

## CHAPTER 4I. PEDESTRIAN CONTROL FEATURES

### Section 4I.01 Pedestrian Signal Heads

#### Support:

- 01 Pedestrian signal heads provide special types of traffic signal indications exclusively intended for controlling pedestrians. These signal indications consist of the illuminated symbols of a WALKING PERSON (symbolizing WALK) and an UPRAISED HAND (symbolizing DONT WALK).
- 02 Section 4D.02 contains information on when to use pedestrian signal heads.
- 03 Accessible pedestrian signals (see Chapter 4K) where pedestrian signal heads are used provide information in non-visual formats (such as audible tones and/or speech messages, and vibrating surfaces) so that a pedestrian with vision disabilities can know when to cross the street.
- 04 Chapter 4J contains information regarding the use of pedestrian hybrid beacons and Chapter 4U contains information regarding the use of In-Roadway Warning Lights at unsignalized marked crosswalks.

### Section 4I.02 Size, Design, and Illumination of Pedestrian Signal Head Indications

#### Standard:

- 01 All new pedestrian signal head indications shall be displayed within a rectangular background and shall consist of symbolized messages (see Figure 4I-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 "Standard Highway Signs" publication (see Section 1A.05) shall be used. Each pedestrian signal head indication shall be independently displayed and emit a single color.
- 02 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.
- 03 The WALKING PERSON (symbolizing WALK) signal indication shall be white, with all except the symbol obscured by an opaque material for signal optical units that use incandescent lamps within optical assemblies that include lenses. The UPRAISED HAND (symbolizing DONT WALK) signal indication shall be Portland orange, with all except the symbol obscured by an opaque material for signal optical units that use incandescent lamps within optical assemblies that include lenses.
- 04 Except as provided in Paragraph 5 of this Section, the requirements of Chapter 3 of the publication entitled "Equipment and Materials Standards of the Institute of Transportation Engineers," 2008, ITE, that pertain to the aspects of the pedestrian signal head design that affect the display of the signal indications shall be met for signal optical units that use incandescent lamps within optical assemblies that include lenses. Except as provided in Paragraph 5 of this Section, the requirements of the publication entitled "Pedestrian Traffic Control Signal Indicators – Light Emitting Diode (LED) Signal Modules," 2011, ITE, that pertain to the aspects of the signal head design that affect the display of the signal indications shall be met for light-emitting diode (LED) pedestrian signal head modules.

#### Guidance:

- 05 The intensity and distribution of light from each illuminated pedestrian signal lens or LED pedestrian signal head module should comply with the publications specified in Paragraph 4 of this Section, as appropriate.
- 06 When not illuminated, the WALKING PERSON (symbolizing WALK) and UPRAISED HAND (symbolizing DONT WALK) symbols should not be visible to pedestrians at the far end of the crosswalk that the pedestrian signal head indications control.

#### Standard:

- 07 For pedestrian signal head indications, the symbols shall be at least 6 inches high.
- 08 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 or more than 60 times per minute. The displayed period of each flash shall be a minimum of  $\frac{1}{2}$  and a maximum of  $\frac{2}{3}$  of the total flash cycle.

*Guidance:*

09 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.

10 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.

11 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.

**Option:**

12 An animated eyes symbol may be added to a pedestrian signal head in order to prompt pedestrians to look for vehicles in the intersection during the time that the WALKING PERSON (symbolizing WALK) signal indication is displayed.

**Standard:**

13 If used, the animated eyes symbol shall consist of an outline of a pair of white steadily illuminated eyes with white eyeballs that scan from side to side at a rate of approximately once per second. The animated eyes symbol shall be at least 12 inches wide with each eye having a width of at least 5 inches and a height of at least 2.5 inches. The animated eyes symbol shall be illuminated at the start of the walk interval and shall terminate at the end of the walk interval.

## **Section 4I.03 Location and Height of Pedestrian Signal Heads**

**Standard:**

01 Pedestrian signal heads shall be mounted with the bottom of the signal housing including brackets not less than 7 feet or more than 10 feet above sidewalk level, and shall be positioned and adjusted to provide maximum visibility at the beginning of the controlled sidewalk.

