

UNIVERSITY OF FLORIDA POLICY ON PLACEMENT AND DESIGN OF CROSSWALKS



Prepared for :
UNIVERSITY OF FLORIDA
TRANSPORTATION & PARKING SERVICES &
PLANNING, DESIGN, & CONSTRUCTION



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University of Florida

Policy on Placement and Design of Crosswalks

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1. Introduction

Crosswalks serve as pedestrian right-of-way across major and minor roadways that can either run parallel or perpendicular to the roadway. Their purpose on the University of Florida (UF) campus is paramount to efficient mobility and promotion of a pedestrian friendly campus.

In 2000, the UF Transportation and Parking Services (TAPS) department compiled a document outlining crosswalk policies and standards (**Attachment A**). This document has been used to guide the decision making process for the evaluation of new crosswalk requests and to set standards governing the construction of new crosswalks. In 2015, the UF main campus included more than 200 crosswalks.

Crosswalks are evaluated under the following conditions:

- 1.1 Major or minor construction project impacting pedestrian mobility
- 1.2 Pedestrian incidents warranting specific safety evaluations of pedestrian corridor
- 1.3 Requests by schools, departments, organizations, or other campus pedestrian network users

The demand, location, and maintenance of crosswalks within the pedestrian mobility network shall be evaluated individually based on the standards outlined in this policy.

The primary stakeholders in crosswalk placement on the UF campus are Transportation and Parking Services (TAPS), Planning, Design and Construction (PDC), and the Physical Plant Division (PPD).

2. Policy Objectives

The University's objective is to establish a pedestrian friendly transportation system that protects the cultural and environmental amenities of the campus through sustainable redevelopment. The transportation network shall be designed to meet the needs of pedestrians, bicyclists, transit operators, and vehicular traffic while providing safe and efficient means of travel for all modes. The specific objectives of this policy are as follows:

- 2.1 *The University shall maintain and enhance any existing crosswalks to ensure pedestrian safety and motorist awareness.*
- 2.2 *The University shall provide sufficient means of pedestrian connectivity without unnecessarily impeding vehicular progression throughout the campus roadway network.*
- 2.3 *The University shall encourage pedestrians to safely and correctly use the designated transportation facilities on campus through awareness campaigns or other methods.*
- 2.4 *The University shall consider new crosswalk locations or improvements to existing crosswalks based primarily on safety, then on demand and access.*
- 2.5 *Newly constructed crosswalks shall clearly convey pedestrian objectives, provide awareness to vehicular traffic, and meet current design standards set forth in the FHWA Manual of Uniform Traffic Control Devices, the FDOT Manual of Uniform Minimum Standards for Design, Construction and Maintenance for Streets and Highways, and the UF Design and Construction Standards.*

3. Reference Standards

This policy shall be a living document, adhering to the periodic revisions to the multiple standards which guide the construction or improvement of crosswalks on the UF campus. Since crosswalks adjoining and interior to the campus fall within various municipal jurisdictions, multiple design and construction standards may apply. The most recent revisions of these primary reference standards shall be used to guide the crosswalk improvements on campus.

3.1 Federal Criteria - MUTCD

The Federal Highway Administration (FHWA) Manual on Uniform Traffic Control Devices (MUTCD), latest edition, shall dictate the signage and pavement marking standards for all crosswalks. The following MUTCD references shall be used for design guidance:

MUTCD Part 2: Signage

Section 2B.11 – Yield Here To Pedestrian Signs/Stop Here For Pedestrian Signs (R1-5 Series)
Section 2B.12 – In-Street and Overhead Pedestrian Crossing Signs (R1-6, R1-6a)
Section 2B.51 – Pedestrian Crossing Signs (R9-2, R9-3)
Section 2C.29 – Speed Hump Sign (W17-1)
Section 2C.50 – Non-Vehicular Warning Signs (W11-2)

MUTCD Part 3: Markings

Section 3B.18 – Crosswalk Markings
Section 3B.23 – Curb Markings
Section 3B.25 – Speed Hump Markings

MUTCD Part 4: Highway Traffic Signals

Chapter 4E – Pedestrian Control Features
Chapter 4F – Pedestrian Hybrid Beacons

3.2 State Criteria - Florida Greenbook

The Florida Department of Transportation (FDOT) Manual of Uniform Minimum Standards for Design, Construction and Maintenance for Streets and Highways, latest edition, commonly referred to as the “Florida Greenbook,” shall dictate the acceptable design and construction methods for pedestrian facilities within state right-of-way and shall provide guidance on non-state roads throughout the campus. FDOT standard construction details shall apply, as applicable. American Disabilities Act (ADA) accessibility requirements are generally considered in FDOT design standards, however care should be taken to ensure compliance with maximum slopes and distances for new crosswalks. The following FDOT references shall be used for design guidance:

Florida Greenbook

Chapter 8, Pedestrian Facilities

FDOT Design Standards

Index No. 304 – Public Sidewalk Curb Ramps
Index No. 546 – Sight Distance at Intersections
Index No. 17346 – Special Marking Areas

3.2 UF Design and Construction Standards

The UF Design and Construction Standards are published periodically by a steering committee and maintained by the UF PDC. These design standards shall apply for all situations where other jurisdictional standards do not supersede UF standards. These standards may need revisions or additions to better address a revised crosswalk policy.

UF Standard Construction Details

02500 – B: Crosswalk Details

4. Criteria for Evaluating Crosswalks

All crosswalks shall be evaluated every five years to ensure applicable standards and requirements apply.

4.1 Types of crosswalks:

- Intersections (Crosswalks at signalized intersections)
- Mid-Block Crossings (Crosswalks falling between intersections and driveways)
- Parking Lots and Driveways (Crosswalks at service drives, building driveways, or entrances to parking lots)

4.2 Evaluation parameters for existing or proposed crosswalks:

- Location
- Direction of Travel
- Length
- No. of Lanes Crossed
- Vehicular Sight Distance
- Pedestrian Sight Distance
- Pavement Markings
- Signage
- Lighting
- Accessibility
- Curb Ramps

5. Conditions for Removal of Crosswalks

Existing crosswalks should be removed and pedestrian traffic corridors redefined if warranted by any of the below conditions:

- 5.1 Sight distance endangers pedestrian safety in crosswalk.
- 5.2 ADA requirements are not met.
- 5.3 Adjacent crosswalks fall below minimum separation distances and vehicular flow is impeded.
- 5.4 Pedestrian crossing volumes do not support the crosswalk location.
- 5.5 An engineering study is performed and a location is determined to be unsafe.

6. Crosswalk Design Standards

The University shall maintain and enhance any existing crosswalks to ensure pedestrian safety and motorist awareness.

Newly constructed crosswalks shall clearly convey pedestrian objectives, provide awareness to motorists and bicyclists, and meet current design standards set forth in the MUTCD, Florida Greenbook, and the UF Design and Construction Standards.

In addition to meeting the requirements of the cited reference standards, crosswalks on campus should also adhere to the following design guidelines:

- 6.1 The engineer performing the crosswalk design shall consider all multi-modal transportation, the number of traffic lanes, vehicular speed, crosswalk visibility, and any additional enhancements recommended for sustainability and overall safety.
- 6.2 Crosswalks shall be properly marked with proper signage located on both sides of the crosswalk to encourage motorist awareness.
- 6.3 Pedestrian crossing demand should be sufficient to justify new crosswalk placement, as determined through pedestrian counts and engineering judgment.
- 6.4 Sufficient means of pedestrian connectivity should be provided without significantly impeding vehicular progression throughout the campus roadway network.
- 6.5 All crosswalk locations shall be illuminated. Illumination may include reflective paint, reflective pavement markers, and light fixtures.
- 6.6 No mid-block crosswalk shall be constructed within 500 feet of an existing mid-block crosswalk.
- 6.7 Sufficient site distance and visibility is required at the proposed crosswalk location for both drivers and pedestrians. Sight distance should be evaluated in accordance with FDOT Design Standards Index No. 546.
- 6.8 Vehicular parking on the street should be prohibited within 200 feet of a crosswalk, both ways, to ensure visibility.
- 6.9 Table-top style raised crosswalks should be considered, where applicable, as a combined traffic calming measure. Proper signage and pavement markings for a raised crosswalk configuration are required. Drainage design shall also be considered for raised table-top crosswalks to assure proper drainage conditions at the crosswalk.
- 6.10 A sidewalk network must be provided on both sides of a crosswalk.
- 6.11 The relocation or elimination of an existing crosswalk may be considered to accommodate a new crosswalk location that more efficiently serves pedestrian crossing patterns.
- 6.12 Crosswalk signage and pavement markings must be visible to both pedestrians and drivers at all times.

- 6.13 Landscaping must be maintained and controlled to ensure that motorists have adequate visibility of crosswalks.
- 6.14 Pavement markings must be maintained in accordance with the latest MUTCD standards.
- 6.15 On the main UF campus, rights-of-way may fall within different jurisdictions. All crosswalks should adhere to the requirements of the latest federal and state criteria, though the jurisdiction of each crosswalk should be determined to identify the primary stakeholders in design and permitting. Specific care should be taken to coordinate design on the following state roads with the appropriate permitting agencies:
- SW 13th Street (US HWY 441, SR 24)
 - SW Archer Road (SR 24)
 - W University Avenue (SR 26)
 - SW 34th Street (SR 121)
 - SW 16th Street (SR 226)
 - SW 2nd Avenue (SR 26A)

7. Crosswalk Addition or Enhancement Request Process

The University shall consider new crosswalk locations or improvements to existing crosswalks based primarily on safety, then on demand and access.

- 7.1 Crosswalks can be added or enhanced under the following conditions:
- Major or minor construction project impacting crosswalk
 - Pedestrian incidents warranting specific safety evaluations of a crossing location or crosswalk
 - Requests by schools, departments, organizations, or other campus pedestrian network users
- 7.2 During major or minor construction projects which impact an existing crosswalk or propose a new crosswalk, the project design team should coordinate with TAPS and PDC.
- 7.3 To request a crosswalk addition or enhancement to an existing crosswalk, campus users or user groups should complete and submit a Crosswalk Evaluation Form (**Attachment B**) to the TAPS office.

8. Additional Recommendations

- 8.1 UF shall create an inventory of crosswalks that identifies each crosswalk on campus by number.
- 8.2 UF shall systematically evaluate each existing campus crosswalk by all the parameters in Section 4 of this policy.

- 8.3 UF shall identify deficiencies in each crosswalk on campus and provide a master list of improvements to be undertaken.
- 8.4 UF shall confirm the need for each existing campus crosswalk.
- 8.5 UF shall eliminate any unnecessary campus crosswalks.
- 8.6 UF shall work with city and state agencies, wherever applicable, to identify and address any crosswalk deficiencies adjacent to the UF campus.
- 8.7 UF shall develop a funding mechanism to systematically address any identified crosswalk deficiencies.

9. Attachments

Attachment A – UF Policy on Placement of Crosswalks (October 2000)

Attachment B – Crosswalk Evaluation Form

Attachment C – MUTCD Standards

- Part 2, Section 2B.11
- Part 2, Section 2B.12
- Part 2, Section 2B.51
- Part 2, Section 2C.29
- Part 2, Section 2C.50
- Part 3, Section 3B.18
- Part 3, Section 3B.23
- Part 3, Section 3B.25
- Part 4, Chapter 4E
- Part 4, Chapter 4F

Attachment D – FDOT Standard Indexes

- Florida Greenbook – Chapter 8 – Pedestrian Facilities (2011)
- FDOT Design Standard Index #304 – Special Marking Areas (2013)
- FDOT Design Standard Index #546 – Special Marking Areas (2010)
- FDOT Design Standard Index #17346 – Special Marking Areas (2013)

Attachment E – UF Design and Construction Standards

- UF Standard Detail 02500-B Crosswalk Details (2001)

Attachment A

UF Policy on Placement of Crosswalks (October 2000)

Policy on Placement of Crosswalks

Prior to approval of a new crosswalk, an engineering study will be conducted by PPD to determine if the conditions described below are satisfied.

- Pedestrian volume should be sufficient to justify placement
- The crosswalk should fulfill a reasonable need to direct pedestrians across traffic lanes
- Crosswalk location should be illuminated
- Crosswalk location should be visible to traffic for 200 feet in both directions
- The crosswalk should convey clear and simple meaning to pedestrians and drivers
- There should be no existing marked crosswalk within 500 feet of the proposed location

Standards for Crosswalks

- Signalized Intersections
 - Minimum Configuration:
 - Marked crosswalks on all roadways of the intersection configured in accordance with PPD construction standard 02500-C
 - ADA compliant curb cuts at the end point of all crosswalks
 - Pedestrian WALK/DON'T WALK signals at all intersections
- Stop sign intersections:
 - Minimum Configuration:
 - Marked crosswalks on all roadways of the intersection configured in accordance with PPD construction standard 02500-C
 - ADA compliant curb cuts at the end point of all crosswalks
 - Crosswalk signs placed on the through roadway
 - Possible enhancements:
 - Raised pavement markers placed an appropriate distance in front of the crosswalk on the through roadway
 - Use of ladder style crosswalk on through roadway
 - Flashing lights on crosswalk signs
- Midblock Location
 - Minimum Configuration:
 - Marked crosswalk in accordance with PPD standard
 - Ladder style crosswalk
 - ADA compliant curb cuts at the end of crosswalk
 - Crosswalk signs
 - Raised pavement markers placed an appropriate distance in front of the crosswalk
 - Restrict parking on roadway to ensure visibility

Possible enhancements

- Overhead crosswalk signs
- Flashing lights on crosswalk signs
- Pedestrian refuge island
- Stop bar painted upstream from crosswalk
- Speed bumps or humps
- Light guard system of strobe lights

- Parking Lot and Service Drive Location:

Minimum configuration:

- Mark crosswalk in accordance with PPD standard
- ADA compliant curb cuts at the points of crosswalk

Possible enhancements:

- Ladder style crosswalk

The engineer conducting the crosswalk study will consider pedestrian and vehicular volume, the number of traffic lanes the crosswalk will cross, visibility, lighting and other safety factors in order to make recommendations for the use of possible crosswalk enhancements.

Attachment B

Crosswalk Evaluation Form

CROSSWALK EVALUATION FORM
TAPS FORM NO. – REQUEST FOR THE EVALUATION OF A PEDESTRIAN CROSSWALK

Submitted: Date	<input type="checkbox"/>	Attachments
RE:	<input type="checkbox"/>	Evaluation of an existing crosswalk
	<input type="checkbox"/>	Request for the evaluation of constructing a new crosswalk
To: Scott Fox, Director UF Transportation and Parking Services		
FROM:	Name	Phone: (###) ###-####
	Title, UF Dept. or Organization	E-mail: List university email

Primary Street	Name of primary street related to the crosswalk
Nearest Intersection	Name of street at intersection, or nearest street to locate the crosswalk
Type of Crosswalk	<input type="checkbox"/> Intersection <input type="checkbox"/> Midblock <input type="checkbox"/> Parking Lot/Driveway
Crosswalk Direction	<input type="checkbox"/> North to South <input type="checkbox"/> East to West <input type="checkbox"/> NW to SE <input type="checkbox"/> NE to SW
Length of Crosswalk	Length
Description of Issue or Need for New Crosswalk	Describe issue or request for new crosswalk. Address concerns such as safety, lighting, traffic, RTS bus stops, signage, or visibility
Recommended Action:	Describe a recommendation to make improvements to an existing crosswalk or construct a new crosswalk

FILE: Crosswalk Evaluation Form

OFFICE USE:	
Received by/date:	
Crosswalk #:	
Request #:	



CROSSWALK EVALUATION FORM

TAPS FORM NO. – REQUEST FOR THE EVALUATION OF A PEDESTRIAN CROSSWALK

Submitted:	<input type="checkbox"/> Attachments
RE:	<input type="checkbox"/> Evaluation of an existing crosswalk
	<input type="checkbox"/> Request for the evaluation of constructing a new crosswalk
To:	Scott Fox, Director UF Transportation and Parking Services
FROM:	Phone:
	E-mail:

Primary Street	
Nearest Intersection	
Type of Crosswalk	<input type="checkbox"/> Intersection <input type="checkbox"/> Midblock <input type="checkbox"/> Parking Lot/Driveway
Crosswalk Direction	<input type="checkbox"/> North to South <input type="checkbox"/> East to West <input type="checkbox"/> NW to SE <input type="checkbox"/> NE to SW
Length of Crosswalk	
Description of Issue or Need for New Crosswalk	
Recommended Action:	

FILE: Crosswalk Evaluation Form

OFFICE USE:	
Received by/date:	
Crosswalk #:	
Request #:	

Attachment C

MUTCD

Support:

- 10 Figure 2A-3 shows examples of some typical placements of STOP signs and YIELD signs.
- 11 Section 2A.16 contains additional information about separate and combined mounting of other signs with STOP or YIELD signs.

Guidance:

- 12 *Stop lines that are used to supplement a STOP sign should be located as described in Section 3B.16. Yield lines that are used to supplement a YIELD sign should be located as described in Section 3B.16.*
- 13 *Where there is a marked crosswalk at the intersection, the STOP sign should be installed in advance of the crosswalk line nearest to the approaching traffic.*
- 14 *Except at roundabouts, where there is a marked crosswalk at the intersection, the YIELD sign should be installed in advance of the crosswalk line nearest to the approaching traffic.*
- 15 *Where two roads intersect at an acute angle, the STOP or YIELD sign should be positioned at an angle, or shielded, so that the legend is out of view of traffic to which it does not apply.*
- 16 *If a raised splitter island is available on the left-hand side of a multi-lane roundabout approach, an additional YIELD sign should be placed on the left-hand side of the approach.*

Option:

- 17 If a raised splitter island is available on the left-hand side of a single lane roundabout approach, an additional YIELD sign may be placed on the left-hand side of the approach.
- 18 At wide-throat intersections or where two or more approach lanes of traffic exist on the signed approach, observance of the right-of-way control may be improved by the installation of an additional STOP or YIELD sign on the left-hand side of the road and/or the use of a stop or yield line. At channelized intersections or at divided roadways separated by a median, the additional STOP or YIELD sign may be placed on a channelizing island or in the median. An additional STOP or YIELD sign may also be placed overhead facing the approach at the intersection to improve observance of the right-of-way control.

Standard:

- 19 **More than one STOP sign or more than one YIELD sign shall not be placed on the same support facing in the same direction.**

Option:

- 20 For a yield-controlled channelized right-turn movement onto a roadway without an acceleration lane and for an entrance ramp onto a freeway or expressway without an acceleration lane, a NO MERGE AREA (W4-5P) supplemental plaque (see Section 2C.40) may be mounted below a Yield Ahead (W3-2) sign and/or below a YIELD (R1-2) sign when engineering judgment indicates that road users would expect an acceleration lane to be present.

Section 2B.11 Yield Here To Pedestrians Signs and Stop Here For Pedestrians Signs (R1-5 Series)**Standard:**

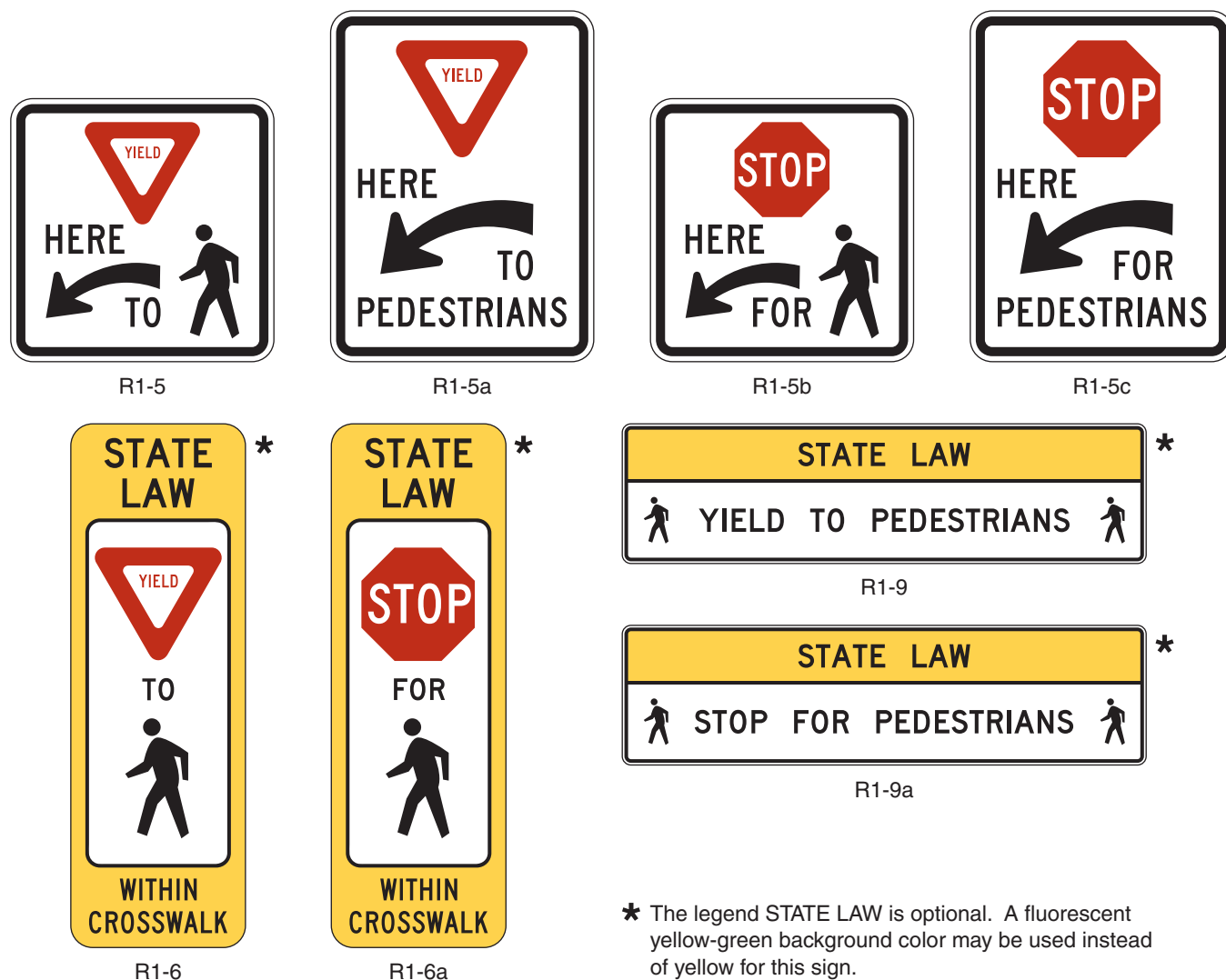
- 01 **Yield Here To (Stop Here For) Pedestrians (R1-5, R1-5a, R1-5b, or R1-5c) signs (see Figure 2B-2) shall be used if yield (stop) lines are used in advance of a marked crosswalk that crosses an uncontrolled multi-lane approach. The Stop Here for Pedestrians signs shall only be used where the law specifically requires that a driver must stop for a pedestrian in a crosswalk. The legend STATE LAW may be displayed at the top of the R1-5, R1-5a, R1-5b, and R1-5c signs, if applicable.**

Guidance:

- 02 *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, they should be placed 20 to 50 feet in advance of the nearest crosswalk line (see Section 3B.16 and Figure 3B-17), and parking should be prohibited in the area between the yield (stop) line and the crosswalk.*
- 03 *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:

- 04 Yield Here To (Stop Here For) Pedestrians signs may be used in advance of a crosswalk that crosses an uncontrolled multi-lane approach to indicate to road users where to yield (stop) even if yield (stop) lines are not used.

Figure 2B-2. Unsignalized Pedestrian Crosswalk Signs

- 05 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:

- 06 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 or block the road user's view of the W11-2 sign.

Option:

- 07 An advance Pedestrian Crossing (W11-2) warning 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.
- 08 In-Street Pedestrian Crossing signs and Yield Here To (Stop Here For) Pedestrians signs may be used together at the same crosswalk.

Section 2B.12 In-Street and Overhead Pedestrian Crossing Signs (R1-6, R1-6a, R1-9, and R1-9a)

Option:

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

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

Standard:

- 03 If used, the In-Street Pedestrian Crossing sign shall be placed in the roadway at the crosswalk location on the center line, on a lane line, or on a median island. The In-Street Pedestrian Crossing sign shall not be post-mounted on the left-hand or right-hand side of the roadway.

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

- 05 An In-Street or Overhead Pedestrian 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:

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

Option:

- 07 If a Pedestrian Crossing (W11-2) warning sign is used in combination with an In-Street or an Overhead Pedestrian Crossing sign, the W11-2 sign with a diagonal downward pointing arrow (W16-7P) plaque may be post-mounted on the right-hand side of the roadway at the crosswalk location.

Standard:

- 08 The In-Street Pedestrian Crossing sign and the Overhead Pedestrian Crossing sign shall not be used at signalized locations.

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

- 10 The In-Street Pedestrian Crossing sign shall have a black legend (except for the red STOP or YIELD sign symbols) and border on a white background, surrounded by an outer yellow or fluorescent yellow-green background area (see Figure 2B-2). The Overhead Pedestrian Crossing sign shall have a black legend and border on a yellow or fluorescent yellow-green background at the top of the sign and a black legend and border on a white background at the bottom of the sign (see Figure 2B-2).

- 11 Unless the In-Street Pedestrian 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.

Support:

- 12 The Provisions of Section 2A.18 concerning mounting height are not applicable for the In-Street Pedestrian Crossing sign.

Standard:

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

Option:

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

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

Section 2B.13 Speed Limit Sign (R2-1)

Standard:

- 01 Speed zones (other than statutory speed limits) shall only be established on the basis of an engineering study that has been performed in accordance with traffic engineering practices. The engineering study shall include an analysis of the current speed distribution of free-flowing vehicles.

- 02 The Speed Limit (R2-1) sign (see Figure 2B-3) shall display the limit established by law, ordinance, regulation, or as adopted by the authorized agency based on the engineering study. The speed limits displayed shall be in multiples of 5 mph.

- 03 Speed Limit (R2-1) signs, indicating speed limits for which posting is required by law, shall be located at the points of change from one speed limit to another.

Section 2B.48 Placement of Parking, Stopping, and Standing Signs

Guidance:

- 01 *When signs with arrows are used to indicate the extent of the restricted zones, the signs should be set at an angle of not less than 30 degrees or more than 45 degrees with the line of traffic flow in order to be visible to approaching traffic.*
- 02 *Spacing of signs should be based on legibility and sign orientation.*
- 03 *If the zone is unusually long, signs showing a double arrow should be used at intermediate points within the zone.*

Standard:

- 04 **If the signs are mounted at an angle of 90 degrees to the curb line, two signs shall be mounted back to back at the transition point between two parking zones, each with an appended THIS SIDE OF SIGN (R7-202P) supplemental plaque.**

Guidance:

- 05 *If the signs are mounted at an angle of 90 degrees to the curb line, signs without any arrows or appended plaques should be used at intermediate points within a parking zone, facing in the direction of approaching traffic. Otherwise the standards of placement should be the same as for signs using directional arrows.*

Section 2B.49 Emergency Restriction Signs (R8-4, R8-7, R8-8)

Option:

- 01 The EMERGENCY PARKING ONLY (R8-4) sign (see Figure 2B-25) or the EMERGENCY STOPPING ONLY (R8-7) sign (see Figure 2B-25) may be used to discourage or prohibit shoulder parking, particularly where scenic or other attractions create a tendency for road users to stop temporarily.
- 02 The DO NOT STOP ON TRACKS (R8-8) sign (see Figure 8B-1) may be used to discourage or prohibit parking or stopping on railroad or light rail transit tracks (see Section 8B.09).

Standard:

- 03 **Emergency Restriction signs shall be rectangular and shall have a red or black legend and border on a white background.**

Section 2B.50 WALK ON LEFT FACING TRAFFIC and No Hitchhiking Signs (R9-1, R9-4, R9-4a)

Option:

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

Standard:

- 02 **If used, the WALK ON LEFT FACING TRAFFIC sign shall 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:

- 03 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 2B.51 Pedestrian Crossing Signs (R9-2, R9-3)

Option:

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

Standard:

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

Option:

- 03 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.
- 04 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.
- 05 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.

Figure 2B-26. Pedestrian Signs and Plaques (Sheet 1 of 2)



R9-1



R9-2



R9-3



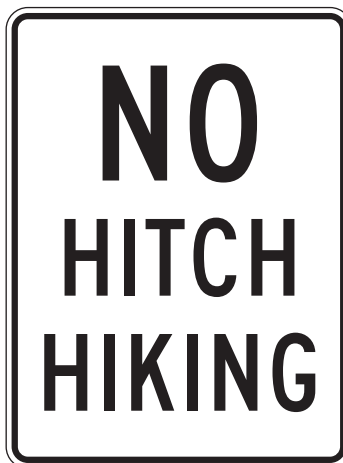
R9-3a



R9-3bP



R9-4



R9-4a



R10-1



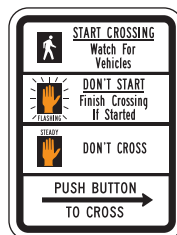
R10-2



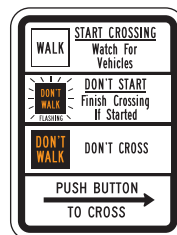
R10-3



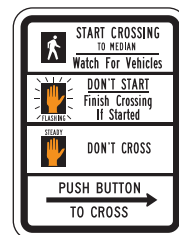
R10-3a



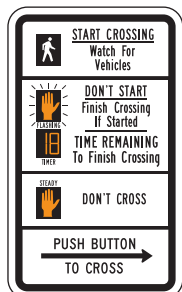
R10-3b



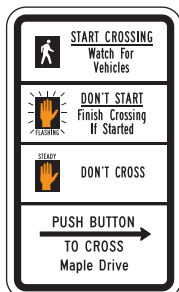
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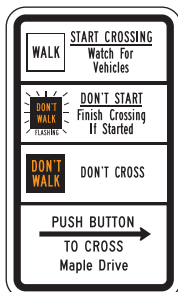
R10-3d



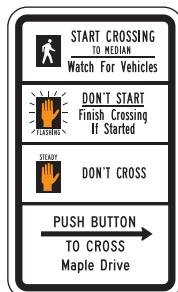
R10-3e



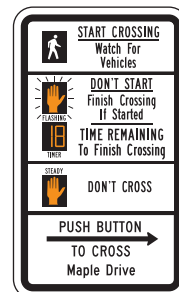
R10-3f



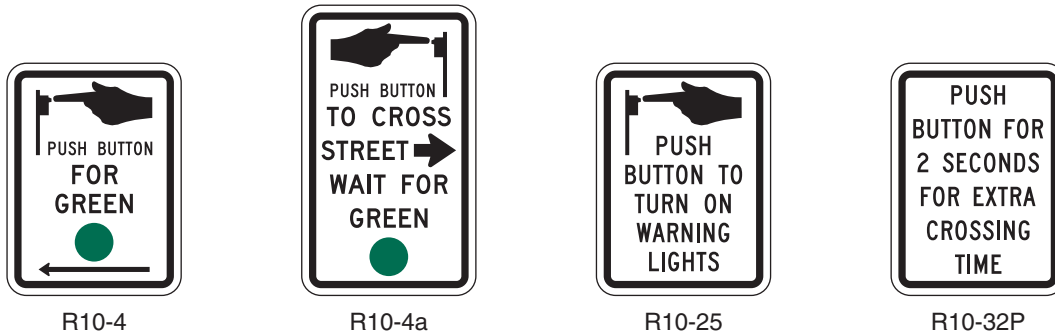
R10-3g



R10-3h



R10-3i

Figure 2B-26. Pedestrian Signs and Plaques (Sheet 2 of 2)**Support:**

- 06 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.

