



Department of Transportation

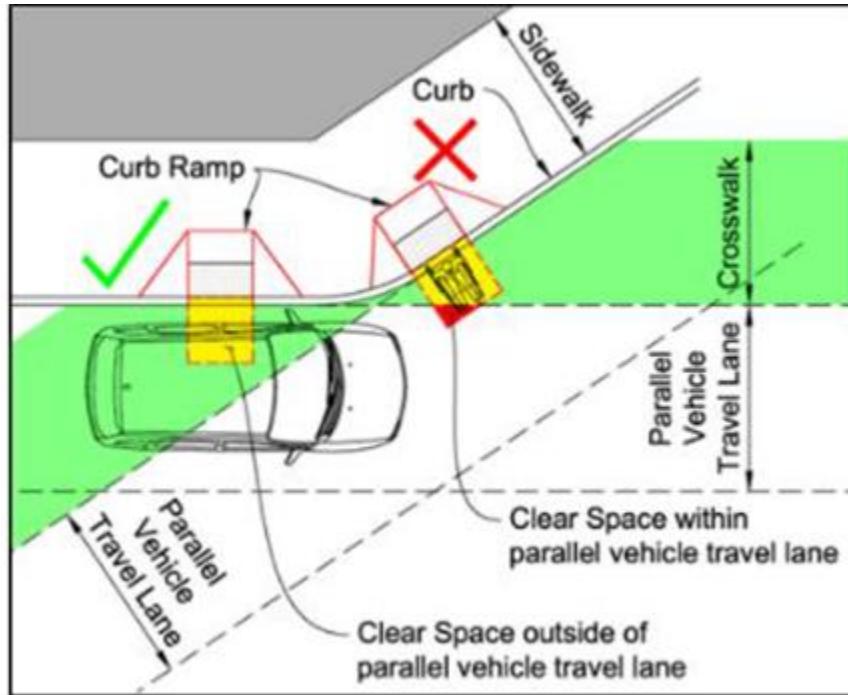
Henry B. Gutman, Commissioner

The following attachments are submitted to the MUTCD NPA docket as part of NYCDOT's comments.

Attachments include:

- Proposed figure of clear space for Section 3C.03
- Proposed Pedestrian Island chapter combined with Curb Extensions
- Proposed Figure for Figure 4I-2/4I-3 showing an APS unit on one pole
- Proposed Signal Warrant 4 Alternative slideshow
- Proposed updated Pedestrian Interval Figure 4I-4
- Proposed Pedestrian Part incorporated into Part 7
- Proposed All Bike with Arrow regulatory sign in Figure 9B-1

Attachment for a new figure in 3C.03 depicting clear space





Department of Transportation

Henry B. Gutman, Commissioner

Proposed Pedestrian Island Chapter

[New text in blue taken from various sources like earlier additions of the MUTCD, NACTO, AASHTO Green Book, and NYCDOT Street Design Manual. Text in black exists from 2009 MUTCD or draft MUTCD. The purpose of this chapter is to build on the existing pedestrian island Section 3C.12 and align it more with the FHWA proposed curb extension chapter. Pedestrians are the most vulnerable road users and there should be more concise language on provisions for pedestrians when crossing a street.]

CHAPTER XY . PEDESTRIAN ISLANDS AND CURB EXTENSIONS

Section 3C.12 ~~Pedestrian Islands and Medians~~ XY.01 General

Standard:

Except where specifically provided in this Chapter, the provisions of other Chapters in Part 3 shall apply to islands and medians.

Support:

Raised or painted islands or medians of sufficient width ~~that are~~ placed in ~~the center area~~ ~~of~~ a street or highway can serve as a place of refuge for pedestrians who are attempting to cross at a midblock or intersection location or waiting at a transit loading zone. ~~Center~~ Islands or medians allow pedestrians at an unsignalized crossing to find an adequate gap in one direction of traffic at a time, as the pedestrians are able to stop, if necessary, in the ~~center~~ island or median area and wait for an adequate gap in the other direction of traffic before crossing the remaining second half of the street or highway. Islands and medians also provide a place of safety for pedestrians crossing without enough signal time, reduce crossing distance and associated exposure risk, and provide predictability on the position of vehicles approaching the crossing. The minimum widths for accessible refuge islands and for design and placement of detectable warning surfaces are provided in the “Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG)” (see Section 1A.05). A pedestrian island may be designated by curbs, pavement edges, pavement markings, channelizing devices, or other devices. Traffic islands may also be used as pedestrian islands. Figure XY-1 shows refuge islands. [Next to last sentence similar to sentence in curb extension chapter.]

Signs for islands and medians are discussed in Part 2.

Figure XY-1 Example of Raised and Painted Pedestrian Refuge Island



Section XY.02 Refuge Islands and Medians

Standard:

Where pedestrian travel can be expected within islands, adequate provisions shall be made for pedestrians with disabilities. [Similar language from the curb extension chapter below]

Guidance:

Pedestrian islands should extend through the crosswalk and include end treatments to protect pedestrians from errant vehicles. Raised or channelizing devices should be provided at any edge which might otherwise be encroached by vehicles. In areas where vehicle speeds are relatively high, a refuge island should have adequate physical protection at the end toward approaching traffic in the form of a barrier to withstand the impact of a colliding errant vehicle. Figure XY-2 shows end treatments.

[Language from older version of MUTCD]

Option:

Other methods of physical separation may be used beyond the markings delineating an island.
[Similar language from the curb extension chapter below]

Figure XY-2 Example of End Treatments for Refuge Islands



Section XY.03 Transit Loading Islands [Transit boarding islands are appearing more often and should be mentioned as they act more than typical refuge islands or curb extensions as people can wait extending periods of time and queue into larger numbers.]

Support:

Transit loading islands are special types of islands dedicated as waiting and boarding areas for passengers that streamline transit service and improve accessibility by enabling in-lane stops. Side boarding islands are separated from the sidewalk by a travel lane or bicycle lane, eliminating conflicts between transit vehicles and bicycles at stops.

Loading islands should allow for accessible boarding with level or near-level boarding platforms. If used at a raised island, an accessible ramp should be placed at the approach end of the loading island entering the crosswalk at an intersection. Midblock loading islands should have at least one marked crosswalk from the near sidewalk or across the entire roadway, depending upon conditions. A loading island should be of sufficient length to provide adequate access to entrances for the full number of transit vehicles likely to stop at the island at one time. Figure XY-3 shows an example of a transit loading island. [From older version of MUTCD and NACTO Guides]

Guidance:

Side protection of transit loading islands where crowds of waiting passengers would otherwise overflow the island is recommended, particularly where a platform is not provided.

Figure XY-3 Example of Transit Loading Island



Section XY.04 3J.07 Curb Extensions Designated by Pavement Markings

Support:

Curb extensions are used to extend the sidewalk or other pedestrian space, shorten crossing distances for pedestrians, alter the roadway geometry for speed control or channelizing, and for other purposes.

Curb extensions are typically created by physical infrastructure including concrete or asphalt, but can also be designated by pavement markings.

For the purposes of this Section, the paved areas between the solid double line forming the curb extension (see Paragraph 4 of this Section) and the sidewalk or other roadside area are considered to be outside of the street.

Standard:

Curb extensions formed by pavement markings shall be established using solid double lines. The color of the solid double line shall comply with the general principles of markings (see Section 3A.03).

Guidance:

Physical separation or delineation should be provided where curb extensions are created by pavement markings and pedestrian travel can be expected within the area created by the curb extension.

Option:

Channelizing devices such as tubular markers (see Chapter 3I) may be used along the solid double line of a curb extension created by pavement markings.

Other methods of physical separation may be used beyond the solid double line outside of the limits of the street.

Guidance:

Diagonal markings (see Section 3B.24) or colored pavement (see Chapter 3H) should be used within the marked curb extension to emphasize that the area is outside of the street.

Support:

Curb extensions are distinct from areas within the street such as shoulders, flush medians, or gore areas where travel is discouraged by the presence of diagonal markings (see Section 3B.24). Curb extensions designate areas outside of the street where travel is prohibited.

Guidance:

Where pedestrian travel can be expected within curb extensions created by pavement markings, adequate provisions should be made for pedestrians with disabilities.

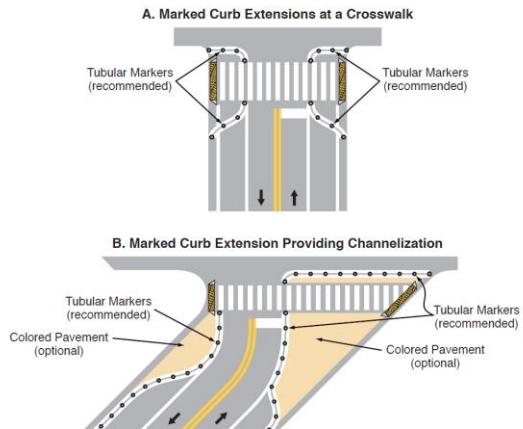
Support:

Additional information on the design and construction of accessible facilities is found in publications listed in Section 1A.05 (see Publications 12 and 42).

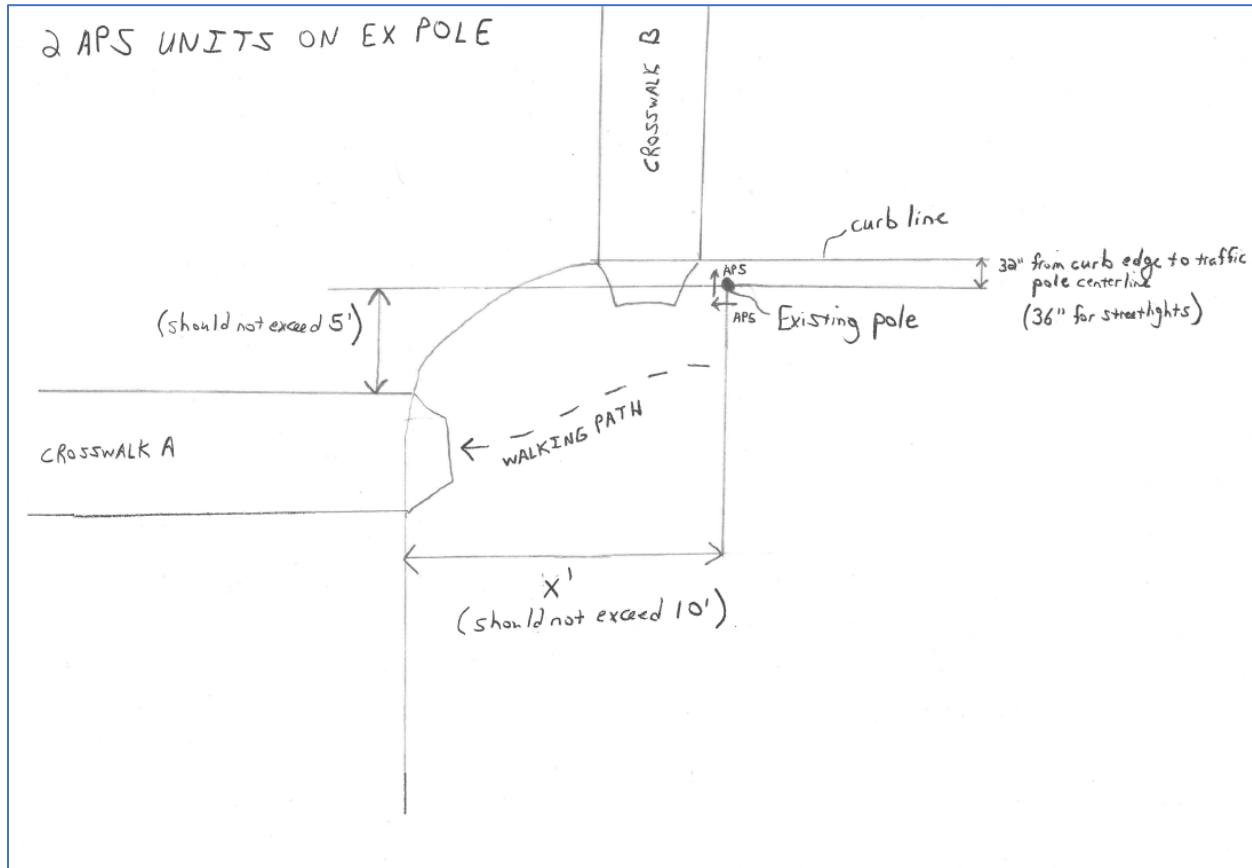
Figure [XY-9](#) ~~3J-6~~ illustrates examples of curb extensions designated by pavement markings.

Figure 3J-6 XY-8 Examples of Curb Extensions Designated by Pavement Markings

Figure 3J-6. Examples of Curb Extensions Designated By Pavement Markings



Proposed Figure for 4I-2/4I-3
showing APS units on one pole:





PEDESTRIAN WARRANTS

LOCAL MODIFICATIONS TO NATIONAL WARRANTS
FOR TRAFFIC CONTROLS

Presentation to APBP

Introduction

1

BACKGROUND

- Warrant 4 requires relatively high volumes of pedestrians and vehicles.
- The existing criteria for 70% factor renders it unusable in NYC.
- Adding crash history to volume presents a more complete picture of an intersection.
- In 2018, NYCDOT developed draft modifications. Crash history was used as a threshold to lower volumes.



OVERVIEW OF PROPOSED CHANGES TO WARRANT #4

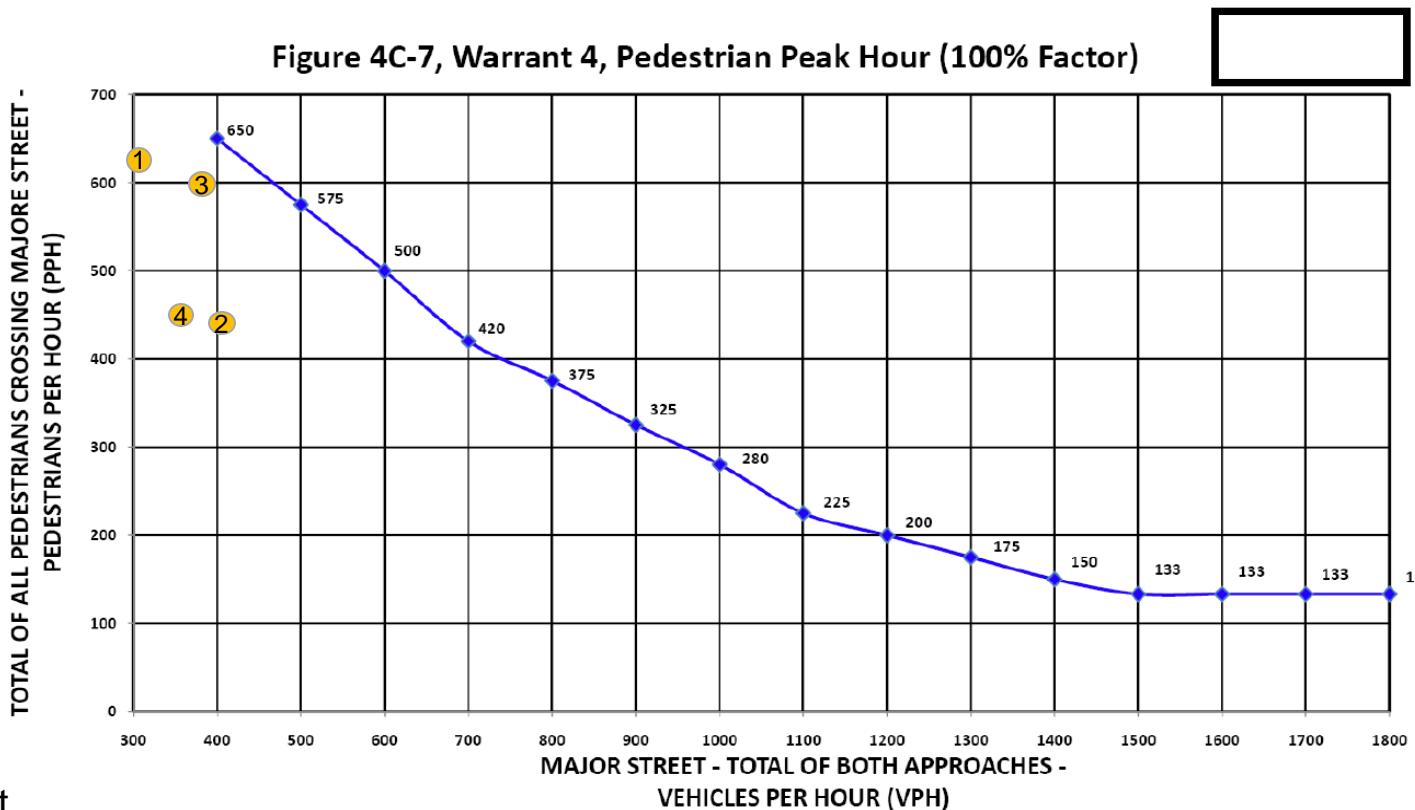
WARRANT #4	PPH (MIN) FOR THE TOTAL OF ALL PEDESTRIAN CROSSING THE STREET	MAJOR STREET(BOTH APPROCHES) VEHICLES (VPH)	CRASH HISTORY/PEDESTRIAN CLASSIFICATION
WARRANT #4 (100%) Figure 4C-7	133	400	-
WARRANT #4 (80%) Figure 4C-7a	106	280	Shall be used for intersection having 1-2 preventable crashes in a 12-month period
WARRANT #4 (70%) Figure 4C-7b	93	250	If the 85th percentile speed on the major street exceeds 35 mph or shall be used for intersection having 3-5 preventable crashes in a 12-month period
WARRANT #4 (60%) Figure 4C-7c	80	210	Shall be used for intersection having at least 1 preventable crashes and 1 KSI in a 12-month period or more than 5 preventable crashes in a 12-month period
WARRANT #4 (50%) Figure 4C-7d	67	400	Shall be used if the 15th-percentile crossing speed of pedestrians is less than 3.5 FT/SEC or if 15% of the crossing population is schoolchildren and/or senior pedestrians

Application of Pedestrian Warrant at 4 Intersections

3

NYCDOT approved controls at the following locations using the modified warrant. The chart below shows where they fell on the 100% factor.