*Guidance:*

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

## **Section 4I.04 Countdown Pedestrian Signals**

**Standard:**

01 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:**

02 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:**

03 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.

04 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 4I-1).

05 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.

06 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. Countdown displays shall not be used during the red clearance interval of a concurrent vehicular phase that is ending simultaneously with or after the end of the pedestrian phase.

*Guidance:*

07 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 4I.06) 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.

08 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.

09 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.

10 If the pedestrian change interval is interrupted or shortened as a part of a transition into a preemption sequence (see Section 4F.19), the countdown pedestrian signal display should be discontinued and go dark immediately upon activation of the preemption transition.

Support:

11 Refer to Section 9E.12 for countdown pedestrian signals, when used with bicycle boxes.

## Section 4I.05 Pedestrian Detectors

Option:

01 Pedestrian detectors may be push buttons or passive detection devices.

Support:

02 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.

03 The provisions in this Section place pedestrian push buttons within easy reach of pedestrians who are intending to cross each crosswalk and make it obvious which push button is associated with each crosswalk. These provisions also position push button poles in optimal locations for installation of accessible pedestrian signals (see Chapter 4K).

Information regarding reach ranges can be found in the U.S. Department of Justice 2010 ADA Standards for Accessible Design, September 15, 2010, 28 CFR 35 and 36, Americans with Disabilities Act of 1990.

Guidance:

04 If pedestrian push buttons are used, they should be capable of easy activation requiring no more than 5 pounds of force, should not require tight grasping, pinching, or twisting of the wrist, and should be conveniently located near each end of the crosswalks. Except as provided in Paragraphs 5 and 6 of this Section, pedestrian push buttons should be located to meet all of the following criteria (see Figure 4I-2):

- A. Unobstructed and accessible within one or more of the reach ranges specified in Section 308, and from a clear ground space as specified in Section 305, of the 2010 ADA Standards for Accessible Design;
- B. To provide a wheelchair accessible route from the push button to the ramp;
- C. On the side of the curb ramp which is farthest from the center of the intersection;
- D. Not greater than 10 feet from the edge of the associated curb ramp which is farther from the center of the intersection;
- E. Not greater than 5 feet from the outside edge of the marked crosswalk farthest from the center of the intersection;
- F. Not farther from the crosswalk than the stop line is, if present;
- G. Between 1.5 and 6 feet from the face of the curb or from the outside edge of the shoulder (or if no shoulder exists, from the edge of the pavement);
- H. With the face of the push button parallel to the crosswalk to be used;
- I. At a mounting height of approximately 3.5 feet, but no more than 4 feet, above the sidewalk;
- J. Allowing a minimum 4-foot continuous clear width for a pedestrian access route; and
- K. Outside the flared side of the curb ramp, if present.

05 Where there are physical constraints that make it impracticable to place the pedestrian push button adjacent to a level all-weather surface, the surface should be as level as feasible.

06 Where there are physical constraints that make it impracticable to place the pedestrian push button between 1.5 and 6 feet from the face of the curb or from the outside edge of the shoulder (or if no shoulder exists, from the edge of the pavement), it should not be farther than 10 feet from the face of the curb or from the outside edge of the shoulder (or if

*no shoulder exists, from the edge of the pavement).*

07 Except as provided in Paragraph 8 of this Section, where two pedestrian push buttons are provided on the same corner of a signalized location, the push buttons should be separated by a distance of at least 10 feet.

Option:

08 Where there are physical constraints on a particular corner that make it impracticable to provide the 10-foot separation between the two pedestrian push buttons the push buttons may be placed closer together or on the same pole.

Support:

09 Figure 4I-3 shows typical pedestrian push button locations for a variety of situations.

Standard:

10 If a pedestrian push button is provided, a sign (see Section 2B.58) shall also be installed **adjacent to immediately above** the pedestrian push button detector explaining the purpose and use.