Guidance:

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

Section 2B.52 Traffic Signal Pedestrian and Bicycle Actuation Signs (R10-1 through R10-4, and R10-24 through R10-26)

Standard:

- 01 **Traffic Signal signs applicable to pedestrian actuation (see Figure 2B-26) or bicyclist actuation (see Figure 9B-2) shall be mounted immediately above or incorporated into the pushbutton detector units (see Section 4E.08).**

Support:

- 02 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:

- 03 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).
- 04 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:

- 05 *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:

- 06 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.

- 07 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.

- 08 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 4N) or flashing beacons that have been added to the pedestrian warning signs.

Support:

- 09 Section 4E.08 contains information regarding the application of the R10-32P plaque.

- 05 When the W14-1 or W14-2 sign is used, the sign shall be posted as near as practical to the entry point or at a sufficient advance distance to permit the road user to avoid the dead end or no outlet condition by turning at the nearest intersecting street.
- 06 The DEAD END (W14-1a) or NO OUTLET (W14-2a) signs shall not be used instead of the W14-1 or W14-2 signs where traffic can proceed straight through the intersection into the dead end street or no outlet area.

Section 2C.27 Low Clearance Signs (W12-2 and W12-2a)

Standard:

- 01 The Low Clearance (W12-2) sign (see Figure 2C-5) shall be used to warn road users of clearances less than 12 inches above the statutory maximum vehicle height.
- Guidance:*
- 02 The actual clearance should be displayed on the Low Clearance sign to the nearest 1 inch not exceeding the actual clearance. However, in areas that experience changes in temperature causing frost action, a reduction, not exceeding 3 inches, should be used for this condition.
- 03 Where the clearance is less than the legal maximum vehicle height, the W12-2 sign with a supplemental distance plaque should be placed at the nearest intersecting road or wide point in the road at which a vehicle can detour or turn around.
- 04 In the case of an arch or other structure under which the clearance varies greatly, two or more signs should be used as necessary on the structure itself to give information as to the clearances over the entire roadway.
- 05 Clearances should be evaluated periodically, particularly when resurfacing operations have occurred.

Option:

- 06 The Low Clearance sign may be installed on or in advance of the structure. If a sign is placed on the structure, it may be a rectangular shape (W12-2a) with the appropriate legend (see Figure 2C-5).

Section 2C.28 BUMP and DIP Signs (W8-1, W8-2)

Guidance:

- 01 BUMP (W8-1) and DIP (W8-2) signs (see Figure 2C-6) should be used to give warning of a sharp rise or depression in the profile of the road.

Option:

- 02 These signs may be supplemented with an Advisory Speed plaque (see Section 2C.08).

Standard:

- 03 The DIP sign shall not be used at a short stretch of depressed alignment that might momentarily hide a vehicle.

Guidance:

- 04 A short stretch of depressed alignment that might momentarily hide a vehicle should be treated as a no-passing zone when center line striping is provided on a two-lane or three-lane road (see Section 3B.02).

Section 2C.29 SPEED HUMP Sign (W17-1)

Guidance:

- 01 The SPEED HUMP (W17-1) sign (see Figure 2C-6) should be used to give warning of a vertical deflection in the roadway that is designed to limit the speed of traffic.
- 02 If used, the SPEED HUMP sign should be supplemented by an Advisory Speed plaque (see Section 2C.08).

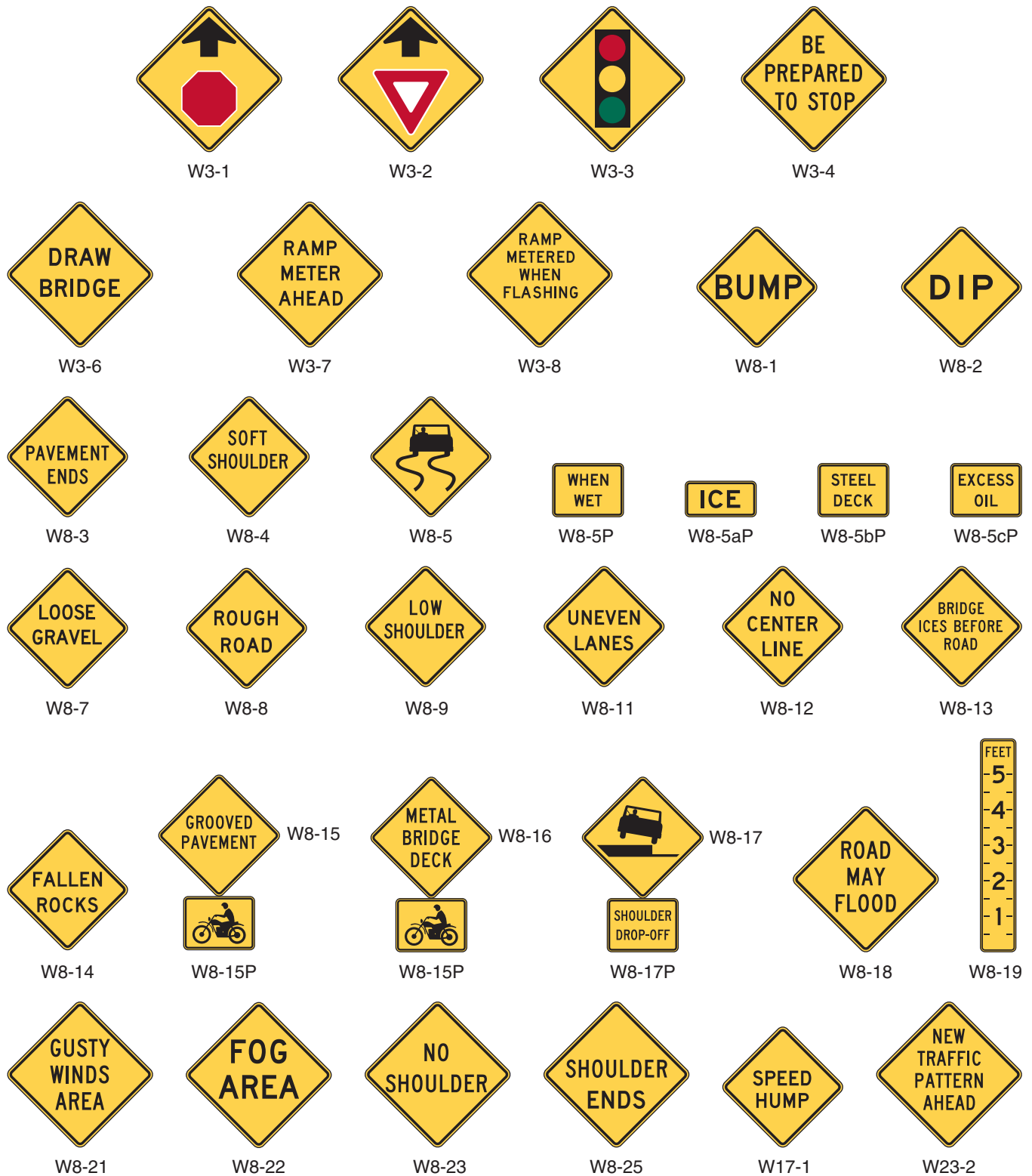
Option:

- 03 If a series of speed humps exists in close proximity, an Advisory Speed plaque may be eliminated on all but the first SPEED HUMP sign in the series.
- 04 The legend SPEED BUMP may be used instead of the legend SPEED HUMP on the W17-1 sign.

Support:

- 05 Speed humps generally provide more gradual vertical deflection than speed bumps. Speed bumps limit the speed of traffic more severely than speed humps. Other forms of speed humps include speed tables and raised intersections. However, these differences in engineering terminology are not well known by the public, so for signing purposes these terms are interchangeable.

Figure 2C-6. Roadway and Weather Condition and Advance Traffic Control Signs and Plaques



Standard:

- 11 The Emergency Vehicle (W11-8) sign (see Figure 2C-10) with the **EMERGENCY SIGNAL AHEAD (W11-12P)** supplemental plaque (see Figure 2C-10) shall be placed in advance of all emergency-vehicle traffic control signals (see Chapter 4G).

Option:

- 12 The Emergency Vehicle (W11-8) sign, or a word message sign indicating the type of emergency vehicle (such as rescue squad), may be used in advance of the emergency-vehicle station when no emergency-vehicle traffic control signal is present.
- 13 A Warning Beacon (see Section 4L.03) may be used with any Vehicular Traffic 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.
- 14 A supplemental WHEN FLASHING (W16-13P) plaque (see Figure 2C-12) may be used with any Vehicular Traffic 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.

Section 2C.50 Non-Vehicular Warning Signs (W11-2, W11-3, W11-4, W11-6, W11-7, W11-9, and W11-16 through W11-22)

Option:

- 01 Non-Vehicular Warning (W11-2, W11-3, W11-4, W11-6, W11-7, W11-9, and W11-16 through W11-22) signs (see Figure 2C-11) may be used to alert road users in advance of locations where unexpected entries into the roadway might occur or where shared use of the roadway by pedestrians, animals, or equestrians might occur.

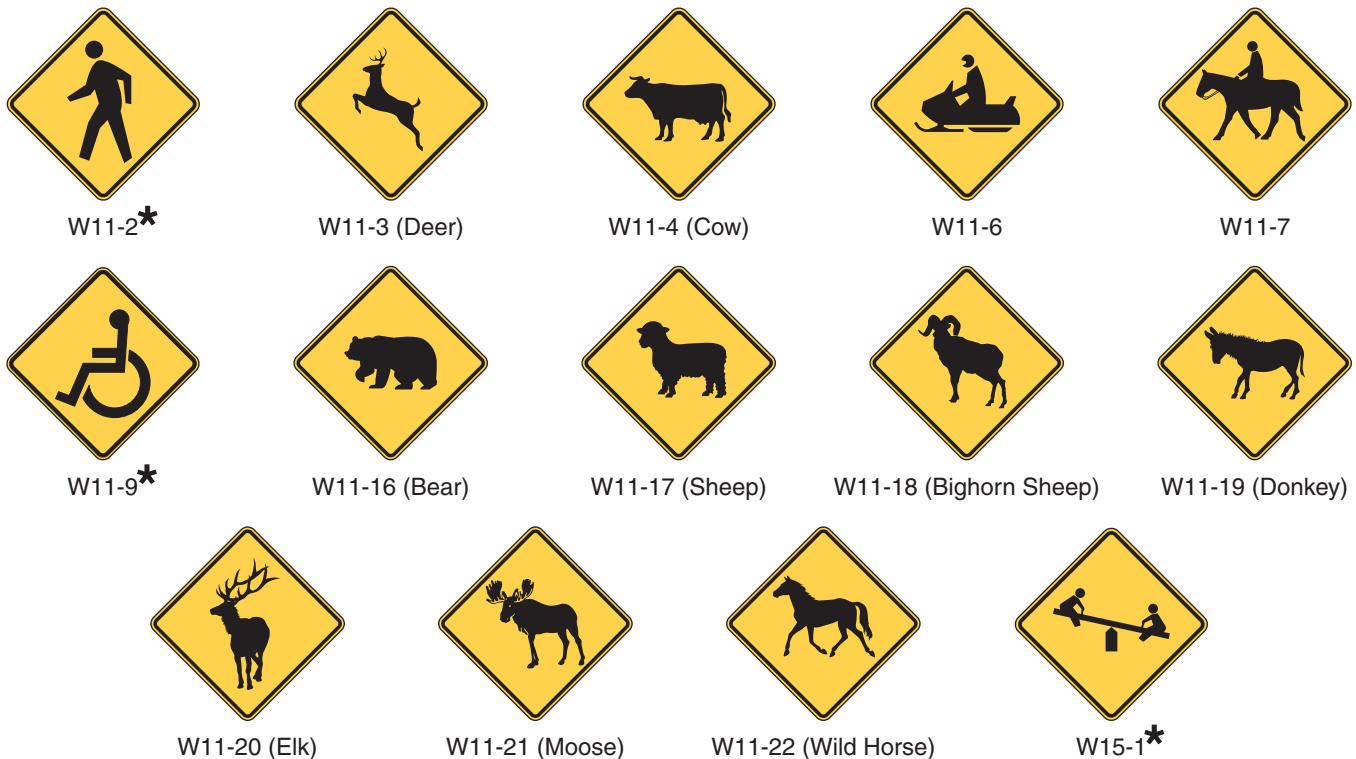
Support:

- 02 These conflicts might be relatively confined, or might occur randomly over a segment of roadway.

Guidance:

- 03 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.55) with the legend **AHEAD** or **XX FEET** to inform road users that they are approaching a point where crossing activity might occur.

Figure 2C-11. Non-Vehicular Warning Signs



* A fluorescent yellow-green background color may be used for this sign or plaque.

Standard:

- 04 **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-12) 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.**

Option:

- 05 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.11) have been installed in advance of the crosswalk.

Standard:

- 06 **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 or block the road user's view of the W11-2 sign.**

Option:

- 07 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.
- 08 The crossing location identified by a W11-2, W11-6, W11-7, or W11-9 sign may be defined with crosswalk markings (see Section 3B.18).
- 09 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:

- 10 *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:

- 11 A Warning Beacon (see Section 4L.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.
- 12 A supplemental WHEN FLASHING (W16-13P) plaque (see Figure 2C-12) 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.

Section 2C.51 Playground Sign (W15-1)**Option:**

- 01 The Playground (W15-1) sign (see Figure 2C-11) may be used to give advance warning of a designated children's playground that is located adjacent to the road.
- 02 The Playground sign may have a fluorescent yellow-green background with a black legend and border.

Guidance:

- 03 *If the access to the playground area requires a roadway crossing, the application of crosswalk pavement markings (see Section 3B.18) and Non-Vehicular Warning signs (see Section 2C.50) should be considered.*

Section 2C.52 NEW TRAFFIC PATTERN AHEAD Sign (W23-2)**Option:**

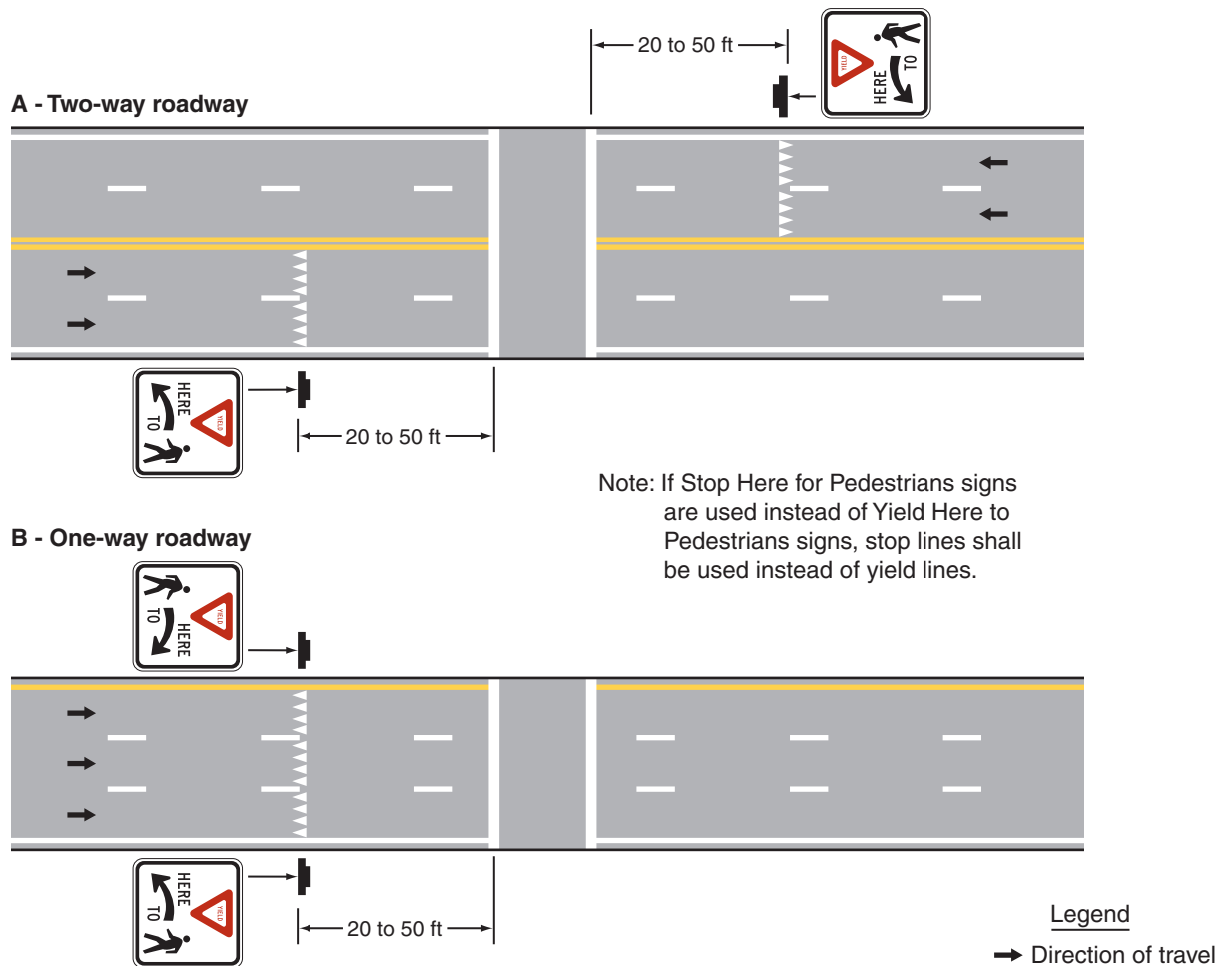
- 01 A NEW TRAFFIC PATTERN AHEAD (W23-2) sign (see Figure 2C-6) may be used on the approach to an intersection or along a section of roadway to provide advance warning of a change in traffic patterns, such as revised lane usage, roadway geometry, or signal phasing.

Guidance:

- 02 *The NEW TRAFFIC PATTERN AHEAD sign should be removed when the traffic pattern returns to normal, when the changed pattern is no longer considered to be new, or within six months.*

Section 2C.53 Use of Supplemental Warning Plaques**Option:**

- 01 A supplemental warning plaque (see Figure 2C-12) may be displayed with a warning or regulatory sign when engineering judgment indicates that road users require additional warning information beyond that contained in the main message of the warning or regulatory sign.

Figure 3B-17. Examples of Yield Lines at Unsignalized Midblock Crosswalks**Section 3B.18 Crosswalk Markings**

Support:

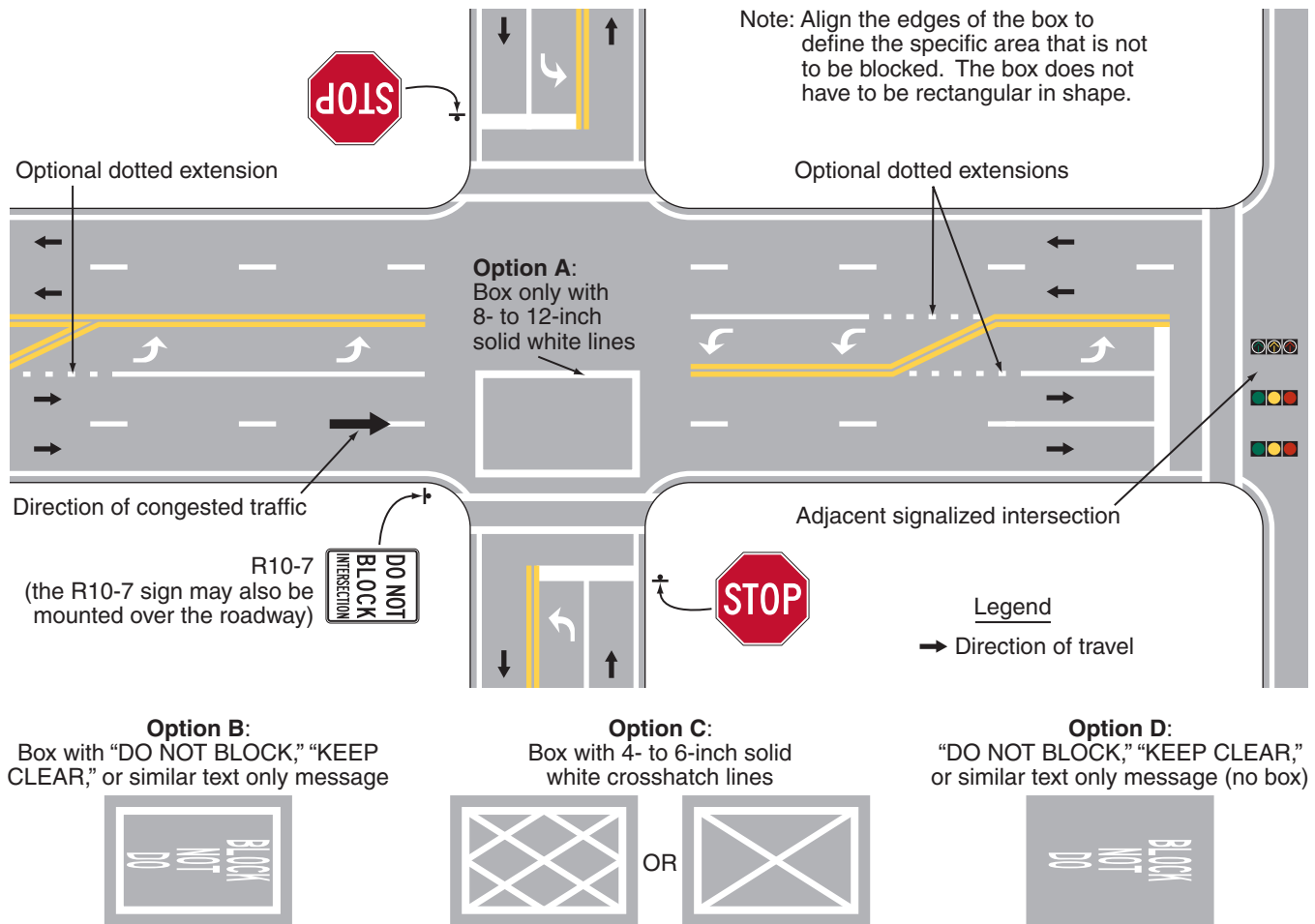
- 01 Crosswalk markings provide guidance for pedestrians who are crossing roadways by defining and delineating paths on approaches to and within signalized intersections, and on approaches to other intersections where traffic stops.
- 02 In conjunction with signs and other measures, crosswalk markings 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.
- 03 At non-intersection locations, crosswalk markings legally establish the crosswalk.

Standard:

- 04 **When crosswalk lines are used, they shall consist of solid white lines that mark the crosswalk. They shall not be less than 6 inches or greater than 24 inches in width.**

Guidance:

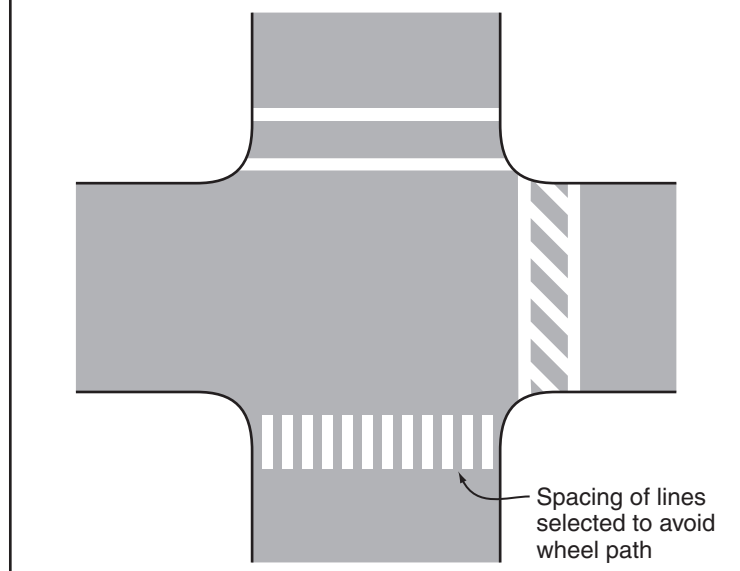
- 05 *If transverse lines are used to mark a crosswalk, the gap between the lines should not be less than 6 feet. If diagonal or longitudinal lines are used without transverse lines to mark a crosswalk, the crosswalk should be not less than 6 feet wide.*
- 06 *Crosswalk lines, if used on both sides of the crosswalk, should extend across the full width of pavement or to the edge of the intersecting crosswalk to discourage diagonal walking between crosswalks (see Figures 3B-17 and 3B-19).*
- 07 *At locations controlled by traffic control signals or on approaches controlled by STOP or YIELD signs, crosswalk lines should be installed where engineering judgment indicates they are needed to direct pedestrians to the proper crossing path(s).*

Figure 3B-18. Do Not Block Intersection Markings

08 Crosswalk lines 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 engineering study should consider the number of lanes, the presence of a median, the distance from adjacent signalized intersections, the pedestrian volumes and delays, the average daily traffic (ADT), the posted or statutory speed limit or 85th-percentile speed, the geometry of the location, the possible consolidation of multiple crossing points, the availability of street lighting, and other appropriate factors.

09 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 the speed limit exceeds 40 mph and either:

- 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
- 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.

Figure 3B-19. Examples of Crosswalk Markings

Support:

- 10 Chapter 4F contains information on Pedestrian Hybrid Beacons. Section 4L.03 contains information regarding Warning Beacons to provide active warning of a pedestrian's presence. Section 4N.02 contains information regarding In-Roadway Warning Lights at crosswalks. Chapter 7D contains information regarding school crossing supervision.

Guidance:

- 11 *Because non-intersection pedestrian crossings are generally unexpected by the road user, warning signs (see Section 2C.50) should be installed for all marked crosswalks at non-intersection locations and adequate visibility should be provided by parking prohibitions.*

Support:

- 12 Section 3B.16 contains information regarding placement of stop line markings near crosswalk markings.

Option:

- 13 For added visibility, the area of the crosswalk may be marked with white diagonal lines at a 45-degree angle to the line of the crosswalk or with white longitudinal lines parallel to traffic flow as shown in Figure 3B-19.
- 14 When diagonal or longitudinal lines are used to mark a crosswalk, the transverse crosswalk lines may be omitted. This type of marking may be used at locations where substantial numbers of pedestrians cross without any other traffic control device, at locations where physical conditions are such that added visibility of the crosswalk is desired, or at places where a pedestrian crosswalk might not be expected.

Guidance:

- 15 *If used, the diagonal or longitudinal lines should be 12 to 24 inches wide and separated by gaps of 12 to 60 inches. The design of the lines and gaps should avoid the wheel paths if possible, and the gap between the lines should not exceed 2.5 times the width of the diagonal or longitudinal lines.*

Option:

- 16 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 3B-20 may be used for the crosswalk.

Guidance:

- 17 *Crosswalk markings should be located so that the curb ramps are within the extension of the crosswalk markings.*

Support:

- 18 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.11) contains specifications for design and placement of detectable warning surfaces.

Section 3B.19 Parking Space Markings**Support:**

- 01 Marking of parking space boundaries encourages more orderly and efficient use of parking spaces where parking turnover is substantial. Parking space markings tend to prevent encroachment into fire hydrant zones, bus stops, loading zones, approaches to intersections, curb ramps, and clearance spaces for islands and other zones where parking is restricted. Examples of parking space markings are shown in Figure 3B-21.

Standard:

- 02 **Parking space markings shall be white.**

Figure 3B-20. Example of Crosswalk Markings for an Exclusive Pedestrian Phase that Permits Diagonal Crossing

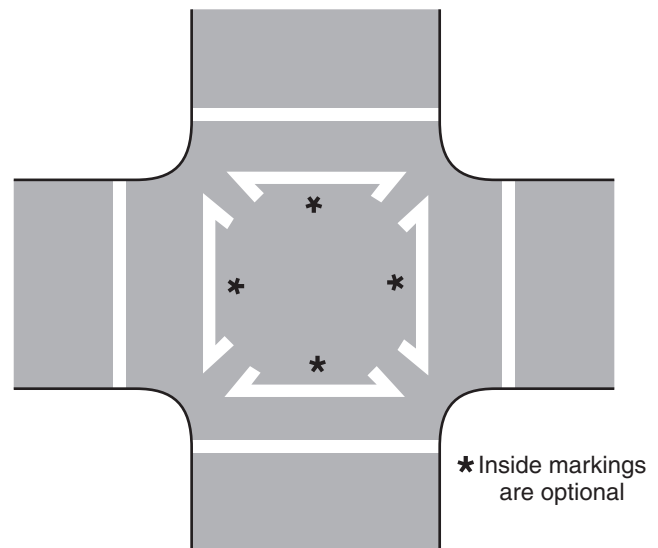
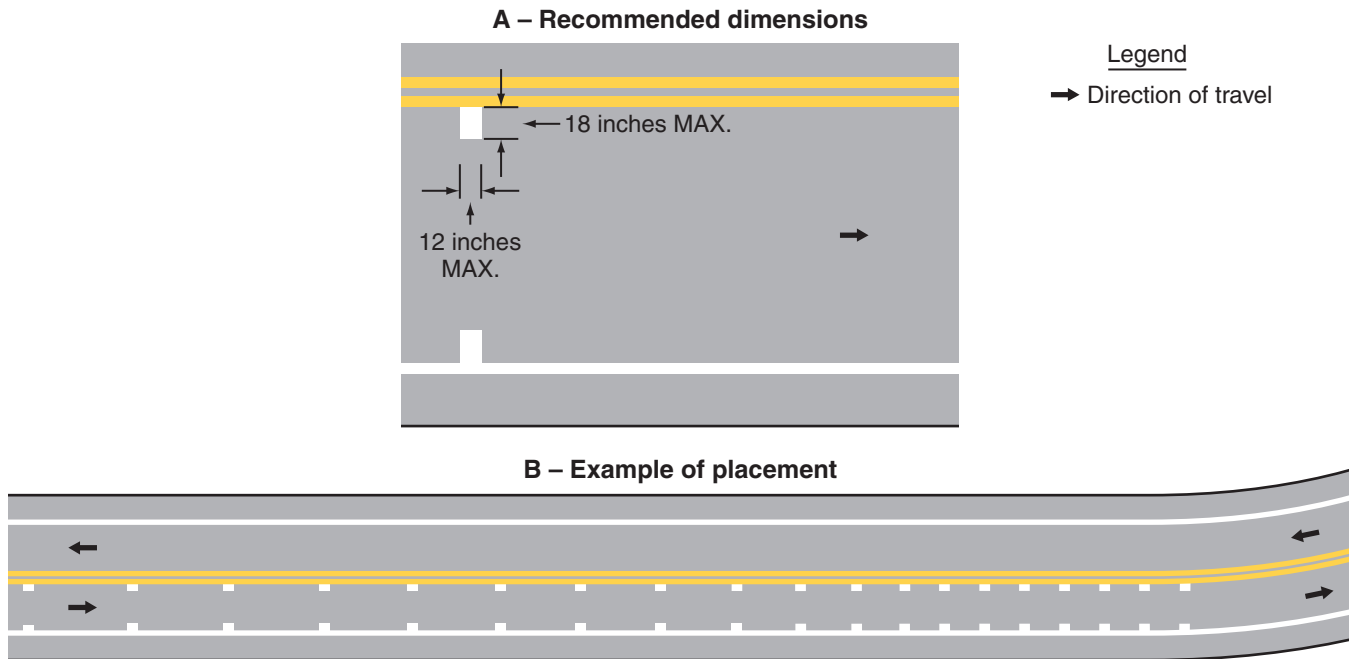


Figure 3B-28. Example of the Application of Speed Reduction Markings**Section 3B.23 Curb Markings****Support:**

- 01 Curb markings are most often used to indicate parking regulations or to delineate the curb.