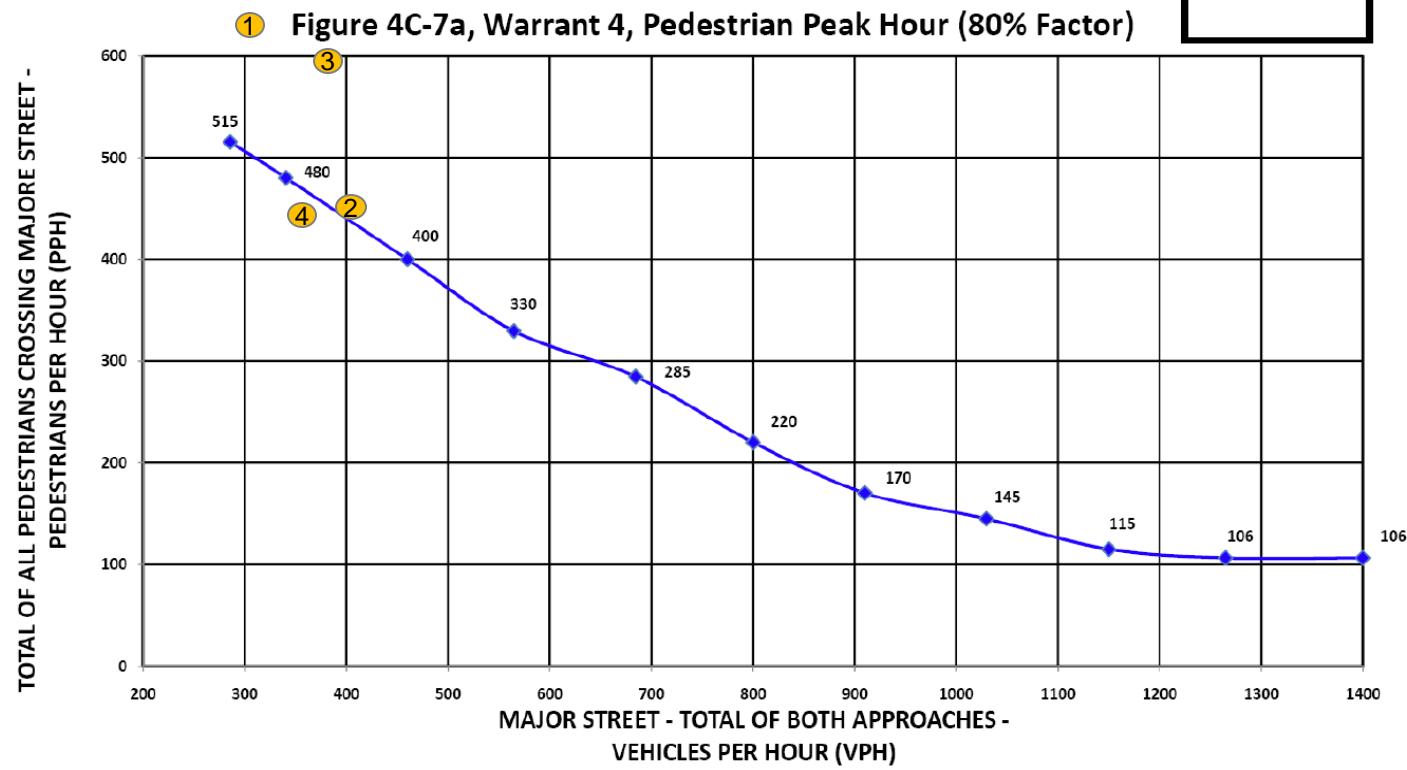
None met the warrant due to low vehicle volumes despite high pedestrian volumes.



1. Henry St and Clinton St
2. 43 Ave and 97 Pl
3. 45 Ave and Union St
4. Bedford Ave and N 8 St

KEY

- 0 preventable crashes
- 1-2 preventable crashes
- 3-5 preventable crashes
- ≥1 preventable crashes
- ● and ≥1 KSI, or
>5 preventable crashes
- 15-percentile <3.5 ft/sec,
or 15% population are
schoolchildren/seniors

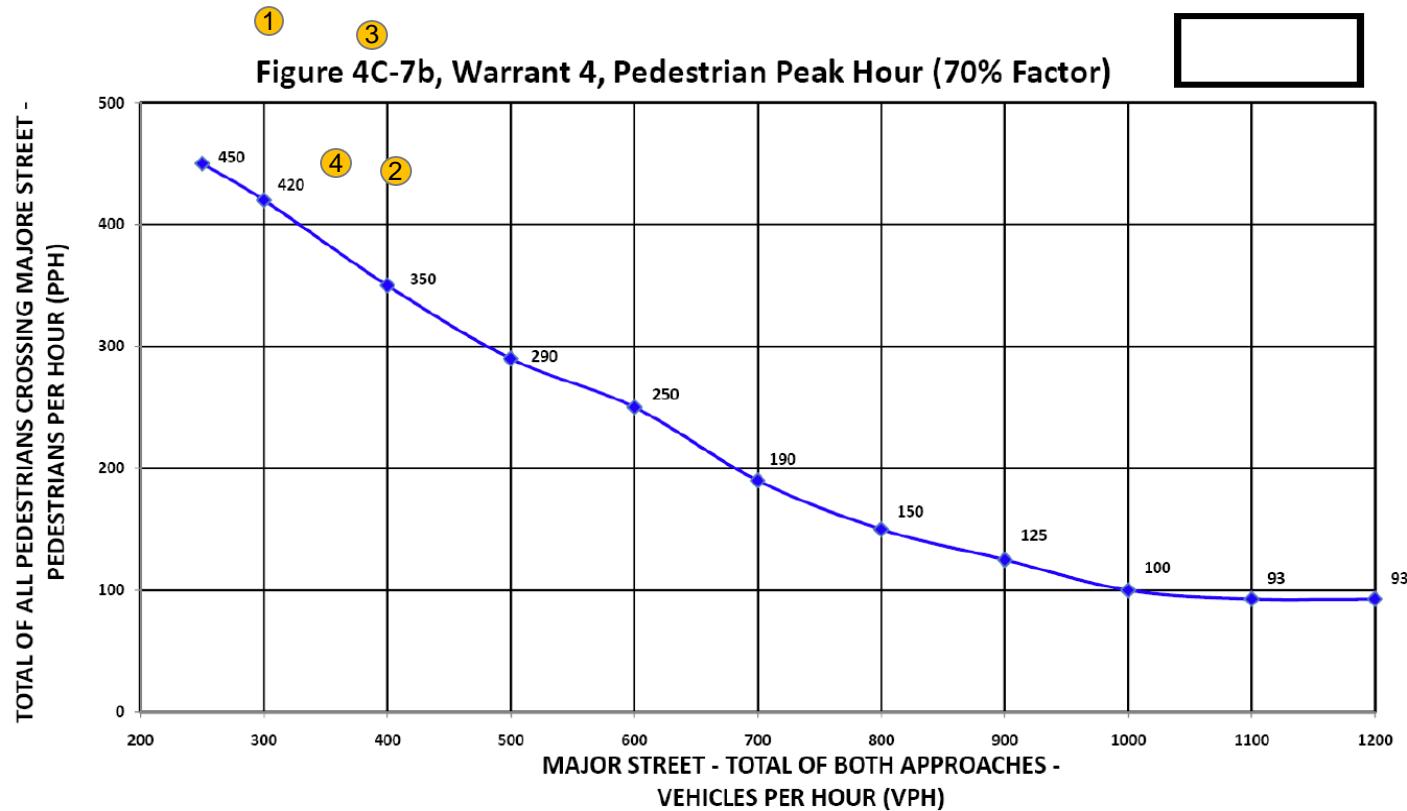


The 80% factor graph shall be used for intersections having 1-2 preventable crashes in a 12-month period.

1. Henry St and Clinton St
2. 43 Ave and 97 Pl
3. 45 Ave and Union St
4. Bedford Ave and N 8 St

KEY

- 0 preventable crashes
- 1-2 preventable crashes
- 3-5 preventable crashes
- ≥1 preventable crashes
- and ≥1 KSI, or
>5 preventable crashes
- 15-percentile <3.5 ft/sec,
or 15% population are
schoolchildren/seniors



The 70% factor graph shall be used for intersections having 3-5 preventable crashes in a 12-month period or if the 85th percentile speed on the major street exceeds 35 mph.

1. Henry St and Clinton St
2. 43 Ave and 97 Pl
3. 45 Ave and Union St
4. Bedford Ave and N 8 St

Next Steps

4

NEXT STEPS

NYCDOT will continue to approve locations that meet the criteria of the modified warrants and collect before after crash data for all locations. We have one year for the original four location with details in the following section.

Before and After Crash Data

5

HENRY ST AND CLINTON ST

Crashes and Injuries Three-Year After Analysis, Henry St and Clinton St

	Before				After				Change	
	'16/ '17	'17/ '18	'18/ '19	Average	2020	2021	2022	Average	Actual	Percent
Total Crashes	4	4	5	4.3	3			3.0	-1.3	-31%
Crashes w/ Injuries	1	0	0	0.3	1			1.0	0.7	200%
Motor Vehicle Occupant	0	0	0	0.0	0			0.0	0.0	N/A
Pedestrian	1	0	0	0.3	1			1.0	0.7	200%
Cyclist	0	0	0	0.0	0			0.0	0.0	N/A
Total Injuries	1	0	0	0.3	1			1.0	0.7	200%

The 3-yr before period is October 01, 2016 to September 30, 2019.

The 1-yr after period is January 01, 2020 to December 31, 2020.

The implementation period of October 01, 2019 to December 31, 2019 is excluded.

Source: NYPD AIS/TAMS Crash Database

- Previously was an uncontrolled crossing
- Intersection of two one-way roads
- Pedestrian volumes twice that of vehicles
- Low minor street vehicle volume

Major: 301 vehicles
Minor: 87 vehicles
Pedestrians: 631
3 preventable crashes



43 AVE AND 97 PL

Crashes and Injuries

Three-Year After Analysis, 43 Ave and 97 Pl

	Before				After				Change	
	'16/ '17	'17/ '18	'18/ '19	Average	2020	2021	2022	Average	Actual	Percent
Total Crashes	8	8	2	6.0	1			1.0	-5.0	-83%
Crashes w/ Injuries	0	1	1	0.7	0			0.0	-0.7	-100%
Motor Vehicle Occupant	0	0	0	0.0	0			0.0	0.0	N/A
Pedestrian	0	0	3	1.0	0			0.0	-1.0	-100%
Cyclist	0	1	0	0.3	0			0.0	-0.3	-100%
Total Injuries	0	1	3	1.3	0			0.0	-1.3	-100%

The 3-yr before period is October 01, 2016 to September 30, 2019.

The 1-yr after period is January 01, 2020 to December 31, 2020.

The implementation period of October 01, 2019 to December 31, 2019 is excluded.

Source: NYPD AIS/ TAMS Crash Database

- Previously was an uncontrolled crossing
- Low minor street vehicle volumes
- High crash location
- Pedestrian volume higher than vehicle volumes

Major: 401 vehicles
 Minor: 36 vehicles
 Pedestrians: 457
 5 preventable crashes



45 AVE AND UNION ST

Crashes and Injuries Three-Year After Analysis, 45 Ave and Union St

	Before				After				Change	
	'16/ '17	'17/ '18	'18/ '19	Average	2020	2021	2022	Average	Actual	Percent
Total Crashes	5	5	1	3.7	2			2.0	-1.7	-45%
Crashes w/ Injuries	0	0	0	0.0	0			0.0	0.0	N/A
Motor Vehicle Occupant	0	0	0	0.0	0			0.0	0.0	N/A
Pedestrian	0	0	0	0.0	0			0.0	0.0	N/A
Cyclist	0	0	0	0.0	0			0.0	0.0	N/A
Total Injuries	0	0	0	0.0	0			0.0	0.0	N/A

The 3-yr before period is August 01, 2016 to July 31, 2019.

The 1-yr after period is November 01, 2019 to October 31, 2020.

The implementation period of August 01, 2019 to October 31, 2019 is excluded.

Source: NYPD AIS/ TAMS Crash Database

- Previously was an all-way stop
- Intersection of two one-way roads
- Low minor street vehicle volumes
- Pedestrian volume higher than vehicle volumes

Major: 385 vehicles
Minor: 78 vehicles
Pedestrians: 599
4 preventable crashes



BEDFORD AVE AND N 8 ST

Crashes and Injuries Three-Year After Analysis, Bedford Ave and N 8

Total Crashes

	Before			
	'16/ '17	'17/ '18	'18/ '19	Average
6	14	9	9.7	
0	4	1	1.7	

Crashes w/ Injuries

Motor Vehicle Occupant	0	0	1	0.3
Pedestrian	0	4	0	1.3
Cyclist	0	1	0	0.3

Total Injuries

0	5	1	2.0	1		1.0	-1.0	-50%
---	---	---	------------	---	--	------------	------	------

The 3-yr before period is August 01, 2016 to July 31, 2019.

The 1-yr after period is November 01, 2019 to October 31, 2020.

The implementation period of August 01, 2019 to October 31, 2019 is excluded.

Source: NYPD AIS/TAMS Crash Database

- Previously was an all-way stop
- Low minor street vehicle volumes
- Pedestrian volume as high as vehicle volumes



Major: 453 vehicles

Minor: 121 vehicles

Pedestrians: 453

3 preventable crashes



Thank you!



NYCDOT



nyc_dot



nyc_dot



NYCDOT

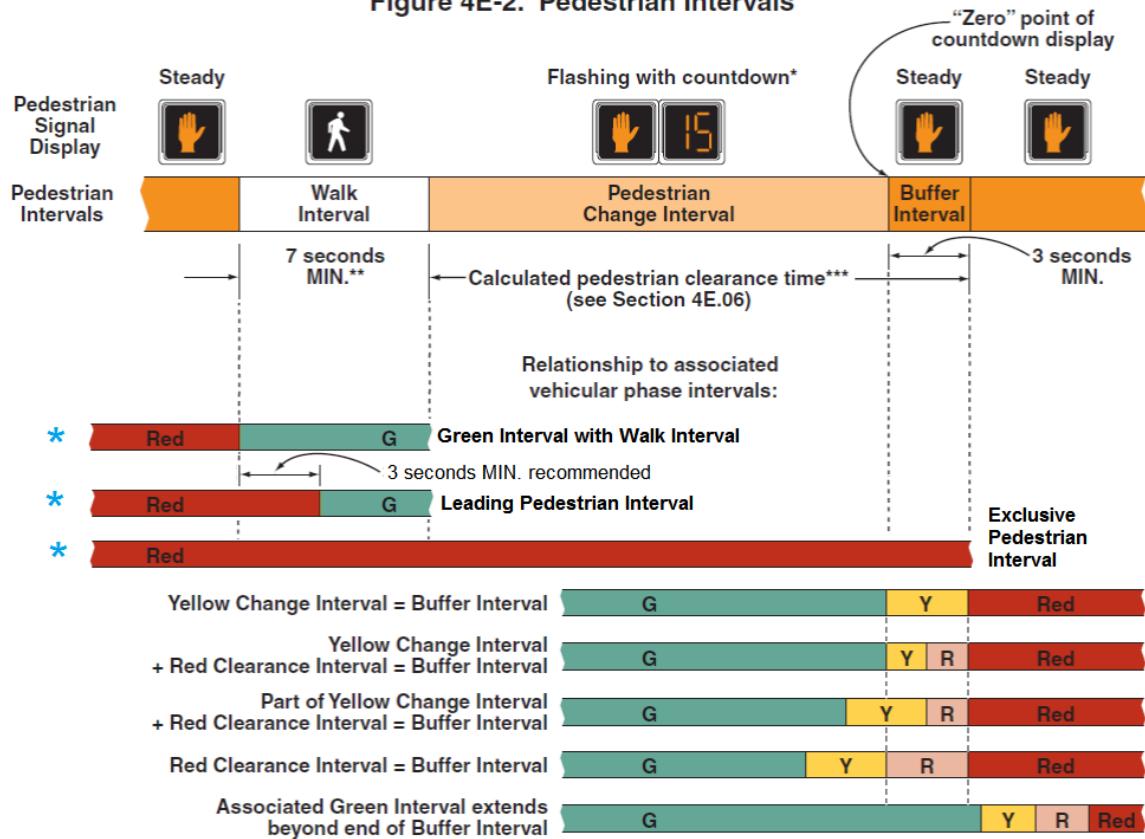
Proposed updated Pedestrian Interval Figure 4I-4:

Page 498

DRAFT

2009 Edition

Figure 4E-2. Pedestrian Intervals



Legend

* 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.06).

*** 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.

G = Green Interval

Y = Yellow Change Interval (of at least 3 seconds)

R = Red Clearance Interval

* Red = Red Interval

Part 7 Traffic Control For Pedestrian Facilities

[This is a first draft of combining various pedestrian sections throughout the manual into one chapter. The intent is to better organize the critical pedestrian elements (signs, signals, markings) so they are in one place rather than separate chapters. Not all pedestrian elements are here but the ones that have a prominent role in pedestrian traffic control have been relocated here. If an element is important for pedestrians but not in this chapter, it provides a reference of where to find that information. This is in blue underline. This proposed chapter takes the existing Part 7 for School Areas and adds the pedestrian elements to the beginning. The School Area text remains unchanged and is still grouped together in Part 7. With the existing chapters for specific uses like Bicycles, Railroads, Schools, and a proposed Autonomous Vehicle chapter, the rationale is that the most vulnerable users, pedestrians, should have a chapter with the relevant content consolidated to make it easier for the practitioner when designing pedestrian traffic controls, for example one chapter for crosswalks, ped signals, and ped signs.]

Section 7A.01 Introduction

Support:

Part 7 sets forth basic principles and prescribes standards for the design, application, installation, and maintenance of all traffic control devices (including signs, signals, and markings) and other controls (including islands, and adult crossing guards) that are necessary for pedestrians, the special pedestrian conditions in school areas.

Part 6 contains information on work zones for pedestrian facilities and the mitigation of pedestrian travel through work zones.

Chapters 7H, 7I, and 7J contain information regarding traffic control devices for school areas.