Option:

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

Standard:

12 The positioning of pedestrian push buttons and the legends on the pedestrian push button signs shall indicate which crosswalk signal is actuated by each pedestrian push button.

13 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:

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

15 If used, special purpose push buttons (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:

16 If used, a pilot light or other means of indication installed with a pedestrian push button 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.

Option:

17 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 push button press.

Standard:

18 If additional crossing time is provided by means of an extended push button press, a PUSH BUTTON FOR 2 SECONDS FOR EXTRA CROSSING TIME (R10-32P) plaque (see Figure 2B-27) shall be installed adjacent to the pedestrian push button detector.

## Section 4I.06 Pedestrian Intervals and Signal Phases

Standard:

01 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.

02 Except as provided in Paragraph 3 of Section 4J.03, when the pedestrian signal heads associated with a crosswalk are displaying either a steady WALKING PERSON (symbolizing WALK) or a flashing UPRAISED HAND (symbolizing DONT WALK) signal indication, a steady red signal indication shall be shown to any conflicting vehicular movement that is approaching the intersection or midblock location perpendicular or nearly perpendicular to the crosswalk.

03 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.

04 A pedestrian change interval consisting of a flashing UPRAISED HAND (symbolizing DONT WALK) signal indication shall begin immediately following the WALKING PERSON (symbolizing WALK) signal indication **except as provided in Section 4F.19**. Following the pedestrian change interval, a buffer interval consisting of a

**steady UPRAISED HAND (symbolizing DONT WALK) signal indication shall be displayed for at least 2 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 Paragraphs 7 through 16 of this Section). The buffer interval shall not begin later than the beginning of the red clearance interval, if used.**

Option:

05 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:

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

Guidance:

07 *Except as provided in Paragraph 8 of this Section, the pedestrian clearance time should be sufficient to allow a pedestrian crossing in the crosswalk who left the curb or edge of pavement at the end of the WALKING PERSON (symbolizing WALK) signal indication to travel at a walking speed of 3.5 feet per second to at least the far side of the traveled way or to a median of sufficient width for pedestrians to wait.*

Option:

08 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 push button 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.

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

Guidance:

10 *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.*

10a *Where older or disabled pedestrians routinely use the crosswalk, a walking speed of 2.8 feet per second should be considered in determining the pedestrian clearance time.*

11 *Except as provided in Paragraph 12 of this Section, 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:

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

Support:

13 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:

14 *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 behind the face of the curb or 6 feet behind 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:

15 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:**

16 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 (see Sections 4I.05 and 4K.01) if actuated operation is used, shall be provided and signing such as the R10-3d sign (see Section 2B.58) shall be provided to notify pedestrians to cross only to the median to await the next WALKING PERSON (symbolizing WALK) signal indication.

**Support:**

17 Accessible pedestrian signals (see Chapter 4K) where median-mounted pedestrian signals and detectors are used provide information in non-visual formats (such as audible tones and/or speech messages, and vibrating surfaces) so that a pedestrian with vision disabilities can know when to resume crossing the street after crossing to the median.

**Option:**

18 During the transition into preemption, the walk interval and the pedestrian change interval may be shortened or omitted as described in Section 4F.19.

19 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.

**Support:**

20 Accessible pedestrian signals (see Chapter 4K) where leading pedestrian intervals are used provide information in non-visual formats (such as audible tones and/or speech messages, and vibrating surfaces) so that a pedestrian with vision disabilities can know when to cross the street in the absence of the audible cues normally provided when the onset of the vehicular and pedestrian movements coincide.

21 If a leading pedestrian interval is used without accessible features, pedestrians with vision disabilities might begin crossing at the onset of the vehicular movement when vehicle operators are not expecting them to begin crossing.