Standard:

- 02 **Where curbs are marked to convey parking regulations in areas where curb markings are frequently obscured by snow and ice accumulation, signs shall be used with the curb markings except as provided in Paragraph 4.**

Guidance:

- 03 *Except as provided in Paragraph 4, when curb markings are used without signs to convey parking regulations, a legible word marking regarding the regulation (such as “No Parking” or “No Standing”) should be placed on the curb.*

Option:

- 04 Curb markings without word markings or signs may be used to convey a general prohibition by statute of parking within a specified distance of a STOP sign, YIELD sign, driveway, fire hydrant, or crosswalk.
- 05 Local highway agencies may prescribe special colors for curb markings to supplement standard signs for parking regulation.

Support:

- 06 Since yellow and white curb markings are frequently used for curb delineation and visibility, it is advisable to establish parking regulations through the installation of standard signs (see Sections 2B.46 through 2B.48).

Standard:

- 07 **Where curbs are marked for delineation or visibility purposes, the colors shall comply with the general principles of markings (see Section 3A.05).**

Guidance:

- 08 *Retroreflective solid yellow 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.*
- 09 *Retroreflective solid white markings should be used when traffic is permitted to pass on either side of the island.*

Support:

- 10 Where the curbs of the islands become parallel to the direction of traffic flow, it is not necessary to mark the curbs unless an engineering study indicates the need for this type of delineation.

- 11 Curbs at openings in a continuous median island need not be marked unless an engineering study indicates the need for this type of marking.

Option:

- 12 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 as of raised medians and curbs of islands, as a supplement to or substitute for retroreflective curb markings used for delineation.

Section 3B.24 Chevron and Diagonal Crosshatch Markings

Option:

- 01 Chevron and diagonal crosshatch markings may be used to discourage travel on certain paved areas, such as shoulders, gore areas, flush median areas between solid double yellow center line markings or between white channelizing lines approaching obstructions in the roadway (see Section 3B.10 and Figure 3B-15), between solid double yellow center line markings forming flush medians or channelized travel paths at intersections (see Figures 3B-2 and 3B-5), buffer spaces between preferential lanes and general-purpose lanes (see Figures 3D-2 and 3D-4), and at grade crossings (see Part 8).

Standard:

- 02 When crosshatch markings are used in paved areas that separate traffic flows in the same general direction, they shall be white and they shall be shaped as chevron markings, with the point of each chevron facing toward approaching traffic, as shown in Figure 3B-8, Drawing A of Figure 3B-9, Figure 3B-10, and Drawing C of Figure 3B-15.
- 03 When crosshatch markings are used in paved areas that separate opposing directions of traffic, they shall be yellow diagonal markings that slant away from traffic in the adjacent travel lanes, as shown in Figures 3B-2 and 3B-5 and Drawings A and B of Figure 3B-15.
- 04 When crosshatch markings are used on paved shoulders, they shall be diagonal markings that slant away from traffic in the adjacent travel lane. The diagonal markings shall be yellow when used on the left-hand shoulders of the roadways of divided highways and on the left-hand shoulders of one-way streets or ramps. The diagonal markings shall be white when used on right-hand shoulders.

Guidance:

- 05 The chevrons and diagonal lines used for crosshatch markings should be at least 12 inches wide for roadways having a posted or statutory speed limit of 45 mph or greater, and at least 8 inches wide for roadways having posted or statutory speed limit of less than 45 mph. The longitudinal spacing of the chevrons or diagonal lines should be determined by engineering judgment considering factors such as speeds and desired visual impacts. The chevrons and diagonal lines should form an angle of approximately 30 to 45 degrees with the longitudinal lines that they intersect.

Section 3B.25 Speed Hump Markings

Standard:

- 01 If speed hump markings are used, they shall be a series of white markings placed on a speed hump to identify its location. If markings are used for a speed hump that does not also function as a crosswalk or speed Table, the markings shall comply with Option A, B, or C shown in Figure 3B-29. If markings are used for a speed hump that also functions as a crosswalk or speed Table, the markings shall comply with Option A or B shown in Figure 3B-30.

Section 3B.26 Advance Speed Hump Markings

Option:

- 01 Advance speed hump markings (see Figure 3B-31) may be used in advance of speed humps or other engineered vertical roadway deflections such as dips where added visibility is desired or where such deflection is not expected.
- 02 Advance pavement wording such as BUMP or HUMP (see Section 3B.20) may be used on the approach to a speed hump either alone or in conjunction with advance speed hump markings. Appropriate advance warning signs may be used in compliance with Section 2C.29.

Standard:

- 03 If advance speed hump markings are used, they shall be a series of eight white 12-inch transverse lines that become longer and are spaced closer together as the vehicle approaches the speed hump or other deflection. If advance markings are used, they shall comply with the detailed design shown in Figure 3B-31.

Guidance:

- 04 If used, advance speed hump markings should be installed in each approach lane.

CHAPTER 4E. PEDESTRIAN CONTROL FEATURES

Section 4E.01 Pedestrian Signal Heads

Support:

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

Guidance:

- 02 *Engineering judgment should determine the need for separate pedestrian signal heads (see Section 4D.03) and accessible pedestrian signals (see Section 4E.09).*

Support:

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

Section 4E.02 Meaning of Pedestrian Signal Head Indications

Standard:

- 01 Pedestrian signal head indications shall have the following meanings:
- A. A steady WALKING PERSON (symbolizing WALK) signal indication means that a pedestrian facing the signal indication is permitted to start to cross the roadway in the direction of the signal indication, possibly in conflict with turning vehicles. The pedestrian shall yield the right-of-way to vehicles lawfully within the intersection at the time that the WALKING PERSON (symbolizing WALK) signal indication is first shown.
 - B. A flashing UPRAISED HAND (symbolizing DONT WALK) signal indication means that a pedestrian shall not start to cross the roadway in the direction of the signal indication, but that any pedestrian who has already started to cross on a steady WALKING PERSON (symbolizing WALK) signal indication shall proceed to the far side of the traveled way of the street or highway, unless otherwise directed by a traffic control device to proceed only to the median of a divided highway or only to some other island or pedestrian refuge area.
 - C. A steady UPRAISED HAND (symbolizing DONT WALK) signal indication means that a pedestrian shall not enter the roadway in the direction of the signal indication.
 - D. A flashing WALKING PERSON (symbolizing WALK) signal indication has no meaning and shall not be used.

Section 4E.03 Application of Pedestrian Signal Heads

Standard:

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

Guidance:

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

Option:

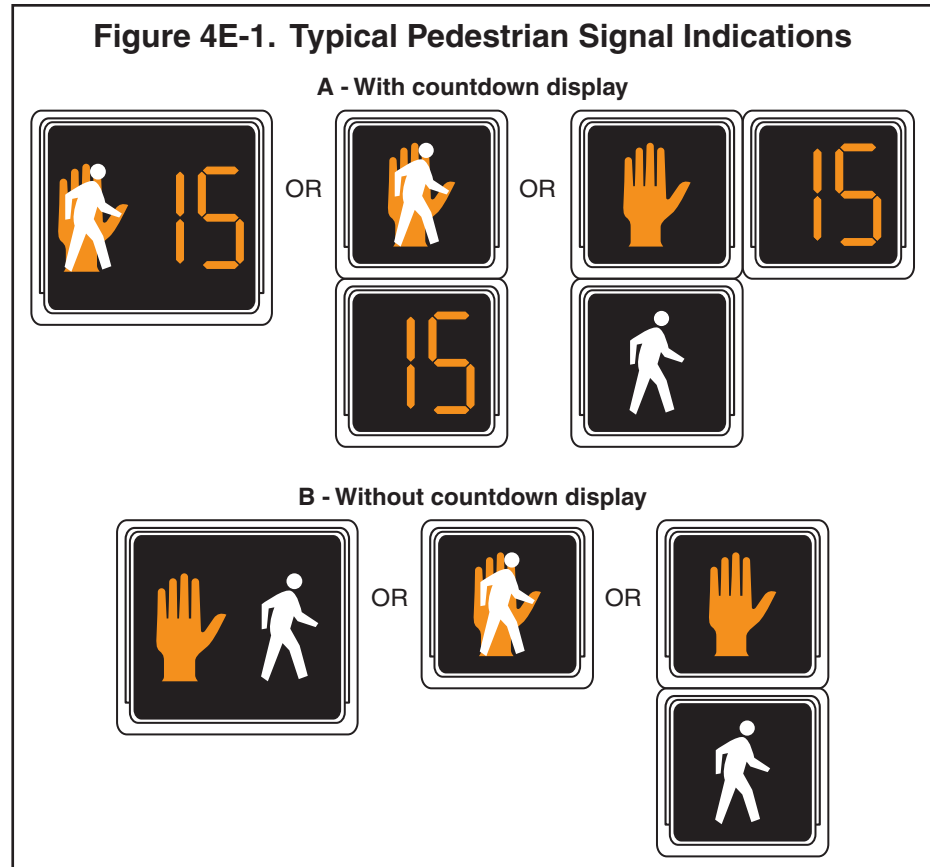
- 03 Pedestrian signal heads may be used under other conditions based on engineering judgment.

Section 4E.04 Size, Design, and Illumination of Pedestrian Signal Head Indications

Standard:

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

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



- 03 The WALKING PERSON (symbolizing WALK) signal indication shall be white, conforming to the publication entitled “Pedestrian Traffic Control Signal Indications” (see Section 1A.11), with all except the symbol obscured by an opaque material.
- 04 The UPRAISED HAND (symbolizing DONT WALK) signal indication shall be Portland orange, conforming to the publication entitled “Pedestrian Traffic Control Signal Indications” (see Section 1A.11), with all except the symbol obscured by an opaque material.
- 05 When not illuminated, the WALKING PERSON (symbolizing WALK) and UPRAISED HAND (symbolizing DONT WALK) symbols shall not be readily visible to pedestrians at the far end of the crosswalk that the pedestrian signal head indications control.
- 06 For pedestrian signal head indications, the symbols shall be at least 6 inches high.
- 07 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:

- 08 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.
- 09 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.
- 10 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:

- 11 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:

- 12 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 4E.05 Location and Height of Pedestrian Signal Heads

Standard:

- 01 Pedestrian signal heads shall be mounted with the bottom of the signal housing including brackets not less than 7 feet or more than 10 feet above sidewalk level, and shall be positioned and adjusted to provide maximum visibility at the beginning of the controlled crosswalk.
- 02 If pedestrian signal heads are mounted on the same support as vehicular signal heads, there shall be a physical separation between them.

Section 4E.06 Pedestrian Intervals and Signal Phases

Standard:

- 01 At intersections equipped with pedestrian signal heads, the pedestrian signal indications shall be displayed except when the vehicular traffic control signal is being operated in the flashing mode. At those times, the pedestrian signal indications shall not be displayed.
- 02 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 or 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.
- 03 When pedestrian signal heads are used, a WALKING PERSON (symbolizing WALK) signal indication shall be displayed only when pedestrians are permitted to leave the curb or shoulder.
- 04 A pedestrian change interval consisting of a flashing UPRAISED HAND (symbolizing DONT WALK) signal indication shall begin immediately following the WALKING PERSON (symbolizing WALK) signal indication. 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 3 seconds prior to the release of any conflicting vehicular movement. The sum of the time of the pedestrian change interval and the buffer interval shall not be less than the calculated pedestrian clearance time (see Paragraphs 7 through 16). The buffer interval shall not begin later than the beginning of the red clearance interval, if used.

Option:

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

Support:

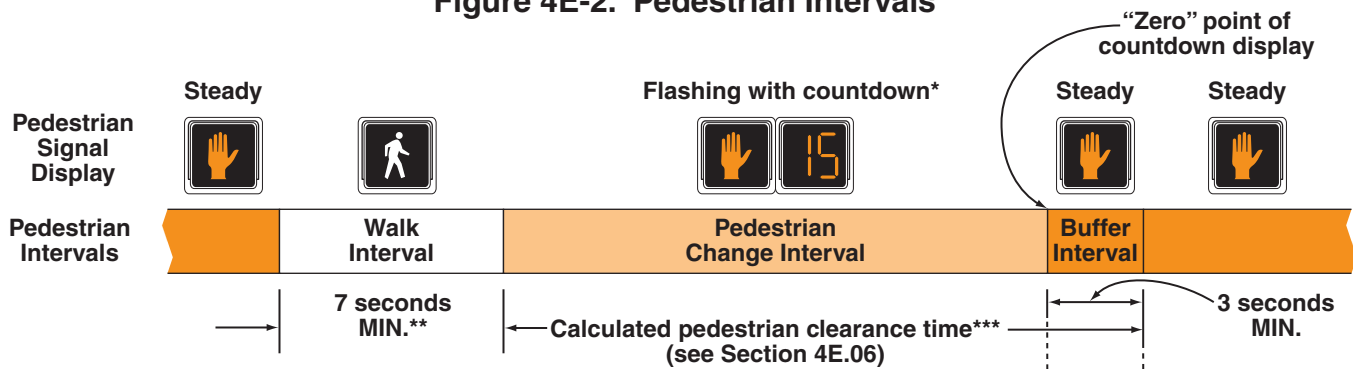
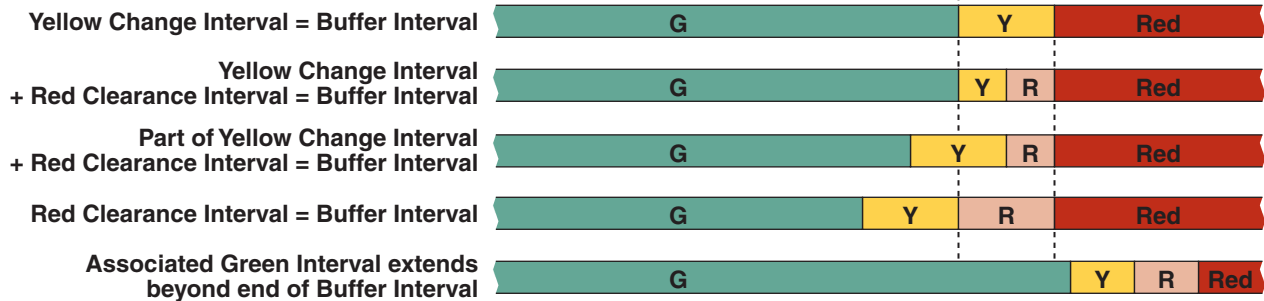
- 06 Figure 4E-2 illustrates the pedestrian intervals and their possible relationships with associated vehicular signal phase intervals.

Guidance:

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

Option:

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

Figure 4E-2. Pedestrian Intervals**Relationship to associated vehicular phase intervals:****Legend**

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

* 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.

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

Guidance:

10 Where pedestrians who walk slower than 3.5 feet per second, or pedestrians who use wheelchairs, routinely use the crosswalk, a walking speed of less than 3.5 feet per second should be considered in determining the pedestrian clearance time.

11 Except as provided in Paragraph 12, the walk interval should be at least 7 seconds in length so that pedestrians will have adequate opportunity to leave the curb or shoulder before the pedestrian clearance time begins.

Option:

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

Support:

13 The walk interval is intended for pedestrians to start their crossing. The pedestrian clearance time is intended to allow pedestrians who started crossing during the walk interval to complete their crossing. Longer walk intervals are often used when the duration of the vehicular green phase associated with the pedestrian crossing is long enough to allow it.

Guidance:

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

Option:

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

Standard:

- 16 **Where the pedestrian clearance time is sufficient only for crossing from the curb or shoulder to a median of sufficient width for pedestrians to wait, median-mounted pedestrian signals (with pedestrian detectors if actuated operation is used) shall be provided (see Sections 4E.08 and 4E.09) and signing such as the R10-3d sign (see Section 2B.52) shall be provided to notify pedestrians to cross only to the median to await the next WALKING PERSON (symbolizing WALK) signal indication.**

Guidance:

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

Option:

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

- 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:

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

Support:

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

Guidance:

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

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

Support:

- 24 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.

Section 4E.07 Countdown Pedestrian Signals

Standard:

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

Option:

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

Standard:

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

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

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

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

Guidance:

07 *If used with a pedestrian signal head that does not have a concurrent vehicular phase, the pedestrian change interval (flashing UPRAISED HAND) should be set to be approximately 4 seconds less than the required pedestrian clearance time (see Section 4E.06) and an additional clearance interval (during which a steady UPRAISED HAND is displayed) should be provided prior to the start of the conflicting vehicular phase.*

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

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

10 *If the pedestrian change interval is interrupted or shortened as a part of a transition into a preemption sequence (see Section 4E.06), the countdown pedestrian signal display should be discontinued and go dark immediately upon activation of the preemption transition.*

Section 4E.08 Pedestrian Detectors

Option:

01 Pedestrian detectors may be pushbuttons or passive detection devices.

Support:

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

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

Guidance:

04 *If pedestrian pushbuttons are used, they should be capable of easy activation and conveniently located near each end of the crosswalks. Except as provided in Paragraphs 5 and 6, pedestrian pushbuttons should be located to meet all of the following criteria (see Figure 4E-3):*

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

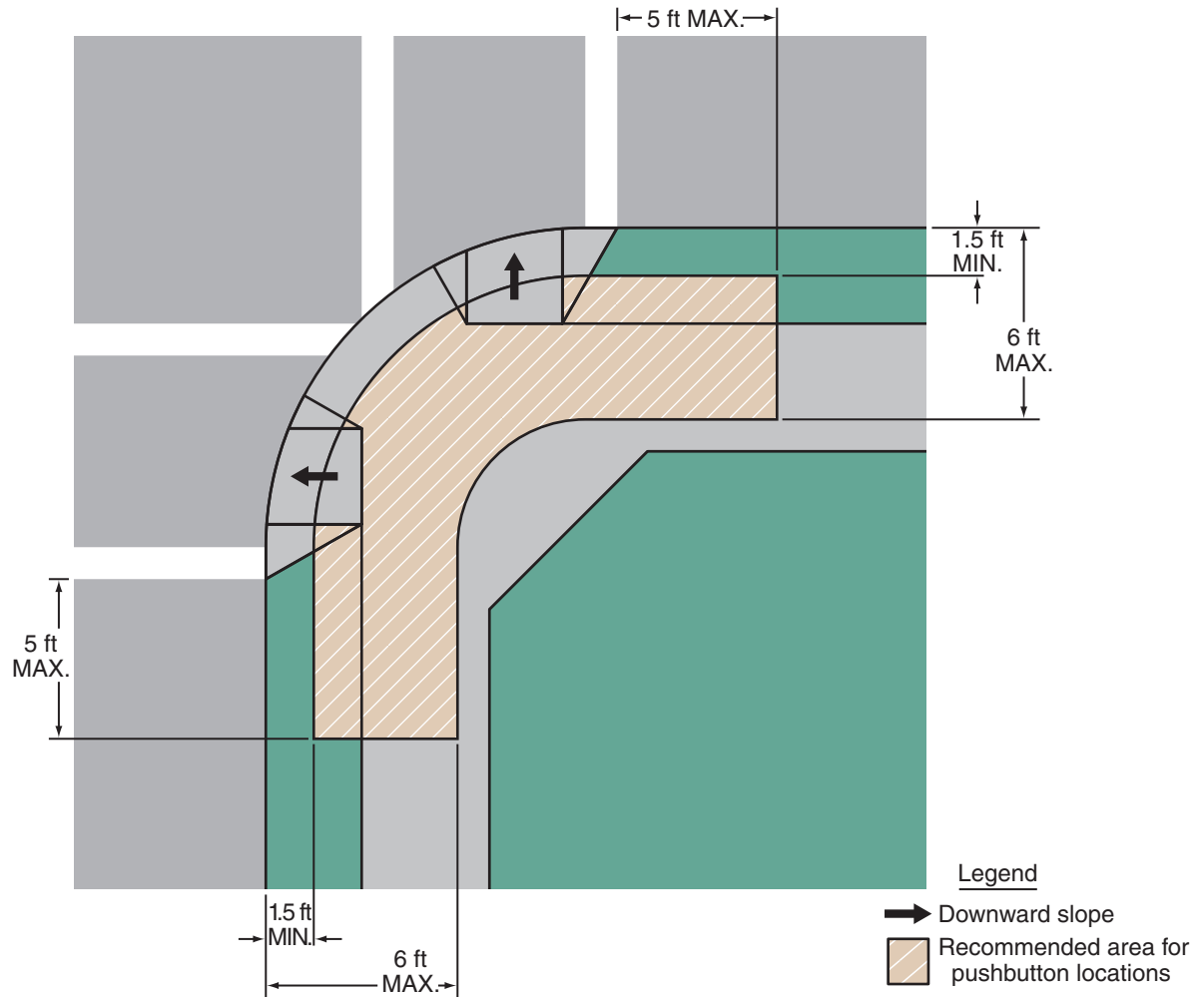
05 *Where there are physical constraints that make it impractical to place the pedestrian pushbutton adjacent to a level all-weather surface, the surface should be as level as feasible.*

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

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

Option:

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

Figure 4E-3. Pushbutton Location Area**Notes:**

1. Where there are constraints that make it impractical to place the pedestrian pushbutton between 1.5 feet and 6 feet from the edge of the curb, shoulder, or pavement, it should not be further than 10 feet from the edge of curb, shoulder, or pavement.
2. Two pedestrian pushbuttons on a corner should be separated by 10 feet.
3. This figure is not drawn to scale.
4. Figure 4E-4 shows typical pushbutton locations.

Support:

09 Figure 4E-4 shows typical pedestrian pushbutton locations for a variety of situations.

Standard:

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

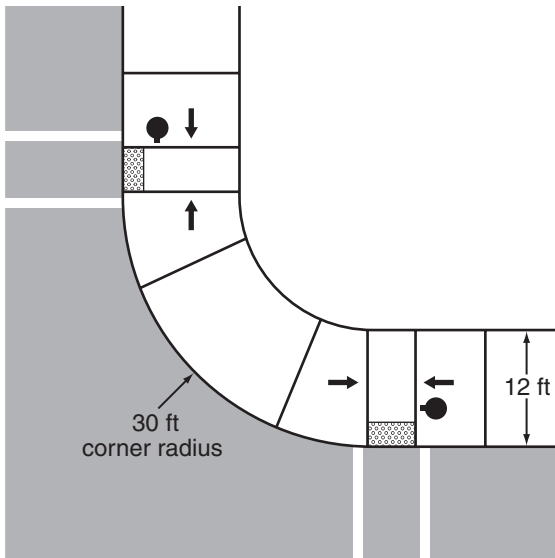
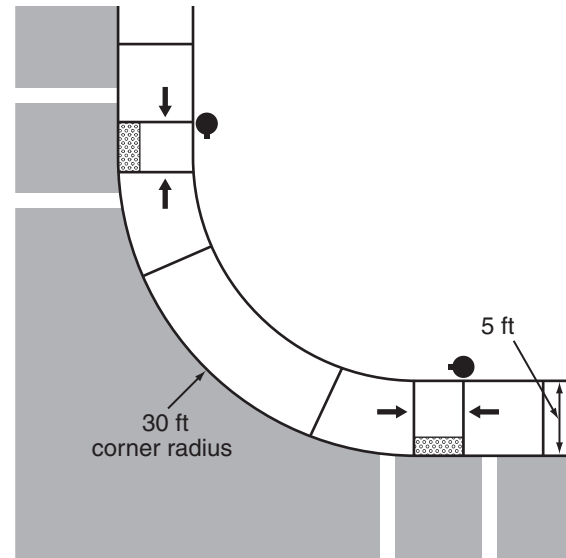
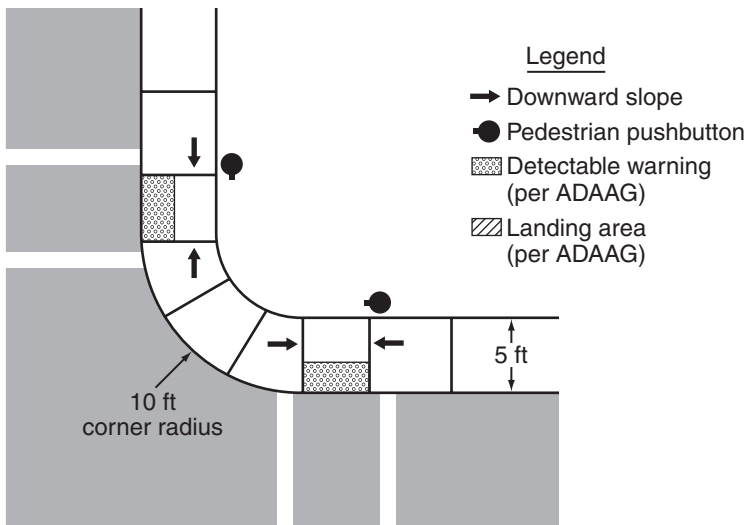
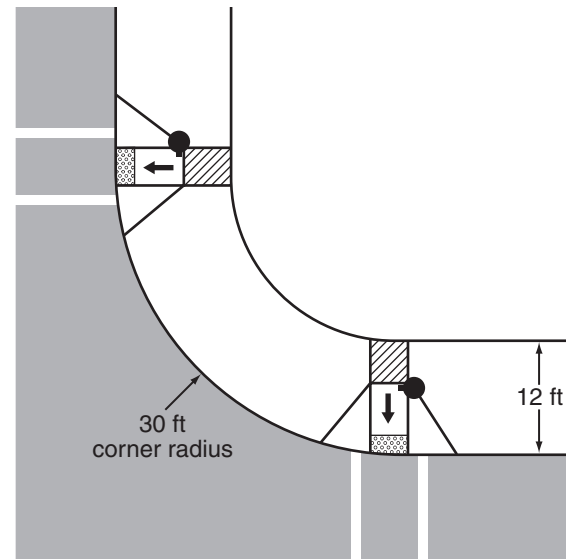
Option:

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

Standard:

12 **The positioning of pedestrian pushbuttons and the legends on the pedestrian pushbutton signs shall clearly indicate which crosswalk signal is actuated by each pedestrian pushbutton.**

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

Figure 4E-4. Typical Pushbutton Locations (Sheet 1 of 2)**A - Parallel ramps with wide sidewalk****B - Parallel ramps with narrow sidewalk****C - Parallel ramps with narrow sidewalk and tight corner radius****D - Perpendicular ramps with crosswalks far apart****Notes:**

1. This figure is not drawn to scale.
2. These drawings are intended to describe the typical locations for pedestrian pushbutton installations. They are not intended to be a guide for the design of curb cut ramps.
3. Figure 4E-3 shows the recommended area for pushbutton locations.

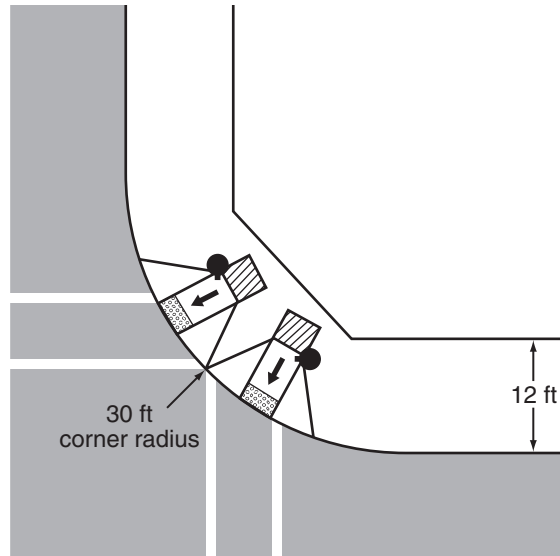
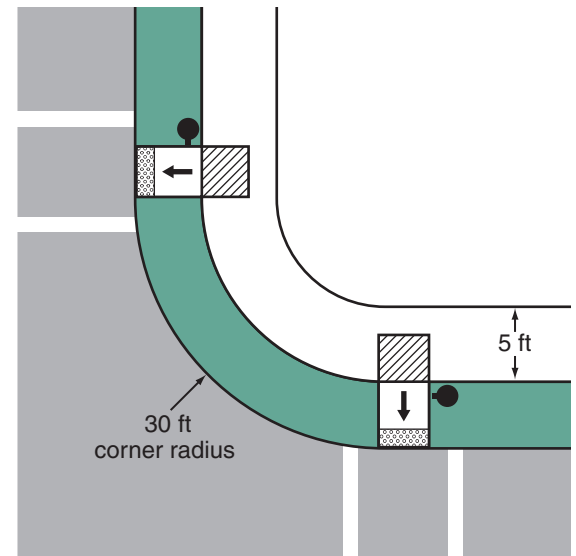
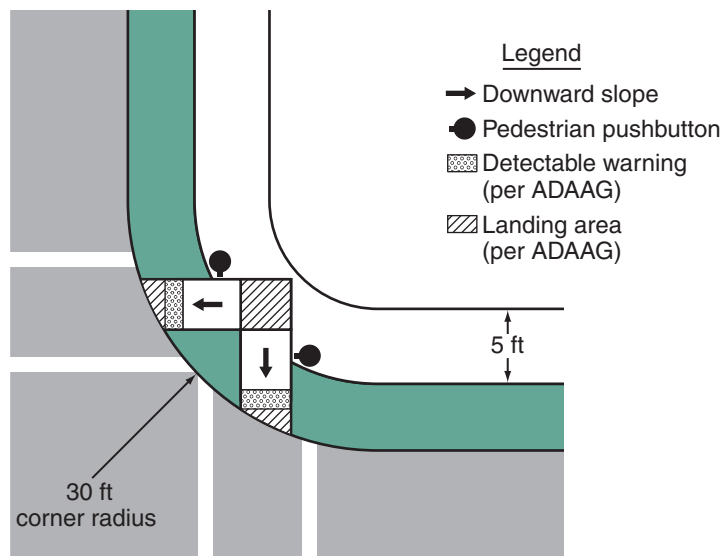
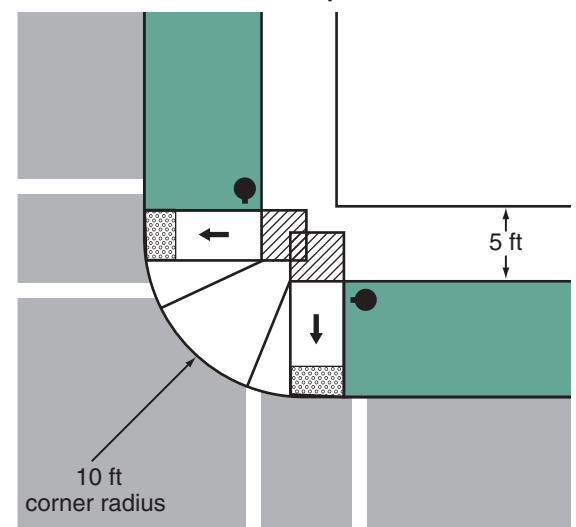
Guidance:

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

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

Standard:

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

Figure 4E-4. Typical Pushbutton Locations (Sheet 2 of 2)**E - Perpendicular ramps with crosswalks close together****F - Perpendicular ramps with sidewalk set back from road with crosswalks far apart****G - Perpendicular ramps with sidewalk set back from road with crosswalks close together****H - Perpendicular ramps with sidewalk set back from road with continuous sidewalk between ramps****Notes:**

1. This figure is not drawn to scale.
2. These drawings are intended to describe the typical locations for pedestrian pushbutton installations. They are not intended to be a guide for the design of curb cut ramps.
3. Figure 4E-3 shows the recommended area for pushbutton locations.

