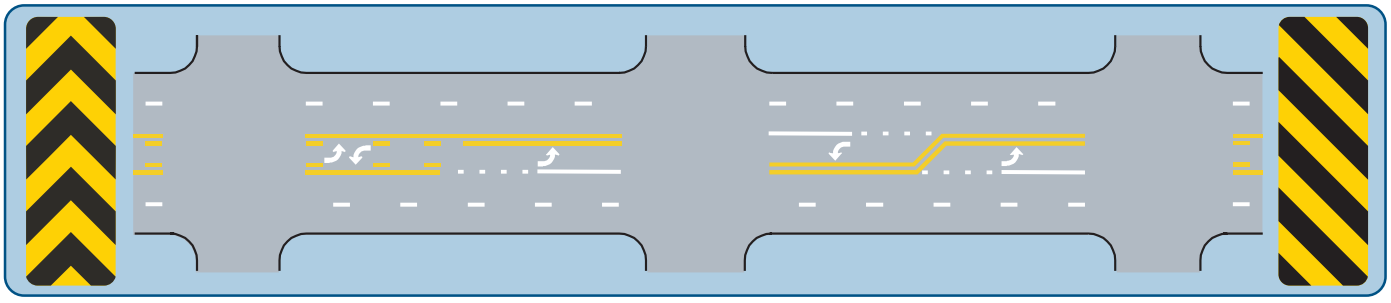
Delaware Department of Transportation

Manual on Uniform Traffic Control Devices (MUTCD)

for Streets and Highways

PART 3

MARKINGS



DelDOT

Delaware Department of Transportation

FEBRUARY 2010

Legend

DelDOT Revision

PART 3. MARKINGS

TABLE OF CONTENTS

		Page
CHAPTER 3A.	**GENERAL**	
Section 3A.01	Functions and Limitations	3A-1
Section 3A.02	Standardization of Application	3A-1
Section 3A.03	Materials	3A-1
Section 3A.04	Colors	3A-2
Section 3A.05	Widths and Patterns of Longitudinal Pavement Markings	3A-2
CHAPTER 3B.	**PAVEMENT AND CURB MARKINGS**	
Section 3B.01	Yellow Centerline Pavement Markings and Warrants	3B-1
Section 3B.02	No-Passing Zone Pavement Markings and Warrants	3B-5
Section 3B.03	Other Yellow Longitudinal Pavement Markings	3B-6
Section 3B.04	White Lane Line Pavement Markings and Warrants	3B-14
Section 3B.05	Other White Longitudinal Pavement Markings	3B-14
Section 3B.06	Edge Line Pavement Markings	3B-15
Section 3B.07	Warrants for Use of Edge Lines	3B-28
Section 3B.08	Extensions Through Intersections or Interchanges	3B-28
Section 3B.09	Lane Reduction Transition Markings	3B-31
Section 3B.10	Approach Markings for Obstructions	3B-31
Section 3B.11	Raised Pavement Markers	3B-32
Section 3B.12	Raised Pavement Markers as Vehicle Positioning Guides with Other Longitudinal Markings	3B-33
Section 3B.13	Raised Pavement Markers Supplementing Other Markings	3B-33
Section 3B.14	Raised Pavement Markers Substituting for Pavement Markings (NOT APPLICABLE IN DELAWARE)	3B-48
Section 3B.15	Transverse Markings	3B-48
Section 3B.16	Stop and Yield Lines	3B-48
Section 3B.17	Crosswalk Markings	3B-49
Section 3B.18	Parking Space Markings	3B-52
Section 3B.19	Pavement Word and Symbol Markings	3B-52
Section 3B.20	Speed Measurement Markings	3B-66
Section 3B.21	Curb Markings	3B-66
Section 3B.22	Preferential Lane Word and Symbol Markings	3B-67
Section 3B.23	Preferential Lane Longitudinal Markings for Motor Vehicles	3B-67
Section 3B.24	Markings for Roundabout Intersections	3B-68
Section 3B.25	Markings for Other Circular Intersections	3B-72
Section 3B.26	Speed Hump Markings	3B-72
Section 3B.27	Advance Speed Hump Markings	3B-72
CHAPTER 3C.	**OBJECT MARKERS**	
Section 3C.01	Object Marker Design and Placement Height	3C-1
Section 3C.02	Markings for Objects in the Roadway	3C-1
Section 3C.03	Markings for Objects Adjacent to the Roadway	3C-3
Section 3C.04	End-of-Roadway Markers	3C-3
CHAPTER 3D.	**DELINEATORS**	
Section 3D.01	Delineators	3D-1
Section 3D.02	Delineator Design	3D-1
Section 3D.03	Delineator Application	3D-1
Section 3D.04	Delineator Placement and Spacing	3D-2

CHAPTER 3E. COLORED PAVEMENTS

Section 3E.01 General 3E-1

CHAPTER 3F. BARRICADES AND CHANNELIZING DEVICES

Section 3F.01 Barricades 3F-1
Section 3F.02 Channelizing Devices 3F-1

CHAPTER 3G. ISLANDS

Section 3G.01 General 3G-1
Section 3G.02 Approach-End Treatment 3G-1
Section 3G.03 Island Marking Application 3G-1
Section 3G.04 Island Marking Colors 3G-2
Section 3G.05 Island Object Markers 3G-2
Section 3G.06 Island Delineators 3G-2