**Guidance:**

22 *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.*

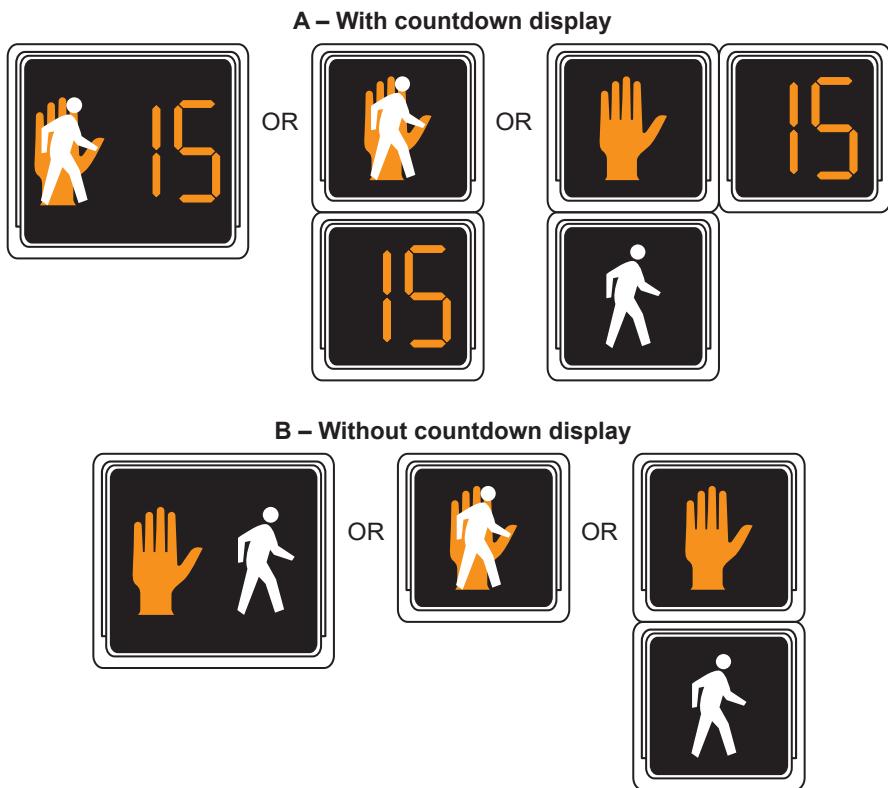
23 *If a leading pedestrian interval is used, consideration should be given to prohibiting turns across the crosswalk during the leading pedestrian interval.*

24 *At locations where a leading pedestrian interval is used, the minimum time for the WALKING PERSON (symbolizing WALK) indication should be the time provided for the leading pedestrian interval plus 7 seconds.*