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

Option:

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

Standard:

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

Section 4E.09 Accessible Pedestrian Signals and Detectors – General

Support:

- 01 Accessible pedestrian signals and detectors provide information in non-visual formats (such as audible tones, speech messages, and/or vibrating surfaces).
- 02 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:

- 03 *If a particular signalized location presents difficulties for pedestrians who have visual disabilities to cross the roadway, an engineering study should be conducted that considers the needs of pedestrians in general, as well as the information needs of pedestrians with visual disabilities. The engineering study should consider the following factors:*
- A. *Potential demand for accessible pedestrian signals;*
 - B. *A request for accessible pedestrian signals;*
 - C. *Traffic volumes during times when pedestrians might be present, including periods of low traffic volumes or high turn-on-red volumes;*
 - D. *The complexity of traffic signal phasing (such as split phases, protected turn phases, leading pedestrian intervals, and exclusive pedestrian phases); and*
 - E. *The complexity of intersection geometry.*

Support:

- 04 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.
- 05 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:

- 06 **When used, accessible pedestrian signals shall be used in combination with pedestrian signal timing. The information provided by an accessible pedestrian signal shall clearly indicate which pedestrian crossing is served by each device.**
- 07 **Under stop-and-go operation, accessible pedestrian signals shall not be limited in operation by the time of day or day of week.**

Option:

- 08 Accessible pedestrian signal detectors may be pushbuttons or passive detection devices.
- 09 At locations with pretimed traffic control signals or non-actuated approaches, pedestrian pushbuttons may be used to activate the accessible pedestrian signals.

Support:

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

Option:

- 11 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:

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

Standard:

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

Section 4E.10 Accessible Pedestrian Signals and Detectors – Location**Support:**

- 01 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:

- 02 *Pushbuttons for accessible pedestrian signals should be located in accordance with the provisions of Section 4E.08 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:

- 03 **If two accessible pedestrian pushbuttons are placed less than 10 feet apart or on the same pole, each accessible pedestrian pushbutton shall be provided with the following features (see Sections 4E.11 through 4E.13):**
- A. A pushbutton locator tone,
 - B. A tactile arrow,
 - C. A speech walk message for the WALKING PERSON (symbolizing WALK) indication, and
 - D. A speech pushbutton information message.
- 04 **If the pedestrian clearance time is sufficient only to cross from the curb or shoulder to a median of sufficient width for pedestrians to wait and accessible pedestrian detectors are used, an additional accessible pedestrian detector shall be provided in the median.**

Section 4E.11 Accessible Pedestrian Signals and Detectors – Walk Indications**Support:**

- 01 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:

- 02 **Accessible pedestrian signals shall have both audible and vibrotactile walk indications.**
- 03 **Vibrotactile walk indications shall be provided by a tactile arrow on the pushbutton (see Section 4E.12) that vibrates during the walk interval.**
- 04 **Accessible pedestrian signals shall have an audible walk indication during the walk interval only. The audible walk indication shall be audible from the beginning of the associated crosswalk.**
- 05 **The accessible walk indication shall have the same duration as the pedestrian walk signal except when the pedestrian signal rests in walk.**

Guidance:

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

Standard:

- 07 **Where two accessible pedestrian signals are separated by a distance of at least 10 feet, the audible walk indication shall be a percussive tone. Where two accessible pedestrian signals on one corner are not separated by a distance of at least 10 feet, the audible walk indication shall be a speech walk message.**
- 08 **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:

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

Standard:

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

Guidance:

- 11 *The sound level of audible walk indications and pushbutton locator tones should be adjusted to be low enough to avoid misleading pedestrians who have visual disabilities when the following conditions exist:*
- A. *Where there is an island that allows unsignalized right turns across a crosswalk between the island and the sidewalk.*
 - B. *Where multi-leg approaches or complex signal phasing require more than two pedestrian phases, such that it might be unclear which crosswalk is served by each audible tone.*
 - C. *At intersections where a diagonal pedestrian crossing is allowed, or where one street receives a WALKING PERSON (symbolizing WALK) signal indication simultaneously with another street.*

Option:

- 12 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:

- 13 An alert tone can be particularly useful if the walk tone is not easily audible in some traffic conditions.
- 14 Speech walk messages communicate to pedestrians which street has the walk interval. Speech messages might be either directly audible or transmitted, requiring a personal receiver to hear the message. To be a useful system, the words and their meaning need to be correctly understood by all users in the context of the street environment where they are used. Because of this, tones are the preferred means of providing audible walk indications except where two accessible pedestrian signals on one corner are not separated by a distance of at least 10 feet.
- 15 If speech walk messages are used, pedestrians have to know the names of the streets that they are crossing in order for the speech walk messages to be unambiguous. In getting directions to travel to a new location, pedestrians with visual disabilities do not always get the name of each street to be crossed. Therefore, it is desirable to give users of accessible pedestrian signals the name of the street controlled by the pushbutton. This can be done by means of a speech pushbutton information message (see Section 4D.13) during the flashing or steady UPRaised HAND intervals, or by raised print and Braille labels on the pushbutton housing.
- 16 By combining the information from the pushbutton message or Braille label, the tactile arrow aligned in the direction of travel on the relevant crosswalk, and the speech walk message, pedestrians with visual disabilities are able to correctly respond to speech walk messages even if there are two pushbuttons on the same pole.

Standard:

- 17 **If speech walk messages are used to communicate the walk interval, they shall provide a clear message that the walk interval is in effect, as well as to which crossing it applies. Speech walk messages shall be used only at intersections where it is technically infeasible to install two accessible pedestrian signals at one corner separated by a distance of at least 10 feet.**
- 18 **Speech walk messages that are used at intersections having pedestrian phasing that is concurrent with vehicular phasing shall be patterned after the model: “Broadway. Walk sign is on to cross Broadway.”**
- 19 **Speech walk messages that are used at intersections having exclusive pedestrian phasing shall be patterned after the model: “Walk sign is on for all crossings.”**
- 20 **Speech walk messages shall not contain any additional information, except they shall include designations such as “Street” or “Avenue” where this information is necessary to avoid ambiguity at a particular location.**

Guidance:

- 21 *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:

- 22 **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.**
- 23 **If a pilot light (see Section 4E.08) is used at an accessible pedestrian signal location, each actuation shall be accompanied by the speech message “wait.”**

Option:

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

Standard:

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

Section 4E.12 Accessible Pedestrian Signals and Detectors – Tactile Arrows and Locator Tones

Standard:

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

- 02 **An accessible pedestrian pushbutton shall incorporate a locator tone.**

Support:

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

Standard:

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

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

- 06 **Pushbutton locator tones shall be intensity responsive to ambient sound, and be audible 6 to 12 feet from the pushbutton, or to the building line, whichever is less.**

Support:

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

Section 4E.13 Accessible Pedestrian Signals and Detectors – Extended Pushbutton Press Features

Option:

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

Standard:

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

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

Support:

- 04 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.

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

Guidance:

- 06 *Audible beaconing should only be considered following an engineering study at:*
- A. *Crosswalks longer than 70 feet, unless they are divided by a median that has another accessible pedestrian signal with a locator tone;*
 - B. *Crosswalks that are skewed;*
 - C. *Intersections with irregular geometry, such as more than four legs;*
 - D. *Crosswalks where audible beaconing is requested by an individual with visual disabilities; or*
 - E. *Other locations where a study indicates audible beaconing would be beneficial.*

Option:

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

Standard:

- 08 **If audible beaconing is used, the volume of the pushbutton locator tone during the pedestrian change interval of the called pedestrian phase shall be increased and operated in one of the following ways:**
- A. The louder audible walk indication and louder locator tone comes from the far end of the crosswalk, as pedestrians cross the street,**
 - B. The louder locator tone comes from both ends of the crosswalk, or**
 - C. The louder locator tone comes from an additional speaker that is aimed at the center of the crosswalk and that is mounted on a pedestrian signal head.**

Option:

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

Standard:

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

Guidance:

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

Support:

- 12 Additional information on the structure and wording of speech pushbutton 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).

CHAPTER 4F. PEDESTRIAN HYBRID BEACONS

Section 4F.01 Application of Pedestrian Hybrid Beacons

Support:

- 01 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:

- 02 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:

- 03 **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:

- 04 *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 and 4E.*
- 05 *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.*
- 06 *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 4F-1 for the length of the crosswalk.*
- 07 *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 4F-2 for the length of the crosswalk.*
- 08 *For crosswalks that have lengths other than the four that are specifically shown in Figures 4F-1 and 4F-2, the values should be interpolated between the curves.*

Section 4F.02 Design of Pedestrian Hybrid Beacons

Standard:

- 01 **Except as otherwise provided in this Section, a pedestrian hybrid beacon shall meet the provisions of Chapters 4D and 4E.**
- 02 **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 4F-3).**
- 03 **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 conforming to the provisions set forth in Chapter 4E shall be installed at each end of the marked crosswalk, and**
 - D. **The pedestrian hybrid beacon shall be pedestrian actuated.**

Guidance:

- 04 *When an engineering study finds that installation of a pedestrian hybrid beacon is justified, then:*
- A. *The pedestrian hybrid beacon should be installed at least 100 feet from side streets or driveways that are controlled by STOP or YIELD signs,*

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

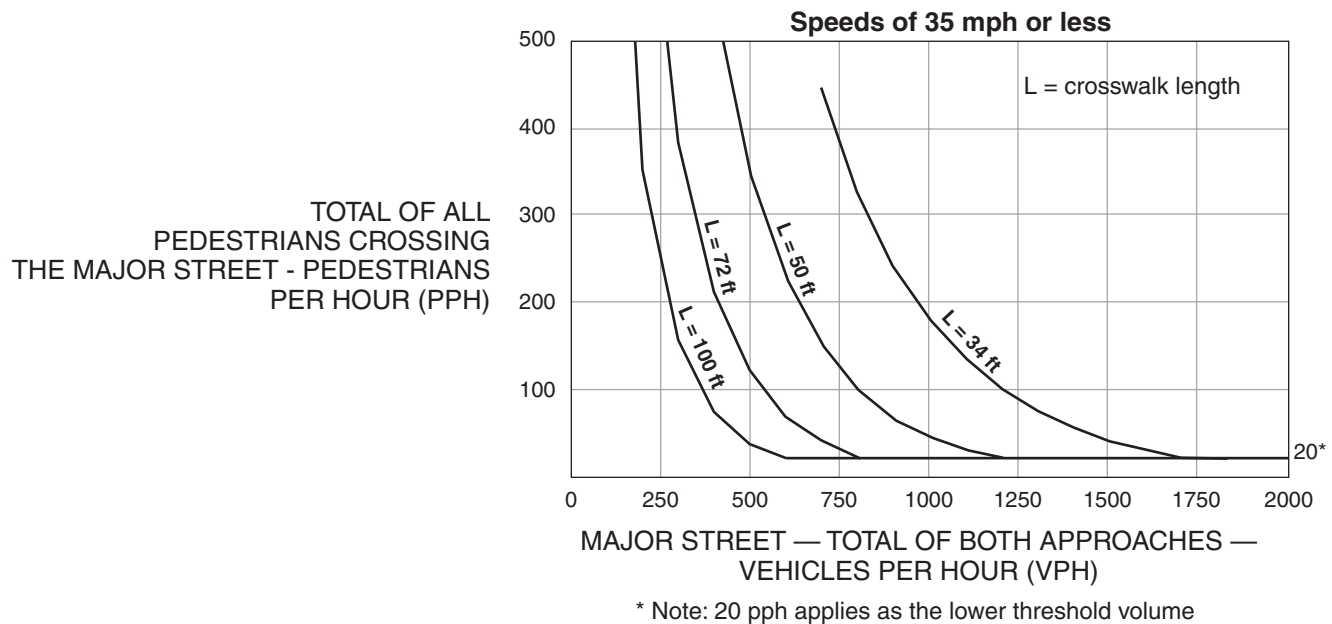


Figure 4F-2. Guidelines for the Installation of Pedestrian Hybrid Beacons on High-Speed Roadways

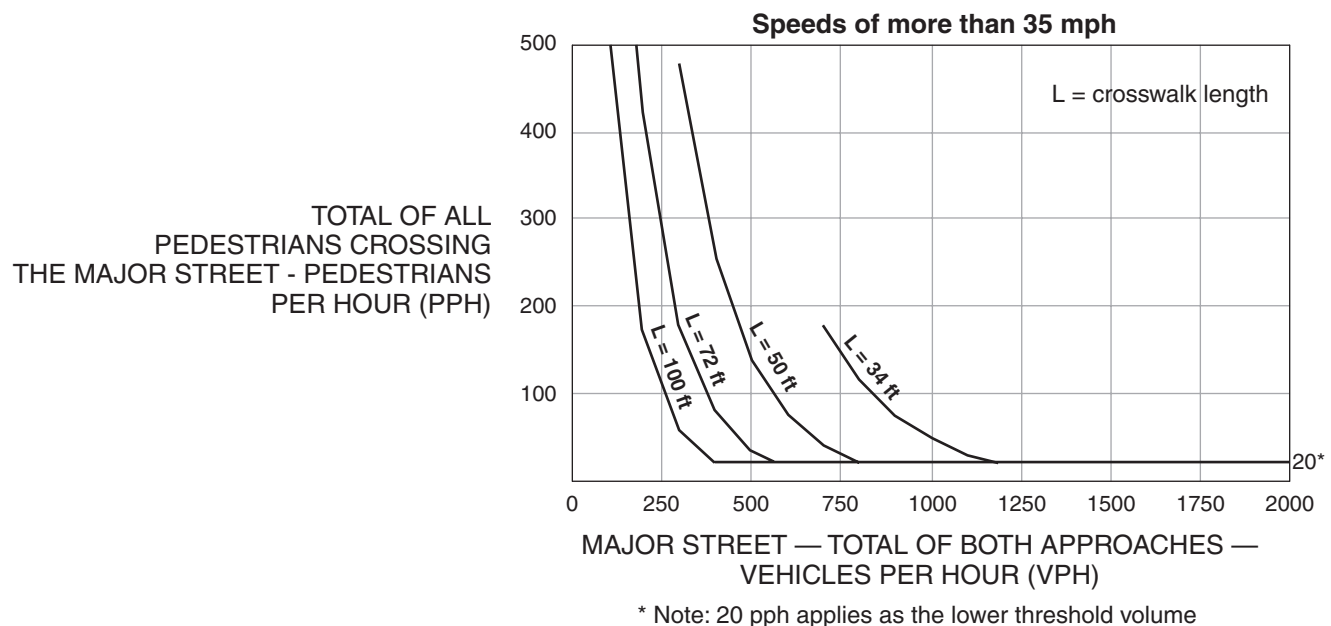
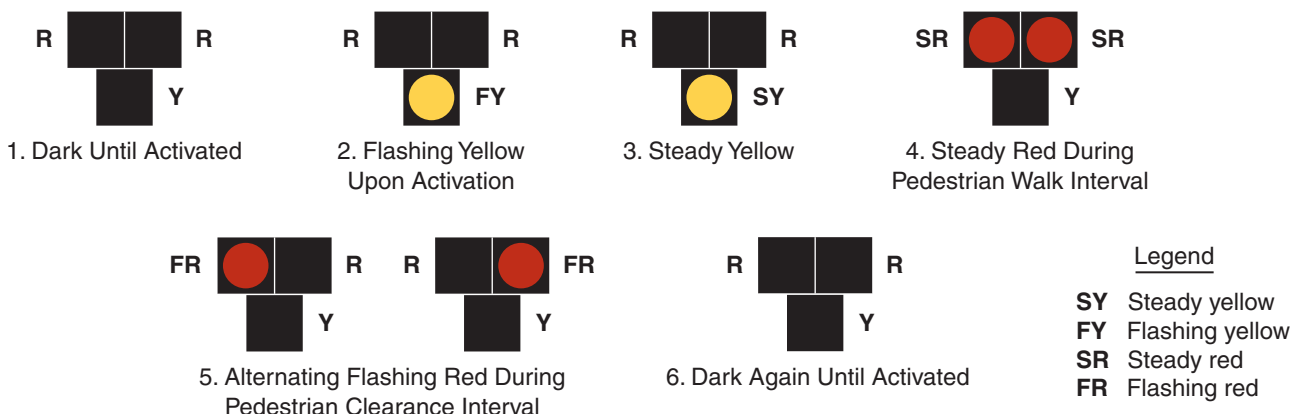


Figure 4F-3. Sequence for a Pedestrian Hybrid Beacon

B. 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,

C. The installation should include suitable standard signs and pavement markings, and

D. If installed within a signal system, the pedestrian hybrid beacon should be coordinated.

05 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.

06 On multi-lane approaches having a 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.

07 A pedestrian hybrid beacon should comply with the signal face location provisions described in Sections 4D.11 through 4D.16.

Standard:

08 A CROSSWALK STOP ON RED (symbolic circular red) (R10-23) sign (see Section 2B.53) shall be mounted adjacent to a pedestrian hybrid beacon face on each major street approach. If an overhead pedestrian hybrid beacon face is provided, the sign shall be mounted adjacent to the overhead signal face. Option:

09 A Pedestrian (W11-2) warning sign (see Section 2C.50) 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:

10 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:

11 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 4L.01 and 4L.03.

Section 4F.03 Operation of Pedestrian Hybrid Beacons

Standard:

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

02 Upon 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 clearance interval (see Figure 4F-3). Upon termination of the pedestrian clearance interval, the pedestrian hybrid beacon faces shall revert to a dark (not illuminated) condition.

- 03 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 clearance interval, the pedestrian signal heads shall revert to a steady UPRAISED HAND (symbolizing DONT WALK) signal indication.

Option:

- 04 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:

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

Standard:

- 06 **The duration of the steady yellow change interval shall be determined using engineering practices.**

Guidance:

- 07 *The steady yellow interval should have a minimum duration of 3 seconds and a maximum duration of 6 seconds (see Section 4D.26). The longer intervals should be reserved for use on approaches with higher speeds.*

Attachment D

Florida Greenbook FDOT Standards

CHAPTER 8

PEDESTRIAN FACILITIES

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CHAPTER 8

PEDESTRIAN FACILITIES

A INTRODUCTION

Pedestrian facilities shall be given full consideration in the planning and development of transportation facilities, including the incorporation of such facilities into state, regional, and local transportation plans and programs under the assumption that transportation facilities will be used by pedestrians. Pedestrian facilities should be considered in conjunction with the construction, reconstruction, or other significant improvement of any transportation facility. Special emphasis should be given to projects in or within 1 mile of an urban area.

Each highway agency responsible for a system of streets and highways should establish and maintain a program for implementing pedestrian facilities, and for maintaining existing pedestrian facilities.

B TYPES OF PEDESTRIAN FACILITIES

There are several ways in which pedestrians can be accommodated in the public right of way.

B.1 Sidewalks

Sidewalks are walkways parallel to the roadway and designed for use by pedestrians. Sidewalks provided on both sides of a street are the preferred pedestrian facility; however, the construction of sidewalks on both sides of the street would not be required in cases where pedestrians would not be expected such as when the roadway parallels a railroad or drainage canal. To comply with ADA standards, newly constructed, reconstructed, or altered sidewalks must be accessible to and usable by persons with disabilities.

For additional information concerning the design of sidewalks, refer to Section C.7.d of CHAPTER 3 – GEOMETRIC DESIGN.

B.2 Off-Road Paths

An off-road path, paved or unpaved, can be an appropriate facility in rural or low-density suburban areas. Paths are usually set back from the road and separated by a green area, ditch, swales or trees.

B.3 Shared-Use Paths

Shared use paths are designed for the use by both pedestrians and bicyclists and shall meet ADA Standards.

For information concerning the design of shared-use paths, refer to CHAPTER 9 - BICYCLE FACILITIES.

B.4 Shared Streets

Shared uses of a street for people walking, bicycling and driving are referred to as shared streets. These are usually specially designed spaces such as pedestrian streets which are used on local urban streets with extremely low vehicle speed.

B.5 Shoulders

Most highway shoulders are not pedestrian facilities, because they are not intended for use by pedestrians, although they can accommodate occasional pedestrian usage.

C MINIMIZING CONFLICTS

The planning and design of new streets and highways shall include provisions that minimize vehicle-pedestrian conflicts. These include:

- Sidewalks and/or shared use paths parallel to the roadway
- Marked pedestrian crossings
- Detectable warnings at roadway and major driveway connections
- Raised median or refuge islands
- Pedestrian signal features such as walk lights and push buttons

- Transit stops and shelters
- Commuter and light rail,
- Bus rapid transit (BRT)

In some situations it may be possible to eliminate a vehicle-pedestrian conflict. The elimination of vehicle-pedestrian conflict points requires close coordination with the planning of pedestrian pathways and activity outside of the highway right of way. Care should be exercised to ensure the elimination of a given conflict point does not transfer the problem to a different location. A reduction in the number of conflict points allows for economical and effective control and protection at the remaining conflict points, thus providing an efficient method of pedestrian hazard reduction. Procedures for the elimination of vehicle-pedestrian conflicts are given in the subsequent material.

Any effort to minimize or eliminate conflict points must consider the mobility needs of the pedestrian. The desired travel path should not be severed and the number of required crossing points and/or walking distances should not be significantly increased. Some conflict points will have to be redesigned rather than eliminated or relocated.

C.1 General Needs

Minimizing vehicle-pedestrian conflicts can be accomplished by providing adequate horizontal, physical, or vertical (primarily for crossings) separation between the roadway and the pedestrian pathways.

C.2 Independent Systems

One ideal method for eliminating vehicle-pedestrian conflicts is to provide essentially independent systems for vehicular and pedestrian traffic. This requires adequate land use allocation and restriction (CHAPTER 2 - LAND DEVELOPMENT) and the proper layout and design of pedestrian pathways and the surface transportation network.

Where independent systems are provided, intersections between the two modes (i.e., parking areas) are still required. Due to the small number of these intersections or conflict points, they can be economically developed for safe and efficient operation.

C.3 Horizontal Separation

The development of independent systems for pedestrian and vehicular traffic is the preferred method for providing adequate horizontal separation.

C.3.a General Criteria

Pedestrian pathways should be placed as far from the roadway as practical, as shown by the following criteria, which are given in a sequence of desirability:

- Outside of the right of way in a separately dedicated corridor adjacent to the right of way
- At or near the right of way line (ideally, 3 feet of width should be provided behind the sidewalk for above ground utilities)
- Outside of the minimum required clear zone (CHAPTER 3 GEOMETRIC DESIGN Table 3-12)
- As far from the edge of the driving lane as practical

Sidewalk alignments, which are set back from the roadway, should taper for alignment closer to the roadway at intersections. This will allow for coordinated placement of crosswalks and stop bars.

C.3.b Buffer Widths

Providing a buffer can improve pedestrian safety and enhance the overall walking experience. Buffer width is defined as the space between the sidewalk and the edge of traveled way. On-street parking or bike lanes can also act as an additional buffer. When separated from the curb, the minimum separation for a sidewalk from the back of curb is 2 feet. The planting strip or buffer strip should be 6 feet where practical to eliminate the need to narrow or reroute sidewalks around driveways. With this wider buffer strip, the sidewalk is placed far enough back so that the driveway slope does not have to encroach into the sidewalk. Wider sidewalks should be considered in Central Business Districts and in areas where heavy two-way pedestrian traffic is expected.

C.4 Other Considerations

When designing urban highways with substantial pedestrian-vehicle conflict points, the following are measures that may be considered to help reduce these conflicts and increase the safe and efficient operation of the roadway:

- Control, reduce, or eliminate left and/or right turns
- Prohibit free flow right turn movements
- Prohibit right turn on red
- Reduce the number of lanes
- Use narrower lanes and introduce raised medians to provide pedestrian refuge areas
- Provide pedestrian signal features
- Provide pedestrian grade separations

D BARRIER SEPARATION

Barriers may be used to assist in the separation of vehicular and pedestrian traffic.

D.1 Longitudinal Barriers

Longitudinal barriers such as guardrails, rigid barriers, and bridge railings are designed primarily to redirect errant vehicles away from roadside hazards. These barriers can also be used to provide valuable protection of pedestrian pathways from out of control vehicles.

Where adequate horizontal separation is not feasible, or where there is a significant hazard from out of control vehicles, longitudinal barriers may be utilized. If electing to use barriers, special consideration should be made to ensure proper sight distance near driveways and intersections is maintained.

D.2 Fencing or Landscaping

Fencing or landscaping may be used to discourage pedestrian access to the roadway and aid in channeling pedestrian traffic to the proper crossing points. Fencing or landscaping shall not be considered a substitute for longitudinal barriers, but may be used in conjunction with redirection devices.

Fencing at the right of way line and placement of pedestrian (and bicycle) pathways in separate corridors outside of this line is necessary on limited access facilities.

E VERTICAL SEPARATION

Vertical separation may be selectively utilized to support the crossing of large pedestrian volumes across highways where the traffic volume on the roadway is at or near capacity or where speeds are high. Overpasses or underpasses may be justified at major pedestrian generators such as schools, shopping centers, sports and amusement facilities, transit centers, commercial buildings, parks and playgrounds, hospitals, and parking facilities. The minimum clear width of any pedestrian overpass or underpass on a pedestrian accessible route is 8 feet. However, if the contiguous sidewalk or path is greater than 8 feet wide, the clear width of the overpass or underpass should match that width. The minimum clear height of a pedestrian overpass or underpass is 8 feet.

E.1 Overpasses

Pedestrian overpasses are typically bridge structures over major roadways or railroads. Overpasses should either provide elevator access or meet ADA ramp criteria for maximum slopes, level landings, and handrails on both sides. Bridges over roadways should be covered or screened to reduce the likelihood of objects being dropped or thrown below. The area adjacent to overpasses may be fenced to prevent unsafe crossings and to channel pedestrians to the overpass structure.

E.2 Underpasses

Pedestrian underpasses or tunnels perform the same function as overpasses. Their use is convenient when the roadway is elevated above the surrounding terrain.

Underpasses should be adequately maintained to reduce potential problems in lighting, cleaning, policing, and flooding and to maximize safety. The area adjacent to underpasses may be fenced to prevent unsafe crossings and to channel pedestrians to the underpass structure.

F PEDESTRIAN CROSSINGS

The design of pedestrian crossings and parallel pathways within the right of way shall be considered an integral part of the overall design of a street or highway.

The development of protection at any remaining crossings or conflict points must be adequate to achieve a total pedestrian transportation mode that is reasonably safe.

F.1 Crosswalks

Crosswalks serve as the pedestrian right-of-way across streets. A crosswalk is: (a) that part of a roadway at an intersection included within the connections of the lateral lines of the sidewalks on opposite sides of the highway, measured from the curbs or, in the absence of curbs, from the edges of the traversable roadway; (b) any portion of a roadway at an intersection or elsewhere distinctly indicated for pedestrian crossing by lines or other markings on the surface.

The design of pedestrian crosswalks should be based on the following requirements:

- Crosswalks should be placed at locations with ample sight distances
- At crossings, the roadway should be free from changes in alignment or cross section
- The entire length of crosswalk shall be visible to drivers at a sufficient distance to allow a stopping maneuver
- Stop bars or yield markings, in conjunction with the appropriate signing, shall be provided at all marked crosswalks
- All crosswalks shall be easily identified and clearly delineated, in accordance with Manual on Uniform Traffic Control Devices (MUTCD) (Rule 14-15.010)

F.1.a Marked Crosswalks

Marked crosswalks are one tool to allow pedestrians to cross the roadway safely. They are often used in combination with other treatments (signs, flashing beacons, curb extensions, pedestrian signals, raised median or refuge islands, and enhanced overhead lighting). Marked crosswalks serve two purposes: 1) to inform motorists of the location of a pedestrian crossing so that they have time to lawfully yield to a crossing pedestrian; and 2) to

assure the pedestrian that a legal crosswalk exists at a particular location.

Marked crosswalks shall not be installed in an uncontrolled environment (without signals, stop signs, or yield signs) when the posted speeds are greater than 40 mph, or on multilane roads where traffic volumes exceed 12,000 vpd (without raised median) or 15,000 vpd (with raised median).

Marked crosswalks can also be used to create midblock crossings.

F.1.b Midblock Crosswalks

Midblock crossings help meet crossing needs within an area. At specific locations where intersections are spaced relatively far apart or substantial pedestrian generators are located between intersections, midblock crossing may be used; however, since midblock crossings are not generally expected by motorists, they should be well signed and marked. Midblock crossings are located according to a number of factors including pedestrian volume, traffic volume, roadway width, traffic speed and type, desired paths for pedestrians, land use, and to accommodate transit connectivity. Midblock crossings should not be installed where sight distance or sight lines are limited for either the motorist or pedestrian. Midblock crossings should be illuminated, marked, and outfitted with advanced warning signs or warning flasher in accordance with the MUTCD.

F.1.c Crossing Distance Considerations

At midblock locations where roadway crossings exceed sixty feet, or where there are a limited number of gaps in traffic, a median or crossing island should be considered and be accessible. When a midblock crossing is provided along a multilane arterial, a median or crossing island is desirable, and consideration should be given to providing supplementary traffic control devices (signs, beacons, signals, etc.).

F.2 Curb Ramps

Curb ramps provide access between the sidewalk and the street for people who use mobility aids such as wheelchairs and scooters, people pushing strollers and pulling suitcases, children on bicycles, and delivery services. Curb ramps, with detectable warnings, meeting the requirements of ADA Standards for Accessible

Design and the Florida Building Code (Rule 9B-7.0042), Chapter 11, shall be provided at all pedestrian crossings, including mid block crossings and intersections to give persons with disabilities safe access. A level landing is necessary for turning, maneuvering, or bypassing the sloped surface.

F.3 Controls

Signs, signals, and markings should be utilized to provide the necessary information and direction for pedestrians. All directions and regulations should be clear, consistent and logical, and should, at a minimum, conform to the requirements given in the MUTCD. The use of accessible pedestrian signals that include audible and/or vibro-tactile, and visual signals, should be considered for pedestrian traffic control and regulation.

F.4 Sight Distance

The general requirements for sight distances for the driver are given in CHAPTER 3 - GEOMETRIC DESIGN.

Stopping sight distances greater than the minimum should be provided at all pedestrian crossings. These sight distances should include a clear view of the pedestrian approach pathway for at least 15 feet from the outside travel lane. Where parallel pedestrian pathways are within the roadside recovery area, or where casual pedestrian crossings are likely, the normal required stopping sight distance should also include a clear view of the entire roadside recovery area.

Sight distances shall be based upon a driver's eye and object height as discussed in CHAPTER 3 – GEOMETRIC DESIGN. Due to the small size of some pedestrians (particularly children), they are generally easy to confuse with other background objects.

Parking shall be prohibited where it would interfere with the required sight distance. Particular care should be exercised to ensure ample mutual sight distances are provided at all intersections and driveways.

F.5 Lighting

Lighting of the roadway itself is not only important for the safety of vehicular traffic,

but also valuable for the protection of pedestrians. Vehicle headlamps often do not provide sufficient lighting to achieve the required stopping sight distance. Since this requirement is of vital importance at any potential pedestrian crossing point, lighting of the crossing should be considered. Lighting a street or highway is also valuable in improving the pedestrian's view of oncoming vehicles. At intersections or other locations with vehicle turning maneuvers, vehicle headlights may not be readily visible to the pedestrian.