Part 8 contains information on sidewalks and pathways at grade crossings. Part 9 contains information on shared-use paths.

Definitions and acronyms pertaining to Part 7 are provided in Sections 1C.01 and 1C.03.

Guidance:

All signs, signals, and markings, including those on pedestrian facilities, should be properly maintained to command respect from the pedestrian.

Section 7A.y Standardization of Application for Signing

[The language below is similar to 9A.02 for Bicycles except using the term pedestrian instead]

Standard:

Pedestrian signs shall be standard in shape, legend, and color.

All signs shall be retroreflective for use on pedestrian facilities.

Where signs serve both pedestrians and other road users, vertical mounting height and lateral placement shall be as provided in Part 2.

If the sign or plaque applies to vehicles and pedestrians, then the size shall be as shown for conventional roads in Tables 2B-1, 2C-1, or 2D-2.

Option:

Larger size signs and plaques may be used on pedestrian facilities when appropriate (see Section 2A.07).

Any diamond-shaped warning sign that is placed such that it is only applicable to pedestrians may be 18" x 18".

Guidance:

Except for size, the design of signs and plaques for pedestrian facilities should be identical to that provided in this Manual for signs and plaques for streets and highways.

Support:

Uniformity in design of pedestrian signs and plaques includes shape, color, symbols, arrows, wording, lettering, and illumination or retroreflectivity .

Section 7A.y Standardization of Application for Markings

[The language below is similar to 9A.03 for Bicycles except using the term pedestrian instead]

Support:

Markings indicate the separation of the lanes for road users and assist the pedestrian by indicating assigned travel paths.

CHAPTER 7B – Signs for Pedestrian Facilities

[The below is new text but is referencing sections in 2B related to intersection controls where pedestrians are a factor.]

Section 7B.v Signing for Pedestrian Right-of-Way at Intersections

Support:

Section 2B.06 contains general considerations when selecting a form of intersection control.

Section 2B.07 contains information on determining the minor road for unsignalized intersections where controlling the direction that conflicts the most with established pedestrian crossing activity or school walking routes should be considered.

Section 2B.08 contains information on considerations before converting to a more restrictive form of right-of-way control at an unsignalized intersection.

Section 2B.09 contains information on the decision not to use intersection control.

Section 2B.10 contains information on yield controls should be installed on the approach that conflicts the most with established pedestrian crossing activity or school walking routes or bicycle crossing activity.

Section 2B.16 and 2B.17 contains information on all-way stop controls where pedestrian volumes and movements justify the installation of all-way stop controls.

Section 9B.01 contains provisions regarding the assignment of priority at a shared-use path/roadway intersection

Section 7B.v 2B.19 Yield Here To Pedestrians Signs and Stop Here For Pedestrians Signs (R1-5 Series)

Support:

The R1-5 series signs are intended to mitigate the scenario that can place pedestrians at risk by blocking other drivers' view of pedestrians and by blocking the pedestrians' view of the vehicles approaching in the adjacent lanes.

Standard:

Yield Here To (Stop Here For) Pedestrians (R1-5, R1-5a, R1-5b, or R1-5c) signs shall only be used if yield (stop) lines are used in advance of a marked crosswalk that crosses an uncontrolled multi-lane approach. The Stop Here for Pedestrians signs shall only be used where the law specifically requires that a driver must stop for a pedestrian in a crosswalk. The legend STATE LAW shall not be displayed on the R1-5 series signs.

If yield (stop) lines and Yield Here To (Stop Here For) Pedestrians signs are used in advance of a crosswalk that crosses an uncontrolled multi-lane approach, the signs shall be placed 20 to 50 feet in advance of the nearest crosswalk line (see Section 3B.19 and Figure 3B-16).

Option:

The R1-5a and R1-5c signs may be used in place of the R1-5 and R1-5b signs provided that the signs are only used in advance of a marked crosswalk that crosses an uncontrolled multi-lane approach within school zones (see Part 7).

Guidance:

When Yield Here To (Stop Here For) Pedestrians signs are provided in advance of a crosswalk across an multi-lane approach, parking should be prohibited in the area between the yield (stop) line and the crosswalk.

Yield (stop) lines and Yield Here To (Stop Here For) Pedestrians signs should not be used in advance of crosswalks that cross an approach to or departure from a roundabout.

Option:

Yield Here To (Stop Here For) Pedestrians signs may be used in accordance with Paragraphs 2 through 4 of this Section even if yield (stop) lines are not used.

A Pedestrian Crossing (W11-2) warning sign may be placed overhead or may be post-mounted with a diagonal downward pointing arrow (W16-7P) plaque at the crosswalk location where Yield Here To (Stop Here For) Pedestrians signs have been installed in advance of the crosswalk.

Standard:

If a W11-2 sign has been post-mounted at the crosswalk location where a Yield Here To (Stop Here For) Pedestrians sign is used on the approach, the Yield Here To (Stop Here For) Pedestrians sign shall not be placed on the same post as the W11-2 sign.

Option:

An advance Pedestrian Crossing (W11-2) warning sign with an AHEAD or a distance supplemental plaque may be used in conjunction with a Stop Here For (Yield Here To) Pedestrians sign on the approach to the same crosswalk.

In-Street Pedestrian Crossing signs and Stop Here For (Yield Here To) Pedestrians signs may be used together at the same crosswalk.

Section 7B.v 2B.20 In-Street and Overhead Pedestrian and Trail Crossing Signs (R1-6 and R1-9 Series)

Option:

The In-Street Pedestrian Crossing (R1-6 or R1-6a) sign (see Figure 2B-2), In-Street Trail Crossing (R1-6b or R1-6c) sign (see Figure 2B-2), the Overhead Pedestrian Crossing (R1-9 or R1-9a) sign (see Figure 2B-2), or the Overhead Trail Crossing (R1-9d or R1-9e) may be used to remind road users of laws regarding right-of-way at an unsignalized crosswalk. The legend STATE LAW may be displayed at the top of the R1-6 and R1-9 series signs if applicable. On the R1-6 series signs, the legends STOP or YIELD may be used instead of the appropriate STOP sign or YIELD sign symbol.

Highway agencies may develop and apply criteria for determining the applicability of In-Street Pedestrian Crossing signs.

Standard:

If used, the In-Street Pedestrian or Trail Crossing sign shall be placed at one of the following locations:

A: in the roadway at the crosswalk location on the center line;

B: on a median island;

C: or, in the case of a one-way roadway application, on a lane line.

The In-Street Pedestrian or Trail Crossing sign shall not be post-mounted on the left-hand or right-hand side of the roadway.

If used, the Overhead Pedestrian or Trail Crossing sign shall be placed over the roadway at the crosswalk location.

If used, the In-Street or Overhead Pedestrian Crossing sign shall be used only as a supplement to a Pedestrian Crossing (W11-2) warning sign with a diagonal downward-pointing arrow (W16-7P) plaque at the crosswalk location.

If used, the In-Street or Overhead Trail Crossing sign shall be used only as a supplement to a Trail Crossing (W11-15) warning sign with a diagonal downward-pointing arrow (W16-7P) plaque at the crosswalk location.

An In-Street or Overhead Pedestrian or Trail Crossing sign shall not be placed in advance of the crosswalk to educate road users about the State law prior to reaching the crosswalk, nor shall it be installed as an educational display that is not near any crosswalk.

Guidance:

If an island (see Chapter 3I) is available, the In-Street Pedestrian or Trail Crossing sign, if used, should be placed on the island.

Option:

In-Street Pedestrian or Trail Crossing signs may be mounted back to back in the median or on the centerline of an undivided roadway.

Standard:

The In-Street Pedestrian or Trail Crossing sign and the Overhead Pedestrian Crossing or Trail sign shall not be used at crosswalks on approaches controlled by a traffic control signal, pedestrian hybrid beacon, or an emergency vehicle hybrid beacon.

The STOP FOR legend shall only be used in States where the State law specifically requires that a driver must stop for a pedestrian or bicycle in a crosswalk.

Except where the In-Street Crossing sign is placed on a physical island, the sign support shall be designed to bend over and then bounce back to its normal vertical position when struck by a vehicle.

Option:

The In-Street and Overhead Pedestrian and Trail Crossing sign may be used at intersections or midblock pedestrian crossings with flashing beacons.

Support:

The provisions of Section 2A.14 concerning mounting height are not applicable for the In-Street Pedestrian Crossing sign. See Section 2A.21 for sign mounting methods.

Standard:

The top of an In-Street Pedestrian or Trail Crossing sign shall be a maximum of 4 feet above the pavement surface. The top of an In-Street Pedestrian or Trail Crossing sign placed in an island shall be a maximum of 4 feet above the island surface.

Option:

The In-Street Pedestrian Crossing or Trail Crossing signs may be used seasonally to prevent damage in winter because of plowing operations, and may be removed at night if the pedestrian activity at night is minimal.

Both sign mounting types, In-Street Crossing (R1-6 series) signs and Overhead Crossing (R1-9 series) signs may be used together at the same crosswalk.

Figure 2B-2. Unsignalized Pedestrian Crosswalk Signs

Section 7B.v Speed Limit Sign

[The below is new text but is referencing sections in 2B.21 that already exist where ped activity is a factor to consider in speed control.]

Support:

[Section 2B.21 contains information on speed limit signs where pedestrian activity is among the factors considered when establishing or reevaluating speed limits within speed zones.](#)

Section 7B.v 2B.57 WALK ON LEFT FACING TRAFFIC and No Hitchhiking Signs (R9-1, R9-4, R9-4a)

Option:

The WALK ON LEFT FACING TRAFFIC (R9-1) sign (see Figure 2B-26) may be used on highways where no sidewalks are provided.

Guidance:

If used, the WALK ON LEFT FACING TRAFFIC sign should be installed on the right-hand side of the road where pedestrians walk on the pavement or shoulder in the absence of pedestrian pathways or sidewalks.

Option:

The No Hitchhiking (R9-4) sign (see Figure 2B-26) may be used to prohibit standing in or adjacent to the roadway for the purpose of soliciting a ride. The R9-4a word message sign (see Figure 2B-26) may be used as an alternate to the R9-4 symbol sign.

Section 7B.v 2B.58 Pedestrian Crossing Signs (R9-2, R9-3)

Option:

Pedestrian Crossing signs (see Figure 2B-26) may be used to limit pedestrian crossing to specific locations.

Standard:

If used, Pedestrian Crossing signs shall be installed to face pedestrian approaches.

Option:

Where crosswalks are clearly defined, the CROSS ONLY AT CROSSWALKS (R9-2) sign may be used to prohibit pedestrians from crossing at locations away from crosswalks.

The No Pedestrian Crossing (R9-3) sign may be used to prohibit pedestrians from crossing a roadway at an undesirable location or in front of a school or other public building where a crossing is not designated.

The NO PEDESTRIAN CROSSING (R9-3a) word message sign may be used as an alternate to the R9-3 symbol sign. The USE CROSSWALK (R9-3bP) supplemental plaque, along with an arrow, may be installed below either sign to designate the direction of the crossing.

Support:

One of the most frequent uses of the Pedestrian Crossing signs is at signalized intersections that have three crossings that can be used and one leg that cannot be crossed. Pedestrians with low-vision capabilities might need additional features other than traffic control devices to communicate the prohibition of pedestrian crossing.

Guidance:

The R9-3bP plaque should not be installed in combination with educational plaques.

Section 7B.v-2B.59—Traffic Signal Pedestrian and Bicycle Actuation Signs (R10-1 through R10-4, and R10-24 through R10-26)

Standard:

Where manual actuation of a traffic signal is required for pedestrians or bicyclists to call a signal phase to cross the roadway, traffic signal signs applicable to pedestrian actuation (see Figure 2B-26) or bicyclist actuation (see Figure 9B-1) shall be mounted immediately above or incorporated into the pushbutton detector units (see Section 4I.06).

Support:

Traffic Signal signs applicable to pedestrians include:

- A. CROSS ONLY ON GREEN (symbolic circular green) (R10-1);
- B. CROSS ONLY ON (symbolic walk indication) SIGNAL (R10-2);
- C. Push Button for Walk Signal (R10-3 series); and
- D. Push Button for Green Signal (R10-4 series).

Option:

The following signs may be used as an alternate for the R10-3 and R10-4 signs:

- A. Push Button to Cross Street Wait for Walk Signal (R10-3a); or
- B. Push Button to Cross Street Wait for Green Signal (R10-4a).

The name of the street to be crossed may be substituted for the word STREET in the legends on the R10-3a and R10-4a signs.

Guidance:

The finger in the pushbutton symbol on the R10-3, R10-3a, R10-4, and R10-4a signs should point in the same direction as the arrow on the sign.

Option:

Where symbol-type pedestrian signal indications are used, an educational sign (R10-3b) may be used instead of the R10-3 sign to improve pedestrian understanding of pedestrian indications at signalized intersections. Where word-type pedestrian signal indications are being retained for the remainder of their useful service life, the legends WALK/DONT WALK may be substituted for the symbols on the educational sign R10-3b, thus creating educational sign R10-3c. The R10-3d educational sign may be used to inform pedestrians that the pedestrian clearance time is sufficient only for the pedestrian to cross to the median at locations where pedestrians cross in two stages using a median refuge island. The R10-3e educational sign may be used where countdown pedestrian signals have been provided. In order to assist the pedestrian in understanding which pushbutton to push, the R10-3f to R10-3i educational signs that provide the name of the street to be crossed may be used instead of the R10-3b to R10-3e educational signs. The R10-3j sign may be used where a pedestrian pushbutton is only to activate the accessible pedestrian signals. The R10-3k sign may be used where a pedestrian pushbutton has sensors to allow for touch-free activation.

The R10-24 or R10-26 sign (see Section 9B.11) may be used where a pushbutton detector has been installed exclusively to actuate a green phase for bicyclists.

The R10-25 sign (see Figure 2B-26) may be used where a pushbutton detector has been installed for pedestrians to activate In-Roadway Warning Lights (see Chapter 4U) or flashing beacons that have been added to the pedestrian warning signs.

Support:

Section 4I.06 contains information regarding the application of the R10-32P plaque.

Figure 2B-26. Pedestrian Signs and Plaques

Section 7B.v-2B.60 Pedestrian Traffic Signal Signs (R10-5 through R10-30)

Standard:

The CROSSWALK—STOP ON RED (symbolic circular red) (R10-23) and WAIT ON STEADY RED—YIELD ON FLASHING RED AFTER STOP (R10-23a) signs (see Figure 2B-27) shall only be used in conjunction with pedestrian hybrid beacons (see Section 4J.02).

The EMERGENCY SIGNAL (R10-13) sign (see Figure 2B-27) shall be used in conjunction with emergency-vehicle traffic control signals (see Section 4M.02).

The EMERGENCY SIGNAL—STOP ON FLASHING RED (R10-14 or R10-14a) sign (see Figure 2B-27) shall be used in conjunction with emergency-vehicle hybrid beacons (see Section 4N.02).

Option:

If needed for extra emphasis, a STOP HERE ON FLASHING RED (R10-14b) sign may be installed with an emergency-vehicle hybrid beacon.

Where conditions may warrant additional emphasis to drivers turning at a signalized intersection where potential pedestrian conflicts may not be readily apparent, a Turning Vehicles Yield to (Stop For) Pedestrians (R10-15, R10-15a), sign (see Figure 2B-27) may be used.

Standard:

The Turning Vehicles Stop for Pedestrians (R10-15a) sign shall only be used in jurisdictions where laws, ordinances or resolutions specifically require that a driver must stop for a pedestrian.

Option:

A U TURN YIELD TO RIGHT TURN (R10-16) sign (see Figure 2B-27) may be installed near the left-turn signal face if U-turns are allowed on a protected left-turn movement on an approach from which a right-turn GREEN ARROW signal indication is simultaneously being displayed to drivers making a right turn from the conflicting approach to their left.

A U TURN SIGNAL (R10-10a) sign (see Figure 2B-27) may be installed adjacent to the signal face that exclusively controls a U-turn movement.

Figure 2B-27. Traffic Signal Signs and Plaques

Section 7B.y No Turn on Red Signs (R10-11 Series, R10-17a, and R10-30)

[The below is new text but is referencing sections in 2B.61 that already exist where ped activity is a factor to consider in banning turns on red.]

Support:

Section 2B.61 contains information where a No Turn on Red sign should be considered when an engineering study finds that an exclusive pedestrian phase or an unacceptable number of pedestrian conflicts with right-turn-on-red maneuvers, especially involving children, older pedestrians, or persons with disabilities.

Section 7B.y ~~2C.55~~ Non-Vehicular Warning Signs (W11-2, W11-3, W11-4, W11-6, W11-7, W11-9, and W11-16 through W11-22)

Guidance:

If used in advance of a pedestrian, snowmobile, or equestrian crossing, the W11-2, W11-6, W11-7, and W11-9 signs should be supplemented with plaques (see Section 2C.61) with the legend AHEAD or XX FEET to inform road users that they are approaching a point where crossing activity might occur.

Standard:

If a post-mounted W11-2, W11-6, W11-7, or W11-9 sign is placed at the location of the crossing point where pedestrians, snowmobilers, or equestrians might be crossing the roadway, a diagonal downward pointing arrow (W16-7P) plaque (see Figure 2C-17) shall be mounted below the sign. If the W11-2, W11-6, W11-7, or W11-9 sign is mounted overhead, the W16-7P plaque shall not be used.

Figure 2C-16. Non-Vehicular Warning Signs

Option:

A Pedestrian Crossing (W11-2) sign may be placed overhead or may be post-mounted with a diagonal downward pointing arrow (W16-7P) plaque at the crosswalk location where Yield Here To (Stop Here For) Pedestrians signs (see Section 2B.20) have been installed in advance of the crosswalk.

Standard:

If a W11-2 sign has been post-mounted at the crosswalk location where a Yield Here To (Stop Here For) Pedestrians sign is used on the approach, the Yield Here To (Stop Here For) Pedestrians sign shall not be placed on the same post as the W11-2 sign.

Option:

An advance Pedestrian Crossing (W11-2) sign with an AHEAD or a distance supplemental plaque may be used in conjunction with a Yield Here To (Stop Here For) Pedestrians sign on the approach to the same crosswalk.