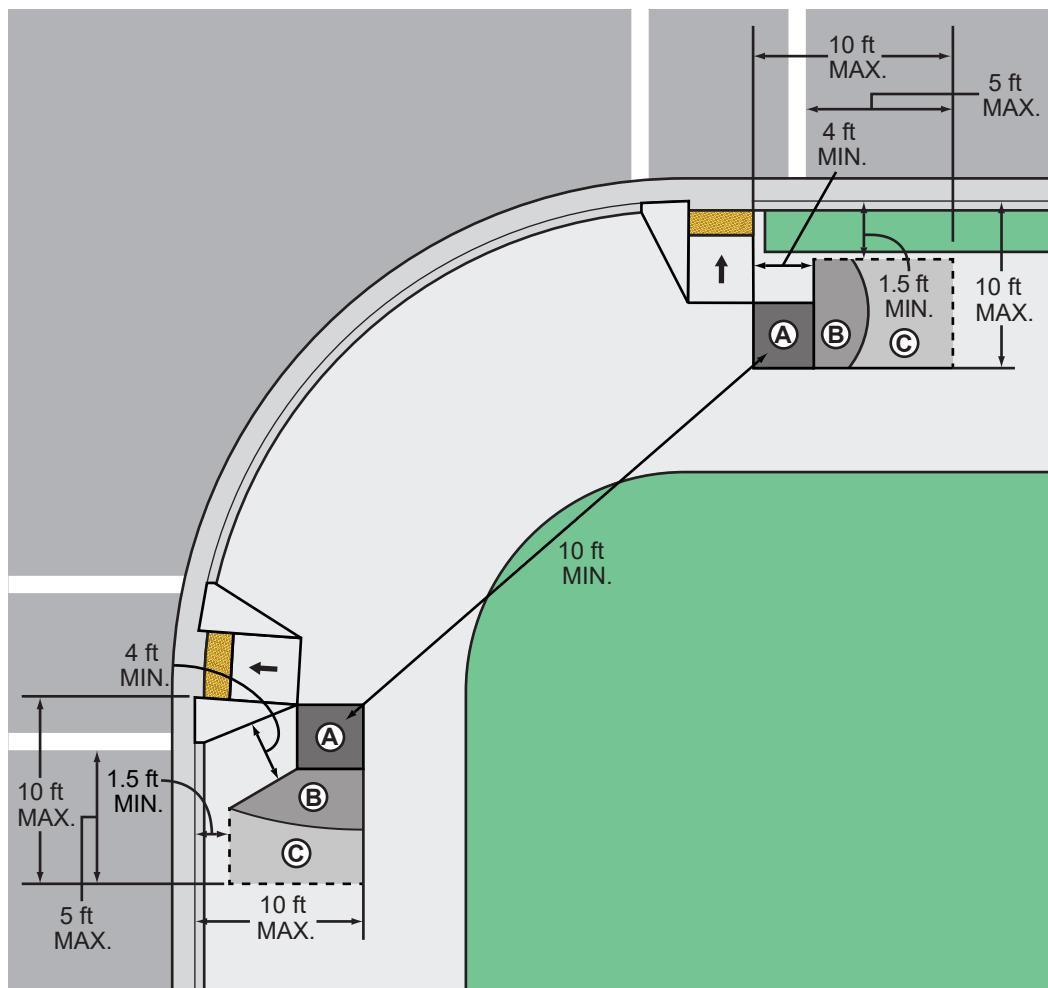
**Support:**

25 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.

### Figure 4I-1. Typical Pedestrian Signal Indications



**Figure 4I-2. Preferred Push Button Location Area**



Notes:

1. The push button detector should be located 5 feet or less from the outside edge of the marked crosswalk farthest from the intersection.
2. The push button detector should be located no farther from the crosswalk than the stop line, if one is present.
3. A 4-foot minimum unobstructed pedestrian access route should be maintained.
4. The maximum (MAX.) and minimum (MIN.) dimensions shown in this figure are recommendations.
5. Two pedestrian push buttons on the same corner should be separated by at least 10 feet. The 10-foot dimension shown in this figure is in reference to the placement of the push buttons within their respective areas.
6. Figure 4I-3 shows typical push button locations.
7. This figure is not drawn to scale.
8. Refer to California Building Code (CBC) Section 11B-101 et seq, Code of Federal Regulation (28 CFR 35.151; and the 2004 ADAAG at 36 CFR part 1191, appendices B and D), Americans with Disabilities Act (ADA) for placement of pedestrian pushbuttons.