FIGURES

CHAPTER 3B. PAVEMENT AND CURB MARKINGS

Figure 3B-1 Examples of Two-Lane, Two-Way Marking Applications 3B-2
Figure 3B-2 Examples of Four-or-More Lane, Two-Way Marking Applications 3B-3
Figure 3B-3 Examples of Three-Lane, Two-Way Marking Applications 3B-4
Figure 3B-4 Example of Three-Lane, Two-Way Marking for Changing Direction of the Center Lane 3B-7
Figure 3B-5 Method of Locating and Determining the Limits of No-Passing Zones at Curves 3B-8
Figure 3B-6 Example of Reversible Lane Marking Application 3B-9
Figure 3B-7 Example of Two-Way Left-Turn Lane Marking Applications 3B-10
Figure 3B-7A Example of Combination Lane and Centerline Markings - Two-Way Left Turn Lane (DelDOT MUTCD Only) 3B-11
Figure 3B-7B Example of Turn Lane Marking Application (DelDOT MUTCD Only) 3B-12
Figure 3B-7C Examples of Auxiliary Lane Lines – By-pass Lane (DelDOT MUTCD Only) 3B-13
Figure 3B-8 Examples of Channelizing Line Applications for Exit Ramp Markings Along Interstates, Freeways, or Expressways 3B-16
Figure 3B-8A Examples of Channelizing Line Applications for Exit Ramp Markings Along All Other Roads (NON Interstates, Freeways, or Expressways) (DelDOT MUTCD Only) 3B-18
Figure 3B-9 Examples of Channelizing Line Applications for Entrance Ramp Markings Along Interstates, Freeways or Expressways 3B-20
Figure 3B-9A Examples of Channelizing Line Applications for Entrance Ramp Markings Along All Other Roads (NON Interstates, Freeways or Expressways) (DelDOT MUTCD Only) 3B-21
Figure 3B-9B Example of Channelizing Line Application for Added Lane Entrance Ramp (DelDOT MUTCD Only) 3B-22
Figure 3B-10 Example of Lane Drop Markings at Exit Ramps Along Interstates, Freeways or Expressways 3B-23
Figure 3B-10A Example of Lane Drop Markings as Exit Ramps Along All Other Roads (NON Interstates, Freeways or Expressways) (DelDOT MUTCD Only) 3B-24
Figure 3B-10B Example of Combination Choice Lane plus Lane Drop Marking Along Interstates, Freeways or Expressways (DelDOT MUTCD Only) 3B-25
Figure 3B-10C Example of Channelizing Line Application for Interstate, Freeway, or Expressway Split (DelDOT MUTCD Only) 3B-26
Figure 3B-10D Example of Wide Edge Lines (DelDOT MUTCD Only) 3B-27

Figure 3B-11 Examples of Extensions through Intersections Along All Other Roads (NON Interstates, Freeways or Expressways) 3B-29
Figure 3B-12 Examples of Lane Reduction Markings 3B-34
Figure 3B-12A Example of Lane Reduction Markings for Interstates, Freeways or Expressways (45 mph or more) (DelDOT MUTCD Only) 3B-35
Figure 3B-12B Example of Lane Reduction Beyond Intersection Marking Application Along All Other Roads (NON Interstates, Freeways or Expressways) (45 mph or more) (DelDOT MUTCD Only) 3B-36
Figure 3B-12C Example of Lane Reduction Beyond Intersection Marking Application Along All Other Roads (NON Interstates, Freeways or Expressways) (Less than 45 mph) (DelDOT MUTCD Only) 3B-37
Figure 3B-13 Examples of Markings for Obstructions in the Roadway 3B-38
Figure 3B-13A Example of Raised Pavement Marker (RPM) Application on Interstates, Freeways or Expressways (DelDOT MUTCD Only) 3B-40
Figure 3B-13B Example of Raised Pavement Marker (RPM) Application on Interstate, Freeway or Expressway Ramps (DelDOT MUTCD Only) 3B-41
Figure 3B-13C Example of Raised Pavement Marker (RPM) Application on Interstate, Freeway or Expressway Exit Ramp (DelDOT MUTCD Only) 3B-42
Figure 3B-13D Example of Raised Pavement Marker (RPM) Application on Arterial and Other Two Lane Roads (DelDOT MUTCD Only) 3B-43
Figure 3B-13E Example of Raised Pavement Marker (RPM) Application on Multi-Lane Arterial Roads (DelDOT MUTCD Only) 3B-44
Figure 3B-13F Example of Raised Pavement Marker (RPM) Application for Left Turn Lane (DelDOT MUTCD Only) 3B-45
Figure 3B-13G Example of Raised Pavement Marker (RPM) Application for Acceleration, Deceleration By-pass Lanes (DelDOT MUTCD Only) 3B-46
Figure 3B-13H Example of Raised Pavement Marker (RPM) Application for Left Turn Lane with Flush Median (DelDOT MUTCD Only) 3B-47
Figure 3B-14 Example of Yield Line Layouts 3B-50
Figure 3B-15 Examples of Yield Lines at Unsignalized Midblock Crosswalks 3B-51
Figure 3B-16 Example of Crosswalk Markings 3B-53
Figure 3B-16A Example of YIELD Sign at Second Roadway of Divided Highway Yield Lines (DelDOT MUTCD Only) 3B-54
Figure 3B-17 Example of Crosswalk Markings for Exclusive Pedestrian Phase That Permits Diagonal Crossing (NOT APPLICABLE IN DELAWARE) 3B-54
Figure 3B-18 Examples of Parking Space Markings 3B-55
Figure 3B-19 International Symbol of Accessibility Parking Space Marking with Blue Background and White Border Options 3B-56
Figure 3B-20 Example of Elongated Letters for Word Pavement Markings 3B-58
Figure 3B-21 Examples of Standard Arrows for Pavement Markings 3B-59
Figure 3B-21A Examples of Word and Arrow Pavement Markings used in Lane Drop Marking Applications (DelDOT MUTCD Only) 3B-60
Figure 3B-21B Example of Arrow Pavement Markings used in Turn Lane Applications (DelDOT MUTCD Only) 3B-61
Figure 3B-22 Example of Lane Use Control Word and Symbol Markings 3B-62
Figure 3B-23 Example of Arrow Markings at Exit Ramp Terminals 3B-63
Figure 3B-24 Example of Arrow Markings at Entrance Ramp Terminals 3B-64
Figure 3B-25 Examples of Yield Ahead Triangle Symbols 3B-65
Figure 3B-26 Examples of Markings for Preferential Lanes 3B-70
Figure 3B-27 Examples of Markings for Roundabout Intersections with One-Lane Approaches 3B-73
Figure 3B-28 Examples of Markings for Roundabout Intersections with Two-Lane Approaches 3B-74
Figure 3B-29 Example of Pavement Markings for Speed Humps Without Crosswalks 3B-75