The crossing location identified by a W11-2, W11-6, W11-7, or W11-9 sign may be defined with crosswalk markings (see Chapter 3C).

The W11-2 and W11-9 signs and their related supplemental plaques may have a fluorescent yellow-green background with a black legend and border.

Guidance:

When a fluorescent yellow-green background is used, a systematic approach featuring one background color within a zone or area should be used. The mixing of standard yellow and fluorescent yellow-green backgrounds within a selected site area should be avoided.

Option:

A Warning Beacon (see Section 4S.03) may be used with any Non-Vehicular Warning sign to indicate specific periods when the condition or activity is present or is likely to be present, or to provide enhanced sign conspicuity.

A supplemental WHEN FLASHING (W16-13P) plaque (see Figure 2C-17) may be used with any Non-Vehicular Warning sign that is supplemented with a Warning Beacon to indicate specific periods when the condition or activity is present or is likely to be present.

CHAPTER 7C – Pavement Markings for Pedestrian Facilities

Section 7C.v Stop and Yield Lines

[The below is new text but is referencing sections in 3B.19 and 4J.02 that already exist where ped activity is a factor to consider in speed control.]

Option:

Section 3B.19 contains information regarding the use of stop and yield lines where drivers or bicyclists are required by State law to yield to pedestrians.

Section 4J.02 contains information regarding the use and application of stop lines in conjunction with a pedestrian hybrid beacon.

Guidance:

Yield (stop) lines and Yield Here To (Stop Here For) Pedestrians signs should not be used in advance of crosswalks that cross an approach to or departure from a circular intersection.

Figure 3B-16. Examples of Yield Lines at Unsignalized Midblock Crosswalks

CHAPTER 7C.v 3C. CROSSWALKS

Section 7C.v 3C.01 General

Standard:

Crosswalk markings shall be provided at non-intersection crosswalk locations.

Support:

Crosswalk markings provide guidance for pedestrians who are crossing roadways by defining and delineating paths on approaches to and within signalized intersections, and on approaches to other intersections where traffic stops.

In conjunction with signs and other measures, crosswalk markings help to alert road users of a designated pedestrian crossing point across roadways at locations that are not controlled by traffic control signals or STOP or YIELD signs.

Detectable warning surfaces mark boundaries between pedestrian and vehicular ways where there is no raised curb. Detectable warning surfaces are required by 49 CFR, Part 37 and by the Americans with Disabilities Act (ADA) where curb ramps are constructed at the junction of sidewalks and the roadway, for marked and unmarked crosswalks. Detectable warning surfaces contrast visually with adjacent walking surfaces, either light-on-dark, or dark-on-light. The "Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG)" (see Section 1A.05) contains specifications for design and placement of detectable warning surfaces.

Provisions for aesthetic treatments for the interior portion of a legally established crosswalk are contained in Section 3H.03.

Standard:

If paving materials are used to function as the white transverse lines to establish a marked crosswalk, white additives shall be part of the mixture to produce a white surface. The white paving materials shall be retroreflective.

Section 7C.v 3C.02 Application of Crosswalk Markings

Support:

Chapter 4J contains information on Pedestrian Hybrid Beacons. Section 4S.03 contains information regarding Warning Beacons to provide active warning of a pedestrian's presence. Section 4U.02 contains information regarding In-Roadway Warning Lights at crosswalks. Chapter 7C contains information on school crosswalks. Chapter 7J contains information regarding school crossing supervision.

Guidance:

Crosswalk markings should not be used indiscriminately. An engineering study should be performed before a marked crosswalk is installed at a location away from a traffic control signal or an approach controlled by a STOP or YIELD sign.

The following criteria should be considered in an engineering study for the installation of a marked crosswalk:

- A.** *Total number of approach lanes,*
- B.** *The presence of a median,*
- C.** *The distance from adjacent signalized intersections where crosswalks are provided,*
- D.** *Pedestrian volumes,*
- E.** *Pedestrian ages,*
- F.** *Pedestrian delays,*
- G.** *Average daily traffic (ADT),*
- H.** *Speed limit or the 85th-percentile speed,*
- I.** *The geometry of the crossing location,*
- J.** *The possible consolidation of multiple crossing points,*
- K.** *The availability of street lighting, and*
- L.** *Other appropriate factors.*

New marked crosswalks alone, without other measures designed to reduce traffic speeds, shorten crossing distances, enhance driver awareness of the crossing, and/or provide active warning of pedestrian presence, should not be installed across uncontrolled roadways where any of the following conditions exist:

- A.** *The roadway has four or more lanes of travel without a raised median or pedestrian refuge island and an ADT of 12,000 vehicles per day or greater; or*
- B.** *The roadway has four or more lanes of travel with a raised median or pedestrian refuge island and an ADT of 15,000 vehicles per day or greater, or*
- C.** *The posted speed limit is 40 mph or greater, or*
- D.** *A crash study reveals that multiple-threat crashes are the predominant crash type on a multi-lane approach or when adequate visibility cannot be provided by parking prohibitions.*

At locations controlled by traffic control signals or on approaches controlled by STOP or YIELD signs, crosswalk markings should be installed where engineering judgment indicates they are needed to direct pedestrians to the proper crossing path(s).

Section 7C.v 3C.03 Design of Crosswalk Markings

Support:

Section 3B.19 contains information regarding placement of stop line markings near crosswalk markings.

Standard:

Crosswalk markings shall be white. When used, transverse lines shall not be less than 6 inches or greater than 24 inches in width.

Support:

The allowable upper limit approaching 24 inches for the width of the transverse lines is normally applied where no stop or yield line is used in advance of the crosswalk or when approach speeds exceed 35 miles per hour.

Crosswalk markings are classified as basic or high visibility. Basic crosswalk markings consist of two transverse lines. High visibility markings consist of longitudinal lines parallel to traffic flow with or without transverse lines. Figure 3C-1 presents examples of crosswalk markings.

Standard:

Except as provided in Paragraph 5, the minimum width of a marked crosswalk shall be 6 feet.

At a non-intersection crosswalk where the posted speed limit is 40 mph or greater, the minimum width of the crosswalk shall be 8 feet.

Guidance:

Because non-intersection pedestrian crossings are generally unexpected by the road user, warning signs (see Section 2C.55) and high visibility crosswalk markings (such as shown in Figure 3C-1) should be installed for all crosswalks at non-intersection locations.

Option:

Added visibility may be provided by parking prohibitions on the approach to marked crosswalks.

Standard:

Where curb ramps are provided, crosswalk markings shall be located so that the curb ramps are within the extension of the crosswalk markings.

Guidance:

Transverse crosswalk markings should extend across the full width of pavement or to the edge of the intersecting crosswalk to discourage diagonal walking between crosswalks.

Section 7C.v 3C.04 Basic Crosswalks

Support:

The basic crosswalk marking design is limited to two parallel transverse lines (See Figure 3C-1).

Option:

Basic crosswalk markings may be used if an engineering study determines that establishing a crosswalk would be beneficial to:

- A. Define where the channelization of pedestrians or other non-motorized users is necessary to facilitate crossing the roadway.
- B. Alert motorists to the location of where pedestrians and other non-motorized users may be expected when crossing the roadway.
- C. Establish a crosswalk at a controlled intersection.
- D. Fulfill a legal need to mark the crosswalk.

Figure 3C-1. Examples of Crosswalk Markings

Section 7C.v 3C.05 High-Visibility Crosswalks

Option:

High-visibility crosswalk markings may be used where additional conspicuity is desired for a crosswalk over basic transverse crosswalk markings.

Support:

High-visibility crosswalk markings are limited to the Longitudinal Bar, Perpendicular, and Double Paired designs (See Figure 3C-1).

High-visibility crosswalk markings can provide benefits to crosswalk operations including:

- A. Providing greater detection distances for the approaching motorist.
- B. Establishing a crosswalk where substantial numbers of pedestrians cross without any other traffic control device.
- C. Establishing a crosswalk at an uncontrolled intersection.
- D. Emphasizing the location where a high number of conflicts between turning motorists and users of the crosswalk are expected.
- E. Improving visibility of the crosswalk location for otherwise difficult to detect pedestrians or other non-motorized users of the crosswalk.
- F. Establishing a school crossing.

Standard:

The minimum number of individual longitudinal elements to establish a high-visibility crosswalk shall be three. For the double-paired crosswalk design (see Section 3C.08), a coupling set of two longitudinal bars shall be considered to be one individual longitudinal element.

The dimensions of the individual longitudinal element and the lateral spacing between subsequent individual longitudinal elements for a high-visibility crosswalk shall be uniform when establishing the crosswalk.

The dimensions of the individual longitudinal element and the lateral spacing between subsequent individual longitudinal elements for a high-visibility crosswalk shall be uniform on both sides of a median refuge island if one is present.

Guidance:

The dimensions of the individual longitudinal element and the lateral spacing between subsequent individual longitudinal elements for a high-visibility crosswalk should be uniform when establishing separate crosswalks on multiple approaches to the same intersection.

The individual longitudinal elements of a high-visibility crosswalk should be angled such that they are parallel to approaching traffic.

Section 7C.v 3C.06 Longitudinal Bar Crosswalks

Support:

The longitudinal bar crosswalk marking design provides for improved detection and recognition over the basic crosswalk for people with low vision and cognitive impairments.

Standard:

The width of an individual longitudinal bar shall not be less than 12 inches or greater than 24 inches.

The lateral spacing between subsequent longitudinal bars shall not be less than 12 inches or greater than 60 inches. The lateral spacing of the longitudinal bars shall not exceed 2.5 times the width of a longitudinal bar.

Section 7C.v 3C.07 Perpendicular Crosswalks

Support:

Perpendicular crosswalks implement a pattern where interior longitudinal bars are perpendicular to the transverse lines used to define the limits of the crosswalk.

Since the longitudinal component of the perpendicular crosswalk marking design is similar to the benefits provided by the longitudinal bar crosswalk design, the perpendicular crosswalk design is normally used to discourage or prohibit diagonal walking between crosswalks.

Standard:

The transverse lines used to establish the limits of the perpendicular crosswalk shall not be less than 6 inches or greater than 24 inches in width.

The width of an individual interior longitudinal bar shall not be less than 12 inches or greater than 24 inches.

The lateral spacing between subsequent interior longitudinal bars shall not be less than 12 inches or greater than 60 inches. The lateral spacing of the interior longitudinal bars shall not exceed 2.5 times the width of an interior longitudinal bar.

Option:

Where it may be necessary to alleviate a parallax phenomenon due to approaching roadway geometry that curves or to accommodate low approach angles of the approaching motorist, the interior longitudinal bars may be rotated up to 45 degrees to the transverse lines to remain parallel to approaching traffic.

Section 7C.v 3C.08 Longitudinal Bar Pair Crosswalks

Support:

Longitudinal bar pair crosswalks can provide the same benefits as other high visibility crosswalk designs with the opportunity for less maintenance.

Longitudinal bar pair crosswalks can be useful in locations that are susceptible to slip and fall incidents exacerbated by extreme or inclement weather, or in locations where high motorcycle or bicycle use is expected in order to maximize wheel traction with the road surface.

Standard:

The width of an individual longitudinal bar that establishes one-half of the bar pair shall not be less than 8 inches or greater than 12 inches. The lateral space between successive individual longitudinal bars within the same bar pair shall be equal to the width of one longitudinal bar.

The lateral spacing between each of the longitudinal bars in a bar pair shall not be less than 24 inches or greater than 60 inches, or 2.5 times the width of the total width of a bar pair.

Longitudinal bar pair crosswalks shall not be installed with accompanying transverse lines.

Section 7C.v 3C.09 Crosswalk Markings at Circular Intersections

Standard:

Crosswalk markings shall not be provided to or from the central island of roundabouts.

Guidance:

If pedestrian facilities are provided, crosswalks should be marked across roundabout entrances and exits to indicate where pedestrians are intended to cross.

Crosswalks should be a minimum of 20 feet from the edge of the circulatory roadway.

Support:

Chapter 3D provides figures that illustrate examples of crosswalk markings in circular intersections.

Section 7C.v 3C.10 Crosswalks for Exclusive Pedestrian Phases that Permit Diagonal Crossings

Option:

When an exclusive pedestrian phase that permits diagonal crossing of an intersection is provided at a traffic control signal, a marking as shown in Figure 3C-2 may be used for the crosswalk.

Guidance:

The segments of the crosswalk marking that facilitate the diagonal crossing should not use high-visibility crosswalk markings.

Figure 3C-2. Example of Crosswalk Markings for an Exclusive Pedestrian Phase that Permits a Diagonal Crossing

Section 7C.v 3C.11 Crosswalks at Diamond Interchanges with a Transposed Alignment Crossroad

Support:

Pedestrian crossing movements at a diamond interchange with a transposed alignment crossroad are provided at the crossover points where motor vehicle traffic becomes inverted.

Pedestrian crossing movements provided downstream on the ramp terminals can violate driver expectancy. Devices such as the pedestrian hybrid beacon and the rectangular-rapid flashing beacon do not alleviate these deficiencies in this setting.

Pedestrian crossing movements provided downstream on the ramp terminals can disorient pedestrians with limited vision or cognitive impairments by subjecting the pedestrian to cross the same ramp twice.

Guidance:

Crossings for pedestrians at diamond interchanges with a transposed alignment crossroad should be consolidated and provided where pedestrian desire lines have been demonstrated or established.

The most direct pedestrian paths should be provided to minimize pedestrians whom may cross outside of crosswalks where drivers are less likely to expect them.

Option:

Where the pedestrian movement is facilitated using the median on a shared-use path, Destination Guide signs for shared-use paths may be used (see Section 9D.12).

Support:

Figure 3B-29 illustrates the location of pedestrian crossings at diamond interchanges with a transposed alignment crossroad.

Section 7C.v 3C.12 Pedestrian Islands and Medians

Support:

Raised islands or medians of sufficient width that are placed in the center area of a street or highway can serve as a place of refuge for pedestrians who are attempting to cross at a midblock or intersection location. Center islands or medians allow pedestrians to find an adequate gap in one direction of traffic at a time, as the pedestrians are able to stop, if necessary, in the center island or median area and wait for an adequate gap in the other direction of traffic before crossing the second half of the street or highway. The minimum widths for accessible refuge islands and for design and placement of detectable warning surfaces are provided in the “Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG)” (see Section 1A.05).

Section 7C.v 3D.04 Yield Lines for Roundabouts

Standard:

A yield line (see Section 3B.19) shall be used at multilane roundabout entries to indicate the point in each entry lane behind which vehicles are required to yield to all circulating lanes at the entrance to a roundabout (see Figure 3D-2).

Support:

See Section 2B.09 regarding the TO ALL LANES (R1-2bP) plaque use beneath the YIELD sign.

Option:

A yield line may be used at single-lane roundabout entries to indicate the point behind which vehicles are required to yield at the entrance to a roundabout.

CHAPTER 7D.v 3J. MARKING AND DELINEATION OF ISLANDS AND CURB EXTENSIONS

Section 7D.v 3J.01 General

Support:

This Chapter addresses the marking and delineation of islands (see definition in Section 1C.02) and also curb extensions designated by pavement markings. Definitions, types, sizes, and other criteria for the design of islands are set forth in “A Policy on Geometric Design of Highways and Streets” (see Section 1A.05).

Section 7C.y 3C.12 contains information on pedestrian islands and medians.

Sections 3H.04 and 3H.05 contain information on colored pavement that can be used within islands.

Option:

An island may be designated by curbs, pavement edges, pavement markings, channelizing devices, or other devices.

Section 7D.v 3J.02 Approach-End Treatment

Support:

An approach-end treatment to an island consists of longitudinal pavement markings and/or channelizing devices upstream of the island followed by a divergence of those pavement markings and/or channelizing devices concluding with a transition to other pavement markings that demarcate or outline the island (see Figure 3J-1).

Section 3B.13 contains information on pavement marking that function as approach-end treatments for obstructions.

Guidance:

The ends of islands first approached by traffic should be provided an approach-end treatment, or curb markings (see Section 3J.04), or both to guide vehicles into desired paths of travel along the island edge.

When raised bars or buttons that project more than 1 inch above the pavement surface are used to create a rumble section in the neutral area, the raised bars or buttons should be marked with white or yellow retroreflective materials, as determined by the direction or directions of travel they separate.

Figure 3J-1. Example of Markings for Approach End-Treatment to an Island

Section 7D.v 3J.03 Islands Designated by Pavement Markings

Standard:

Except as provided in Paragraph 2, islands formed by pavement markings only shall be established using channelizing lines, and shall be white when separating traffic flows in the same general direction or yellow when separating opposing directions of traffic.

If a continuous flush median island separating travel in opposite directions is used, two sets of solid double yellow lines shall be used to form the island (see Figure 3B-5). Other markings in the median island area, such as diagonal lines (see Section 3B.25), shall also be yellow, except crosswalk markings which shall be white (see Chapter 3C).

If used, chevrons and diagonal markings (see Section 3B.25) within the island shall be the same color as the channelizing line.

Option:

Both chevrons and diagonal markings of the same color may be used within the same island based on engineering judgment.

Support:

Figure 3J-2 illustrates examples of islands designated by pavement markings.

Figure 3J-2. Examples of Islands Designated by Pavement Markings

Section 7D.v 3J.04 Curb Markings for Raised Islands

Standard:

Where curbs are marked for delineation or visibility purposes, the colors shall comply with the general principles of markings (see Section 3A.03).

Guidance:

Retroreflective solid yellow curb markings should be placed on the approach ends of raised medians and curbs of islands that are located in the line of traffic flow where the curb serves to channel traffic to the right of the obstruction (see Figure 3J-3).

Retroreflective solid white curb markings should be used when traffic is permitted to pass on either side of the island (see Figure 3J-3).

The retroreflective area should be of sufficient length to denote the general alignment of the edge of the island along which vehicles travel, including the approach end, when viewed from the approach to the island.

Option:

Where the curbs of the islands become parallel to the direction of traffic flow or where the island is illuminated or marked with delineators, curb markings may be discontinued based on engineering judgment or study.

Curb markings at openings in a continuous median island may be omitted based on engineering judgment or study.