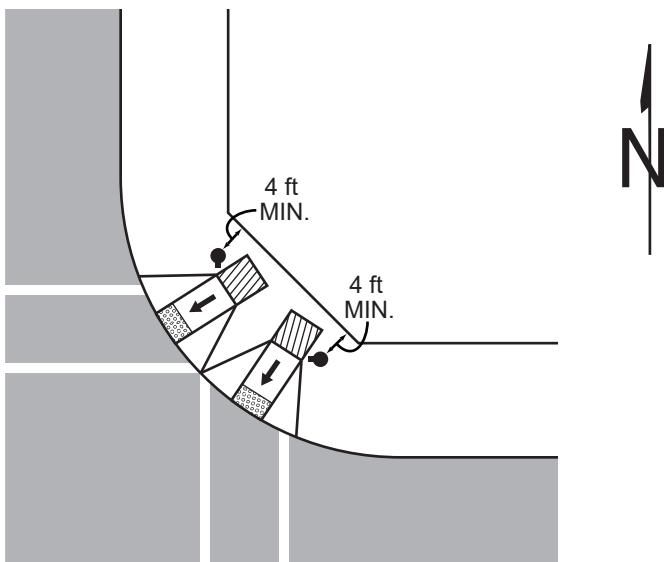
**Legend**

→ Downward slope

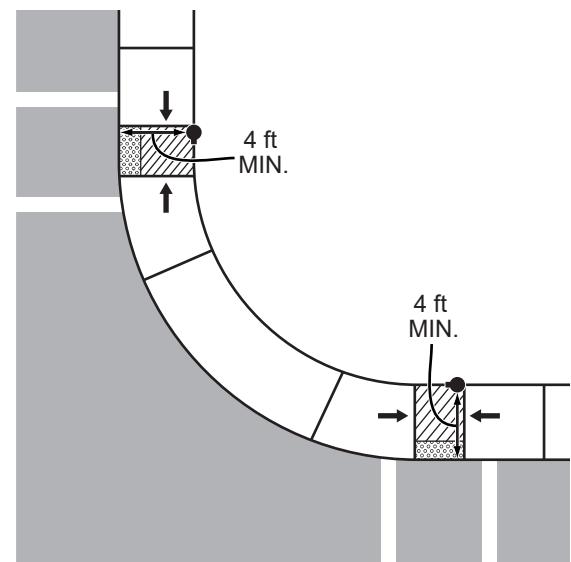
- (A) Preferred location for push button
- (B) Acceptable location for push button
- (C) Acceptable, but less desirable

**Figure 4I-3. Typical Push Button Locations**

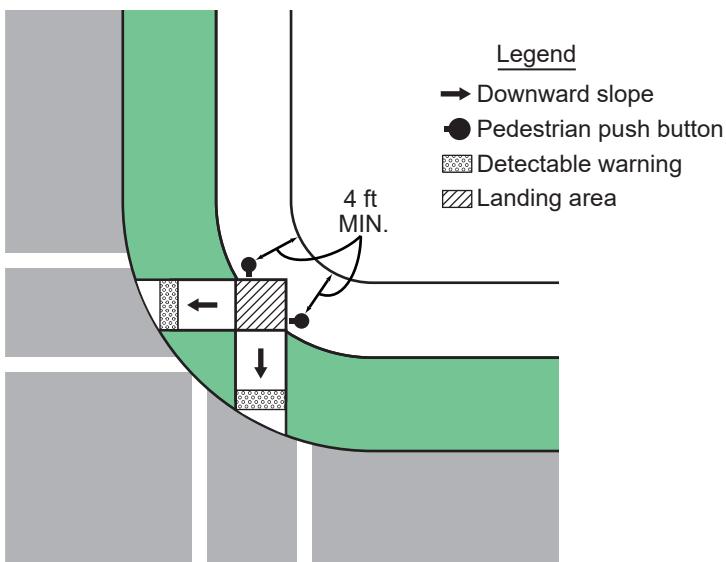
**A – Perpendicular curb ramps with crosswalks close together**