Figure 3B-30 Example of Pavement Markings for Speed Tables or Speed Humps with Crosswalks 3B-76
Figure 3B-31 Example of Advance Warning Markings for Speed Humps 3B-77

CHAPTER 3C. OBJECT MARKERS

Figure 3C-1 Object Markers and End-of-Roadway Markers 3C-2

CHAPTER 3D. DELINEATORS

Figure 3D-1 Example of Delineator Placement 3D-4

TABLES

CHAPTER 3B. PAVEMENT AND CURB MARKINGS

Table 3B-1 Minimum Passing Sight Distances 3B-6
Table 3B-2 Standard Edge Line Lane Markings for Preferential Lanes 3B-69

CHAPTER 3D. DELINEATORS

Table 3D-1 Approximate Spacing for Delineators on Horizontal Curves 3D-3

CHAPTER 3A. GENERAL

Section 3A.01 Functions and Limitations

Support:

Markings on highways have important functions in providing guidance and information for the road user. Major marking types include pavement and curb markings, object markers, delineators, colored pavements, barricades, channelizing devices and islands. In some cases, markings are used to supplement other traffic control devices such as signs, signals and other markings. In other instances, markings are used alone to effectively convey regulations, guidance, or warnings in ways not obtainable by the use of other devices.

Markings have limitations. Visibility of the markings can be limited by snow, debris, and water on or adjacent to the markings. Marking durability is affected by material characteristics, traffic volumes, weather, and location. However, under most highway conditions, markings provide important information while allowing minimal diversion of attention from the roadway.

Pavement markings can enhance roadway delineation with the addition of audible and tactile features such as bars, differential surface profiles, raised pavement markers, or other devices intended to alert the road user that a delineation on the roadway is being traversed.

The general functions of longitudinal lines are:

A. A double line indicates maximum or special restrictions,
B. A solid line discourages or prohibits crossing (depending on the specific application),
C. A broken line indicates a permissive condition, and
D. A dotted line provides guidance.

Section 3A.02 Standardization of Application

Standard:

Each standard marking shall be used only to convey the meaning prescribed for that marking in this Manual. When used for applications not described herein, markings shall conform in all respects to the principles and standards set forth herein.

Guidance:

Before any new highway, paved detour, or temporary route is opened to traffic, all necessary markings should be in place.

Standard:

Markings that are no longer applicable for roadway conditions or restrictions and that might cause confusion for the road user shall be removed or obliterated to be unidentifiable as a marking as soon as practical. Markings that must be visible at night shall be retroreflective unless ambient illumination assures that the markings are adequately visible. All markings on Interstate highways shall be retroreflective.

Option:

Markings may be temporarily masked with tape until they can be removed or obliterated.

Section 3A.03 Materials

Support:

Pavement and curb markings are commonly placed by using paints or thermoplastics; however, other suitable marking materials, including raised pavement markers and colored pavements, are also used. Delineators, object markers, barricades, and channelizing devices are visibly placed in a vertical position similar to signs above the roadway.

Guidance:

The materials used for markings should provide the specified color throughout their useful life.

Consideration should be given to selecting pavement marking materials that will minimize tripping or loss of traction for pedestrians and bicyclists.

Object markers and delineators should not present a vertical or horizontal clearance obstacle for pedestrians.

Section 3A.04 Colors

Standard:

Markings shall be yellow, white, red, or blue. The colors for markings shall conform to the standard highway colors. Black in conjunction with one of the above colors shall be a usable color.