Figure 3J-3. Example of Markings for Approach End-Treatment to a Channelized Island

Section 7D.v 3J.05 Pavement Markings for Raised Islands

Support:

Pavement markings for raised islands include the approach-end treatment (see Section 3J.02), channelizing lines, edge lines, and chevron or diagonal markings.

Option:

Solid yellow edge lines may be used adjacent to raised islands separating travel in opposite directions (see Drawing A of Figure 3J-3).

Standard:

Except as provided in Paragraph 4 and 6, raised islands separating traffic flows in the same general direction shall be outlined with white channelizing lines (see Drawing A of Figure 3J-4).

Option:

Pavement markings for smaller raised islands may be omitted based on engineering judgment.

Guidance:

Smaller raised islands that do not apply channelizing lines, edge lines, or chevron or diagonal lines should be provided curb markings (see Section 3J.04).

Where traffic passes on the right of a raised island separating traffic flows in the same general direction, a yellow edge line may be used adjacent to raised islands of discernible size or length instead of continuing the white channelizing line from the approach-end treatment (see Drawing B of Figure 3J-4).

Support:

Yellow edge lines adjacent to raised islands that separate traffic flows in the same general direction can be advantageous as a countermeasure for wrong-way entry or travel if the yellow edge line is of discernible length.

Option:

Chevron markings may be used in neutral areas formed by diverging channelizing lines at raised islands separating traffic flows in the same general direction.

Diagonal markings of an appropriate color may be used in buffer areas between the channelizing line and the raised island (see Figure 3J-5).

Figure 3J-4. Examples of Pavement Markings for Raised Islands

Figure 3J-5. Example of Diagonal Color Pavement Markings for Channelizing Line and the Raised Island

Section 7D.v 3J.06 Island Delineation

Standard:

Delineators installed on islands shall be the same colors as the related channelizing or edge lines except that, when facing wrong-way traffic, they shall be red (see Section 3G-3).

Each roadway through an intersection shall be considered separately in positioning delineators to assure maximum effectiveness.

Option:

Retroreflective or internally illuminated raised pavement markers of the appropriate color may be placed on the pavement in front of the curb and/or on the top of curbed approach ends of raised medians and curbs of islands, as a supplement to or as a substitute for retroreflective curb markings.

Section 7D.v 3J.07 Curb Extensions Designated by Pavement Markings

Support:

Curb extensions are used to extend the sidewalk or other pedestrian space, shorten crossing distances for pedestrians, alter the roadway geometry for speed control or channelizing, and for other purposes.

Curb extensions are typically created by physical infrastructure including concrete or asphalt, but can also be designated by pavement markings.

For the purposes of this Section, the paved areas between the solid double line forming the curb extension (see Paragraph 4 of this Section) and the sidewalk or other roadside area are considered to be outside of the street.

Standard:

Curb extensions formed by pavement markings shall be established using solid double lines. The color of the solid double line shall comply with the general principles of markings (see Section 3A.03).

Guidance:

Physical separation or delineation should be provided where curb extensions are created by pavement markings and pedestrian travel can be expected within the area created by the curb extension.

Option:

Channelizing devices such as tubular markers (see Chapter 3I) may be used along the solid double line of a curb extension created by pavement markings.

Other methods of physical separation may be used beyond the solid double line outside of the limits of the street.

Guidance:

Diagonal markings (see Section 3B.24) or colored pavement (see Chapter 3H) should be used within the marked curb extension to emphasize that the area is outside of the street.

Support:

Curb extensions are distinct from areas within the street such as shoulders, flush medians, or gore areas where travel is discouraged by the presence of diagonal markings (see Section 3B.24). Curb extensions designate areas outside of the street where travel is prohibited.

Guidance:

Where pedestrian travel can be expected within curb extensions created by pavement markings, adequate provisions should be made for pedestrians with disabilities.

Support:

Additional information on the design and construction of accessible facilities is found in publications listed in Section 1A.05 (see Publications 12 and 42).

Figure 3J-6 illustrates examples of curb extensions designated by pavement markings.

Figure 3J-6. Examples of Curb Extensions Designed by Pavement Markings

CHAPTER 7E – Traffic Control Signals for Pedestrian Facilities

Section 7E.v 4C.05 Warrant 4, Pedestrian Volume

Support:

The Pedestrian Volume signal warrant is intended for application where the traffic volume on a major street is so heavy that pedestrians experience excessive delay in crossing the major street.

Guidance:

The need for a traffic control signal at an intersection or midblock crossing should be considered if an engineering study finds that one of the following criteria is met:

- A. *For each of any 4 hours of an average day, the plotted points representing the vehicles per hour on the major street (total of both approaches) and the corresponding pedestrians per hour crossing the major street (total of all crossings) all fall above the curve in Figure 4C-5; or*
- B. *For 1 hour (any four consecutive 15-minute periods) of an average day, the plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding pedestrians per hour crossing the major street (total of all crossings) falls above the curve in Figure 4C-7.*

Figure 4C-5. Warrant 4, Pedestrian Four-Hour Volume

Option:

If the posted or statutory speed limit or the 85th-percentile speed on the major street exceeds 35 mph, or if the intersection lies within the built-up area of an isolated community having a population of less than 10,000, Figure 4C-6 may be used in place of Figure 4C-5 to evaluate Criterion A in Paragraph 2, and Figure 4C-8 may be used in place of Figure 4C-7 to evaluate Criterion B in Paragraph 2.

Figure 4C-6. Warrant 4, Pedestrian Four-Hour Volume (70% Factor)

Figure 4C-7. Warrant 4, Pedestrian Peak Hour

Figure 4C-8. Warrant 4, Pedestrian Peak Hour (70% Factor)

Where there is a divided street having a median of sufficient width for pedestrians to wait, the criteria in Items A and B of Paragraph 2 may be applied separately to each direction of vehicular traffic.

Guidance:

The Pedestrian Volume signal warrant should not be applied at locations where the distance to the nearest traffic control signal or STOP sign controlling the street that pedestrians desire to cross is less than 300 feet, unless the proposed traffic control signal will not restrict the progressive movement of traffic.

Standard:

If this warrant is met and a traffic control signal is justified by an engineering study, the traffic control signal shall be equipped with pedestrian signal heads complying with the provisions set forth in Chapter 4I.

Guidance:

If this warrant is met and a traffic control signal is justified by an engineering study, then:

- A. *If it is installed at an intersection or major driveway location, the traffic control signal should also control the minor-street or driveway traffic, should be traffic-actuated, and should include pedestrian detection.*
- B. *If it is installed at a non-intersection crossing, the traffic control signal should be installed at least 100 feet from side streets or driveways that are controlled by STOP or YIELD signs, and should be pedestrian-actuated. If the traffic control signal is installed at a non-intersection crossing, at least one of the signal faces should be over the traveled way for each approach, parking and other sight obstructions should be prohibited for at least 100 feet in advance of and at least 20 feet beyond the crosswalk or site accommodations should be made through curb extensions or other techniques to provide adequate sight distance, and the installation should include suitable standard signs and pavement markings.*
- C. *Furthermore, if it is installed within a signal system, the traffic control signal should be coordinated.*

Option:

The criterion for the pedestrian volume crossing the major street may be reduced as much as 50 percent if the 15th-percentile crossing speed of pedestrians is less than 3.5 feet per second.

A traffic control signal may not be needed at the study location if adjacent coordinated traffic control signals consistently provide gaps of adequate length for pedestrians to cross the street.

Section 7E.v 4C.06 Warrant 5, School Crossing

Support:

The School Crossing signal warrant is intended for application where the fact that schoolchildren cross the major street is the principal reason to consider installing a traffic control signal. For the purposes of this warrant, the word "schoolchildren" includes elementary through high school students.

Guidance:

The need for a traffic control signal should be considered when an engineering study of the frequency and adequacy of gaps in the vehicular traffic stream as related to the number and size of groups of schoolchildren at an established school crossing across the major street shows that the number of adequate gaps in the traffic stream during the period when the schoolchildren are using the crossing is less than the number of minutes in the same period and there are a minimum of 20 schoolchildren during the highest crossing hour.

Before a decision is made to install a traffic control signal, consideration should be given to the implementation of other remedial measures, such as warning signs and flashers, school speed zones, school crossing guards, or a grade-separated crossing.

The School Crossing signal warrant should not be applied at locations where the distance to the nearest traffic control signal along the major street is less than 300 feet, unless the proposed traffic control signal will not restrict the progressive movement of traffic.

Standard:

If this warrant is met and a traffic control signal is justified by an engineering study, the traffic control signal shall be equipped with pedestrian signal heads complying with the provisions set forth in Chapter 4I.

Guidance:

If this warrant is met and a traffic control signal is justified by an engineering study, then:

A. If it is installed at an intersection or major driveway location, the traffic control signal should also control the minor-street or driveway traffic, should be traffic-actuated, and should include pedestrian detection.

B. If it is installed at a non-intersection crossing, the traffic control signal should be installed at least 100 feet from side streets or driveways that are controlled by STOP or YIELD signs, and should be pedestrian-actuated. If the traffic control signal is installed at a non-intersection crossing, at least one of the signal faces should be over the traveled way for each approach, parking and other sight obstructions should be prohibited for at least 100 feet in advance of and at least 20 feet beyond the crosswalk or site accommodations should be made through curb extensions or other techniques to provide adequate sight distance, and the installation should include suitable standard signs and pavement markings.

C. Furthermore, if it is installed within a signal system, the traffic control signal should be coordinated

Section 7E.v 4D.02 Provisions for Pedestrians

Support:

Chapter 4I contains additional information regarding pedestrian signals and Chapter 4J contains additional information regarding pedestrian hybrid beacons.

Standard:

Pedestrian signal heads shall be used in conjunction with vehicular traffic control signals under any of the following conditions, unless the crossing is prohibited or as provided in the Option in Paragraph 05a:

A. If the basis for traffic signal installation was justified by an engineering study and meeting either Warrant 4, Pedestrian Volume or Warrant 5, School Crossing (see Chapter 4C);

B. If an exclusive pedestrian signal phase is provided with all conflicting vehicular movements being stopped;

- C. At an established signalized school crossing;
- D. Where there are existing pedestrian accommodations and 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 installed at each marked crosswalk at a location controlled by a traffic control signal.

Accessible pedestrian signals (see Chapter 4K) that provide information in non-visual formats (such as audible tones, speech messages, and/or vibrating surfaces) should be provided based on the results of an engineering study considering the factors listed in Section 4K.01.

Where pedestrian movements regularly occur, pedestrians should be provided with sufficient time to cross the roadway by adjusting the traffic control signal operation and timing to provide sufficient crossing time every cycle or by providing pedestrian detectors.

If it is necessary or desirable to prohibit certain pedestrian movements at a traffic control signal location, No Pedestrian Crossing (R9-3) signs (see Section 2B.61) should be used if it is not practical to provide a barrier or other physical feature to physically discourage the pedestrian movements.

Pedestrian signal heads may be used under other conditions based on engineering judgement.

CHAPTER 4I. PEDESTRIAN CONTROL FEATURES

Section 7E.v 4I.01 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).

See Section 4D.02 for information on when to use pedestrian signal heads.

Guidance:

Accessible pedestrian signals (see Chapter 4K) that provide information in non-visual formats (such as audible tones, speech messages, and/or vibrating surfaces) should be provided based on the results of an engineering study considering the factors listed in Section 4K.01.

Support:

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 7E.v 4I.02 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 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 and Markings" book (see Section 1A.05) shall be used. Each pedestrian signal head indication shall be independently displayed and emit a single color.

Figure 4I-1. Typical Pedestrian Signal Indications

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, 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.

Except as provided in Paragraph 5, the requirements of Chapter 3 of the publication entitled "Equipment and Materials Standards of the Institute of Transportation Engineers" (see Section 1A.05) 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, the requirements of the publication entitled "Pedestrian Traffic Control Signal Indicators – Light Emitting Diode (LED) Signal Modules" (see Section 1A.05) 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:

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, as appropriate.

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:

For pedestrian signal head indications, the symbols shall be at least 6 inches 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 or 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.

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.

Option:

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:

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 7E.v 4I.03 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 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:

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

Section 7E.v 4I.04 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 4I-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. 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:

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.07) 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 4F.19), the countdown pedestrian signal display should be discontinued and go dark immediately upon activation of the preemption transition.

Section 7E.v 4I.05 Pedestrian Detectors

Option:

Pedestrian detectors may be push buttons or passive detection devices. Pedestrian detectors may include features that allow touch-free activation in addition to all other push button features required in this section.

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 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 and

Code of Federal Regulations. Title 28, Parts 35 and 36. Americans with Disabilities Act of 1990 (see Section 1A.05).

Guidance:

If pedestrian push buttons are used, they should be capable of easy activation requiring no more than 5 pounds of force, not require tight grasping, pinching, or twisting of the wrist, and be conveniently located near each end of the crosswalks. Except as provided in Paragraphs 5 and 6, 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 clearance 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.

Figure 4I-2. Pushbutton Location Area

Figure 4I-3. Typical Pushbutton Locations

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

Where there are physical constraints that make it impractical 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).

Except as provided in Paragraph 8, 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:

Where there are physical constraints on a particular corner that make it impractical to provide the 10-foot separation between the two pedestrian push buttons, or when an exclusive pedestrian phase is used at an intersection and the pedestrian signals controlling the crosswalks on a given corner of the intersection both operate together such that the "Walk" indication is always simultaneous for both crosswalks, the push buttons may be placed closer together or on the same pole.

Support:

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

Standard:

If a pedestrian push button is provided, a sign (see Section 2B.62) shall also be installed explaining the purpose and use of the pedestrian push button detector.

Option:

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

Standard:

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.

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 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:

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:

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:

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 Section 2B.62) shall be installed.

Section 7E.y 4I.06 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.

Except as provided in Paragraph 3, 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.

When the pedestrian signal heads at a pedestrian hybrid beacon (see Chapter 4J) location are displaying a flashing UPRAISED HAND (symbolizing DONT WALK) signal indication, a flashing 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.

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 DONT 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 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 8 through 17). 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 4I-4 illustrates the pedestrian intervals and their possible relationships with associated vehicular signal phase intervals.

Figure 4I-4. Pedestrian Intervals

Guidance:

Except as provided in Paragraph 9, 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:

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.

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:

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.

Except as provided in Paragraph 13, 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 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:

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 (see Sections 4I.06 and 4K.02) if actuated operation is used, shall be provided and signing such as the R10-3d sign (see Section 2B.62) 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 Chapter 4K) 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 4F.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.

Guidance:

If a leading pedestrian interval is used, the use of accessible pedestrian signals (see Chapter 4K) should be considered.

Support:

If a leading pedestrian interval is used without accessible features, pedestrians with vision disabilities 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.

Standard:

At locations where a leading pedestrian interval is used without accessible pedestrian signals, the minimum required time for the Walk Interval shall be displayed in addition to the time provided for 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.

Page Break

CHAPTER 7F.v 4J. PEDESTRIAN HYBRID BEACONS

Section 7E.v 4J.01 Application of Pedestrian Hybrid Beacons

Support:

A pedestrian hybrid beacon is a special type of hybrid beacon used to warn and control traffic at an unsignalized location to assist pedestrians in crossing a street or highway at a marked crosswalk.

Option:

A pedestrian hybrid beacon may be considered for installation to facilitate pedestrian crossings at a location that does not meet traffic signal warrants (see Chapter 4C), or at a location that meets traffic signal warrants under Sections 4C.05 and/or 4C.06 but a decision is made to not install a traffic control signal.

Standard:

If used, pedestrian hybrid beacons shall be used in conjunction with signs and pavement markings to warn and control traffic at locations where pedestrians enter or cross a street or highway. A pedestrian hybrid beacon shall only be installed at a marked crosswalk.

Guidance:

If one of the signal warrants of Chapter 4C is met and a traffic control signal is justified by an engineering study, and if a decision is made to install a traffic control signal, it should be installed based upon the provisions of Chapters 4D through 4I and 4K.

If a traffic control signal is not justified under the signal warrants of Chapter 4C and if gaps in traffic are not adequate to permit pedestrians to cross, or if the speed for vehicles approaching on the major street is too high to permit pedestrians to cross, or if pedestrian delay is excessive, the need for a pedestrian hybrid beacon should be considered on the basis of an engineering study that considers major-street volumes, speeds, widths, and gaps in conjunction with pedestrian volumes, walking speeds, and delay.

For a major street where the posted or statutory speed limit or the 85th-percentile speed is 35 mph or less, the need for a pedestrian hybrid beacon should be considered if the engineering study finds that the plotted point representing the vehicles per hour on the major street (total of both approaches) and the

corresponding total of all pedestrians crossing the major street for 1 hour (any four consecutive 15-minute periods) of an average day falls above the applicable curve in Figure 4J-1 for the length of the crosswalk.

For a major street where the posted or statutory speed limit or the 85th-percentile speed exceeds 35 mph, the need for a pedestrian hybrid beacon should be considered if the engineering study finds that the plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding total of all pedestrians crossing the major street for 1 hour (any four consecutive 15-minute periods) of an average day falls above the applicable curve in Figure 4J-2 for the length of the crosswalk.

For crosswalks that have lengths other than the four that are specifically shown in Figures 4J-1 and 4J-2, the values should be interpolated between the curves.

Figure 4J-1. Guidelines for the Installation of Pedestrian Hybrid Beacons on Low-Speed Roadways

Figure 4J-2. Guidelines for the Installation of Pedestrian Hybrid Beacons on High-Speed Roadways

Option:

The criteria for the pedestrian volume crossing the major street shown in Figures 4J-1 and 4J-2 may be reduced as much as 50 percent if the 15th-percentile crossing speed of pedestrians is less than 3.5 feet per second.

Where there is a divided street having a median of sufficient width for pedestrians to wait, the criteria for the major-street traffic volume shown in Figures 4J-1 and 4J-2 may be applied separately to each direction of vehicular traffic.

Section 7E.v 4J.02 Design of Pedestrian Hybrid Beacons

Standard:

Except as otherwise provided in this Section, a pedestrian hybrid beacon shall meet the provisions of Chapters 4D through 4G, 4I, and 4J.