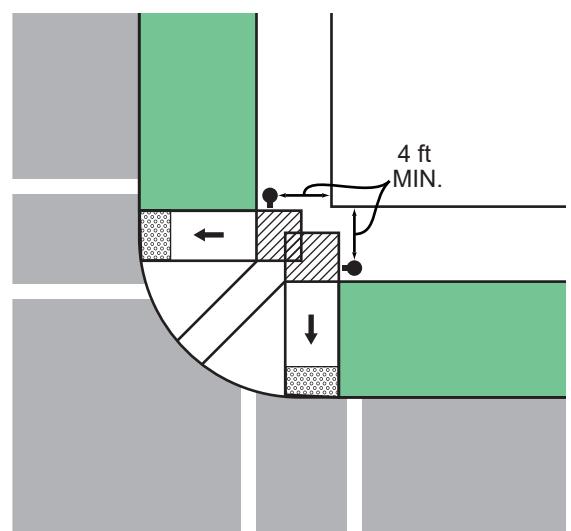
**B – Parallel curb ramps**



**C – Perpendicular curb ramps with shared landing area**



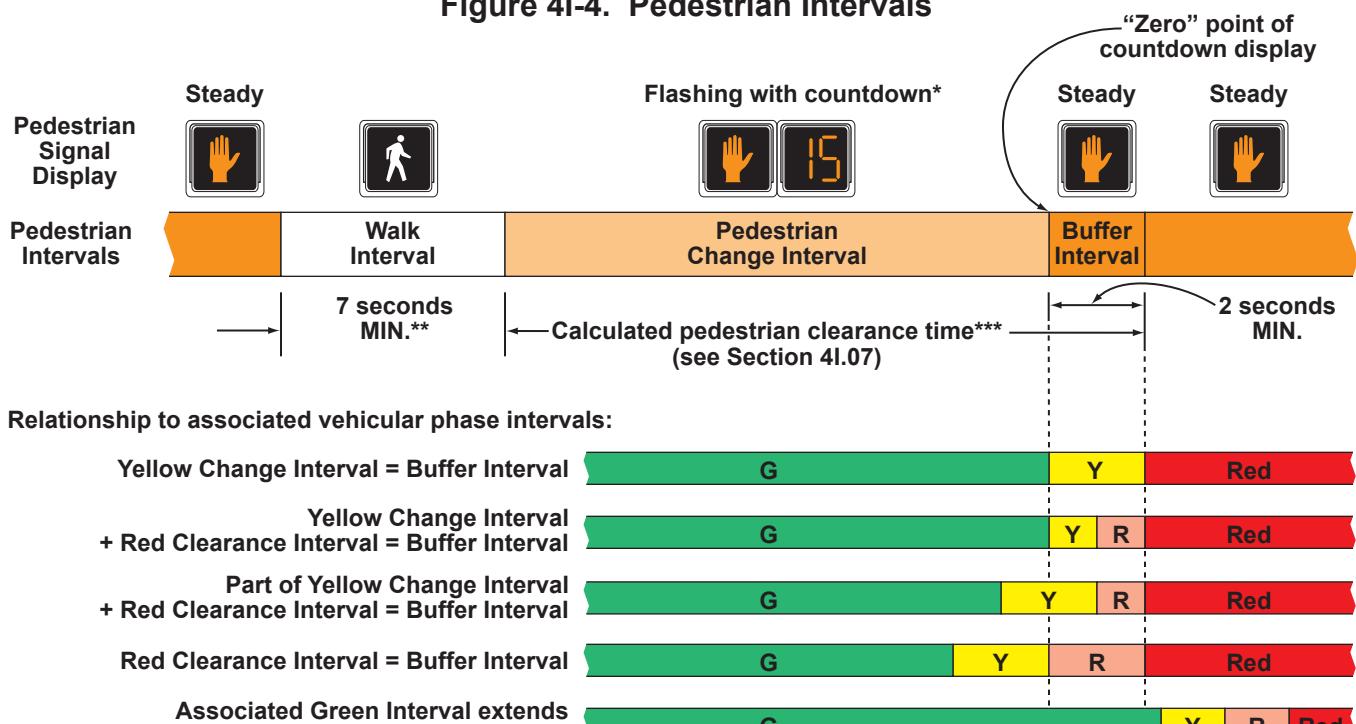
**D – Perpendicular curb ramps with continuous surface between ramps**



**Notes:**

1. This figure is not drawn to scale.
2. These drawings are intended to describe the typical locations for pedestrian push button installations. They are not intended to be a guide for the design of curb ramps.
3. Refer to California Building Code (CBC) Section 11B-101 et seq., Code of Federal Regulation (28 CFR 35.151; and the 2004 ADAAG at 36 CFR part 1191, appendices B and D), Americans with Disabilities Act (ADA) for placement of pedestrian pushbuttons.

Figure 4I-4. Pedestrian 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 4I.07)\*\*\*\*.

\*\*\* The Buffer Interval, which shall always be provided and displayed, may be used to help satisfy the calculated pedestrian clearance time, or may begin after the calculated pedestrian clearance time has ended.

\*\*\*\* Refer to FHWA's List of Known Errors for error in the note. Refer to Section 1A.04 for more details

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