When used, white markings for longitudinal lines shall delineate:

A. The separation of traffic flows in the same direction.
B. The right edge of the roadway.

When used, yellow markings for longitudinal lines shall delineate:

A. The separation of traffic traveling in opposite directions.
B. The left edge of the roadways of divided and one-way highways and ramps.
C. The separation of two-way left turn lanes and reversible lanes from other lanes.

When used, red raised pavement markers shall delineate roadways that shall not be entered or used.

When used, blue markings shall supplement white markings for parking spaces for persons with disabilities. When used, blue raised pavement markers shall indicate locations of fire hydrants along a roadway.

Option:

Black may be used in combination with the above colors where a light-colored pavement does not provide sufficient contrast with the markings.

Support:

When used in combination with other colors, black is not considered a marking color, but only a contrast-enhancing system for the markings.

Section 3A.05 Widths and Patterns of Longitudinal Pavement Markings

Standard:

The widths and patterns of longitudinal lines shall be as follows:

A. A normal line for interstates, freeways, and expressways is 150 mm (6 in) wide. A normal line for all other roads is 100 mm (4 in) wide.
B. A wide line is at least twice the width of a normal line.
C. A double line consists of two parallel lines separated by 6 inches.
D. A broken line consists of normal line segments separated by gaps.
E. A dotted line shall consist of noticeably shorter line segments separated by shorter gaps than used for a broken line. The width of a dotted line shall be at least the same as the width of the line it extends.
F. Black contrast markings shall be applied along with white edge lines, broken lines, and dotted lines on all concrete roadways.

DelDOT Rev.

DelDOT Rev.

Guidance:

Broken lines should consist of 3 m (10 ft) line segments and 9 m (30 ft) gaps, or dimensions in a similar ratio of line segments to gaps as appropriate for traffic speeds and need for delineation.

Standard:

A dotted line for line extensions on interstates, freeways, and expressways shall consist of 0.9 m (3 ft) line segments and 2.7 m (9 ft) gaps. A dotted line for line extensions along all other roads shall consist of 0.6 m (2 ft) line segments and 1.8 m (6 ft) gaps, except when used at roundabouts. Line extensions used at roundabouts shall consist of 0.6 m (2 ft) line segments and 0.6 m (2 ft) gaps.

DelDOT Rev.

CHAPTER 3B. PAVEMENT AND CURB MARKINGS

Section 3B.01 Yellow Centerline Pavement Markings and Warrants

Standard:

Centerline pavement markings, when used, shall be the pavement markings used to delineate the separation of traffic lanes that have opposite directions of travel on a roadway and shall be yellow.

Option:

Centerline pavement markings may be placed at a location that is not the geometric center of the roadway.

On roadways without continuous centerline pavement markings, short sections may be marked with centerline pavement markings to control the position of traffic at specific locations, such as around curves, over hills, on approaches to highway-railroad grade crossings, at highway-railroad grade crossings, and at bridges.

Standard:

The centerline markings on two-lane, two-way roadways shall be one of the following as shown in Figure 3B-1:

A. Two-direction passing zone markings consisting of a normal broken yellow line where crossing the centerline markings for passing with care is permitted for traffic traveling in either direction;

B. One-direction no-passing zone markings consisting of a normal broken yellow line and a normal solid yellow line where crossing the centerline markings for passing with care is permitted for the traffic traveling adjacent to the broken line, but is prohibited for traffic traveling adjacent to the solid line; and

C. Two-direction no-passing zone markings consisting of two normal solid yellow lines where crossing the centerline markings for passing is prohibited for traffic traveling in either direction.

The centerline markings on undivided two-way roadways with four or more lanes for moving motor vehicle traffic always available shall be the two-direction no-passing zone markings consisting of two normal solid yellow lines as shown in Figure 3B-2.

Guidance:

On two-way roadways with three through lanes for moving motor vehicle traffic, two lanes should be designated for traffic in one direction by using one- or two-direction no-passing zone markings as shown in Figure 3B-3.

Standard:

Centerline markings shall be placed on all paved roadways that have a traveled way of 5.8 m (19 ft) or more in width and an ADT of 1,000 vehicles per day or greater.

Guidance:

Centerline markings may be placed on any paved roadway 5.8 m (19 ft) or more with an ADT less than 1,000 where an engineering study indicates such a need. Surface treated roads 5.8 m (19 ft) wide with an ADT greater than 1,000 should have a centerline marking. Surface treated roads 5.8 m (19 ft) wide with an ADT less than 1,000 may have centerline markings on the basis of an engineering study. Subdivision roads typically should not have a centerline marking unless an engineering study indicates such a need. **DelDOT Rev.**

Engineering judgment should be used in determining whether to place centerline markings on traveled ways that are less than 5.8 m (19 ft) wide because of the potential for traffic encroaching on the pavement edges, traffic being affected by parked vehicles, and traffic encroaching into the opposing traffic lane.

Option:

If a traffic count is not available, the ADTs may be obtained from the DelDOT Traffic Summary.