Lighting shall be provided in pedestrian underpasses and should be considered on pedestrian overpasses. All pedestrian lighting shall be vandal resistant. The installation of daytime lighting is warranted when underpass user visibility requirements are not met with sunlight. Pedestrian underpass and overpass lighting should conform to the general lighting requirements given in the American Association of State Highway and Transportation Officials (AASHTO) Roadway Lighting Design Guide.

The general requirements for lighting on streets and highways are given in CHAPTER 6 - ROADWAY LIGHTING. Pathways adjacent to a street or highway should not be illuminated to a level more than twice that of the roadway itself.

In general, lighting should be considered as warranted when it is necessary, at night, to provide the mutual sight distance capabilities described in the preceding CHAPTER 3 - GEOMETRIC DESIGN. Locations with significant night time pedestrian traffic that should be considered for lighting of the roadway and adjacent pedestrian facilities include the following:

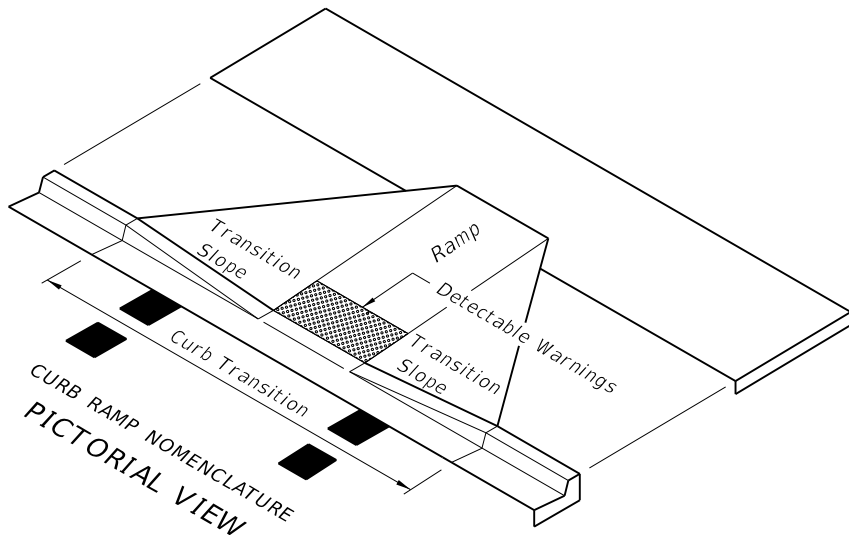
- Any street or highway that meets the warranting criteria given in CHAPTER 6 - ROADWAY LIGHTING
- Streets and highways with speed limits in excess of 40 mph that do not have adequate pedestrian conflict elimination
- Sections of highway with minimal separation of parallel pedestrian pathways
- Intersections, access and decision points, and areas adjacent to changes in alignment or cross sections
- Areas adjacent to pedestrian generators
- Bus stops and other mass transit transfer locations
- Parking facilities
- Entertainment districts, sports/recreation complexes, schools, and other activity centers generating night travel

- Pedestrian crossings
- Any location where improvement of night time sight distance will reduce the hazard of vehicle-pedestrian conflicts

G REFERENCES FOR INFORMATIONAL PURPOSES

1. Florida Department of Transportation Transit Facility Design
<http://www.dot.state.fl.us/transit/Pages/NewTransitFacilitiesDesign.shtm>
2. USDOT/FHWA ADA Standards for Accessible Design (ADAAG)
<http://www.access-board.gov/ada-aba/ada-standards-dot.cfm>
3. AASHTO – Guide for the Planning, Design, and Operation of Pedestrian Facilities
<https://bookstore.transportation.org/>
4. AASHTO – Roadway Lighting Design Guide
<https://bookstore.transportation.org/>

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LEGEND

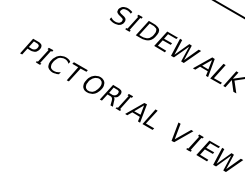
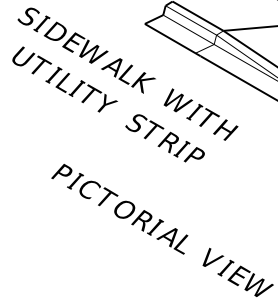
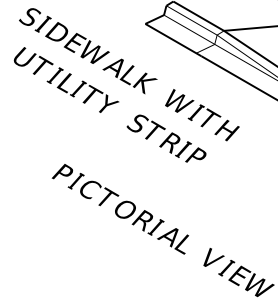


Detectable Warnings

GENERAL NOTES

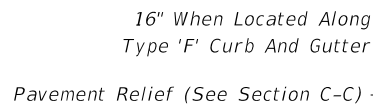
1. Sidewalk curb ramps shall be constructed at locations that will provide continuous unobstructed pedestrian circulation path to pedestrian areas, elements and facilities within the right of way and to accessible pedestrian routes on adjacent sites. Curbed facilities with sidewalks and those without sidewalks are to have curb ramps constructed for all intersections and turnouts with curbed returns. To accommodate curb ramps, partial curb returns are to extend to the limits prescribed in Index No. 515. Ramps constructed at locations without sidewalks are to have a landing constructed at the top of each ramp, see LANDINGS FOR CURB RAMP WITHOUT SIDEWALKS.
2. When altering existing pedestrian facilities, where existing restricted conditions preclude the accommodation of a ramp slope of 1:12, a ramp slope between 1:12 and 1:10 is permitted for a rise of 6" maximum. Where compliance with the requirements for cross slope cannot be fully met, the minimum feasible cross slope shall be provided. Ramp slopes are not required to exceed 15' in length.
3. If sidewalk curb ramps are located where pedestrians must walk across the ramp, then provide transition slopes to the ramp; otherwise a sidewalk curb may be required.
4. All sidewalks, ramps, and landings with a cross slope of 0.02 shown in this Index are 0.02 maximum. All ramp slopes shown in this Index as 1:12 are 1:12 maximum. Landings shall have slopes less than or equal to 0.02 in any direction.
5. Grade breaks at the top and bottom of ramps shall be parallel to each other and perpendicular to the direction of the ramp slope.
6. Where a sidewalk curb ramp is constructed within existing curb, curb and gutter and/or sidewalk, the existing curb or curb and gutter shall be removed to the nearest joint beyond the curb transition or to the extent that no remaining section of curb or curb and gutter is less than 5' long. Existing sidewalks shall be removed to the nearest joint beyond the transition slope or to the extent that no remaining section of sidewalk is less than 5' long. For CONCRETE SIDEWALK details refer to Index 310.
7. Sidewalk curb ramp alpha-identifications are for reference purposes (plans, permits, etc.). Alpha-identifications CR-I and CR-J were intentionally omitted.
8. Detectable warnings shall extend the full width of the ramp and to a depth of 2'. Detectable warnings shall be constructed in accordance with Specification Section 527. For the layout of detectable warnings, refer to the TYPICAL PLACEMENT OF DETECTABLE WARNINGS details. Detectable warnings shall not be provided on transition slopes.
9. When detectable warnings are placed on a slope greater than 5%, domes shall be aligned with the centerline of the ramp; otherwise domes are not required to be aligned.
10. Detectable warnings shall be required on sidewalks at:
 - a. Intersecting roads,
 - b. Median Crossings greater than or equal to 6' in width,
 - c. Railroad Crossings,
 - d. Signalized driveways.
11. Detectable Warnings - Acceptance Criteria:
 - a. Color and texture shall be complete and uniform.
 - b. 90% of individual truncated domes shall be in accordance with the Americans with Disabilities Act Standards for Transportation Facilities, Section 705.
 - c. There shall be no more than 4 non-compliant domes in any one square foot.
 - d. Non-compliant domes shall not be adjacent to other non-compliant domes.
 - e. Surfaces shall not deviate more than 0.10" from a true plane.
12. Detectable warnings shall be installed no greater than 5' from the back of curb or edge of pavement.
13. Detectable warnings shall not be installed over grade breaks.

LAST REVISION 07/01/13	REVISION	DESCRIPTION:	 FDOT 2014 DESIGN STANDARDS	DETECTABLE WARNINGS AND SIDEWALK CURB RAMPs	INDEX NO. 304	SHEET NO. 1 of 7
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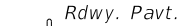


CR-A


$$CR-B$$

$$(CR-C)$$


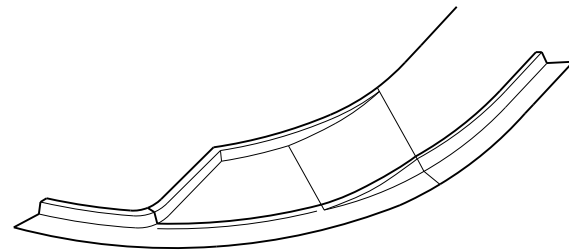
SIDEWALK CURB RAMPS WHERE RAMP AND LANDING DEPTHS ARE NOT RESTRICTED



Note: For Additional Information On Sidewalk Curb Construction, See SIDEWALK CURB and SIDEWALK CURB OPTIONS details.

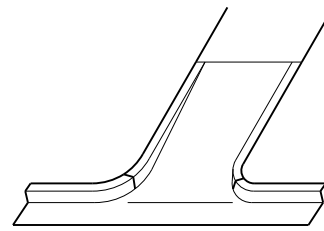


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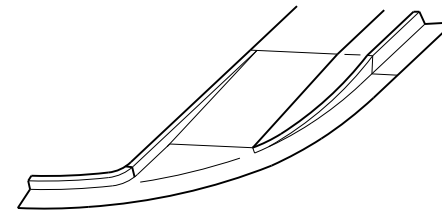
PICTORIAL VIEW

CR-D



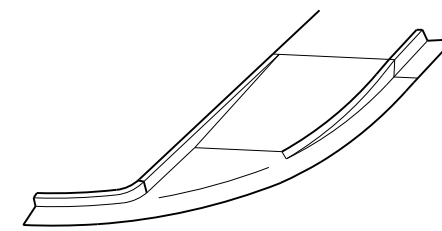
PICTORIAL VIEW

CR-E



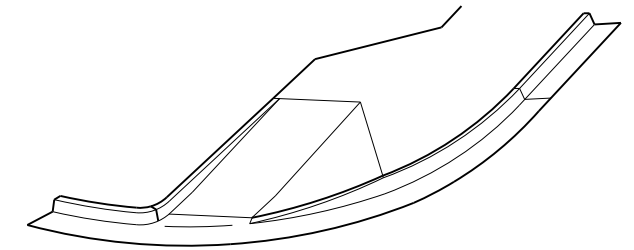
PICTORIAL VIEW

CR-F



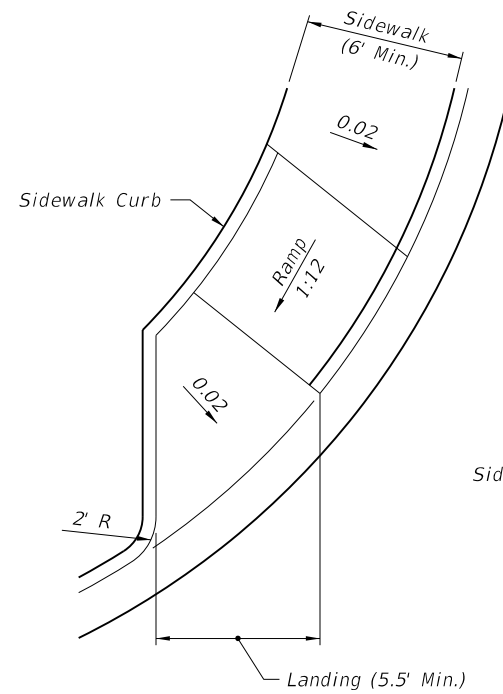
PICTORIAL VIEW

CR-G



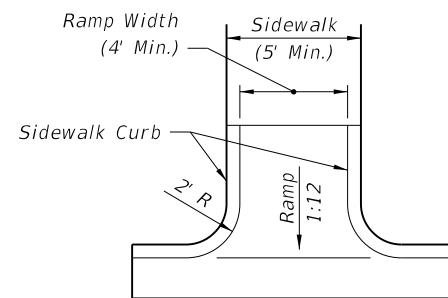
PICTORIAL VIEW

CR-H



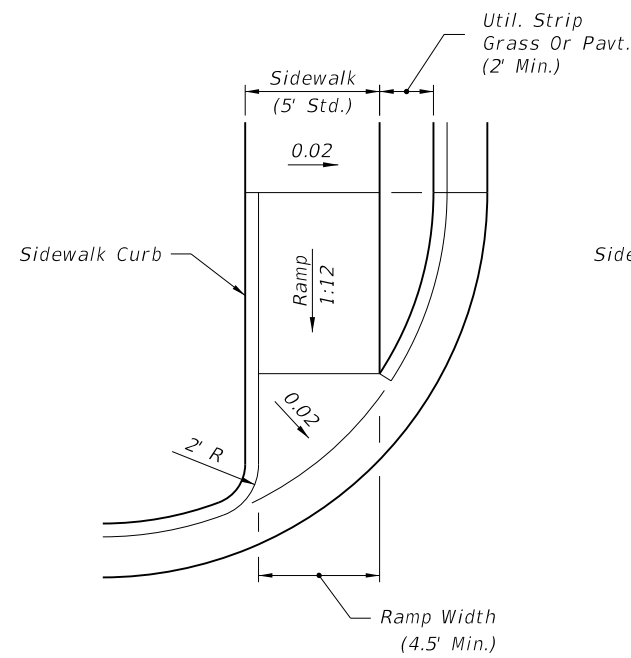
PLAN VIEW

CR-D



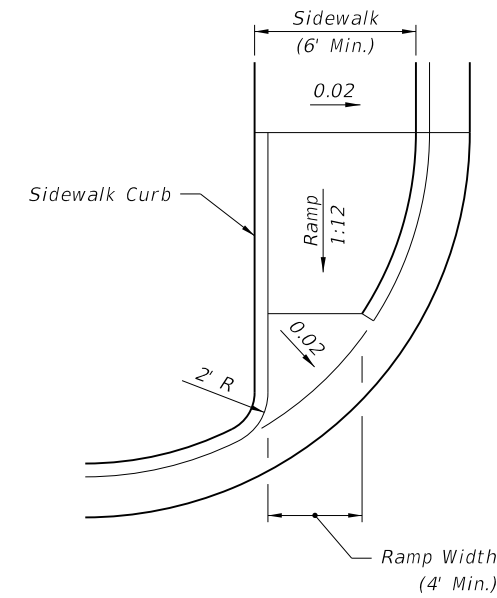
PLAN VIEW

CR-E



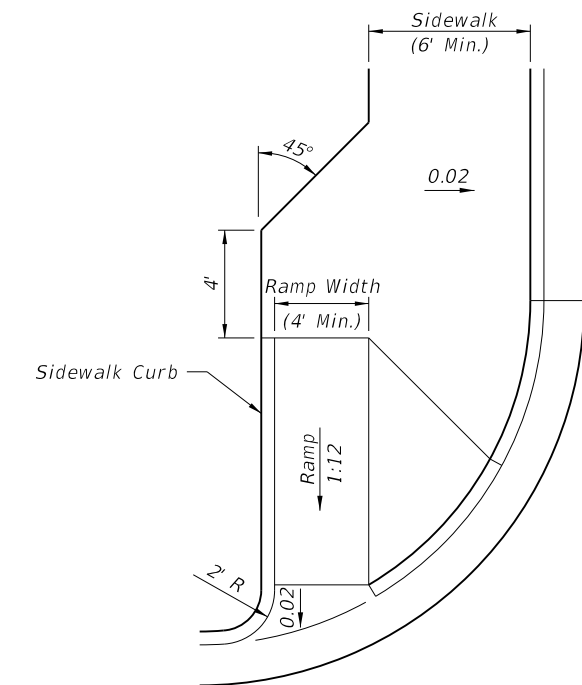
PLAN VIEW

CR-F



PLAN VIEW

CR-G

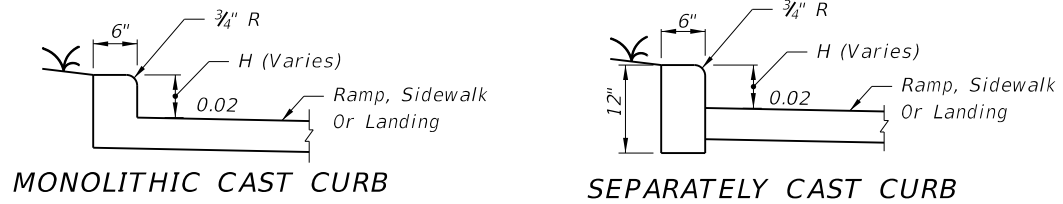


PLAN VIEW

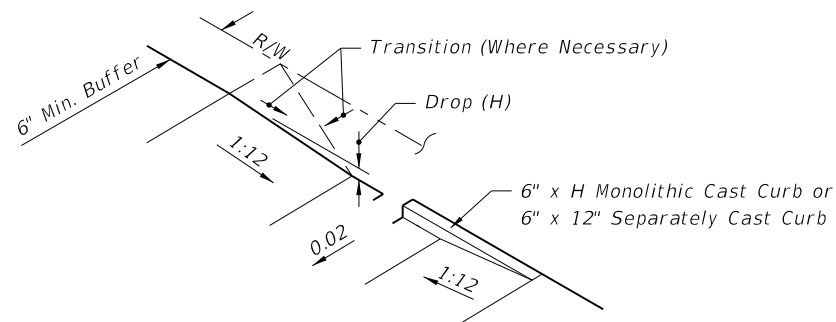
CR-H

DIMENSIONAL FEATURES OF SIDEWALK CURB RAMPS FOR LINEAR PEDESTRIAN TRAFFIC

LAST REVISION 07/01/13	DESCRIPTION:	 FDOT 2014 DESIGN STANDARDS	DETECTABLE WARNINGS AND SIDEWALK CURB RAMPS	INDEX NO. 304	SHEET NO. 3 of 7
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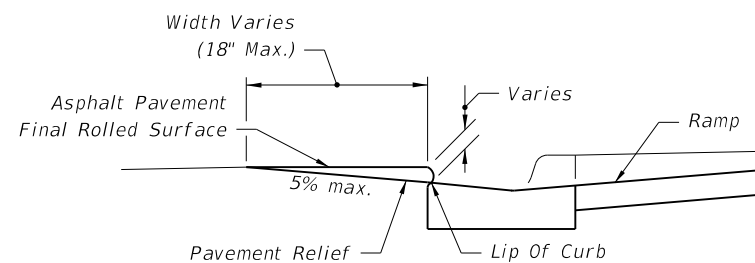
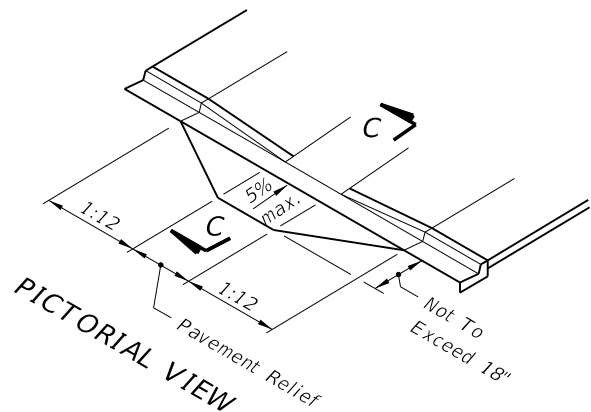


SIDEWALK CURB OPTIONS



Construct Sidewalk Curb In Cut Sections.

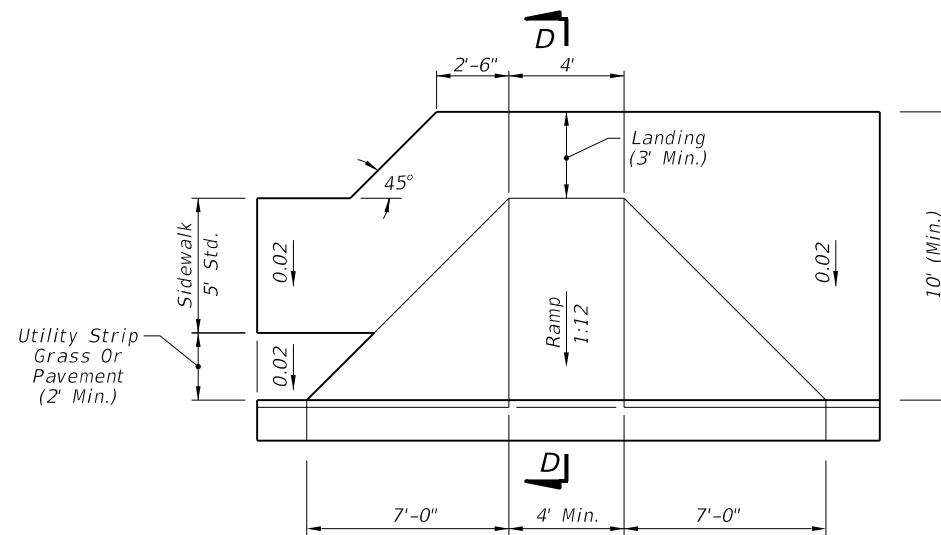
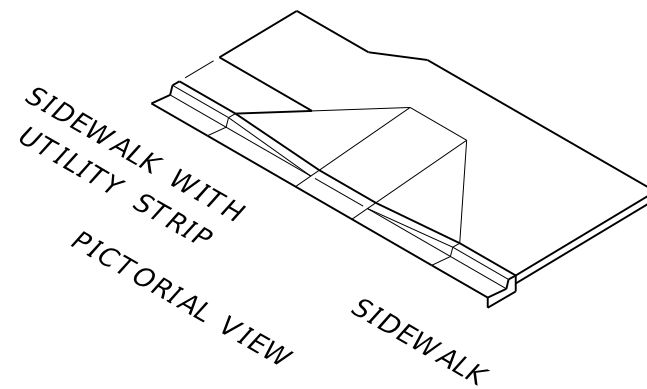
SIDEWALK CURB



Note: Remove Elevated Pavement By Spading And Rolling; Smooth Milling; or Grinding

SECTION C-C

PAVEMENT RELIEF AT LIP OF CURB

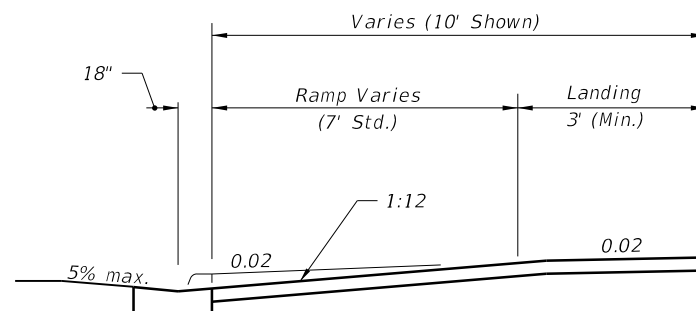


SIDEWALK WITH UTILITY STRIP

SIDEWALK

PLAN VIEW

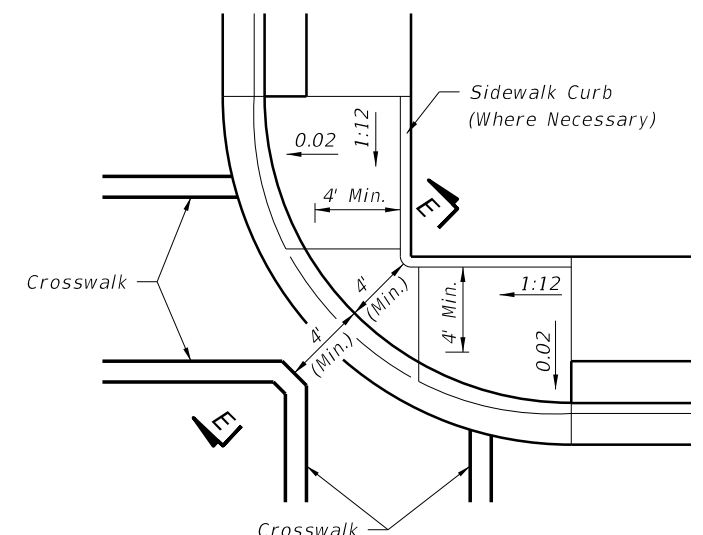
CR-K



SECTION D-D

SECTION THROUGH RAMP AND LANDING (RESTRICTED CONDITIONS)

SIDEWALK CURB RAMPS WHERE RAMP AND LANDING DEPTHS ARE RESTRICTED

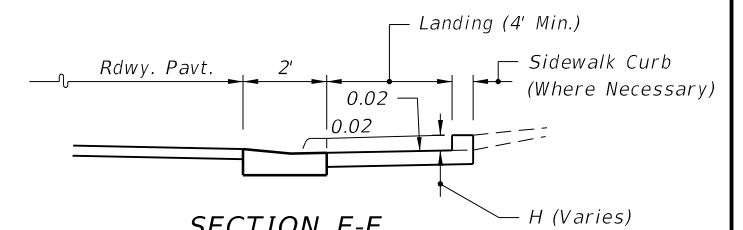


PLAN VIEW

CR-L

Note: Crosswalk Width and Configuration Vary; Must Conform to Index No. 17344 and 17346.

15' Radius Curve Shown for CR-L.



SECTION E-E

SECTION THROUGH LANDING (RESTRICTED CONDITIONS)



**FDOT 2014
DESIGN STANDARDS**

DETECTABLE WARNINGS AND SIDEWALK CURB RAMPS

**INDEX
NO.
304**

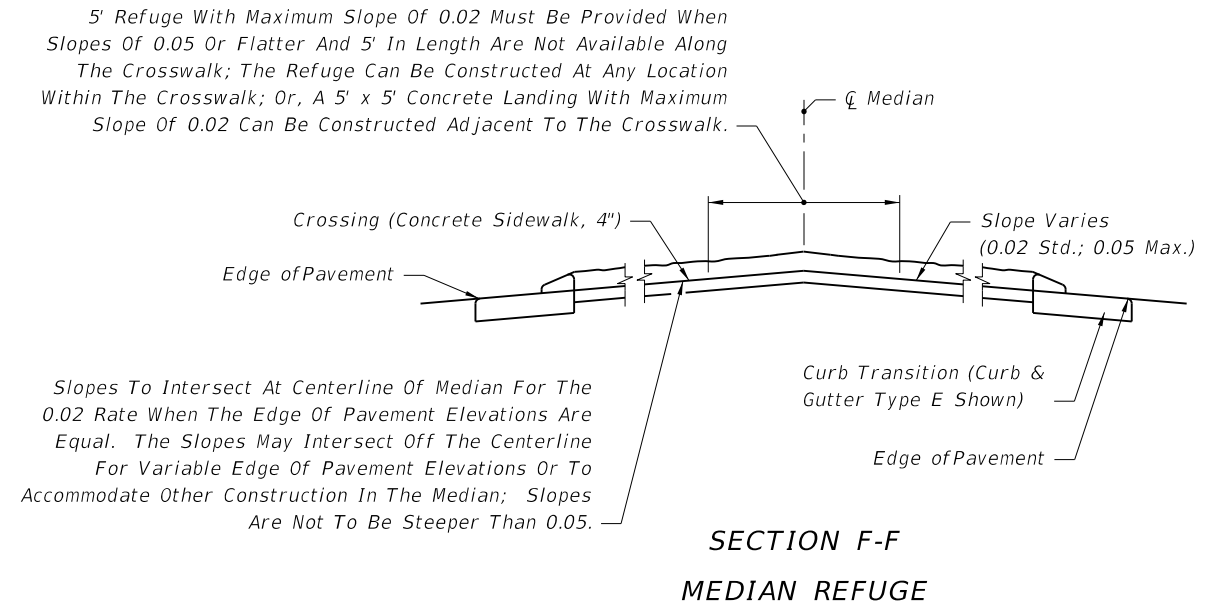
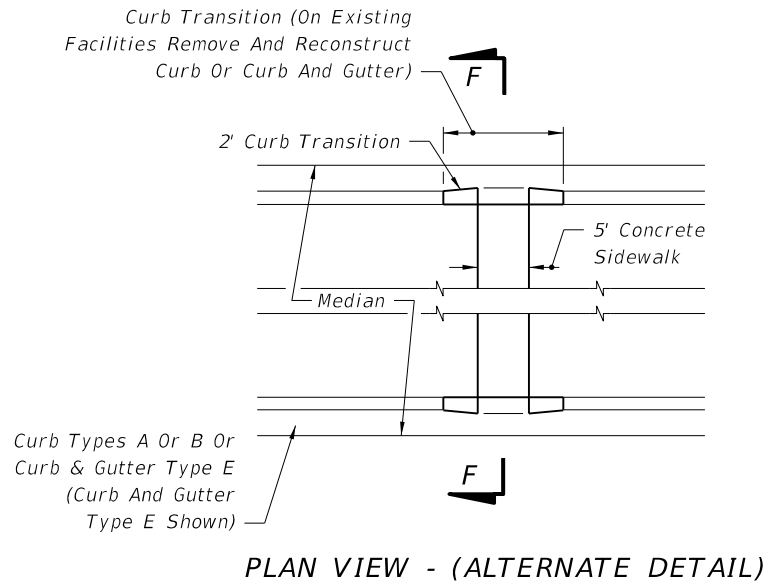
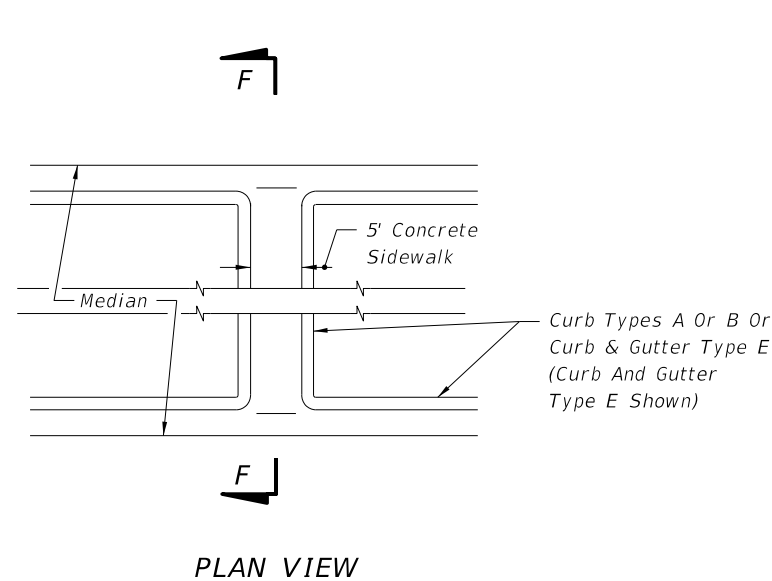
**SHEET
NO.
4 of 7**

