give users of accessible pedestrian signals the name of the street controlled by the pushbutton. This can be done by means of a speech pushbutton information message (see Section 4E.13) during the flashing or steady UPRAISED HAND intervals, or by raised print and Braille labels on the pushbutton housing.

By combining the information from the pushbutton message or Braille label, the tactile arrow aligned in the direction of travel on the relevant crosswalk, and the speech walk message, pedestrians with visual disabilities are able to correctly respond to speech walk messages even if there are two pushbuttons on the same pole.

**STANDARD:**

If speech walk messages are used to communicate the walk interval, they shall provide a clear message that the walk interval is in effect, as well as to which crossing it applies. Speech walk messages shall be used only at intersections where it is technically infeasible to install two accessible pedestrian signals at one corner separated by a distance of at least 10 feet.

Speech walk messages that are used at intersections having pedestrian phasing that is concurrent with vehicular phasing shall be patterned after the model: "Broadway. Walk sign is on to cross Broadway."

Speech walk messages that are used at intersections having exclusive pedestrian phasing shall be patterned after the model: "Walk sign is on for all crossings."

Speech walk messages shall not contain any additional information, except they shall include designations such as "Street" or "Avenue" where this information is necessary to avoid ambiguity at a particular location.

**GUIDANCE:**

Speech walk messages should not state or imply a command to the pedestrian, such as "Cross Broadway now." Speech walk messages should not tell pedestrians that it is "safe to cross," because it is always the pedestrian's responsibility to check actual traffic conditions.

**STANDARD:**

A speech walk message is not required at times when the walk interval is not timing, but, if provided:

- A. It shall begin with the term "wait."
- B. It need not be repeated for the entire time that the walk interval is not timing.

If a pilot light (see Section 4E.8) is used at an accessible pedestrian signal location, each actuation shall be accompanied by the speech message "wait."

**OPTION:**

Accessible pedestrian signals that provide speech walk messages may provide similar messages in languages other than English, if needed, except for the terms "walk sign" and "wait."

**STANDARD:**

Following the audible walk indication, accessible pedestrian signals shall revert to the pushbutton locator tone (see Section 4E.12) during the pedestrian change interval.

**4E.12 Accessible Pedestrian Signals and Detectors - Tactile Arrows and Locator Tones**

**STANDARD:**

To enable pedestrians who have visual disabilities to distinguish and locate the appropriate pushbutton at an accessible pedestrian signal location, pushbuttons shall clearly indicate by means of tactile arrows which crosswalk signal is actuated by each pushbutton. Tactile arrows shall be located on the pushbutton, have high visual contrast (light on dark or dark on light) and shall be aligned parallel to the direction of travel on the associated crosswalk.

An accessible pedestrian pushbutton shall incorporate locator tone.

**SUPPORT:**

A pushbutton locator tone is a repeating sound that informs approaching pedestrians that a pushbutton to actuate pedestrian timing or receive additional information exists, and that enables pedestrians with visual disabilities to locate the pushbutton.

**STANDARD:**

Pushbutton locator tones shall have a duration of 0.15 seconds or less and shall repeat at 1-second intervals.

Pushbutton locator tones shall be deactivated when the traffic control signal is operating in a flashing mode. This requirement shall not apply to traffic control signals or pedestrian hybrid beacons that are activated from a flashing or dark mode to a stop-and-go mode by pedestrian actuations.

Pushbutton locator tones shall be intensity responsive to ambient sound, and be audible 1.8 to 3.7 m (6 to 12 ft) from the pushbutton, or to the building line, whichever is less.

**SUPPORT:**

Section 4E.11 contains additional provisions regarding the volume and sound level of pushbutton locator tones.

**4E.13 Accessible Pedestrian Signals and Detectors - Extended Pushbutton Press Features**

**OPTION:**

Pedestrians may be provided with additional features such as increased crossing time, audible beaconing, or a speech pushbutton information message as a result of an extended pushbutton press.

**STANDARD:**

If an extended pushbutton press is used to provide any additional feature(s), a pushbutton press of less than one second shall actuate only the pedestrian timing and any associated accessible walk indication, and a pushbutton press of two seconds or more shall actuate the pedestrian timing, any associated accessible walk indication, and any additional feature(s).

If additional crossing time is provided by means of an extended pushbutton press, a PUSH BUTTON FOR 2 SECONDS FOR EXTRA CROSSING TIME (R10-32P) plaque (see Figure 2B-26) shall be mounted adjacent to or integral with the pedestrian pushbutton.

**SUPPORT:**

Audible beaconing is the use of an audible signal in such a way that pedestrians with visual disabilities can home in on the signal that is located on the far end of the crosswalk as they cross the street.

Not all crosswalks at an intersection need audible beaconing; audible beaconing can actually cause confusion if used at all crosswalks at some intersections. Audible beaconing is not appropriate at locations with channelized turns or split phasing, because of the possibility of confusion.

**GUIDANCE:**

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

- A. Crosswalks longer than 70 feet, unless they are divided by a median that has another accessible pedestrian signal with a locator tone;
- B. Crosswalks that are skewed;
- C. Intersections with irregular geometry, such as more than four legs;

- D. Crosswalks where audible beaconing is requested by an individual with visual disabilities; or
- E. Other locations where a study indicates audible beaconing would be beneficial.

**OPTION:**

Audible beaconing may be provided in several ways, any of which are initiated by an extended pushbutton press.

**STANDARD:**

If audible beaconing is used, the volume of the pushbutton locator tone during the pedestrian change interval of the called pedestrian phase shall be increased and operated in one of the following ways:

- A. The louder audible walk indication and louder locator tone comes from the far end of the crosswalk, as pedestrians cross the street,
- B. The louder locator tone comes from both ends of the crosswalk, or
- C. The louder locator tone comes from an additional speaker that is aimed at the center of the crosswalk and that is mounted on a pedestrian signal head.

**OPTION:**

Speech pushbutton information messages may provide intersection identification, as well as information about unusual intersection signalization and geometry, such as notification regarding exclusive pedestrian phasing, leading pedestrian intervals, split phasing, diagonal crosswalks, and medians or islands.

**STANDARD:**

If speech pushbutton information messages are made available by actuating the accessible pedestrian signal detector, they shall only be actuated when the walk interval is not timing. They shall begin with the term "Wait," followed by intersection identification information modeled after: "Wait to cross Broadway at Grand." If information on intersection signalization or geometry is also given, it shall follow the intersection identification information.

**GUIDANCE:**

Speech pushbutton information messages should not be used to provide landmark information or to inform pedestrians with visual disabilities about detours or temporary traffic control situations.

**SUPPORT:**

Additional information on the structure and wording of speech pushbutton information messages is included in ITE's "Electronic Toolbox for Making Intersections More Accessible