Figure 3B-1. Examples of Two-Lane, Two-Way Marking Applications

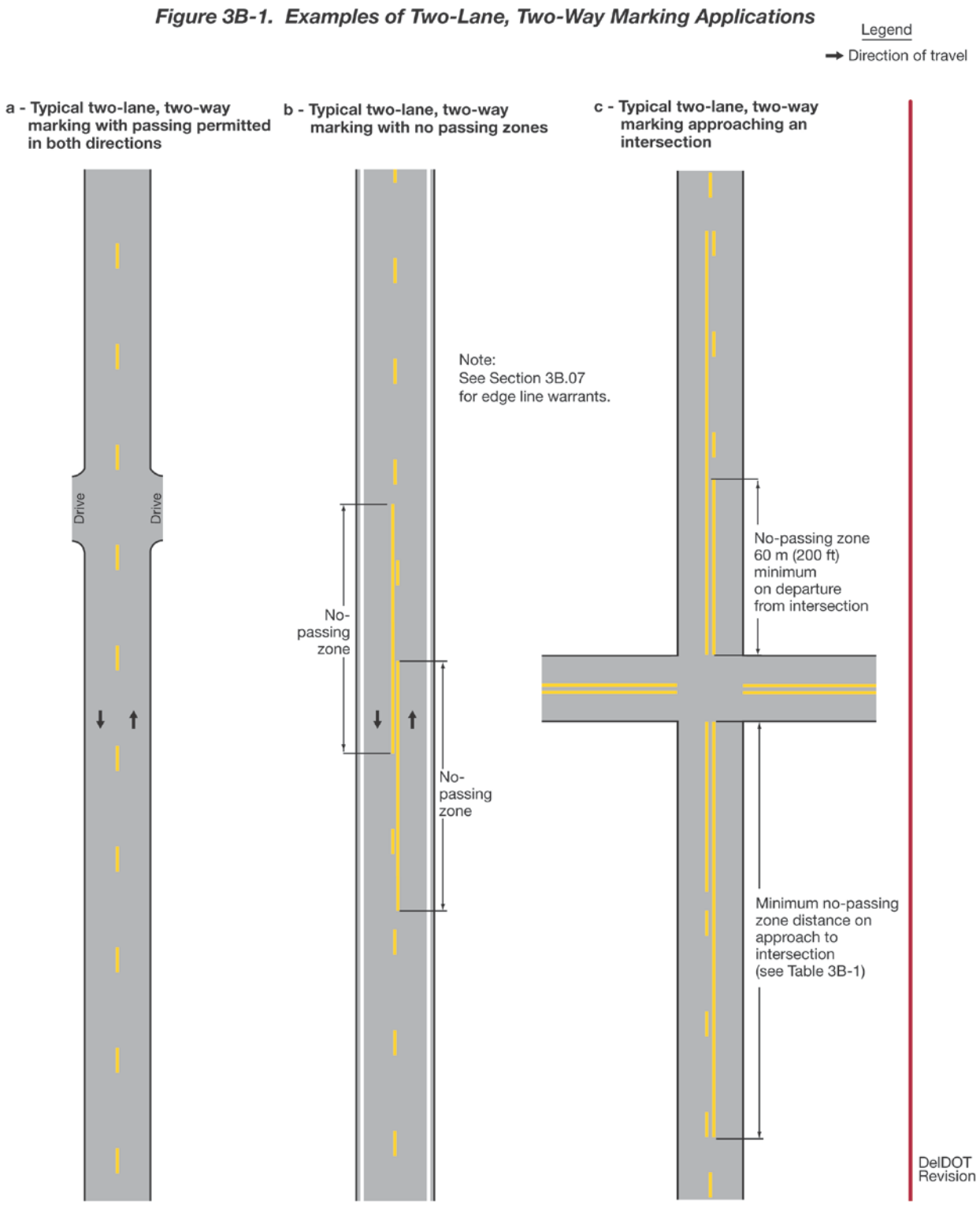


Figure 3B-2. Examples of