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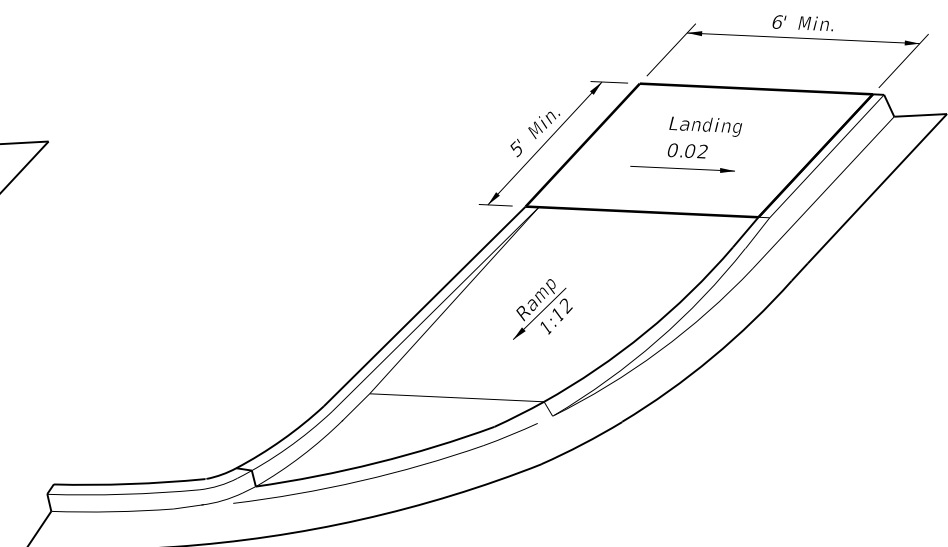
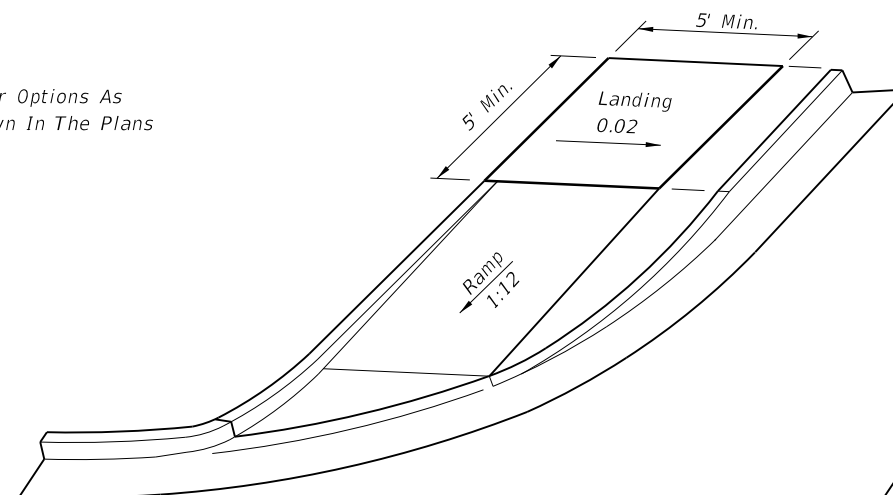
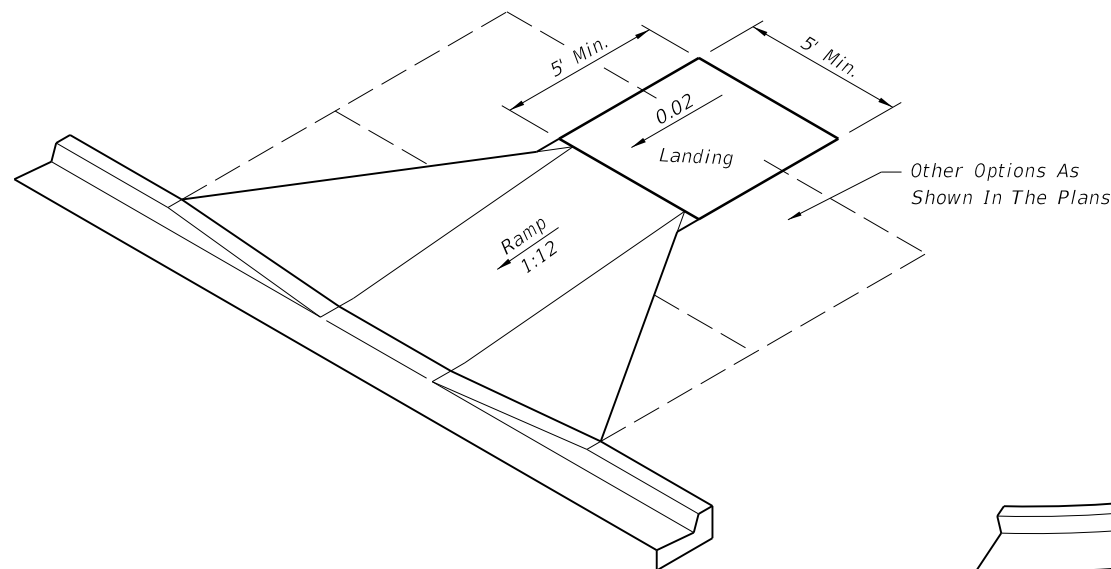
**LAST
REVISION
07/01/13**

REVISION

DESCRIPTION:



MEDIAN CROSSING

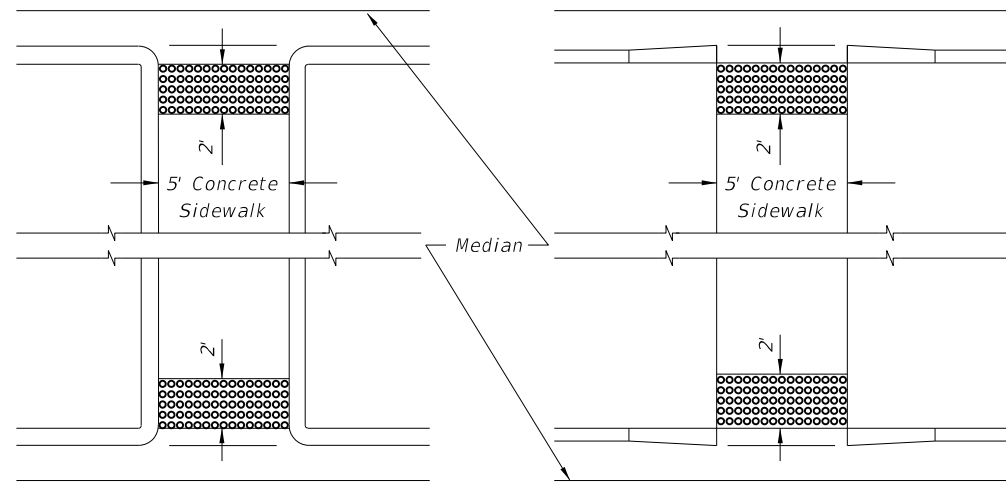


LANDINGS FOR CURB RAMPS WITHOUT SIDEWALKS

LAST REVISION 07/01/13	REVISION	DESCRIPTION:	 FDOT 2014 DESIGN STANDARDS	DETECTABLE WARNINGS AND SIDEWALK CURB RAMPS	INDEX NO. 304	SHEET NO. 5 of 7
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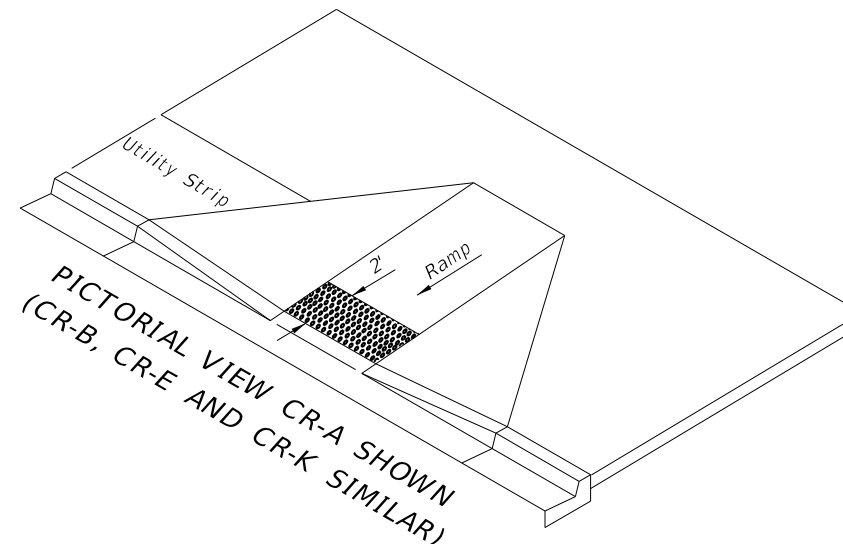
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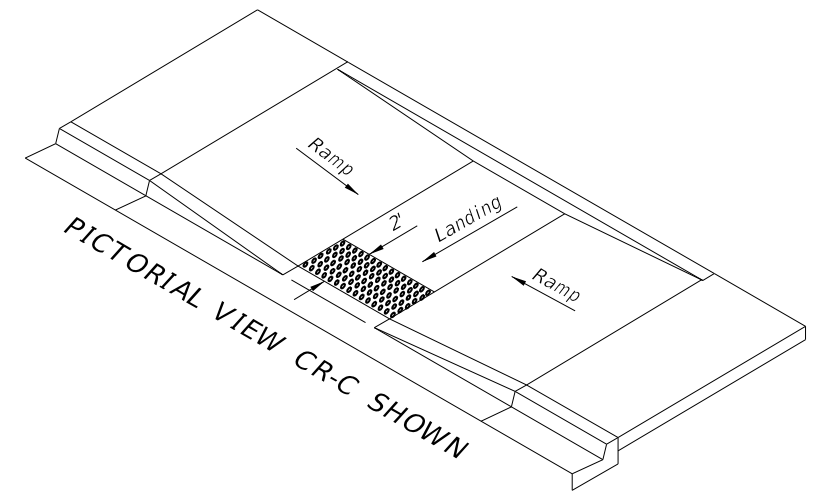
PLAN VIEW

PLAN VIEW - (ALTERNATE DETAIL)

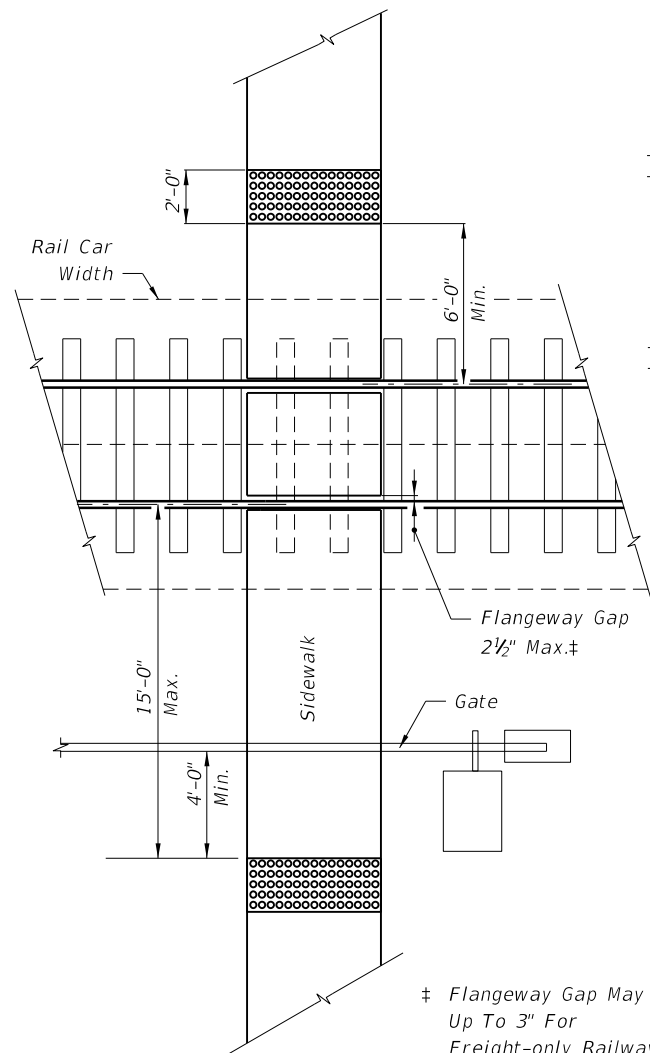
MEDIAN CROSSING



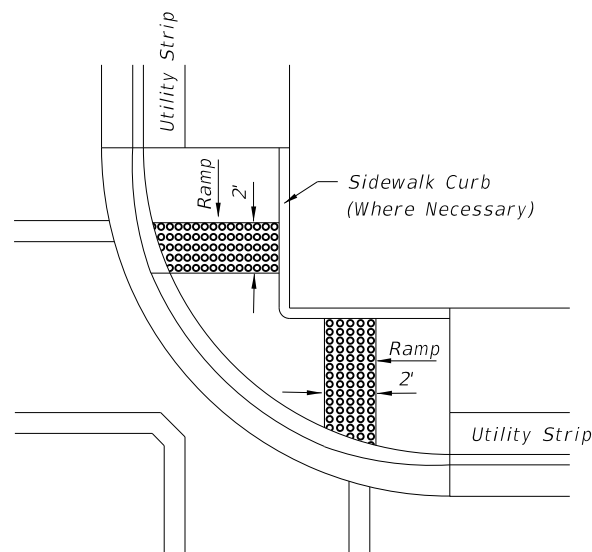
PICTORIAL VIEW CR-A SHOWN
(CR-B, CR-E AND CR-K SIMILAR)



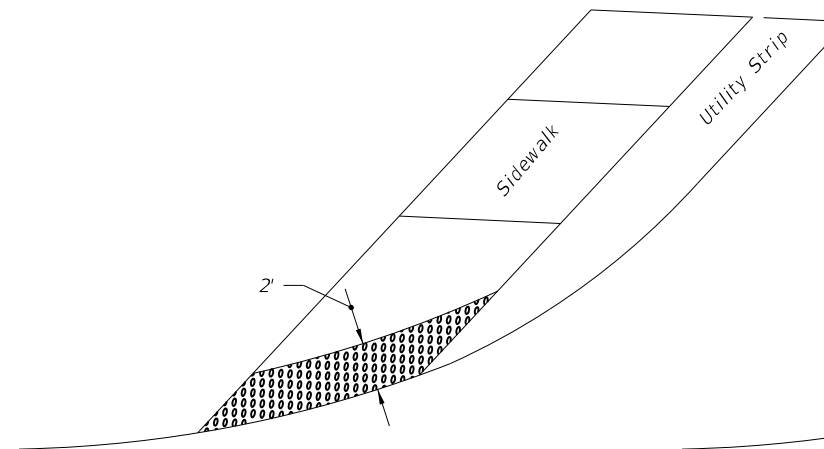
PICTORIAL VIEW CR-C SHOWN



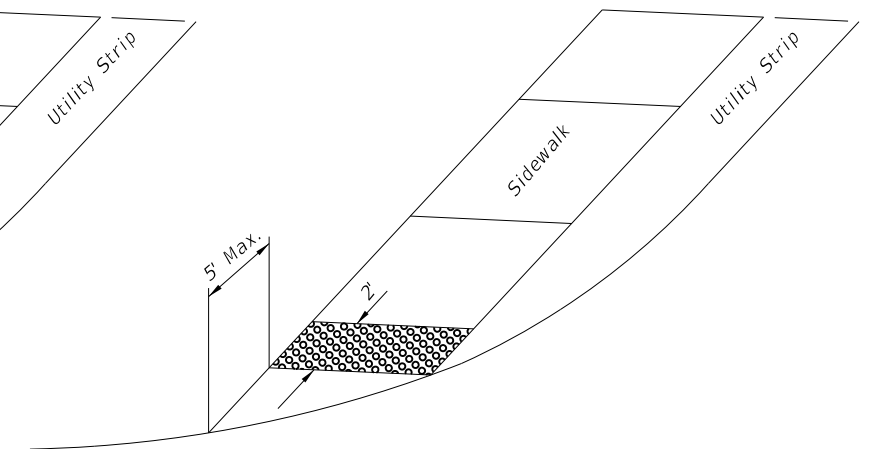
PLAN VIEW
RAILROAD CROSSING



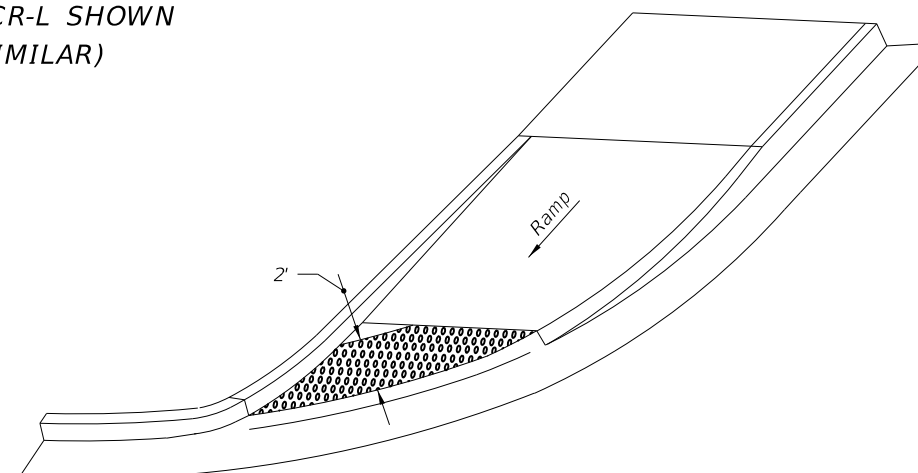
PLAN VIEW CR-L SHOWN
(CR-D SIMILAR)



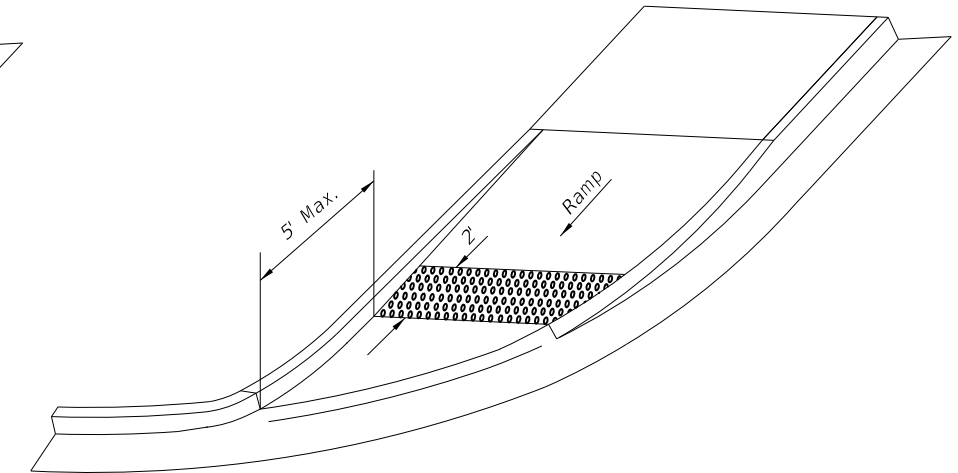
PICTORIAL VIEW
FLUSH SHOULDER
(OPTION A)



PICTORIAL VIEW
FLUSH SHOULDER
(OPTION B)



PICTORIAL VIEW CR-G SHOWN
(OPTION A) (CR-F AND CR-H SIMILAR)

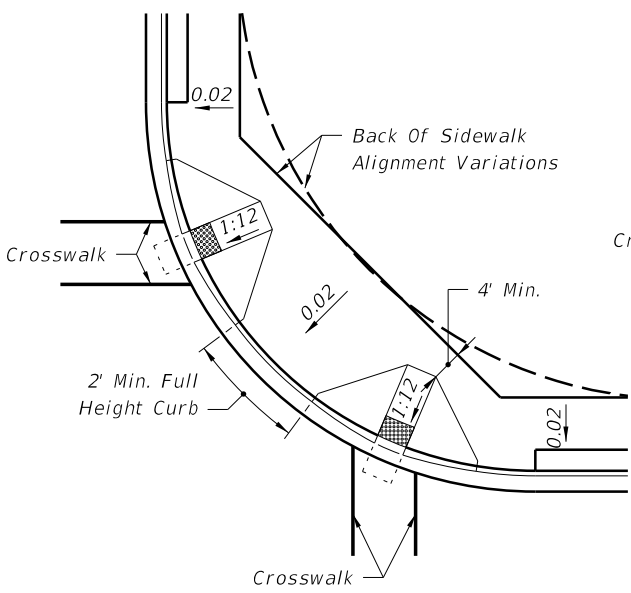


PICTORIAL VIEW CR-G SHOWN
(OPTION B) (CR-F AND CR-H SIMILAR)

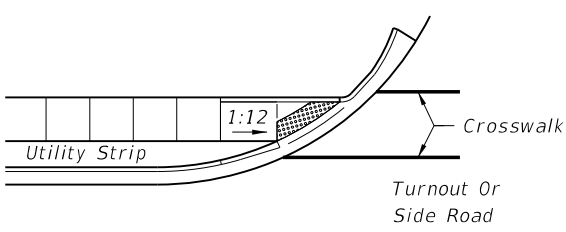
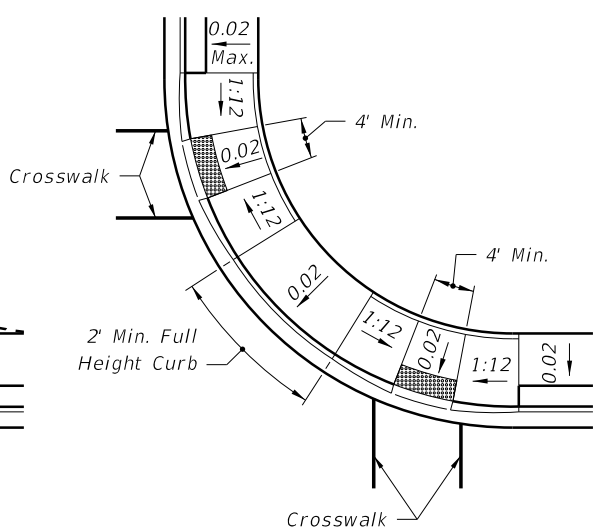
TYPICAL PLACEMENT OF DETECTABLE WARNINGS

LAST REVISION 07/01/13	REVISION	DESCRIPTION:	 FDOT 2014 DESIGN STANDARDS	DETECTABLE WARNINGS AND SIDEWALK CURB RAMPS	INDEX NO. 304	SHEET NO. 6 of 7
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RADIAL SIDEWALK RAMPS



LINEAR SIDEWALK RAMPS

NOTES:

1. Where crosswalk markings are used, ramps shall fall within the crosswalk limits. A clear space of 48" minimum is required at the bottom of the ramp within a marked crosswalk. If crosswalk markings are not present, a clear space of 48" minimum is required at the bottom of the ramp outside of active travel lanes.
2. Crosswalk widths and configurations vary; must conform to Index No. 17344 and 17346.

TYPICAL PLACEMENT OF SIDEWALK CURB RAMPS AT CURBED RETURNS

TABLE OF DETECTABLE WARNINGS		
CURB RAMP TYPE	CURB RADIUS (FT)	TOTAL AREA (SF)
CR-A	N/A	8
CR-B	N/A	8
CR-C	N/A	8
CR-D	25	11
CR-E	N/A	8
CR-F	10	9
	20	11
	25	13
	30	14
CR-G	10	10
	20	11
	25	12
	30	14
CR-H	20	8
	25	8
	30	8
CR-K	N/A	8
CR-L	10	18
	15	13
FLUSH SHOULDER		
OPTION A	10	11
	20	14
	25	15
	30	17
	40	19
	50	21
OPTION B	10	10
	20	10
	25	10

Note:
Due to construction applications, CR-L is the only curb ramp for which a detectable warning quantity was calculated using a curb radius of 15'.

For flush shoulder options with 5' sidewalks, the back of sidewalk is measured at 10' from the edge of traveled way.

AREAS OF DETECTABLE WARNINGS FOR SIDEWALK CURB RAMP AND FLUSH SHOULDER APPLICATIONS

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DESIGN NOTES

1. The information shown on this index is intended solely for the purpose of clear sight development and maintenance at intersecting highways, roads and streets, and is not intended to be used to establish roadway and roadside safety except as related to clear sight corridors. An analysis of sight distance shall be documented for all intersections.
2. Details are based on the AASHTO 'A Policy On Geometric Design Of Highways And Streets, 2001', CHAPTER 9, INTERSECTION SIGHT DISTANCE, CASES B and F, and Department practices for channelized median openings (left turns from major roadways).
3. The minimum driver eye setback of 14.5' from the edge of the traveled way may be adjusted on any intersection leg only when justified by a documented, site specific field study of vehicle stopping position and driver eye position.
4. For SIGNALIZED INTERSECTIONS sight distances should be developed based on AASHTO 'Case D-Intersections With Traffic Signal Control'. 'At signalized intersections, the first vehicle stopped on one approach should be visible to the driver of the first vehicle stopped on each of the other approaches. Left-turning vehicles should have sufficient sight distance to select gaps in oncoming traffic and complete left turns. Apart from these sight conditions, there are generally no other approach or departure sight triangles needed for signalized intersections. However, if the traffic signal is to be placed on two -way flashing operation (i.e. flashing yellow on the major -road approaches and flashing red on the minor -road approaches) under off- peak or nighttime conditions, then the appropriate departure sight triangles for Case B, both to the left and to the right, should be provided for the minor -road approaches. In addition, if right turns on a red signal are to be permitted from any approach, then the appropriate departure sight triangle to the left for Case B2 should be provided to accommodate right turns from that approach.'
5. Where curvature, superelevation, adverse split profiles or other conditions preclude the use of standard tree sizes and spacing, proof of view and shadowing restraints must be documented and the size and location of trees in medians detailed in the plans.
6. Intersection sight distance values are provided for Passenger Vehicles, SU Vehicles and Combination Vehicles. Intersection sight distance based on the Passenger Vehicle is suitable for most intersections. Where substantial volumes of heavy vehicles enter the major -road, such as from ramp terminals with stop control or roadways serving truck terminals, the use of tabulated values for SU Vehicles or Combination Vehicles should be considered.

TREE SPACING TABLE **

Description Diameter (Within Limits Of Sight Window)	Speed (mph)													
	30		35		40		45		50		55		60	
	(Inches)													
	>4≤11	>11≤18	>4≤11	>11≤18	>4≤11	>11≤18	>4≤11	>11≤18	>4≤11	>11≤18	>4≤11	>11≤18	>4≤11	>11≤18
	(Feet)													
Minimum Spacing (c. to c. Of Trunk)	25	90	30	105	35	120	40	135	50	150	55	165	60	180

- ** Sizes and spacings are based on the following conditions:
- a. A single line of trees in the median parallel to but not necessarily colinear with the centerline.
- b. A straight approaching mainline, within skew limits as described in No. 2 above.
- c. 1. Trees and palms ≤ 11" in diameter casting a vertical 6' wide shadow band on a vehicle entering at stop bar location when viewed by mainline driver beginning at distance 'd'; see SHADOW DIAGRAM, Sheet 2.

2. Sabal palms with diameters > 11" ≤ 18" spaced at intervals providing a 2 second full view of entering vehicle at stop bar location when viewed by the mainline driver beginning at distance 'd'; see PERCEPTION DIAGRAM, Sheet 2.
- d. Trees with diameters ≤ 11" intermixed with trees with diameters > 11" ≤ 18" are to be spaced based on trees with diameters > 11" ≤ 18".
- For any other conditions the tree sizes, spacings and locations shall be detailed in the plans; see Design Note 5.

GENERAL NOTES

5. (Cont.)
Ground Cover & Trunked Plants (Separate or Combined):

Ground Covers – Plant selection of low growing vegetation which at maturity does not attain a height greater than 18" below the sight line datum. For ground cover in combination with trees and palms; the following heights below the sight line datum will apply:

24" for trees and palms ≤ 11" dia.; and, 18" for sabal palms >11" but ≤ 18" dia. (dia.-within Sight Window).

Trunked Plants – Plant selection of a mature trunk diameter 4" or less measured at 6" above the ground. Canopy or high borne foliage shall never be lower than 5' above the sight line datum. These selections shall be spaced no closer than 20'.

Trees – Trees can be installed with sod; pavers; gravel, mulch; ground covers or other Department approved material. The clear sight window must be in conformance with the 'WINDOW DETAIL' modified to attain the height requirements listed in 'Ground Covers' above.

A. Size and spacing shall conform to the Tree Spacing Table.

B. Requirements for placement within medians at median openings and at unsignalized and signalized intersections:

a. Horizontal clearance for the mature specimen shall be maintained as specified in Index 700. Specimens whose mature trunk diameter is greater than 18 inches shall not be permitted,

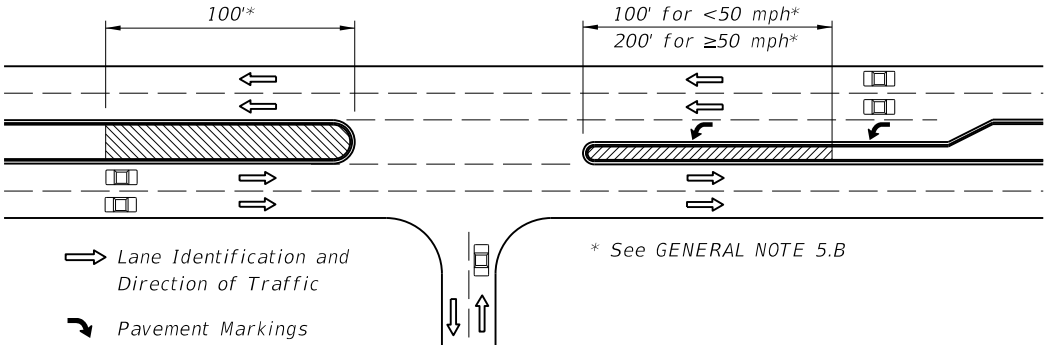
b. Where left turns from the major road are permitted, no trees shall be located within the distance 'd_b', Sheet 2 of 6; and not less than the distances called for in (c) or (d), as applicable,

c. For safety, these additional setbacks are required:

1. Where no left turn lane is present, size and spacing shall conform to the Tree Spacing Table. No trees shall be permitted within 100' of the restricted median nose (measured from the edge of pavement),
2. Where left turn lane(s) are present, the following requirements apply:

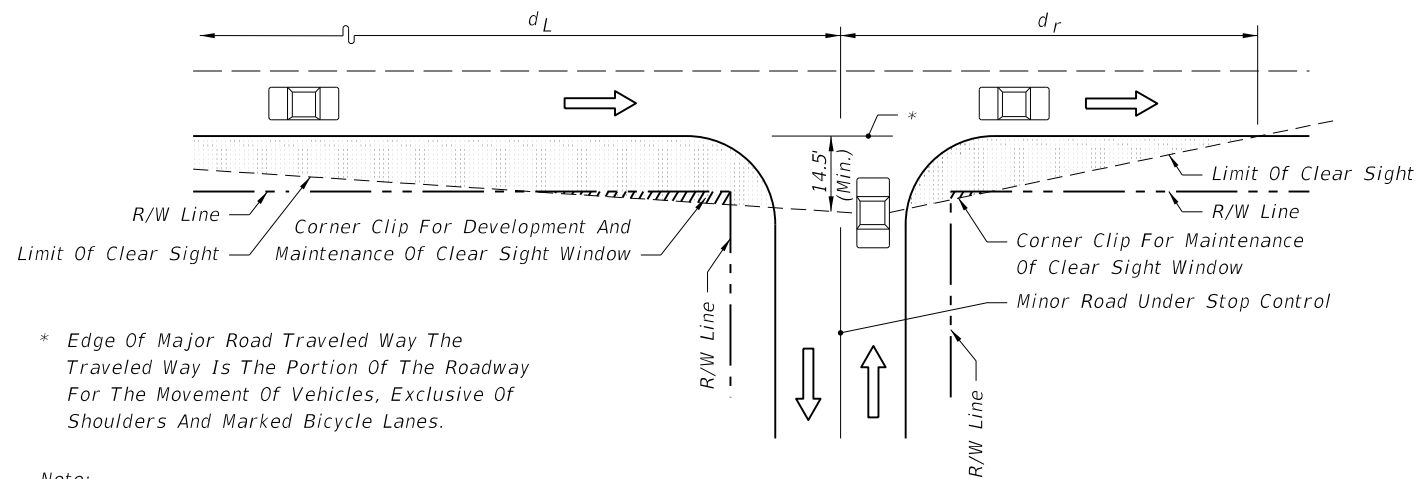
• For low speed facilities (design speed less than 50 mph), size and spacing shall conform to the Tree Spacing Table. No trees shall be permitted within 100' of the restricted median nose (measured from the edge of pavement).