A pedestrian hybrid beacon face shall consist of three signal sections, with a CIRCULAR YELLOW signal indication centered below two horizontally aligned CIRCULAR RED signal indications (see Figure 4J-3).

When an engineering study finds that installation of a pedestrian hybrid beacon is justified, then:

- A. At least two pedestrian hybrid beacon faces shall be installed for each approach of the major street,
- B. A stop line shall be installed for each approach to the crosswalk,
- C. A pedestrian signal head complying with the provisions set forth in Chapter 4I shall be installed at each end of the marked crosswalk,
- D. The pedestrian hybrid beacon shall be pedestrian actuated, and
- E. If the pedestrian hybrid beacon is installed at or immediately adjacent to an intersection with a minor street, a STOP sign shall be installed for each minor-street approach.

Figure 4J-3. Sequence for a Pedestrian Hybrid Beacon

Guidance:

When an engineering study finds that installation of a pedestrian hybrid beacon is justified, then:

- A. Parking and other sight obstructions should be prohibited for at least 100 feet in advance of and at least 20 feet beyond the marked crosswalk, or site accommodations should be made through curb extensions or other techniques to provide adequate sight distance, and
- B. If installed within a signal system, the pedestrian hybrid beacon should be coordinated.

On approaches having posted or statutory speed limits or 85th-percentile speeds in excess of 35 mph and on approaches having traffic or operating conditions that would tend to obscure visibility of roadside hybrid beacon face locations, both of the minimum of two pedestrian hybrid beacon faces should be installed over the roadway.

On multi-lane approaches having posted or statutory speed limits or 85th-percentile speeds of 35 mph or less, either a pedestrian hybrid beacon face should be installed on each side of the approach (if a

median of sufficient width exists) or at least one of the pedestrian hybrid beacon faces should be installed over the roadway.

A pedestrian hybrid beacon should comply with the signal face location provisions described in Sections 4D.04 through 4D.09.

Accessible pedestrian signals should be installed in conjunction with a pedestrian hybrid beacon.

Option:

A CROSSWALK STOP ON RED (symbolic circular red) (R10-23) sign or a STOP ON RED—PROCEED ON FLASHING RED WHEN CLEAR (R10-23a) sign (see Section 2B.63) may be installed facing each major street approach.

Option:

A Pedestrian (W11-2) warning sign (see Section 2C.55) with an AHEAD (W16-9P) supplemental plaque may be placed in advance of a pedestrian hybrid beacon. A warning beacon may be installed to supplement the W11-2 sign.

Guidance:

If a warning beacon supplements a W11-2 sign in advance of a pedestrian hybrid beacon, it should be programmed to flash only when the pedestrian hybrid beacon is not in the dark mode.

Standard:

If a warning beacon is installed to supplement the W11-2 sign, the design and location of the warning beacon shall comply with the provisions of Sections 4S.01 and 4S.03.

Bicycle signal faces (see Chapter 4H) shall not be used at a pedestrian hybrid beacon.

Section 7E.v 4J.03 Operation of Pedestrian Hybrid Beacons

Standard:

Pedestrian hybrid beacon indications shall be dark (not illuminated) during periods between actuations.

Following an actuation by a pedestrian, a pedestrian hybrid beacon face shall display a flashing CIRCULAR YELLOW signal indication, followed by a steady CIRCULAR YELLOW signal indication, followed by both steady CIRCULAR RED signal indications during the pedestrian walk interval, followed by alternating flashing CIRCULAR RED signal indications during the pedestrian change interval (see Figure 4J-3). Upon termination of the pedestrian change interval, the pedestrian hybrid beacon faces shall revert to a dark (not illuminated) condition.

Except as provided in Paragraph 4, the pedestrian signal heads shall continue to display a steady UPRAISED HAND (symbolizing DONT WALK) signal indication when the pedestrian hybrid beacon faces are either dark or displaying flashing or steady CIRCULAR YELLOW signal indications. The pedestrian signal heads shall display a WALKING PERSON (symbolizing WALK) signal indication when the pedestrian hybrid beacon faces are displaying steady CIRCULAR RED signal indications. The pedestrian signal heads shall display a flashing UPRAISED HAND (symbolizing DONT WALK) signal indication when the pedestrian hybrid beacon faces are displaying alternating flashing CIRCULAR RED signal indications. Upon termination of the pedestrian change interval, the pedestrian signal heads shall revert to a steady UPRAISED HAND (symbolizing DONT WALK) signal indication.

Option:

Where the pedestrian hybrid beacon is installed adjacent to a roundabout to facilitate crossings by pedestrians with visual disabilities and an engineering study determines that pedestrians without visual disabilities can be allowed to cross the roadway without actuating the pedestrian hybrid beacon, the pedestrian signal heads may be dark (not illuminated) when the pedestrian hybrid beacon faces are dark.

Guidance:

The duration of the flashing yellow interval should be determined by engineering judgment.

If the pedestrian hybrid beacon is coordinated as a part of a signal system:

A. The duration of the flashing yellow interval should not vary on a cycle-by-cycle basis.

B. The pedestrian hybrid beacon should remain in the dark condition after a pedestrian actuation has been received until the point in the background cycle when the predetermined duration of the flashing yellow interval needs to be initiated in order to achieve the appropriate coordinated offset.

Option:

If a minimum dark time between activations of the pedestrian hybrid beacon has been set on the controller, the pedestrian hybrid beacon may remain in the dark condition after a pedestrian actuation has been received until the minimum dark time has been provided.

Standard:

The duration of the steady yellow change interval shall be determined using engineering practices in accordance with the provisions in Section 4F.17.

Guidance:

A yellow change interval should have a minimum duration of 3 seconds and a maximum duration of 6 seconds (see Section 4F.17). The longer intervals should be reserved for use on approaches with higher speeds.

Option:

A steady red clearance interval may be used after the steady yellow change interval.

The alternating flashing CIRCULAR RED signal indications may continue to flash for a short period after the pedestrian change interval has terminated to provide a buffer interval for pedestrians.

A pedestrian hybrid beacon that is located in close proximity to an active grade crossing may be preempted in accordance with the applicable provisions in Sections 4F.19 and 8D.09.

Standard:

If a pedestrian hybrid beacon is placed into a flashing mode by a conflict monitor (malfunction management unit) or by a manual switch, the pedestrian hybrid beacon faces shall display flashing CIRCULAR YELLOW signal indications to each approach of the major street and the pedestrian signal heads shall revert to a dark (not illuminated) condition.

CHAPTER 7E.v 4K. ACCESSIBLE PEDESTRIAN SIGNALS AND DETECTORS

Section 7E.v 4K.01 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 vision 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 vision 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. Furthermore, 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 (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 indicate which pedestrian crossing is served by each device.

Under steady (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 push buttons or passive detection devices.

Guidance:

At locations where it is not necessary for pedestrians to push a push button detector to receive a WALKING PERSON signal indication, pedestrian push buttons should be used to activate the accessible pedestrian signals and to provide information in non-visual formats to assist pedestrians with visual disabilities.

Support:

Accessible pedestrian signals are typically integrated into the pedestrian detector (push button), so the audible tones and/or messages come from the push button housing. They have a push button locator tone and a vibrotactile 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 can be found in the U.S. Department of Justice 2010 ADA Standards for Accessible Design, September 15, 2010 and Code of Federal Regulations. Title 28, Parts 35 and 36. Americans with Disabilities Act of 1990 (see Section 1A.05).

Standard:

At accessible pedestrian signal locations where pressing the pedestrian push button is necessary to activate the walk interval, pressing the pedestrian push button shall activate both the walk interval and the accessible pedestrian signals.

Section 7E.v 4K.02 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:

Push buttons for accessible pedestrian signals should be located in accordance with the provisions of Section 4I.05 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:

Except for the situation regarding simultaneous “Walk” indications for both crosswalks as described in Paragraph 8 of Section 4I.06, if two accessible pedestrian push buttons are placed less than 10 feet apart or on the same pole (see Paragraphs 7 and 8 in Section 4I.06), each accessible pedestrian push button shall be provided with the following features:

A. A speech walk message for the WALKING PERSON (symbolizing WALK) indication (see Section 4K.03), and

B. A speech push button information message (see Section 4K.05).

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 signal detectors are used, an additional accessible pedestrian signal detector shall be provided in the median.

Section 7E.v 4K.03 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 vibrotactile arrow that is located on the push button or on the speaker box (see Paragraph 1 in Section 4K.04). The vibrotactile arrow shall vibrate 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 at the beginning of the associated 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 longer than the pedestrian change interval.

Standard:

Where two accessible pedestrian signals on one corner, or in a median, that are associated with different phases are placed less than 10 feet apart, the audible walk indication shall be a speech walk message (see Paragraph 3 in Section 4K.02). In all other cases, including at midblock crossings, on corners where only one accessible pedestrian signal is present, in a median, and on corners where two accessible pedestrian signals are separated by a distance of at least 10 feet, the audible walk indication shall be a percussive tone.

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 push button locator tones (see Section 4K.04) 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 push button press.

Standard:

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

Guidance:

The sound level of audible walk indications and push button 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. 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 push button. This can be done by means of a speech push button information message (see Section 4K.05) during the flashing or steady UPRAISED HAND intervals, or by raised print and Braille labels on the push button housing.

By combining the information from the push button message or Braille label, the vibrotactile 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 push buttons 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.

Guidance:

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

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

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 4I.06) 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.

Standard:

If used, speech walk messages in a language other than English shall be stated first in English, and then repeated in the second language, alternating back and forth while the walk interval is timing.

Section 7E.v 4K.04 Vibrotactile Arrows and Locator Tones

Standard:

To enable pedestrians who have visual disabilities to distinguish and locate the appropriate push button at an accessible pedestrian signal location, and to help them align with the crosswalk, each push button shall clearly indicate by means of a vibrotactile arrow which crosswalk signal is actuated by the push button. Vibrotactile arrows shall be located on the button of the push

button assembly or immediately adjacent to the button on the same surface of the push button assembly housing, shall 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. If a push button is not provided for pedestrian detection or to activate the accessible pedestrian signal features, the vibrotactile arrow shall be located on the speaker box, and the speaker box shall be located in compliance with Section 4I.06.

A locator tone shall be incorporated into the accessible pedestrian signal equipment to help pedestrians with visual disabilities locate the tactile arrow, and the associated push button if a push button is provided.

Support:

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

Standard:

Push button locator tones shall have a duration of 0.15 seconds or less, and except as provided in Paragraph 5, push button locator shall repeat at 1-second intervals at all times that the audible walk indication is not active, including during the pedestrian change interval and during the time that the pedestrian signal is resting in walk (see Paragraph 6 in Section 4K.03).

Option:

The push button locator tone may default to a deactivated mode during periods when the steady UPRAISED HAND (symbolizing DONT WALK) signal indication is being displayed for the associated crosswalk if a passive pedestrian detection system is implemented that activates the locator tone at all times (other than when the audible walk indication is active) that a pedestrian is present within a 12-foot radius from the push button location. Where pedestrian facilities (such as sidewalks) are present, the passive detection requirement may be reduced such that it only applies to pedestrians who are on the pedestrian facilities within the 12-foot radius from the push button location.

Standard:

Push button locator tones shall be deactivated when the traffic control signal or pedestrian hybrid beacon 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 steady (stop-and-go) mode by pedestrian actuations.

Push button locator tones shall be intensity responsive to ambient sound.

Guidance:

Push button locator tones should be audible 6 to 12 feet from the push button, or to the building line, whichever is less.

Support:

Section 4K.03 contains additional provisions regarding the volume and sound level of push button locator tones.

Section 7E.v 4K.05 Extended Push Button Press Features

Option:

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

Standard:

If an extended push button press (see Paragraph 18 in Section 4I.06) is used to provide any additional feature(s), a push button press of less than one second shall actuate only the pedestrian timing and any associated accessible walk indication, and a push button press of one second or more shall actuate the pedestrian timing, any associated accessible walk indication, and any additional feature(s).

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 is not appropriate at locations with channelized turns or split phasing, because of the possibility of confusion.

Guidance:

Audible beaconing should be considered following an engineering study at:

- A. Crosswalks longer than 70 feet, unless those crosswalks 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.*

Guidance:

If audible beaconing is used, it should be initiated by an extended push button press.

Standard:

If audible beaconing is used, the volume of the push button locator tone during the pedestrian change interval of the called pedestrian phase shall be increased to a maximum of 100 dBA, and shall come from a loudspeaker that is mounted at the far end of the crosswalk at a height of 7 to 10 feet above the pavement.

Guidance:

The audible beaconing loudspeaker mounted at the far end of the crosswalk should be within the width of the crosswalk.

Support:

When the locator tone is active during the pedestrian change interval at a traffic control signal or pedestrian hybrid beacon where audible beaconing is used, both the audible beaconing loudspeaker and the accessible pedestrian signal emit the tone.

Option:

The sound level of the accessible pedestrian signal walk indication and subsequent push button locator tone may be increased by an extended push button press.

Speech push button 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 push button 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 push button 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 push button information messages is included in ITE’s “Electronic Toolbox for Making Intersections More Accessible for Pedestrians Who Are Blind or Visually Impaired,” which is available at ITE’s website (see Page i).Page Break

CHAPTER 7E.v 4L. RECTANGULAR RAPID FLASHING BEACONS

Section 7E.v 4L.01 Application of Rectangular Rapid Flashing Beacons

Option:

A pedestrian-activated rectangular rapid flashing beacon (RRFB) may be used to provide supplemental emphasis to pedestrian, school, and trail warning signs at marked crosswalks across uncontrolled approaches.

Standard:

An RRFB shall only be installed to function as a Warning Beacon (see Section 4S.03). Except as otherwise provided in this Chapter, all other provisions of the MUTCD applicable to Warning Beacons shall apply to RRFBs.

An RRFB shall only be used to supplement a post-mounted W11-2 (Pedestrian), S1-1 (School), or W11-15 (Trail) crossing warning sign with a diagonal downward arrow (W16-7P) plaque, or an overhead-mounted W11-2 , S1-1, or W11-15 crossing warning sign, located at or immediately adjacent to a marked crosswalk.

Except for crosswalks across the approach to or egress from a roundabout, or crosswalks across free-flow right turn lanes separated by a channelizing island, an RRFB shall not be used for crosswalks across approaches controlled by YIELD signs, STOP signs, traffic control signals, or pedestrian hybrid beacons.

Option:

In the event sight distance approaching the crosswalk at which an RRFB is used is less than deemed necessary by the engineer, an additional RRFB may be installed on that approach in advance of the crosswalk, as a Warning Beacon to supplement a W11-2 (Pedestrian), S1-1 (School), or W11-15 (Trail) crossing warning sign with an AHEAD (W16-9P) or distance (W16-2P or W16-2aP) plaque.

Standard:

If an additional RRFB is installed on the approach in advance of the crosswalk, it shall be supplemental to and not a replacement for the RRFB at the crosswalk itself.

Section 7F.y 4L.02 Design of Rectangular Rapid Flashing Beacons

Standard:

Each RRFB unit shall consist of two rapidly-flashed rectangular-shaped yellow indications, each with an LED-array based pulsing light source. The size of each RRFB indication shall be at least 5 inches wide by at least 2 inches high.

The two RRFB indications for each RRFB unit shall be aligned horizontally, with the longer dimension horizontal and with a minimum space between the two indications of at least 7 inches, measured from nearest edge of one indication to the nearest edge of the other indication. The outside edges of the RRFB indications, including any housings, shall not project beyond the outside edges of the W11-2, S1-1, or W11-15 sign that it supplements.

An RRFB unit shall not be installed independent of the crossing warning signs for the approach that the RRFB faces. If the RRFB unit is supplementing a post-mounted sign, the RRFB unit shall be installed on the same support as the associated W11-2 , S1-1, or W11-15 crossing warning sign and plaque. If the RRFB unit is supplementing an overhead-mounted sign, the RRFB unit shall be mounted directly below the bottom of the sign.

Option:

As a specific exception to Paragraph 6 of Section 4S.01, the RRFB unit associated with a post-mounted sign and plaque may be located between and immediately adjacent to the bottom of the crossing warning sign and the top of the supplemental downward diagonal arrow plaque (or, in the case of a supplemental advance sign, the AHEAD or distance plaque) or within 12 inches above the crossing warning sign, rather than the recommended minimum of 12 inches above or below the sign assembly.

Standard:

For any approach on which RRFBs are used to supplement post-mounted signs, at least two W11-2 , S1-1, or W11-15 crossing warning signs (each with an RRFB unit and a W16-7P plaque) shall be installed at the crosswalk, one on the right-hand side of the roadway and one on the left-hand side of the roadway.

Guidance:

On a divided highway, the left-hand side RRFB assembly should be installed on the median, if practical, rather than on the far left side of the highway.

Standard:

For any approach on which RRFBs are used to supplement an overhead-mounted sign, at least one W11-2 , S1-1, or W11-15 crossing warning sign (without a W16-7P plaque) located approximately over the center of the lanes of the approach (or where optimum visibility can be achieved) shall be installed at the crosswalk.

Option:

RRFBs may be installed at intersections with more than one crosswalks on the same uncontrolled approach.

Standard:

If used at intersections, the design of the RRFBs shall conform to the requirements for post-mounted or overhead placement described in paragraph X.

Option:

If used at intersections with two crosswalks on an uncontrolled approach, post-mounted RRFBs may be installed to face only one direction of travel at the first crosswalk that traffic encounters (see Figure 4L-1).

Figure 4L-1. Example of Post-Mounted RRFBs Installed to Face Only One Direction of Travel at Intersections with Two Crosswalks on an Uncontrolled Approach

The light intensity of the yellow indications during daytime conditions shall meet the minimum specifications for Class 1 yellow peak luminous intensity in the Society of Automotive Engineers (SAE) Standard J595 (Directional Flashing Optical Warning Devices for Authorized Emergency, Maintenance, and Service Vehicles) dated January 2005 or the minimum specifications in subsequent versions of SAE J595.

If the RRFB indications are so bright that they cause excessive glare during nighttime conditions, an automatic signal dimming device may be used to reduce the brilliance of the RRFB indications during nighttime conditions.