Four-or-More Lane, Two-Way Marking Applications

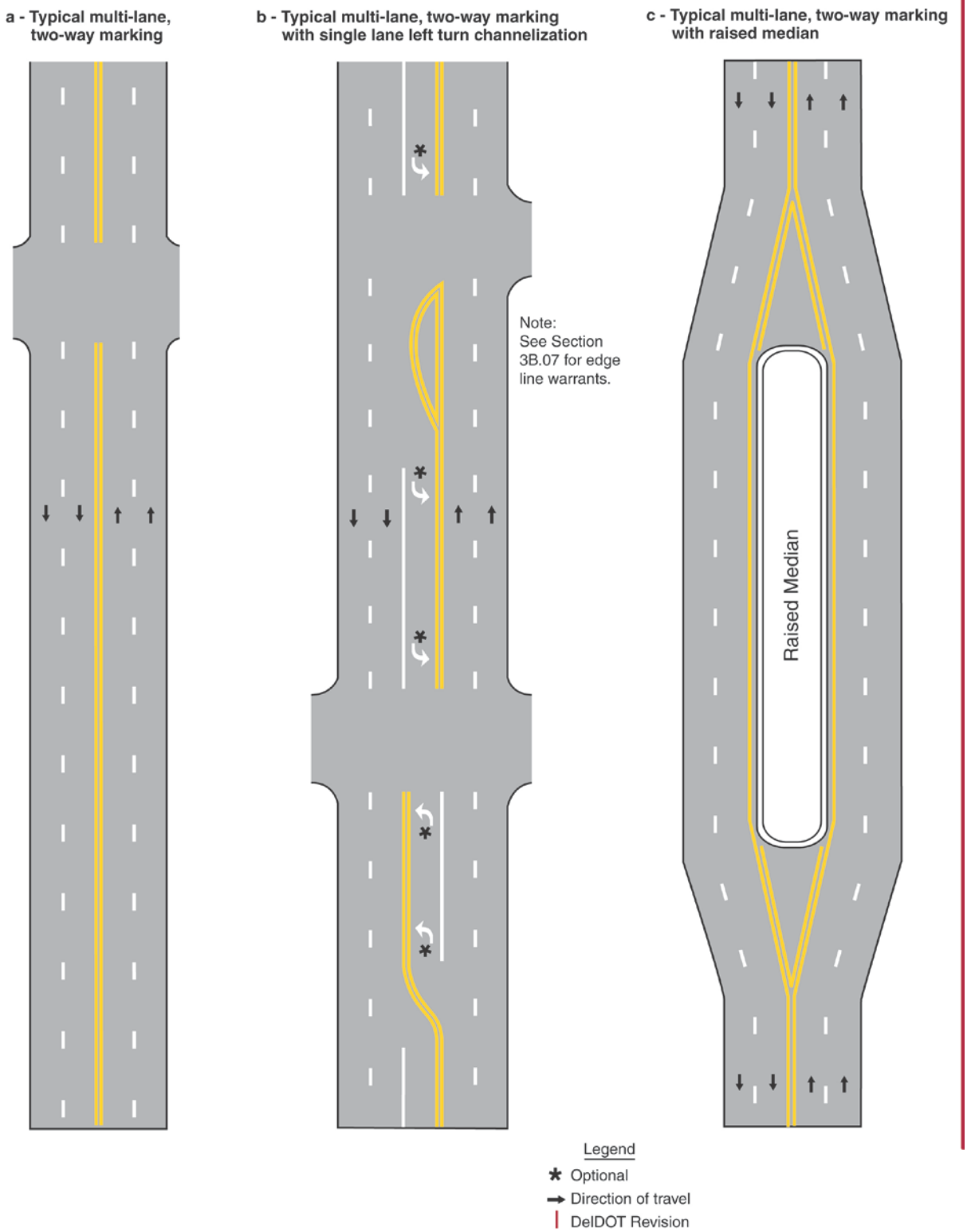
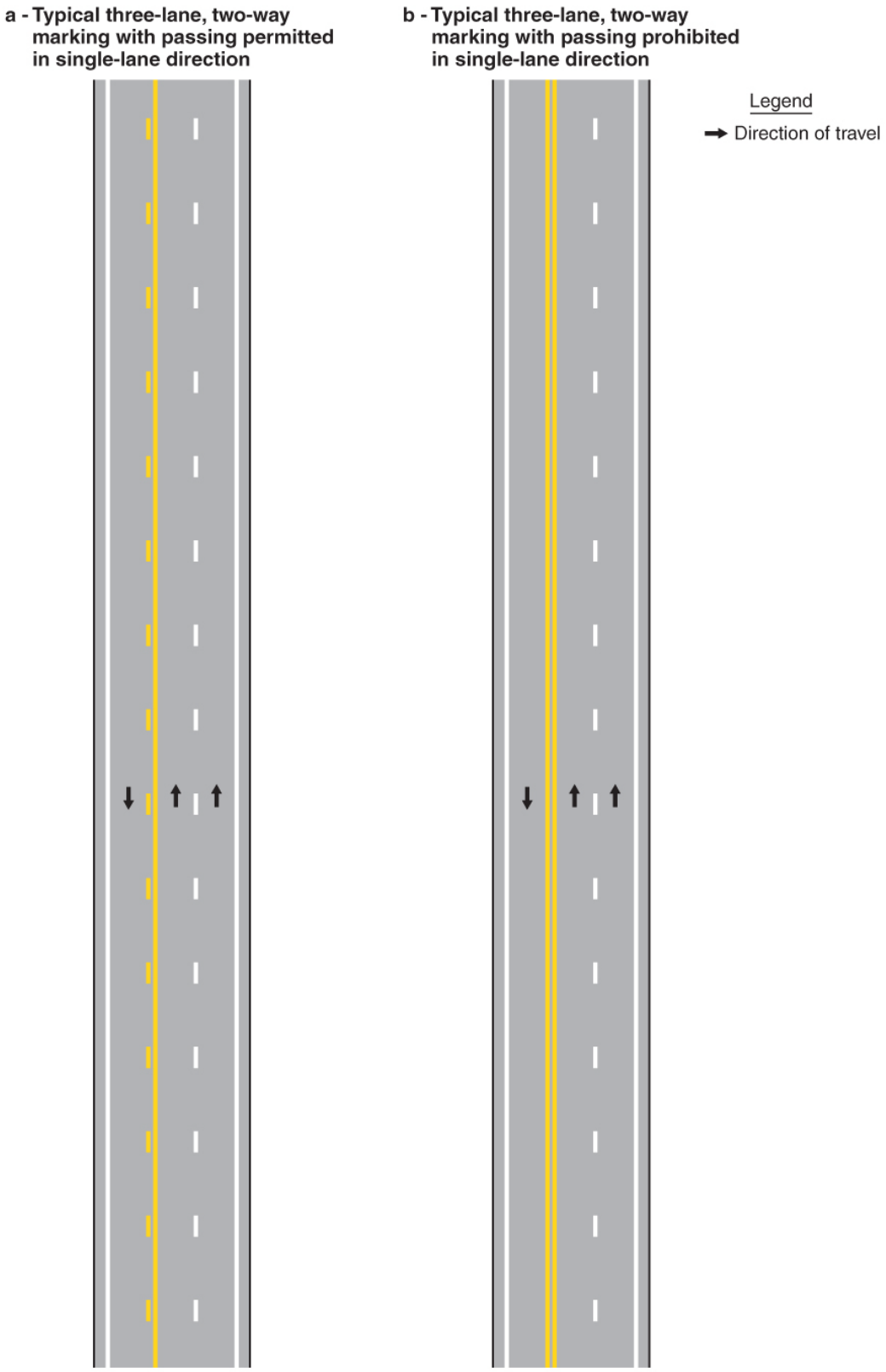