• For high speed facilities (design speed 50 mph or greater), no trees shall be permitted within 200' of the restricted median nose. Beyond this limit, size and spacing shall conform to the Tree Spacing Table.



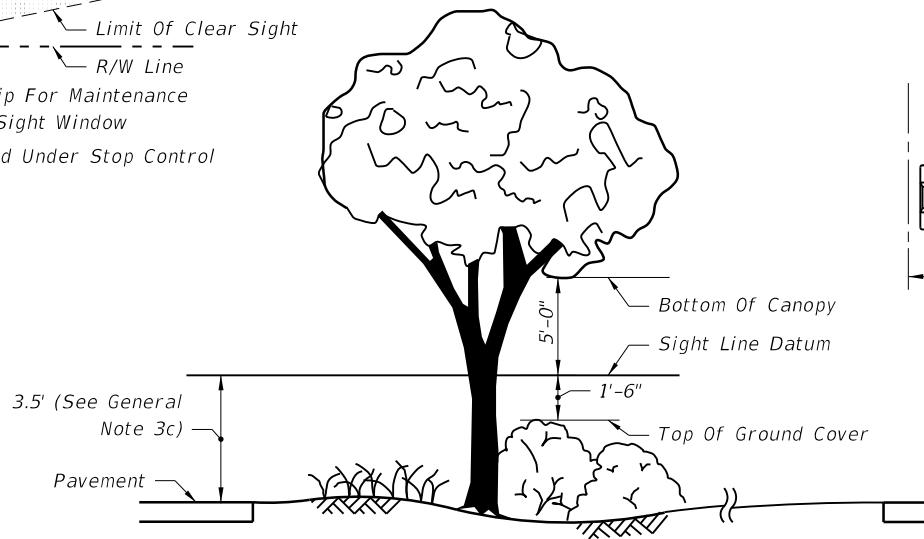
PLAN
Special Areas Limited to Ground Cover

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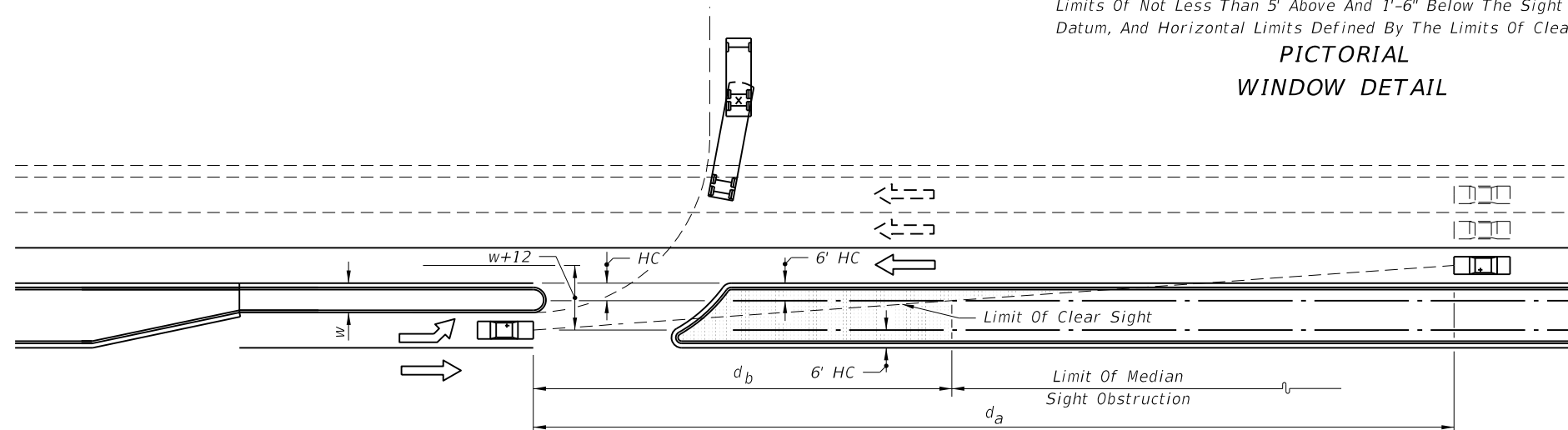
Note:
Lines For 'Limit Of Clear Sight' Are Opposite
Hand When Major Road Near Lane Traffic
Moving Left (e.g., One-Way Left).

PICTORIAL
ORIGIN OF CLEAR SIGHT LINE
ON MINOR ROAD



The Intent Of This Standard Is To Provide A Window With Vertical
Limits Of Not Less Than 5' Above And 1'-6" Below The Sight Line
Datum, And Horizontal Limits Defined By The Limits Of Clear Sight.

PICTORIAL
WINDOW DETAIL



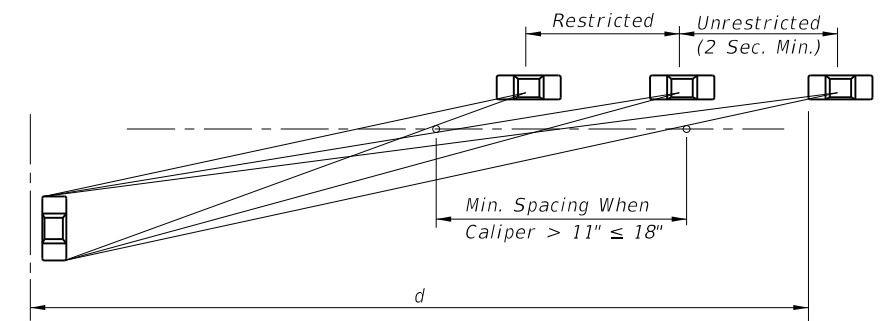
PICTORIAL

d_a (Feet)									
Design Speed MPH	1 Lane Crossed			2 Lanes Crossed			3 Lanes Crossed		
	P	SU	Comb.	P	SU	Comb.	P	SU	Comb.
30	245	285	330	265	320	360	285	350	390
35	285	335	385	310	370	420	335	410	460
40	325	380	440	355	425	480	380	465	525
45	365	430	495	395	475	540	430	525	590
☆ See Note									

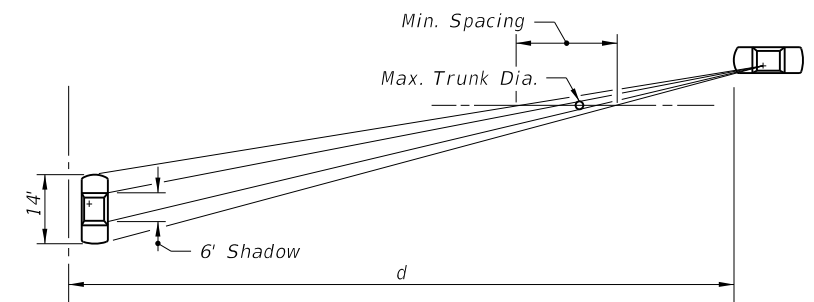
☆ The d_a values in this table were established by the method referenced in Design Note 2, and are applicable to urban, predominantly curbed roadways with design speeds of 45 mph or less and meeting the restricted conditions defined in Index No. 700. For horizontal clearance (HC) of six feet (6'), the values for d_b may be determined by the equation $d_b = d_a (w/(w+12))$. For roadways with nonrestricted conditions, d_a and d_b should be based on the geometry for the left turn storage and on clear zone widths (See Index No. 700).

For wide medians where the turning vehicle can approach the through lanes at or near 90°, use d_v values from tables on sheets 5 or 6. (The clear sight line origin is assumed to be 14.5' from the edge of the near lane.)

CHANNELIZED DIRECTIONAL MEDIAN OPENINGS



PERCEPTION DIAGRAM
SETTING SABAL PALM (STATE TREE) SPACING

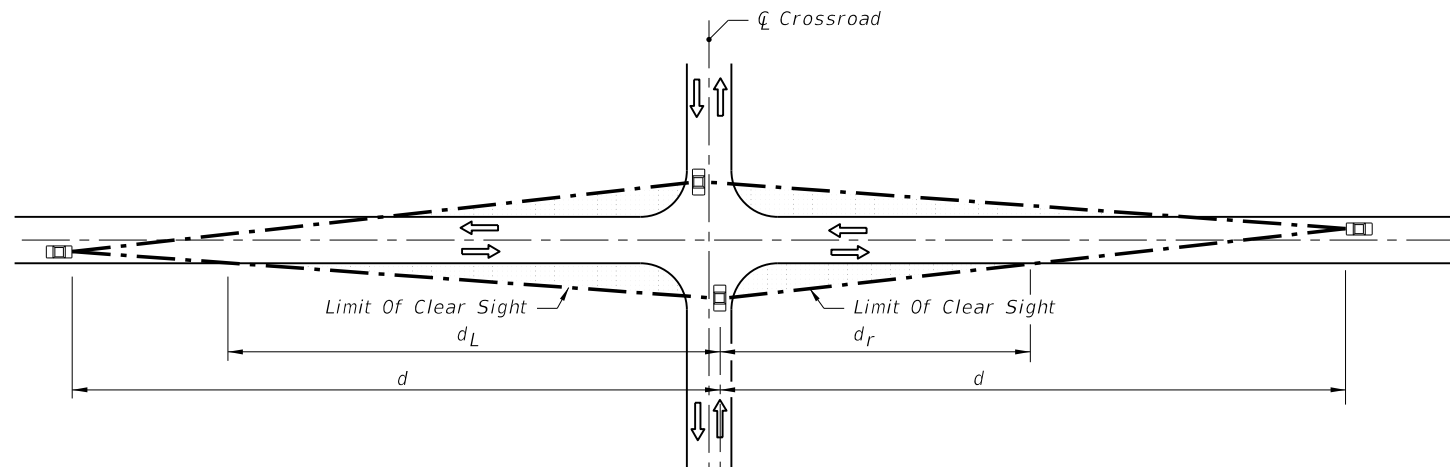


SHADOW DIAGRAM

LEGEND

Areas Free Of Sight Obstructions

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6/24/2013



PICTORIAL
2 LANE UNDIVIDED

Design Speed	d	d _L	d _r
30	335	240	155
35	390	275	175
40	445	315	200
45	500	355	225
50	555	395	250
55	610	435	275
60	665	470	300
65	720	510	325

Passenger Vehicle

Design Speed	d	d _L	d _r
30	420	300	190
35	490	350	220
40	560	400	250
45	630	445	285
50	700	495	315
55	770	545	345
60	840	595	375
65	910	645	410

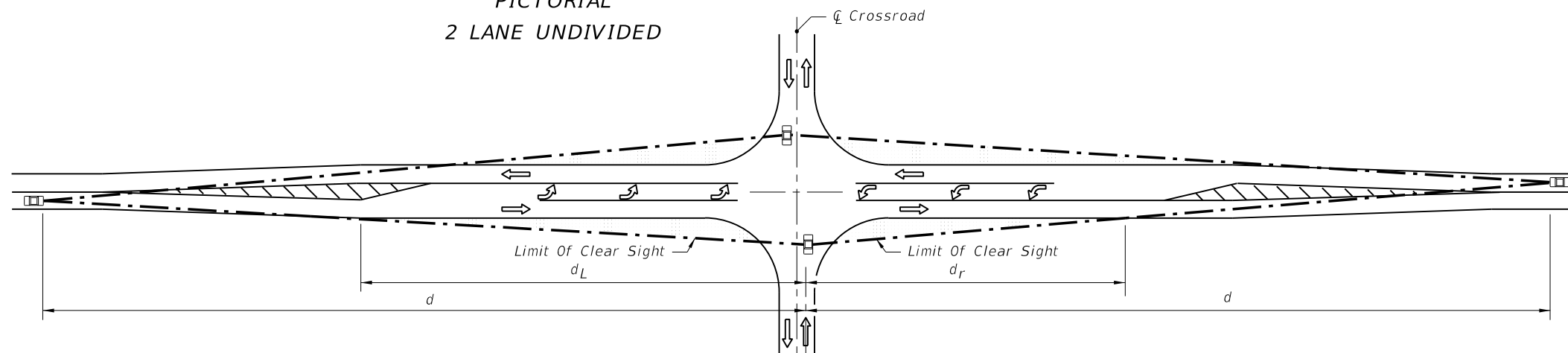
SU Vehicle

Design Speed	d	d _L	d _r
30	510	360	230
35	595	420	265
40	680	480	305
45	765	545	345
50	845	600	380
55	930	660	415
60	1015	720	455
65	1100	780	490

Combination Vehicle

SIGHT DISTANCE (d) AND RELATED DISTANCES (d_L, d_r) (FEET)

2 LANE UNDIVIDED



PICTORIAL
2 LANE 2 WAY • FLARED FOR OPPOSING LEFT TURN CENTERED ON ALIGNMENT

Design Speed	d	d _L	d _r
30	355	195	135
35	415	230	160
40	475	260	180
45	530	290	200
50	590	325	225
55	650	355	245
60	710	390	270
65	765	420	290

Passenger Vehicle

Design Speed	d	d _L	d _r
30	450	250	170
35	525	290	200
40	600	330	225
45	675	370	255
50	750	410	285
55	825	455	310
60	900	495	340
65	975	535	370

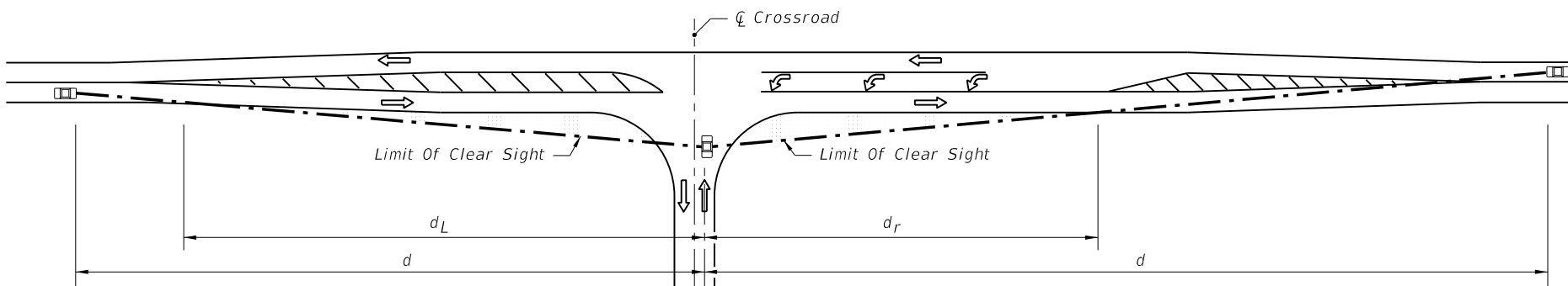
SU Vehicle

Design Speed	d	d _L	d _r
30	540	295	205
35	630	345	240
40	720	395	275
45	810	445	305
50	900	495	340
55	990	545	375
60	1080	590	410
65	1170	640	440

Combination Vehicle

SIGHT DISTANCE (d) AND RELATED DISTANCES (d_L, d_r) (FEET)

2 LANE 2 WAY • FLARED FOR LEFT TURNS



PICTORIAL
2 LANE 2 WAY • FLARED FOR SINGLE SIDE LEFT TURN CENTERED ON ALIGNMENT

LEGEND

Areas Free Of Sight Obstructions

NOTE: See Sheet 2 for intersecting roadway origin of clear sight and quadrant corner clips.

LAST
REVISION
04

DESCRIPTION:



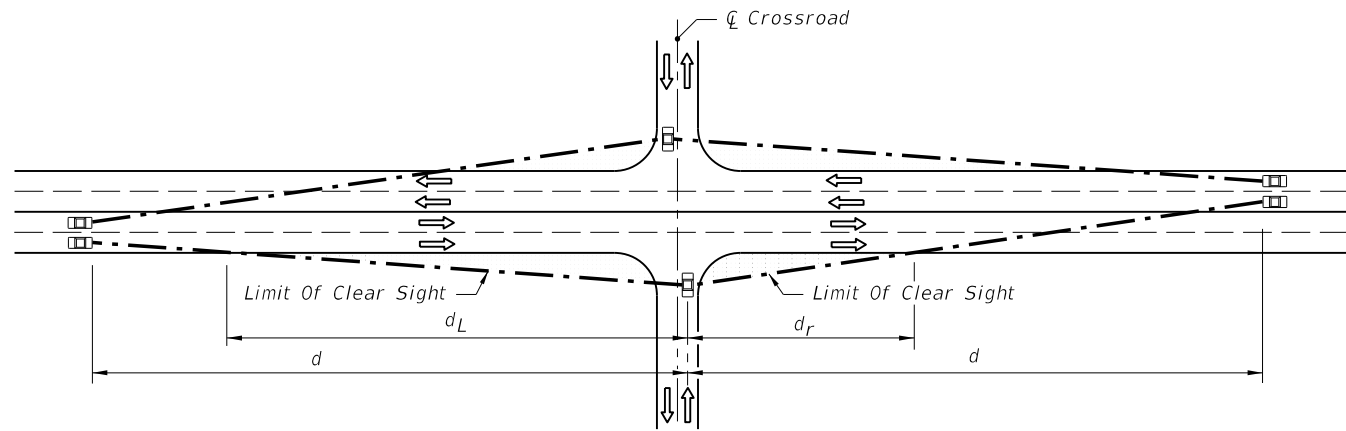
FDOT 2014
DESIGN STANDARDS

SIGHT DISTANCE AT INTERSECTIONS

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PICTORIAL
4 LANE UNDIVIDED

Design Speed	d	d _L	d _r
30	355	255	115
35	415	295	135
40	475	335	155
45	530	375	175
50	590	420	195
55	650	460	215
60	705	500	230
65	765	545	250

Passenger Vehicle

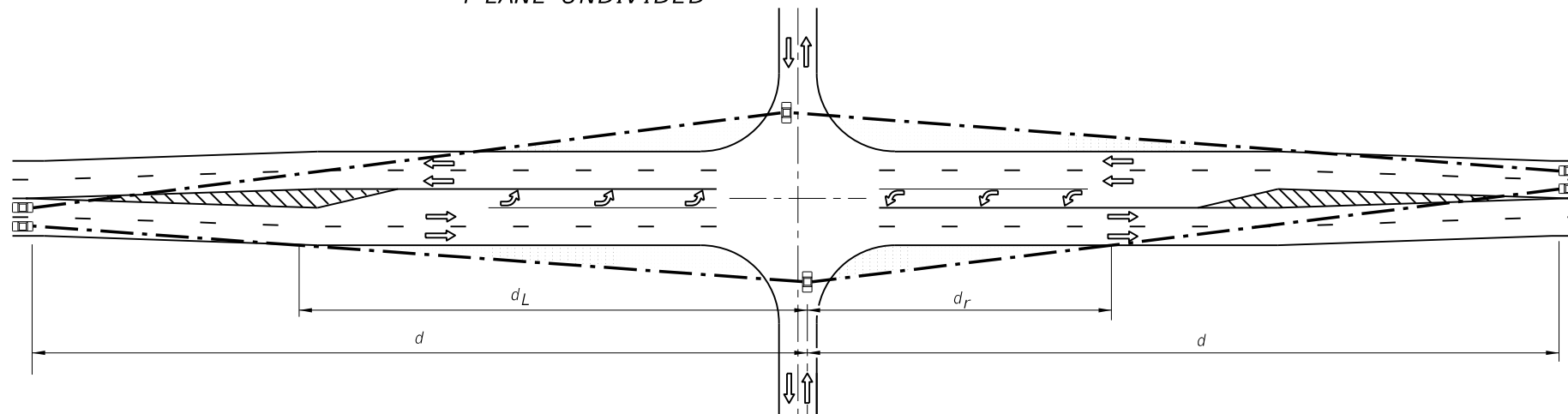
Design Speed	d	d _L	d _r
30	450	320	150
35	525	375	175
40	600	425	195
45	675	480	220
50	750	530	245
55	825	585	270
60	900	640	295
65	975	690	320

SU Vehicle

Design Speed	d	d _L	d _r
30	540	385	175
35	630	445	205
40	720	510	235
45	810	575	265
50	900	640	295
55	990	700	325
60	1080	765	355
65	1170	830	385

Combination Vehicle

SIGHT DISTANCE (d) AND RELATED DISTANCES (d_L, d_r) (FEET)
4 LANE UNDIVIDED



PICTORIAL
4 LANE UNDIVIDED FLARED - SYMMETRICAL

Design Speed	d	d _L	d _r
30	375	205	110
35	440	240	130
40	500	275	145
45	565	310	165
50	625	345	180
55	690	380	200
60	750	410	215
65	815	445	235

Passenger Vehicle

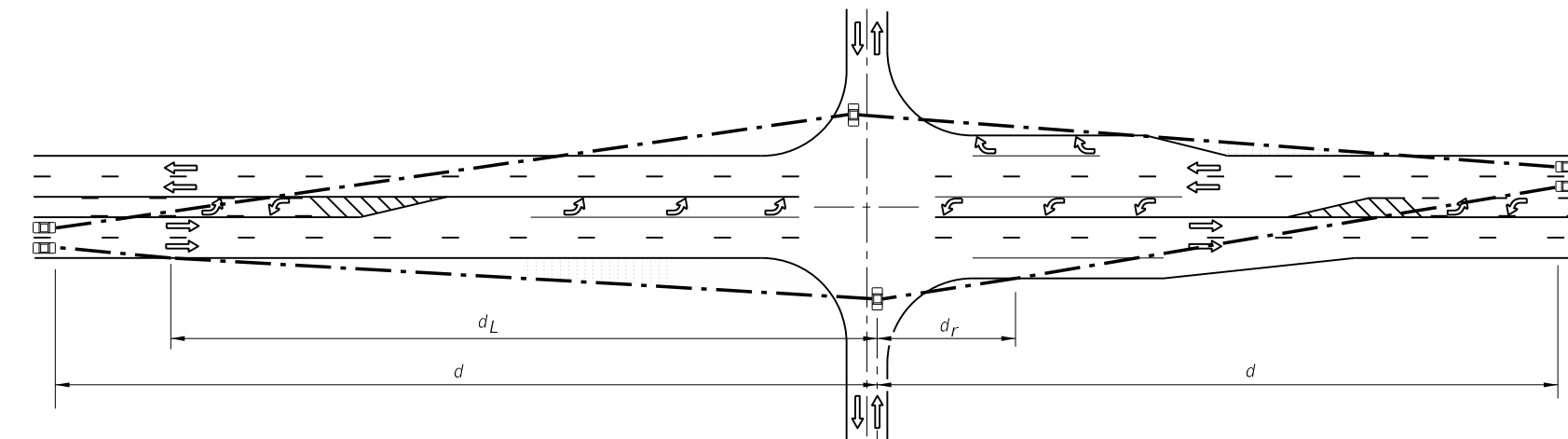
Design Speed	d	d _L	d _r
30	480	265	140
35	560	310	160
40	640	350	185
45	720	395	210
50	800	440	230
55	880	485	255
60	960	525	275
65	1040	570	300

SU Vehicle

Design Speed	d	d _L	d _r
30	570	315	165
35	665	365	190
40	760	415	220
45	855	470	245
50	950	520	275
55	1045	575	300
60	1140	625	330
65	1235	675	355

Combination Vehicle

SIGHT DISTANCE (d) AND RELATED DISTANCES (d_L, d_r) (FEET)
4 LANE UNDIVIDED FLARED - SYMMETRICAL



PICTORIAL
4 LANE UNDIVIDED WITH OPTIONAL LANE

Design Speed	d	d _L	d _r
30	375	265	80
35	440	315	95
40	500	355	105
45	565	400	120
50	625	445	135
55	690	490	150
60	750	530	160
65	815	580	175

Passenger Vehicle

Design Speed	d	d _L	d _r
30	480	340	105
35	560	400	120
40	640	455	135
45	720	510	155
50	800	565	170
55	880	625	190
60	960	680	205
65	1040	735	220


SU Vehicle

Design Speed	d	d _L	d _r
30	570	405	120
35	665	470	140
40	760	540	165
45	855	605	185
50	950	675	205
55	1045	740	225
60	1140	810	245
65	1235	875	265

Combination Vehicle

SIGHT DISTANCE (d) AND RELATED DISTANCES (d_L, d_r) (FEET)
4 LANE UNDIVIDED WITH OPTIONAL LANE

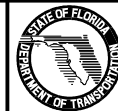
LEGEND

 Areas Free Of Sight Obstructions

NOTE: See Sheet 2 for intersecting roadway origin of clear sight and quadrant corner clips.

LAST
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04

DESCRIPTION:



FDOT 2014
DESIGN STANDARDS

SIGHT DISTANCE AT INTERSECTIONS

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MEDIAN 22' OR LESS				
Design Speed	d	d _L	d _r	d _m
30	390	280	85	320
35	460	325	100	380
40	520	370	115	430
45	590	420	130	485
50	655	465	145	540
55	720	510	160	590
60	785	555	175	645
65	850	605	185	700

PASSENGER VEHICLE (P)

25'-64' MEDIAN				
Design Speed	d	d _L	d _v	d _{vL}
30	355	250	330	240
35	410	290	390	280
40	470	335	445	320
45	530	375	500	360
50	590	420	550	400
55	650	460	610	440
60	705	500	665	480
65	765	545	720	520

MEDIAN 35' OR LESS				
Design Speed	d	d _L	d _r	d _m
30	540	385	110	455
35	630	445	125	530
40	720	510	145	605
45	810	575	160	680
50	900	640	180	755
55	990	700	195	830
60	1080	765	215	905
65	1170	830	230	980

SINGLE-UNIT TRUCK (SU)

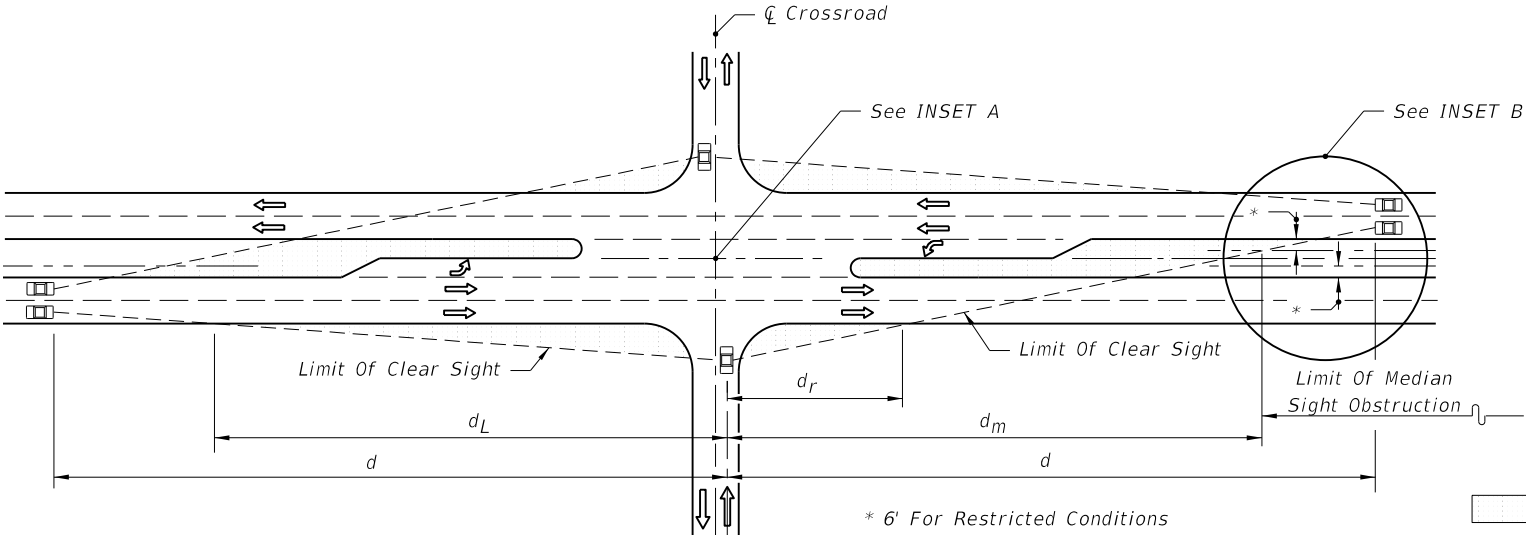
40'-64' MEDIAN				
Design Speed	d	d _L	d _v	d _{vL}
30	450	320	420	300
35	525	370	490	350
40	600	425	560	400
45	675	475	630	450
50	750	530	700	500
55	825	580	770	550
60	900	635	840	600
65	975	690	910	650

MEDIAN 30' OR LESS				
Design Speed	d	d _L	d _r	d _m
30	615	435	120	520
35	720	510	140	605
40	820	580	160	690
45	925	655	180	780
50	1025	725	200	860
55	1130	800	220	950
60	1230	870	240	1035
65	1335	945	260	1120

INTERMEDIATE SEMI-TRAILERS (WB-40 & WB-50)

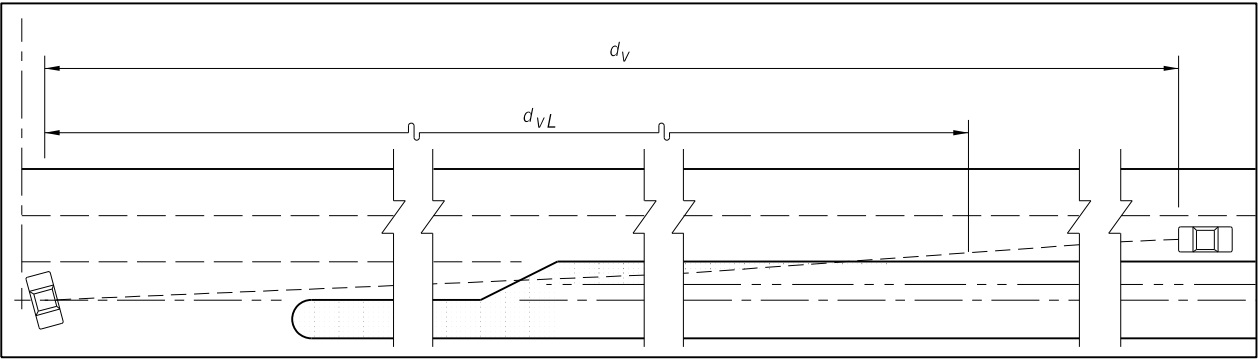
35'-50' MEDIAN				
Design Speed	d	d _L	d _r	d _m
30	670	475	100	585
35	780	555	120	680
40	890	630	140	780
45	1000	710	155	875
50	1110	785	170	970
55	1225	870	190	1070
60	1335	945	205	1165
65	1445	1025	225	1265

64' MEDIAN				
Design Speed	d	d _L	d _v	d _{vL}
30	540	385	510	420
35	630	445	595	490
40	720	510	680	560
45	810	575	760	625
50	900	640	845	695
55	990	700	930	765
60	1080	765	1015	835
65	1165	825	1100	905



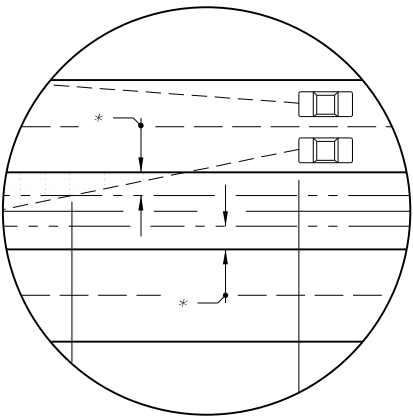
PLAN

PICTORIAL



Where The Median Is Sufficiently Wide For The Design Vehicle To Pause In The Median Vehicle Length Plus 6' Min.) The Clear Line Of Sight To The Right (d_v) Is Measured From The Vehicle Pause Location, i.e., Not From The Cross Road Stop Position; Distances d_r & d_m Do Not Apply.