Standard:

If pedestrian push button detectors (rather than passive detection) are used to actuate the RRFB indications, a PUSH BUTTON TO TURN ON WARNING LIGHTS (R10-25) sign (see Section 2B.62) shall be installed explaining the purpose and use of the pedestrian push button detector.

Guidance:

An audible information device should be used with RRFBs to assist pedestrians with visual disabilities.

Option:

A small light directed at and visible to pedestrians in the crosswalk may be installed integral to the RRFB or pedestrian push button detector to give confirmation that the RRFB is in operation.

Section 7F.y 4L.03 Operation of Rectangular Rapid Flashing Beacons

Standard:

The RRFB shall be normally dark, shall initiate operation only upon pedestrian actuation, and shall cease operation at a predetermined time after the pedestrian actuation or, with passive detection, after the pedestrian clears the crosswalk.

All RRFB units associated with a given crosswalk (including those with an advance crossing sign, if used) shall, when activated, simultaneously commence operation of their rapid flashing indications and shall cease operation simultaneously.

Guidance:

The duration of a predetermined period of operation of the RRFBs following each actuation should be based on the procedures for the timing of pedestrian clearance times for pedestrian signals (see Section 4I.07).

Standard:

The predetermined flash period shall be immediately initiated each and every time that a pedestrian is detected either through passive detection or as a result of a pedestrian pressing a push button detector, including when pedestrians are detected while the RRFBs are already flashing and when pedestrians are detected immediately after the RRFBs have ceased flashing.

When activated, the two yellow indications in each RRFB unit shall flash in a rapidly flashing sequence. As a specific exception to the requirements for the flash rate of beacons provided in Paragraph 3 of Section 4S.01, RRFBs shall use a much faster flash rate and shall provide 75 flashing sequences per minute.

Except as provided in Paragraph 7, during each 800-millisecond flashing sequence, the left and right RRFB indications shall operate using the following sequence:

A. The RRFB indication on the left-hand side shall be illuminated for approximately 50 milliseconds.

B. Both RRFB indications shall be dark for approximately 50 milliseconds.

- C. The RRFB indication on the right-hand side shall be illuminated for approximately 50 milliseconds.
- D. Both RRFB indications shall be dark for approximately 50 milliseconds.
- E. The RRFB indication on the left-hand side shall be illuminated for approximately 50 milliseconds.
- F. Both RRFB indications shall be dark for approximately 50 milliseconds.
- G. The RRFB indication on the right-hand side shall be illuminated for approximately 50 milliseconds.
- H. Both RRFB indications shall be dark for approximately 50 milliseconds.
- I. Both RRFB indications shall be illuminated for approximately 50 milliseconds.
- J. Both RRFB indications shall be dark for approximately 50 milliseconds.
- K. Both RRFB indications shall be illuminated for approximately 50 milliseconds.
- L. Both RRFB indications shall be dark for approximately 250 milliseconds.

The flash rate of each individual RRFB indication, as applied over the full flashing sequence, shall not be more than 5 flashes per second, to avoid frequencies that might cause seizures.

Option:

Existing RRFB units that use the flashing sequence that was specified in the Interim Approval 11 memorandum and a subsequent interpretation (the RRFB indication on the left-hand side emits two slow pulses of light after which the RRFB indication on the right-hand side emits four rapid pulses of light followed by one long pulse of light) may be retained for the remainder of their useful service life.

Standard:

If an audible information device is used in conjunction with an RRFB, the audible information device shall not use vibrotactile indications or percussive indications.

Guidance:

If an audible information device is used in conjunction with an RRFB, the audible message should be a speech message that says, “Yellow lights are flashing”. The audible message should be spoken twice.

Section 7F.v 4U.02 In-Roadway Warning Lights at Crosswalks

Option:

In-Roadway Warning Lights may be installed at certain marked crosswalks, based on an engineering study or engineering judgment, to provide additional warning to road users.

Standard:

If used, In-Roadway Warning Lights at crosswalks shall be installed only at marked crosswalks with applicable warning signs. They shall not be used at crosswalks controlled by YIELD signs, STOP signs, traffic control signals, or pedestrian hybrid beacons.

If In-Roadway Warning Lights are used at a crosswalk, the following requirements shall apply:

- A. Except as provided in Paragraphs 7 and 8, they shall be installed along both sides of the crosswalk and shall span its entire length.
- B. They shall initiate operation based on pedestrian actuation and shall cease operation at a predetermined time after the pedestrian actuation or, with passive detection, after the pedestrian clears the crosswalk.
- C. They shall display a flashing yellow light when actuated. The flash rate shall be at least 50, but no more than 60, flash periods per minute. If they are flashed in a manner that includes a continuous flash of varying intensity and time duration that is repeated to provide a flickering effect, the flickers or pulses shall not repeat at a rate that is between 5 and 30 per second to avoid frequencies that might cause seizures.
- D. They shall be installed in the area between the outside edge of the crosswalk line and 10 feet from the outside edge of the crosswalk.
- E. They shall face away from the crosswalk if unidirectional, or shall face away from and across the crosswalk if bidirectional.

If used on one-lane, one-way roadways, a minimum of two In-Roadway Warning Lights shall be installed on the approach side of the crosswalk. If used on two-lane roadways, a minimum of three In-Roadway Warning Lights shall be installed along both sides of the crosswalk. If used on

roadways with more than two lanes, a minimum of one In-Roadway Warning Light per lane shall be installed along both sides of the crosswalk.

Guidance:

If used, In-Roadway Warning Lights should be installed in the center of each travel lane, at the center line of the roadway, at each edge of the roadway or parking lanes, or at other suitable locations away from the normal tire track paths.

The location of the In-Roadway Warning Lights within the lanes should be based on engineering judgment.

Option:

On one-way streets, In-Roadway Warning Lights may be omitted on the departure side of the crosswalk.

Based on engineering judgment, the In-Roadway Warning Lights on the departure side of the crosswalk on the left-hand side of a median may be omitted.

Unidirectional In-Roadway Warning Lights installed at crosswalk locations may have an optional, additional yellow light indication in each unit that is visible to pedestrians in the crosswalk to indicate to pedestrians in the crosswalk that the In-Roadway Warning Lights are in fact flashing as they cross the street. These yellow lights may flash with and at the same flash rate as the light module in which each is installed.

Guidance:

If used, the period of operation of the In-Roadway Warning Lights following each actuation should be sufficient to allow a pedestrian crossing in the crosswalk to leave the curb or shoulder and 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. 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 period of operation.

An audible information device should be used with In-Roadway Warning Lights to provide assistance for pedestrians with visual disabilities.

Standard:

If pedestrian push buttons (rather than passive detection) are used to actuate the In-Roadway Warning Lights, a PUSH BUTTON TO TURN ON WARNING LIGHTS (R10-25) sign (see Section 2B.62) shall be installed explaining the purpose and use of the pedestrian push button detector.

Where the period of operation is sufficient only for crossing from a curb or shoulder to a median of sufficient width for pedestrians to wait, median-mounted pedestrian actuators shall be provided.

If an audible information device is used in conjunction with In-Roadway Warning Lights, the audible information device shall not use vibrotactile indications or percussive indications.

Guidance:

If an audible information device is used in conjunction with In-Roadway Warning Lights, the audible message during the time that the lights are flashing should be a speech message that says, "Yellow lights are flashing." The audible message should be spoken twice.

CHAPTER 7G TRAFFIC CONTROL DEVICES FOR SCHOOL AREAS 7A. GENERAL

[The below is the existing Part 7 text for School Area. It remains unchanged except for updated section reference numbers.]

Section 7G.01 7A.02 School Route Plans and School Crossings

Guidance:

A school route plan for each school serving elementary to high school students should be prepared in order to develop uniformity in the use of school area traffic controls and to serve as the basis for a school traffic control plan for each school.

The school route plan, developed in a systematic manner by the school, law enforcement, and traffic officials responsible for school pedestrian safety, should consist of a map (see Figure 7A-1) showing streets, the school, existing traffic controls, established school walk routes, and established school crossings.

The type(s) of school area traffic control devices used, either warning or regulatory, should be related to the volume and speed of vehicular traffic, street width, and the number and age of the students using the crossing.

School area traffic control devices should be included in a school traffic control plan.

Support:

To establish a safer route to and from school for schoolchildren, the application of planning criterion for school walk routes might make it necessary for children to walk an indirect route to an established school crossing located where there is existing traffic control and to avoid the use of a direct crossing where there is no existing traffic control.

Guidance:

School walk routes should be planned to take advantage of existing traffic controls.

The following factors should be considered when determining the feasibility of requiring children to walk

a longer distance to a crossing with existing traffic control:

- A. The availability of adequate sidewalks or other pedestrian walkways to and from the location with existing control,*
- B. The number of students using the crossing,*
- C. The age levels of the students using the crossing, and*
- D. The total extra walking distance.*

30

34

35

Figure 7A-1. Example of School Route Plan Map

1 **CHAPTER 7H-7B. SCHOOL SIGNS**

2 **Section 7H.01 ~~7B.01~~ Design of School Signs**

3 **Standard:**

4 **Except as provided in Section 2A.07, the sizes of signs and plaques to be used on
conventional
5 roadways in school areas shall be as shown in Table 7B-1.**

6 Option:

7 Signs and plaques larger than those shown in Table 7B-1 may be used (see Section 2A.07).

8 **Standard:**

9 **School warning signs, including the “SCHOOL” portion of the School Speed Limit (S5-1)
sign and**

10 **including any supplemental plaques used in association with these warning signs, shall have a
11 fluorescent yellow-green background with a black legend and border unless otherwise
provided in this**

12 **Manual for a specific sign.**

13 **The signs used for school area traffic control shall be retroreflective or illuminated.**

14 Support:

15 Sections 2A.12 and 2A.13 contain provisions regarding the installation, placement, and location
of signs.

16 Section 2A.14 contains provisions regarding the mounting height of signs.

17 Section 2A.15 contains provisions regarding the lateral offsets of signs.

18 The “Standard Highway Signs and Markings” book (see Section 1A.05) contains information
regarding

19 sign lettering.

20 Option:

21 In-roadway signs for school traffic control areas may be used consistent with the requirements of
Sections

22 2B.21 and 7B.03.

23 **Table 7B-1 . School Area Sign and Plaque Sizes**

24 **Section 7H.02 School Area Signs and Plaques**

25 Support:

26 Many state and local jurisdictions find it beneficial to advise road users that they are approaching
a school

27 that is adjacent to a highway, where additional care is needed, even though no school crossing is
involved and

28 the speed limit remains unchanged. Additionally, some jurisdictions designate school zones that
have a

29 unique legal standing in that fines for speeding or other traffic violations within designated school
zones are

30 increased or special enforcement techniques such as photo radar systems are used. It is important
and

31 sometimes legally necessary to mark the beginning and end points of these designated school zones
so that the

32 road user is given proper notice.

33 The School (S1-1) sign (see Figure 7B-1) has the following four applications:

34 A. School Area – the S1-1 sign can be used to warn road users that they are approaching a
school area

35 that might include school buildings or grounds, a school crossing, or school related activity
adjacent
36 to the highway.

- 37 B. School Zone – the S1-1 sign can be used to identify the location of the beginning of a
38 designated
39 school zone.
- 39 C. School Advance Crossing – if combined with an AHEAD (W16-9P) plaque or an XX FEET
40 (W16-2P
40 or W16-2aP) plaque to comprise the School Advance Crossing assembly, the S1-1 sign can be
41 used to
41 warn road users that they are approaching a crossing where schoolchildren cross the roadway
42 (see
42 Section 7B.03).
- 43 D. School Crossing – if combined with a diagonal downward pointing arrow (W16-7P) plaque
43 to
44 comprise the School Crossing assembly, the S1-1 sign can be used to warn approaching road
44 users of
45 the location of a crossing where schoolchildren cross the roadway (see Section **7H**.03).
- 46 Option:
47 If a school area is located on a cross street in close proximity to the intersection, a School (S1-1)
47 sign with
48 a supplemental arrow (W16-5P or W16-6P) plaque may be installed on each approach of the street or
48 highway

1 to warn road users making a turn onto the cross street that they will encounter a school area soon
2 after making
the turn.

3 **Standard:**

4 **If a school zone has been designated under State or local statute, a School (S1-1) sign (see**
5 **Figure**

6 **7H-1) shall be installed to identify the beginning point(s) of the designated school zone (see**
7 **Figure 7H-2).**

8 Option:

9 A School Zone (S1-1) sign may be supplemented with a SCHOOL (S4-3P) plaque (see Figure
10 7H-1).

11 A School Zone (S1-1) sign may be supplemented with an ALL YEAR (S4-7P) plaque (see Figure
12 7H-1) if

13 the school operates on a 12-month schedule.

14 The downstream end of a designated school zone may be identified with an END SCHOOL
15 ZONE (S5-2)

16 sign (see Figures 7H-1 and 7H-2).

17 If a school zone is located on a cross street in close proximity to the intersection, a School Zone
18 (S1-1)

19 sign with a supplemental arrow (W16-5P or W16-6P) plaque may be installed on each approach of
the street

20 or highway to warn road users making a turn onto the cross street that they will encounter a school
21 zone soon

22 after making the turn.

23 **Guidance:**

24 *Where increased fines are imposed for traffic violations within a designated school zone, a*
25 *BEGIN*

26 *HIGHER FINES ZONE (R2-10) sign (see Figure 7H-1) or a FINES HIGHER (R2-6P), FINES*
27 *DOUBLE (R2-*

28 *6aP), or \$XX FINE (R2-6bP) plaque (see Figure 2B-3) should be installed as a supplement to the*
29 *School Zone*

30 *(S1-1) sign to identify the beginning point of the higher fines zone (see Figures 7H-2 and 7H-3).*

31 *If the portion of the roadway that is subject to higher fines does not begin at the location of the*
32 *School*

33 *Zone (S1-1) sign, a BEGIN HIGHER FINES ZONE (R2-10) sign should be placed at the point where*
34 *the*

35 *higher fines begin.*

36 Option:

37 If a BEGIN HIGHER FINES ZONE (R2-10) sign is used, a FINES HIGHER (R2-6P), FINES
38 DOUBLE

39 (R2-6aP), or \$XX FINE (R2-6bP) plaque may be placed beneath the School Zone (S1-1) sign.

40 Where appropriate, one of the following plaques may be mounted below the sign that identifies
41 the

42 beginning point of the higher fines zone:

- 43 A. An S4-1P plaque (see Figure 7H-1) specifying the times that the higher fines are in effect,
- 44 B. A WHEN CHILDREN ARE PRESENT (S4-2P) plaque (see Figure 7H-1), or
- 45 C. A WHEN FLASHING (S4-4P) plaque (see Figure 7H-1) if used in conjunction with a yellow
46 flashing

47 beacon.

48 **Standard:**

49 *Where a BEGIN HIGHER FINES ZONE (R2-10) sign or a FINES HIGHER (R2-6P),*
50 *FINES*

51 *DOUBLE (R2-6aP), or \$XX FINE (R2-6bP) plaque supplementing a School Zone (S1-1) sign is*
52 *posted*

36 to notify road users of increased fines for traffic violations, an END HIGHER FINES ZONE
(R2-11)
37 sign (see Figure [7H-1](#)) or an END SCHOOL ZONE (S5-2) sign shall be installed at the
downstream end
38 of the zone to notify road users of the termination of the increased fines zone (see Figures [7H-2](#)
and [7H-
3](#)).
39
40 If exceeding the speed limit is the only traffic violation that is subject to higher fines, a
FINES
41 HIGHER (R2-6P), FINES DOUBLE (R2-6aP), or \$XX FINE (R2-6bP) plaque shall not be
posted
42 beneath the School Zone (S1-1) sign.

Figure [7H-1](#). School Area Signs

44 Section [7H.03 School Crossing Signs](#)

45 Standard:

46 The School Advance Crossing assembly (see Figure [7H-1](#)) shall consist of a School (S1-1)
sign
47 supplemented with an AHEAD (W16-9P) plaque or an XX FEET (W16-2P or W16-2aP)
plaque.
48 Except as provided in Paragraph 3, a School Advance Crossing assembly shall be used in
advance
49 (see Table 2C-4 for advance placement guidelines) of the first School Crossing assembly (see
Section
50 [7H.12](#)) that is encountered in each direction as traffic approaches a school crosswalk (see
Figure [7H-4](#)).

- 1 Option:
- 2 The School Advance Crossing assembly may be omitted (see Figure [7H-5](#)) where a School Zone
3 (S1-1) sign (see Section [7H.09](#)) is installed to identify the beginning of a school zone in advance of the
4 School Crossing assembly.
- 5 If a school crosswalk is located on a cross street in close proximity to an intersection, a School
6 Advance Crossing assembly with a supplemental arrow (W16-5P or W16-6P) plaque may be installed on each approach
7 of the street or highway to warn road users making a turn onto the cross street that they will
8 encounter a school crosswalk soon after making the turn. A 12-inch reduced size in-street School (S1-1) sign (see
9 Figure [7H-6](#)), installed in compliance with the mounting height and special mounting support requirements
10 for In-Street Pedestrian Crossing (R1-6 or R1-6a) signs (see Section 2B.12), may be used in advance of a
11 school crossing to supplement the post-mounted school warning signs. A 12 x 6-inch reduced size AHEAD
12 (W16-9P) plaque may be mounted below the reduced size in-street School (S1-1) sign.
- 13 **Standard:**
- 14 **If used, the School Crossing assembly (see Figure [7H-1](#)) shall be installed at the school crossing (see
15 Figures [7H-4](#) and [7H-5](#)), or as close to it as possible, and shall consist of a School (S1-1) sign
16 supplemented with a diagonal downward pointing arrow (W16-7P) plaque to show the location
17 of the crossing.**
- 18 **The School Crossing assembly shall not be used at crossings other than those adjacent to schools
19 and those on established school pedestrian routes.**
- 20 **The School Crossing assembly shall not be installed on an approach controlled by a STOP sign.**
- 21 *Guidance:*
- 22 *The School Crossing assembly should not be installed on an approach controlled by a YIELD sign.*
- 23 Option:
- 24 The School Crossing assembly may be installed on an approach to a roundabout where the
25 crosswalk is at least one car length in advance of the yield point at the entrance to the roundabout.
- 26 At a signalized or Stop-controlled intersection the School Crossing assembly may be installed on an
27 approach to a channelized right turn lane controlled by a YIELD sign.
- 28 A Yield Here To (Stop Here For) Pedestrians (R1-5a or R1-5c) sign (see Figure [7H-6](#)) may be used, in
29 accordance with the provisions of Section 2B.20, in advance of a marked crosswalk that crosses an
30 uncontrolled multi-lane approach within school zones.
- 31 The In-Street Pedestrian Crossing (R1-6 or R1-6a) sign (see Section 2B.12 and Figure [7H-6](#)) or the In-
32 Street School Crossing (R1-6b or R1-6c) sign (see Figure [7H-6](#)) may be used at school crossings on
33 approaches that are not controlled by a traffic control signal, a pedestrian hybrid beacon, or
34 emergency vehicle hybrid beacon. If used at a school crossing, a 12 x 4-inch SCHOOL (S4-3P) plaque (see Figure [7H-6](#)) may be
35 mounted above the sign. The STATE LAW legend on the R1-6 series signs may be omitted.