Figure 3B-3. Examples of Three-Lane, Two-Way Marking Applications



Section 3B.02 <u>No-Passing Zone Pavement Markings and Warrants</u>

Standard:

No-passing zones shall be marked by either the one direction no-passing zone pavement markings or the two-direction no-passing zone pavement markings described previously and shown in Figures 3B-1 and 3B-3.

When centerline markings are used, no-passing zone markings shall be used on two-way roadways at lane reduction transitions (see Section 3B.09) and on approaches to obstructions that must be passed on the right (see Section 3B.10).

When centerline markings are used, no-passing zone markings on all approaches to an intersection shall be based on the distances shown in Table 3B-1. When centerline markings are used, no-passing zone markings shall extend a minimum of 60 m (200 ft) on all four departure legs of an intersection. **DelDOT Rev.**

Guidance:

Where the distance between successive no-passing zones is less than 120 m (400 ft), no-passing markings should connect the zones.

Standard:

Where centerline markings are used, no-passing zone markings shall be used on approaches to highway-rail grade crossings in conformance with Section 8B.20.

Option:

In addition to pavement markings, no-passing zone signs (see Sections 2B.29, 2B.30, and 2C.35) may be used to emphasize the existence and extent of a no-passing zone.

Support:

Section 11-307 of the "Uniform Vehicle Code (UVC) Revised" contains further information regarding no-passing zones. The "UVC" can be obtained from the National Committee on Uniform Traffic Laws and Ordinances at the address shown on Page i.

Standard:

On two-way, two- or three-lane roadways where centerline markings are installed, no-passing zones shall be established at vertical and horizontal curves and other locations where an engineering study indicates that passing must be prohibited because of inadequate sight distances or other special conditions.

On three-lane roadways where the direction of travel in the center lane transitions from one direction to the other, a no-passing buffer zone shall be provided in the center lane as shown in Figure 3B-4. A lane transition shall be provided at each end of the buffer zone.

The buffer zone shall be a median island that is at least 15 m (50 ft) in length.

Guidance:

For three-lane roadways having a posted or statutory speed limit of 70 km/h (45 mph) or greater, the lane transition taper length should be computed by the formula L = 0.62 WS for speeds in km/h (L = WS for speeds in mph). For roadways where the posted or statutory speed limit is less than 70 km/h (45 mph), the formula $L = WS^2/155$ for speeds in km/h ($L = WS^2/60$ for speeds in mph) should be used to compute taper length. Under both formulas, L equals the taper length in meters (feet), W equals the width of the center lane or offset distance in meters (feet), and S equals the 85th-percentile speed or the posted or statutory speed limit, whichever is higher.

Standard:

The minimum lane transition taper length shall be 30 m (100 ft) in urban areas and 60 m (200 ft) in rural areas.

On roadways with centerline markings, no-passing zone markings shall be used at horizontal or vertical curves where the passing sight distance is less than the minimum necessary for reasonably safe passing at the 85th-percentile speed or the posted or statutory speed limit as shown in Table 3B-1. The passing sight distance on a vertical curve is the distance at which an object 1.07 m (3.5 ft)

above the pavement surface can be seen from a point 1.07 m (3.5 ft) above the pavement (see Figure 3B-5). Similarly, the passing sight distance on a horizontal curve is the distance measured along the centerline (or right-hand lane line of a three-lane roadway) between two points 1.07 m (3.5 ft) above the pavement on a line tangent to the embankment or other obstruction that cuts off the view on the inside of the curve (see Figure 3B-5).

Support:

The beginning of a no-passing zone at point "a" in Figure 3B-5 is that point where the sight distance first becomes less than that specified in Table 3B-1. The end of the no-passing zone at point "b" in Figure 3B-5 is that point at which the sight distance again becomes greater than the minimum specified.

Section 3B.03 <u>Other Yellow Longitudinal Pavement Markings</u>

Standard:

If reversible lanes are used, the lane line pavement markings on each side of reversible lanes shall consist of a normal double broken yellow line to delineate the edge of a lane in which the direction of travel is reversed from time to time, such that each of these markings serve as the centerline markings of the roadway during some period (see Figure 3B-6).