INSET A



INSET B

NOTES FOR 4-LANE DIVIDED ROADWAY

- See Sheet 2 for origin of clear sight line on the minor road.
- Values shown in the tables are the governing (controlling) sight distances calculated based on 'AASHTO Case B - Intersection with Stop Control on the Minor Road.'

Vehicle Type	Vehicle Length (Ft.)
Passenger (P)	19
Single Unit (SU)	30
Large School Bus	40
WB-40	45.5
WB-50	55

SIGHT DISTANCES (d) & (d_v) AND RELATED DISTANCES (d_L , d_r , d_m & d_{vL}) (FEET)

4 LANE DIVIDED ROADWAY

LAST REVISION	REVISION	DESCRIPTION:	 FDOT 2014 DESIGN STANDARDS	SIGHT DISTANCE AT INTERSECTIONS	INDEX NO. 546	SHEET NO. 5 of 6
07/01/10						

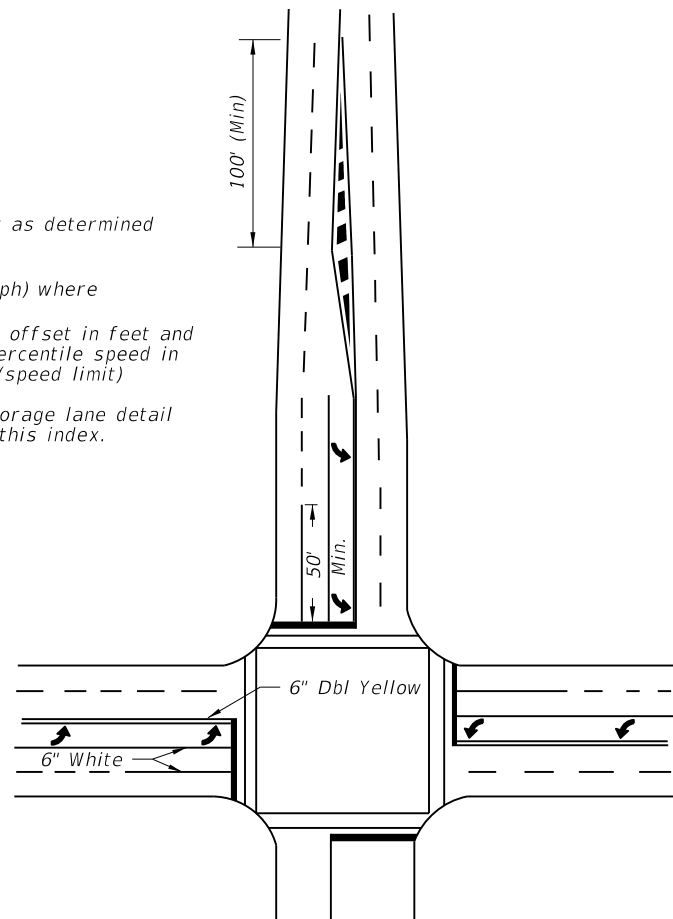
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6/24/2013

6'-10' Skip
6" White

These markings may be used
for locations with restricted
left turn lengths, only when
called for in plans.

6" Dbl Yellow

RESTRICTED LEFT TURN MARKING



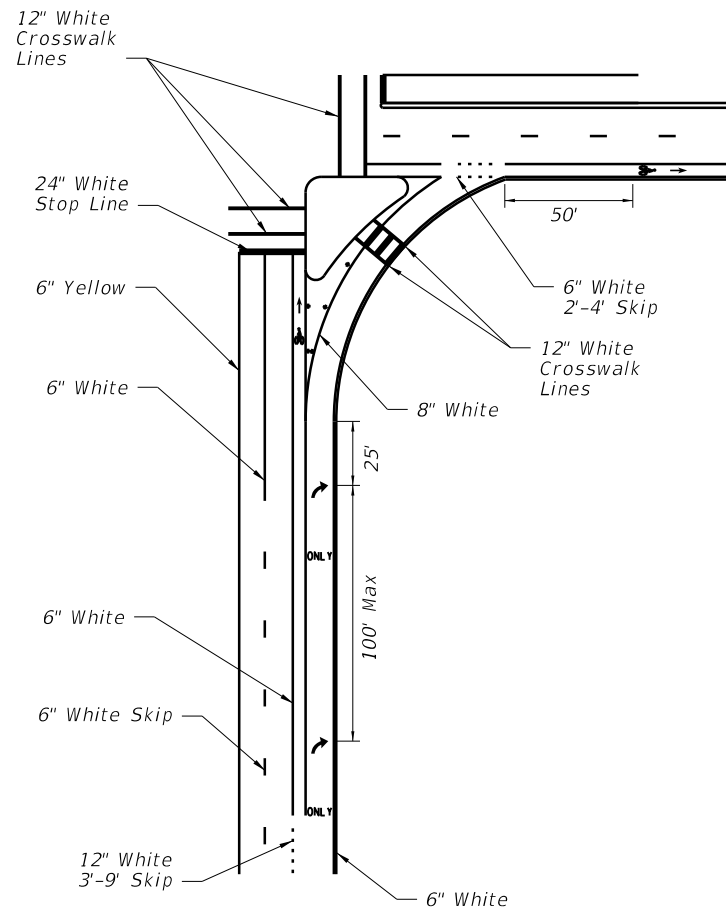
TYPICAL INTERSECTION 2 THRU LANES
PLUS LEFT TURN LANE, WITH CROSSWALK

100' Minimum or as determined
by $L=WS$

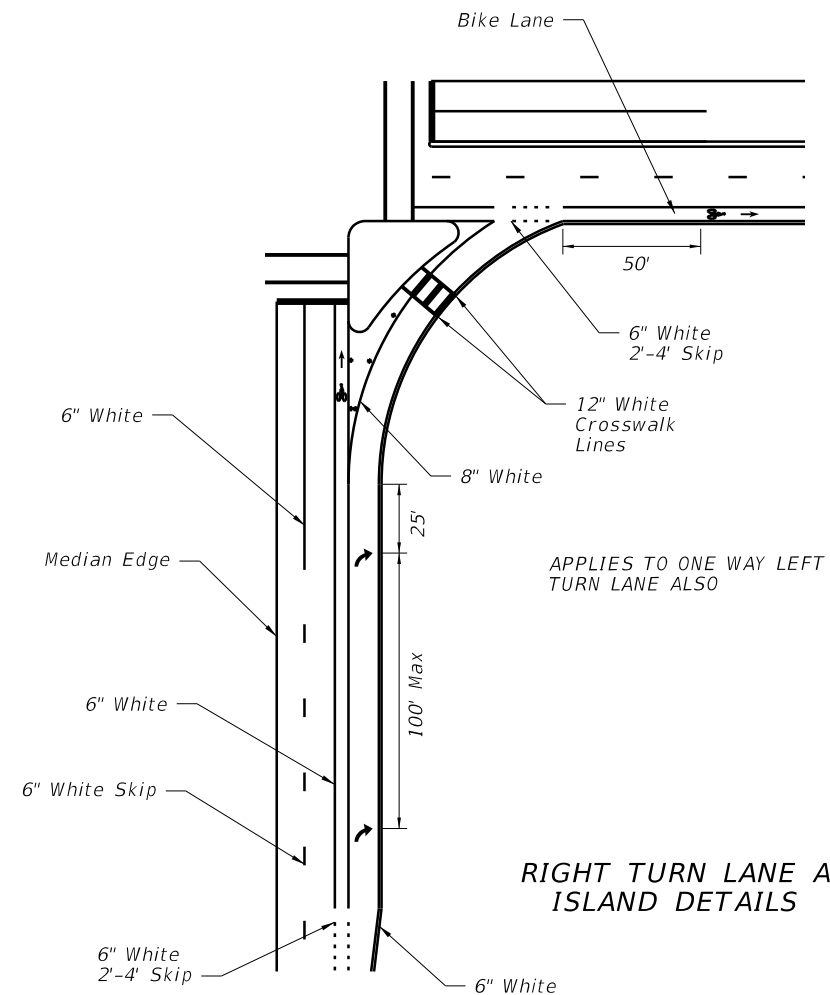
($L = \frac{WS^2}{60}$ < 45 mph) where

W is the lateral offset in feet and
S is the 85th percentile speed in
miles per hour (speed limit)

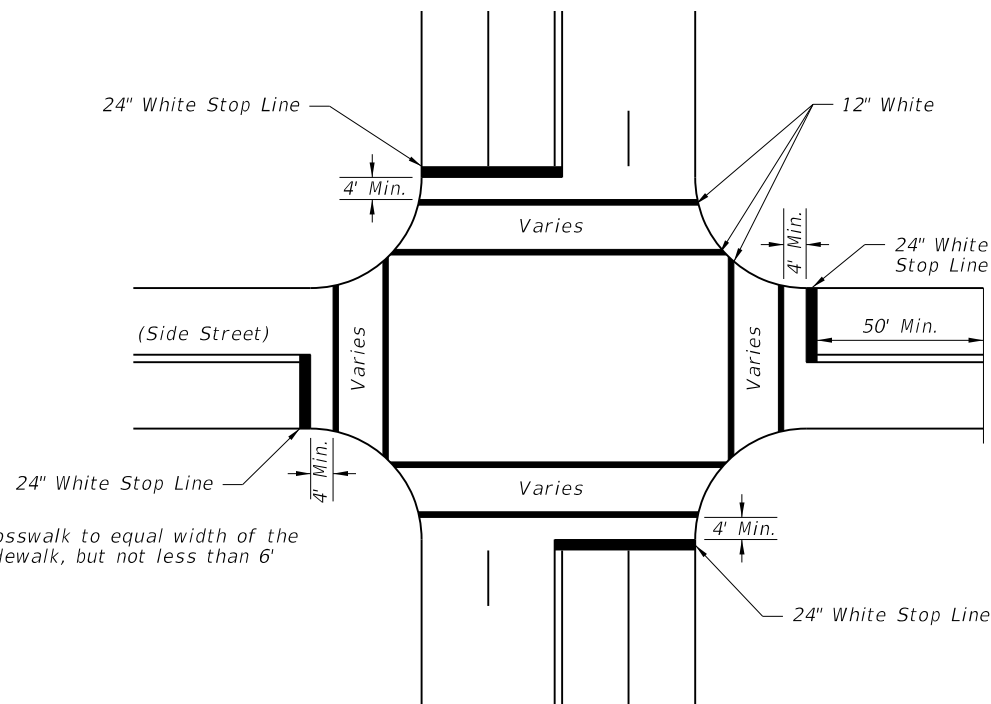
For left turn storage lane detail
see sheet 3 of this index.



RIGHT TURN LANE DROP AND ISLAND DETAILS
LEFT TURN LANE DROP IS MIRROR IMAGE



RIGHT TURN LANE AND
ISLAND DETAILS



STOP BARS, CROSSWALKS AND DOUBLE CENTER LINE DETAILS

NOTES:

1. When public sidewalk curb ramps are present, refer Index No. 17344 and Index No. 304 for crosswalk widths.
2. Double yellow longitudinal center lines on all roadway approaches shall be extended back 100' for projects involving intersection improvements only.
3. When specified, "stop" message shall be placed 25' back of stop lines.

LAST
REVISION
01/01/13

REVISION

DESCRIPTION:
R2013-02--Removed Chevrons from Raised Islands.



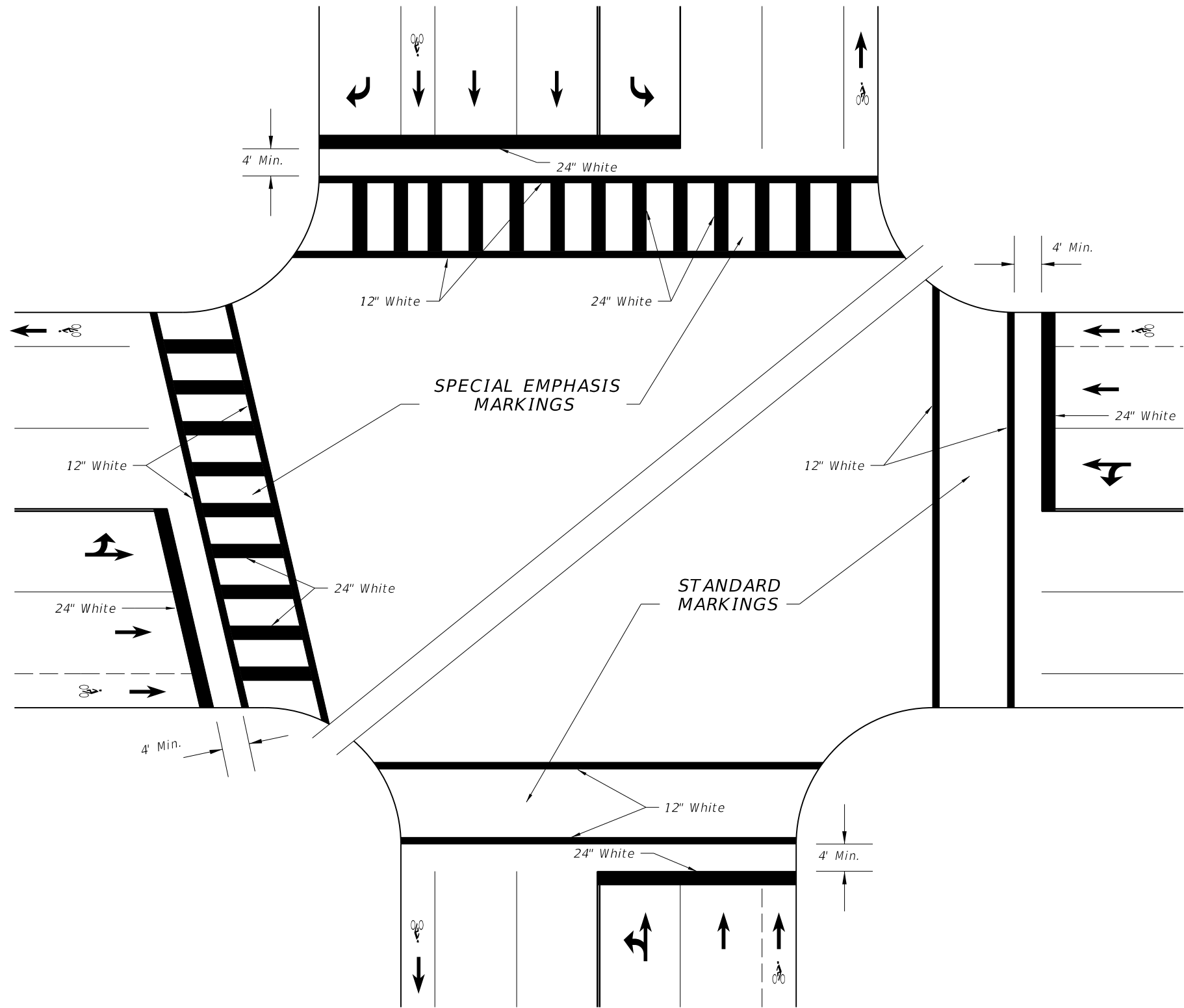
FDOT 2014
DESIGN STANDARDS

SPECIAL MARKING AREAS

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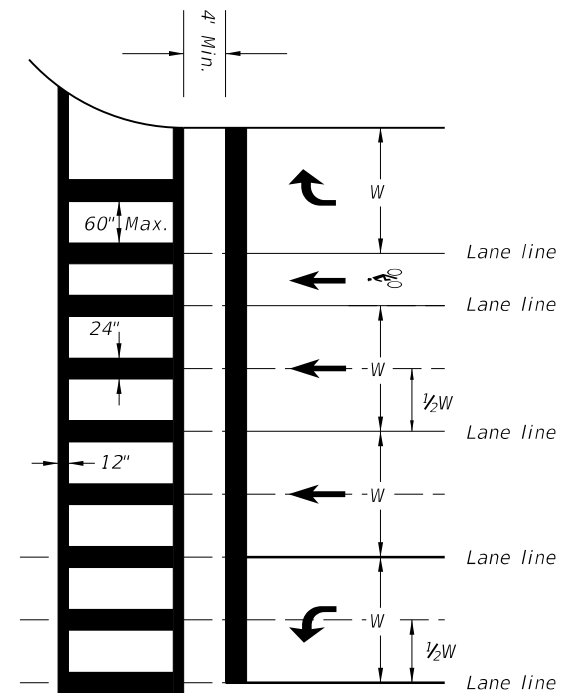


SPECIAL EMPHASIS AND STANDARD CROSSWALKS
SIGNALIZED OR STOP SIGN CONTROLLED INTERSECTION

GENERAL NOTES

1. For traffic and pedestrian signal installation, refer to Index No. 17721 through 17890.
2. For public sidewalk curb ramps, refer to Index No. 304.
3. For pavement marking and sign installation, refer to Indexes 11200 through 17356.
4. Crosswalk minimum widths: Intersection Crosswalk 6'. Midblock Crosswalk 10'.
5. All crosswalk marking shall be white.
6. Longitudinal lines in Special Emphasis Crosswalk shall be 24" wide and spaced to avoid the wheel path of vehicles as shown in detail. The maximum space between markings shall not exceed 60". A longitudinal marking shall be centered at each lane line. Additional longitudinal markings shall be placed at the center of each lane (1/2W).

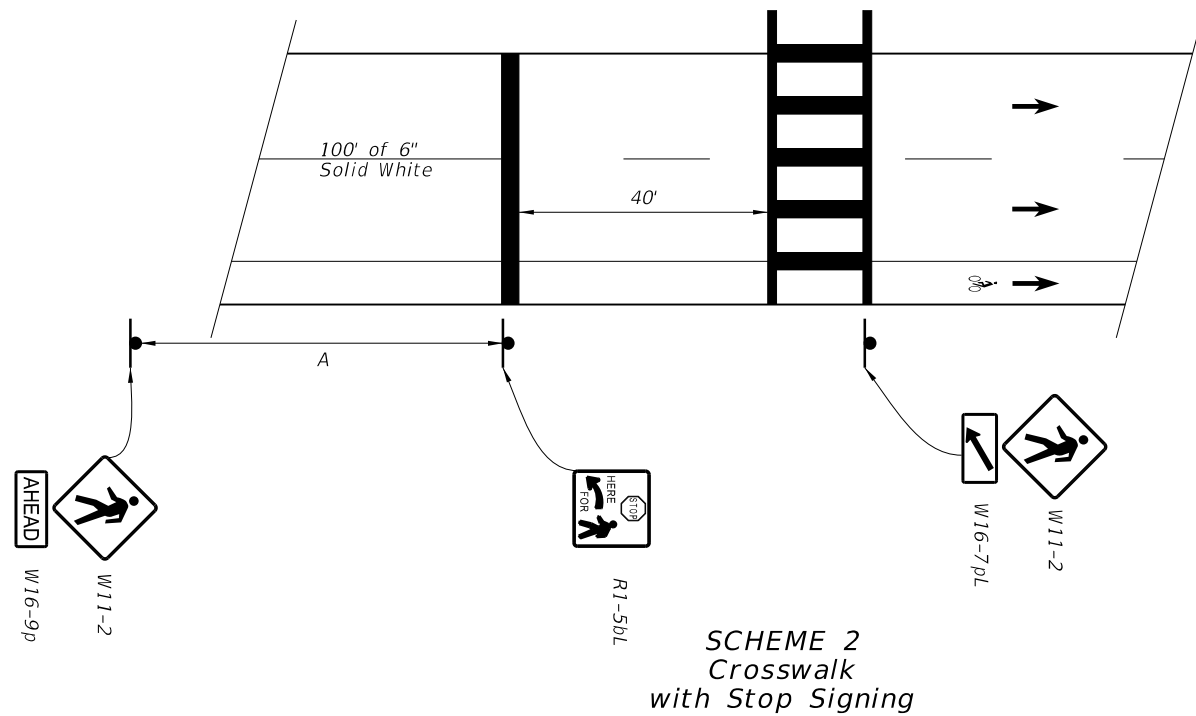
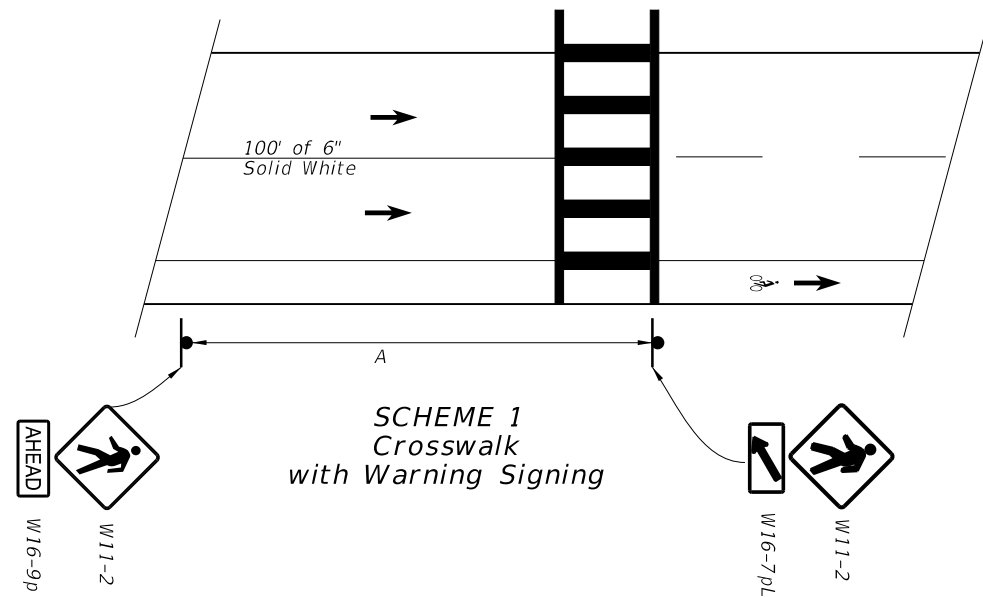
Where the Crosswalk is skewed to the lane lane lines, the Special Emphasis longitudinal lines should be parallel to the lane line.



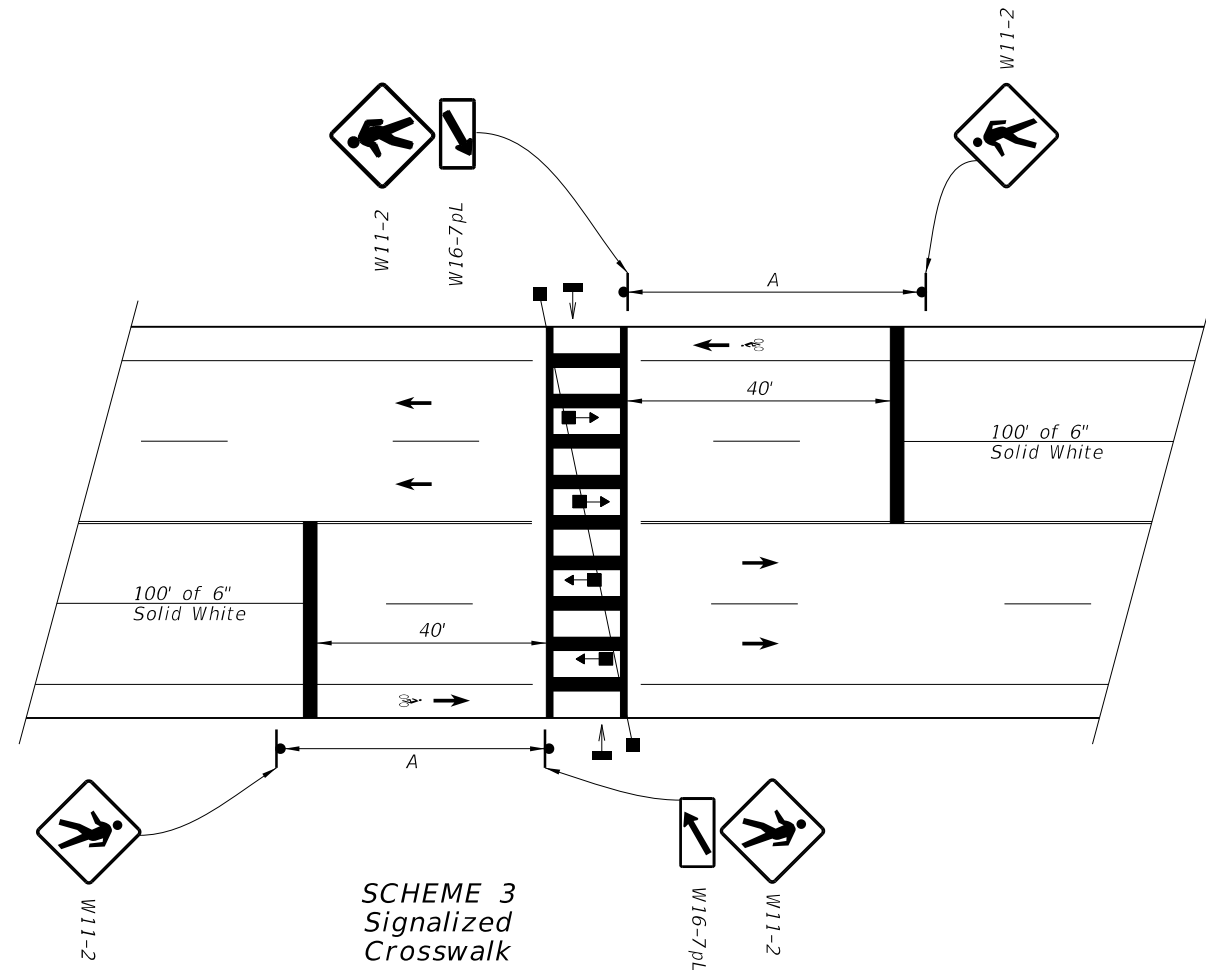
SPECIAL EMPHASIS
CROSSWALK MARKING
DETAIL

LAST REVISION 07/01/09	DESCRIPTION:	 FDOT 2014 DESIGN STANDARDS	SPECIAL MARKING AREAS	INDEX NO. 17346	SHEET NO. 9 of 14
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APPROACH SPEED MPH	A-SUGGESTED DISTANCE (Ft.)
25 Or Less	200
26 To 35	250
36 To 45	300



1. Plans shall indicate which crosswalk scheme is to be used.
2. The details shown do not depict the signing and markings for multi-lane roadways with divided medians. For these applications, additional signs shall be installed on the median side. Minimum width of Mid-Block Crosswalks is 10'.
3. All mid-block crosswalks shall use special emphasis crosswalk markings.
4. Crosswalk marking should utilize preformed marking materials.

LAST
REVISION
01/01/12

REVISION

DESCRIPTION:



FDOT 2014
DESIGN STANDARDS

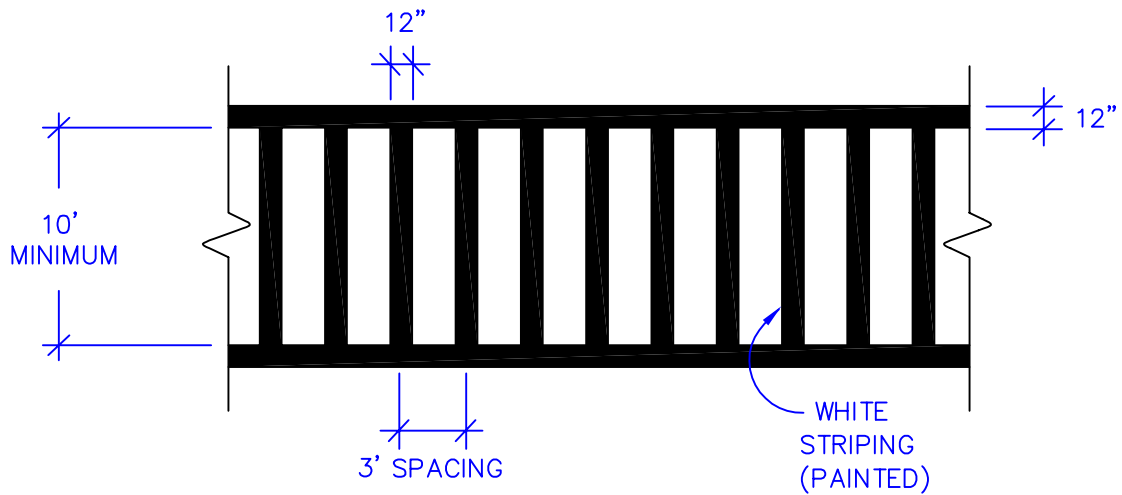
SPECIAL MARKING AREAS

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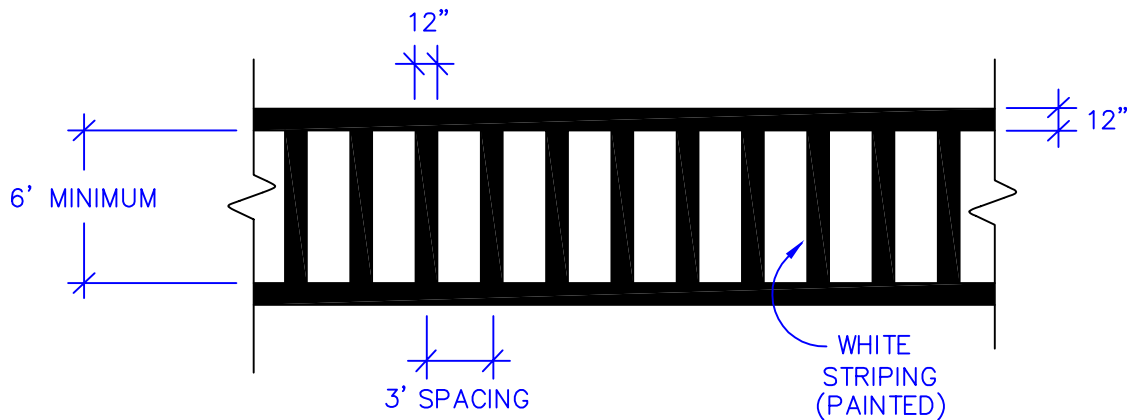
Attachment E

UF Design and Construction Standards



MID-BLOCK CROSSWALK

SCALE: NONE



TYPICAL CROSSWALK

SCALE: NONE

GENERAL NOTE: ALL CROSSWALKS SHALL BE "LADDER" STYLE CROSSWALKS.



UNIVERSITY OF
FLORIDA
PHYSICAL PLANT DIVISION
ARCHITECTURE/ENGINEERING

DRAWING TITLE:

CROSSWALK
DETAILS

PROJECT:

UF CONSTRUCTION STANDARDS

DATE:

MARCH '01

DRAWING NAME:

02500-B

PAGE: 9 OF 9