36 The In-Street Pedestrian Crossing (R1-6 or R1-6a) sign or In-Street School Crossing (R1-6b or
37 R1-6c)
37 sign may be used at intersections or midblock crossings with flashing beacons.
38 The Overhead School Crossing (R1-9b or R1-9c) sign may be used at school crossings on
38 approaches that
39 are not controlled by a traffic control signal, pedestrian hybrid beacon, or an emergency vehicle
39 hybrid
40 beacon. The STATE LAW legend on the R1-9 series signs may be omitted.
41 A 12-inch reduced size in-street School (S1-1) sign (see Figure [7H](#)-6) may be used instead of the
41 In-Street
42 Pedestrian Crossing (R1-6 or R1-6a) or the In-Street School Crossing (R1-6b or R1-6c) sign at a
42 school
43 crossing on approaches that are not controlled by a traffic control signal, pedestrian hybrid beacon,
43 or an
44 emergency vehicle hybrid beacon. A 12 x 6-inch reduced size diagonal downward pointing arrow
44 (W16-7P)
45 plaque may be mounted below the reduced size in-street School (S1-1) sign.
46 **Standard:**
47 **If an In-Street Pedestrian Crossing sign, an In-Street School Crossing sign, or a reduced
47 size in-**
48 **street School (S1-1) sign is placed in the roadway, the sign support shall comply with the
48 mounting**
49 **height and special mounting support requirements for In-Street Pedestrian Crossing (R1-6 or
49 R1-6a)**
50 **signs (see Section 2B.12).**

1 The In-Street Pedestrian Crossing sign, the In-Street School Crossing sign, the Overhead Pedestrian
2 Crossing sign, and the reduced size in-street School (S1-1) sign shall not be used on approaches
3 that are
4 controlled by a traffic control signal, pedestrian hybrid beacon, or an emergency vehicle
5 hybrid beacon.

4 **Section [7H.04](#) School Bus Stop Signs**

5 *Guidance:*

6 *The School Bus Stop Ahead (S3-1) sign (see Figure [7H-1](#)) should be installed in advance of
locations*

7 *where a school bus, when stopped to pick up or discharge passengers, is not visible to road users for
an
adequate distance and where there is no opportunity to relocate the school bus stop to provide
adequate sight
distance.*

10 Option:

11 The SCHOOL BUS TURN AHEAD (S3-2) sign (see Figure [7H-1](#)) may be installed in advance
of

12 locations where a school bus turns around on a roadway at a location not visible to approaching road
users for

13 a distance as determined by the “0” column under Condition B of Table 2C-4, and where there is no
14 opportunity to relocate the school bus turn around to provide the distance provided in Table 2C-4.

15 **Section [7H.05](#) School Bus Stop When Flashing Sign**

16 Option:

17 A “STOP FOR SCHOOL BUS WHEN RED LIGHTS FLASH” (S5-4) sign may be used to
remind

18 drivers of the requirement to stop for school buses when the flashing red lights on the school bus are
in
operation.

19 **Standard:**

21 **The legend “STATE LAW” shall be used with black letters on yellow background on the
top line of**

22 **the sign.**

23 Support:

24 A “STOP FOR SCHOOL BUS WHEN RED LIGHTS FLASH” (S5-4) sign is typically used
where

25 special regulatory emphasis is needed. This sign provides regulatory notice to inform drivers of
applicable

26 laws along sections of roadway with multiple bus stops or those that have a particularly high
incidence of

27 drivers passing or not stopping for school buses when the red lights are flashing.

28 **Section [7H.06](#) School Speed Limit Signs and Plaques**

29 **Standard:**

30 A School Speed Limit assembly (see Figure [7H-1](#)) or a School Speed Limit (S5-1) sign (see
Figure

31 [7H-1](#)) shall be used to indicate the speed limit where a reduced school speed limit zone has been
32 established based upon an engineering study or where a reduced school speed limit is specified
for such

33 areas by statute. The School Speed Limit assembly or School Speed Limit sign shall be placed
at or as

34 near as practical to the point where the reduced school speed limit zone begins (see Figures [7H-
3](#) and
[7H-5](#)).

36 **If a reduced school speed limit zone has been established, a School (S1-1) sign shall be**
37 **installed in**
38 **advance (see Table 2C-4 for advance placement guidelines) of the first School Speed Limit sign**
39 **assembly or S5-1 sign that is encountered in each direction as traffic approaches the reduced**
40 **school**
41 **speed limit zone (see Figures [7H-3](#) and [7H-5](#)).**

42 **Except as provided in Paragraph 5, the downstream end of an authorized and posted**
43 **reduced**

44 **school speed limit zone shall be identified with an END SCHOOL SPEED LIMIT (S5-3) sign**
45 **(see**
46 **Figures [7H-1](#), [7H-3](#), and [7H-5](#)).**

47 **Option:**

48 If a reduced school speed limit zone ends at the same point as a higher fines zone, an END
49 SCHOOL

50 ZONE (S5-2) sign may be used instead of a combination of an END HIGHER FINES ZONE (R2-
51 11) sign

52 and an END SCHOOL SPEED LIMIT (S5-3) sign.

53 A standard Speed Limit sign showing the speed limit for the section of highway that is
54 downstream from

55 the authorized and posted reduced school speed limit zone may be mounted on the same post above
56 the END

57 SCHOOL SPEED LIMIT (S5-3) sign or the END SCHOOL ZONE (S5-2) sign.

1 **Guidance:**

2 *The beginning point of a reduced school speed limit zone should be at least 200 feet in advance
of the*

3 *school grounds or a school crossing; however, this 200-foot distance should be increased if the
reduced*

4 *school speed limit is 30 mph or higher. The maximum beginning point of a reduced school speed
limit zone*

5 *should not be greater than 500 feet.*

6 *Where increased fines are imposed for traffic violations within a reduced school speed limit
zone, a*

7 *FINES HIGHER (R2-6P), FINES DOUBLE (R2-6aP), or \$XX FINE (R2-6bP) plaque (see Figure
7H-3 and*

8 *7H-5) should be installed as a supplement to the reduced school speed limit sign to notify road
users.*

9 *If other traffic violations in addition to exceeding the speed limit are subject to higher fines, then
the*

10 *duplicate FINES HIGHER (R2-6P), FINES DOUBLE (R2-6aP), or \$XX FINE (R2-6bP) plaque
should be*

11 *omitted (see Section 7H.02).*

12 **Standard:**

13 **The School Speed Limit assembly shall be either a fixed-message sign assembly or a
changeable
message sign.**

15 **The fixed-message School Speed Limit assembly shall consist of a top plaque (S4-3P) with
the**

16 **legend SCHOOL, a Speed Limit (R2-1) sign, and a bottom plaque (S4-1P, S4-2P, S4-4P, or S4-
6P)**

17 **indicating the specific periods of the day and/or days of the week that the special school speed
limit is in
effect (see Figure 7H-1).**

19 **Option:**

20 Changeable message signs (see Chapter 2L and Section 6L.05) may be used to inform drivers of
the
school speed limit. If the sign is internally illuminated, it may have a white legend on a black
background.
Changeable message signs with flashing beacons may be used for situations where greater emphasis
of the
special school speed limit is needed.

24 **Guidance:**

25 *Even though it might not always be practical because of special features to make changeable
message
signs conform in all respects to the standards in this Manual for fixed-message signs, during the
periods that
the school speed limit is in effect, their basic shape, message, legend layout, and colors should
comply with
the standards for fixed-message signs.*

29 *A confirmation light or device to indicate that the speed limit message is in operation should be
considered for inclusion on the back of the changeable message sign.*

31 **Standard:**

32 **Fluorescent yellow-green pixels shall be used when the “SCHOOL” message is displayed on
a
changeable message sign for a school speed limit.**

34 **Option:**

35 Changeable message signs may use blank-out messages or other methods in order to display the
school

36 speed limit only during the periods it applies.

37 A Vehicle Speed Feedback plaque (W13-20aP) that displays the speed of approaching drivers (see Section
38 2B.23 and 2C.13) may be used in a school speed limit zone.

39 A Speed Limit Sign Beacon (see Section 4S.04) also may be used, with a WHEN FLASHING
legend, to

40 identify the periods that the school speed limit is in effect.

41 *Guidance:*

42 *A Reduced School Speed Limit Ahead (S4-5, S4-5a) sign (see Figure 7H-1) should be used to
inform road
users of a reduced speed zone where the speed limit is being reduced by more than 10 mph, or where
engineering judgment indicates that advance notice would be appropriate.*

43 **Standard:**

44 **If used, the Reduced School Speed Limit Ahead sign shall be followed by a School Speed
Limit sign
or a School Speed Limit assembly.**

45 **The speed limit displayed on the Reduced School Speed Limit Ahead sign shall be identical
to the
speed limit displayed on the subsequent School Speed Limit sign or School Speed Limit
assembly.**

46 **Section 7H.07 Parking and Stopping Signs (R7 and R8 Series)**

1 Option:

2 Parking and stopping regulatory signs may be used to prevent parked or waiting vehicles from
3 blocking
4 pedestrians' views, and drivers' views of pedestrians, and to control vehicles as a part of the school
5 traffic
6 plan.

5 Support:

6 Parking signs and other signs governing the stopping and standing of vehicles in school areas
7 cover a
8 wide variety of regulations. Typical examples of regulations are as follows:

9 A. NO PARKING X:XX AM to X:XX PM SCHOOL DAYS ONLY
10 B. NO STOPPING X:XX AM to X:XX PM SCHOOL DAYS ONLY,
11 C. XX MIN LOADING X:XX AM to X:XX PM SCHOOL DAYS ONLY, and
12 D. NO STANDING X:XX AM to X:XX PM SCHOOL DAYS ONLY.
13 Sections 2B.54, 2B.55, and 2B.56 contain information regarding the signing of parking
regulations in
school zone areas.

14 **Figure 7H-2. Example of Signing for a Higher Fines School Zone without a School Crossing**

15 **Figure 7H-3. Example of Signing for a Higher Fines School Zone with a School Speed
Limit**

16 **Figure 7H-4. Example of Signing for a School Zone Crossing Outside of a School Zone**

17 **Figure 7H-5. Example of Signing for a School Zone with a School Speed Limit and a School
Crossing**

18 **Figure 7H-6. Pedestrian Crossing Signs in School Areas**

19

CHAPTER 7I. SCHOOL MARKINGS

Section 7I.01 School Crosswalk Markings

Guidance:

Crosswalks should be marked at all intersections on established routes to a school where there is substantial conflict between motorists, bicyclists, and student movements; where students are encouraged to cross between intersections; where students would not otherwise recognize the proper place to cross; or where motorists or bicyclists might not expect students to cross (see Figure 7A-1).

Crosswalk lines should not be used indiscriminately. An engineering study considering the factors

described in Section 3C.02 should be performed before a marked crosswalk is installed at a location away from a traffic control signal or an approach controlled by a STOP or YIELD sign.

Because non-intersection school crossings are generally unexpected by the road user, warning signs (see

Section 7H.03) should be installed for all marked school crosswalks at non-intersection locations. Adequate

visibility of students by approaching motorists and of approaching motorists by students should be provided by parking prohibitions or other appropriate measures.

Support:

Section 3C.03 contains provisions regarding the placement and design of crosswalks, and Section 3B.19

contains provisions regarding the placement and design of the stop lines and yield lines that are associated

with them. Provisions regarding the curb markings that can be used to establish parking regulations on the

approaches to crosswalks are contained in Section 3B.18.

Section 7I.02 Pavement Word, Symbol, and Arrow Markings

Option:

If used, the SCHOOL word marking may extend to the width of two approach lanes (see Figure 7I-1).

Guidance:

If the two-lane SCHOOL word marking is used, the letters should be 10 feet or more in height.

Support:

Section 3B.20 contains provisions regarding other word, symbol, and arrow pavement markings that can

be used to guide, warn, or regulate traffic.

Figure 7I-1. Two-Lane Pavement Marking of “SCHOOL”



1

CHAPTER 7J. SCHOOL CROSSING SUPERVISION

2 Section 7J.01 Qualifications of Adult Crossing Guards

3 Option:

4 Adult crossing guards may be used to provide gaps in traffic at school crossings where
an engineering
5 study has shown that adequate gaps need to be created, and where authorized by law.
6 A recommended method for determining the frequency and adequacy of gaps in the
traffic stream is given
7 in the "Traffic Control Devices Handbook" (see Section 1A.05).

8 Support:

9 High standards for selection of adult crossing guards are essential because they are
responsible for the
10 safety of and the efficient crossing of the street by schoolchildren within and in the
immediate vicinity of
11 school crosswalks.

12 Guidance:

13 *Adult crossing guards should possess the following minimum qualifications:*
14 A. *Average intelligence;*
15 B. *Good physical condition, including sight, hearing, and ability to move and*
maneuver quickly in order
16 *to avoid danger from errant vehicles;*
17 C. *Ability to control a STOP paddle effectively to provide approaching road users*
with a clear, fully
18 *direct view of the paddle's STOP message during the entire crossing movement;*
19 D. *Ability to communicate specific instructions clearly, firmly, and courteously;*
20 E. *Ability to recognize potentially dangerous traffic situations and warn and manage*
students in
21 *sufficient time to avoid injury.*
22 F. *Mental alertness;*
23 G. *Neat appearance;*
24 H. *Good character;*
25 I. *Dependability; and*
26 J. *An overall sense of responsibility for the safety of students.*

27 Section 7J.02 Operating Procedures for Adult Crossing Guards

28 Standard:

29 Law enforcement officers performing school crossing supervision and adult
crossing guards shall
30 wear high-visibility retroreflective safety apparel labeled as ANSI 107-2004 standard
performance for
31 Class 2 as described in Section 6C.05.



Department of Transportation

Henry B. Gutman, Commissioner

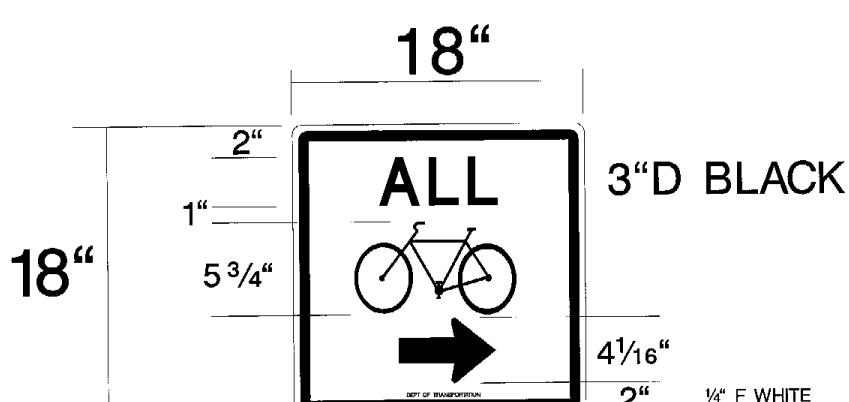
- 32 **Adult crossing guards shall not direct traffic in the usual law enforcement
regulatory sense. In the**
- 33 **control of traffic, they shall pick opportune times to create a sufficient gap in the
traffic flow. At these**
- 34 **times, they shall stand in the roadway to indicate that pedestrians are about to use or
are using the**
- 35 **crosswalk, and that all vehicular traffic must stop.**
- 36 **Adult crossing guards shall use a STOP paddle. The STOP paddle shall be the
primary hand-**
- 37 **signaling device.**
- 38 **The STOP paddle shall comply with the provisions for a STOP/SLOW paddle
(see Section 6D.02)**
- 39 **except both sides shall be a STOP face.**
- 40 **The paddle shall be retroreflective or illuminated when used during hours of
darkness.**



Department of Transportation

Henry B. Gutman, Commissioner

Attachment for Figure 9B-1, new All Bikes with arrow sign similar to what is used in New York City:

NEW YORK CITY DOT		NEW YORK CITY DEPARTMENT OF TRANSPORTATION SIGN MANUFACTURING ORDER
TO: CHIEF DIVISION OF DESIGN AND CONSTRUCTION FROM: CHIEF DIVISION OF HIGHWAY DESIGN		DATE: 08-09-2001
DESIGNATION NO SR-1453		LOCATION: _____
SIZE 18" X 18" COLOR _____		
BACKGROUND: 18" X 18" WHITE		
BORDER: 5/8" BLACK	SINGLE FACE Y	DOUBLE FACE
MARGIN: 3/8" WHITE	REFLECTORIZED Y	
		
NOTES: 1. BIKE SYMBOL (10" X 5 3/4") STAND. BLACK 2. 3 OR 9 O'CLOCK ARROW (4 1/16" X 6") STAND BLACK		
NOTE: USE ONLY FOR OFF ROAD BIKEWAYS.		
RST USED FOR ORDER NO. _____ QUANTITY _____		
TYPE OF MOUNTING _____		
REQUESTED BY	M. PRIMEGGIA	APPROVED
CHECKED BY	<i>Ed Corbett</i>	DIRECTOR OF HIGHWAY SIGN DESIGN

NYC Department of Transportation

Office of the Commissioner

55 Water Street, 9th Floor, New York, NY 10041

T: 212.839.6400 F: 212.839.6453

nyc.gov/dot