Table 3B-1. Minimum Passing Sight Distances

85th-Percentile or Posted or Statutory Speed Limit (km/h)	Minimum Passing Sight Distance (meters)
40	140
50	160
60	180
70	210
80	245
90	280
100	320
110	355
120	395

85th-Percentile or Posted or Statutory Speed Limit (mph)	Minimum Passing Sight Distance (feet)
25	450
30	500
35	550
40	600
45	700
50	800
55	900
60	1,000
65	1,100
70	1,200

Signs (see Section 2B.25), lane-use control signals (see Chapter 4J), or both shall be used to supplement reversible lane pavement markings.

If a two-way left-turn lane that is never operated as a reversible lane is used, the lane line pavement markings on each side of the two-way left-turn lane shall consist of a normal broken yellow line and a normal solid yellow line to delineate the edges of a lane that can be used by traffic in either direction as part of a left-turn maneuver. These markings shall be placed with the broken line toward the two-way left-turn lane and the solid line toward the adjacent traffic lane as shown in Figure 3B-7.

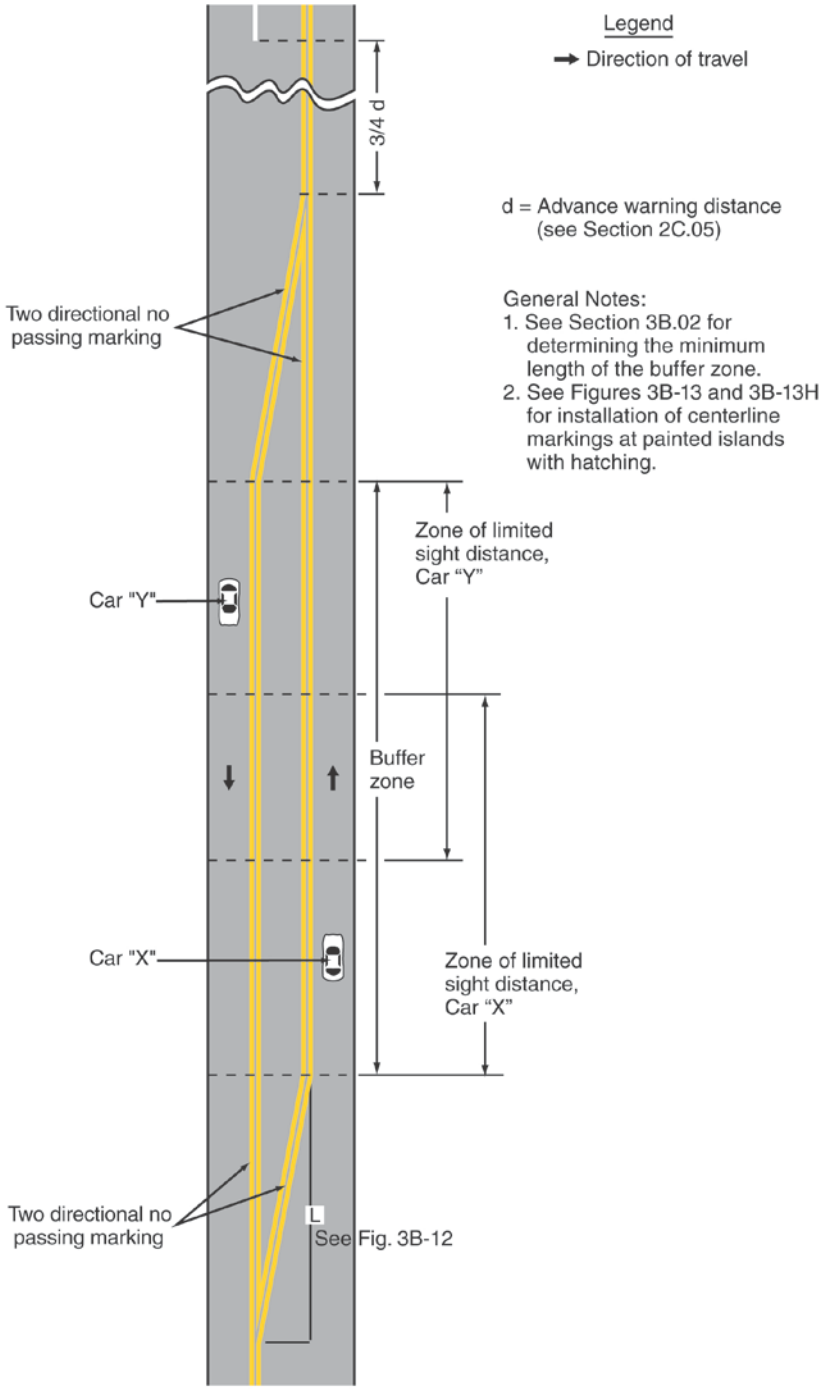
When an exclusive left turn segment is inserted within a two-way left turn system, one or more left turn arrows shall be used to indicate the nature of that segment. The word "ONLY" shall not be used. See Figure 3B-7A for details. **DelDOT Rev.**

Guidance:

Pavement marking arrows should be used in conjunction with the two-way left-turn lane markings as shown in Figure 3B-7.

Signs should be used in conjunction with the two-way left turn markings (see Section 2B.24).

Figure 3B-4. Example of Three-Lane, Two-Way Marking for Changing Direction of the Center Lane



DelDOT Revision

Figure 3B-5. Method of Locating and Determining the Limits of No-Passing Zones at Curves

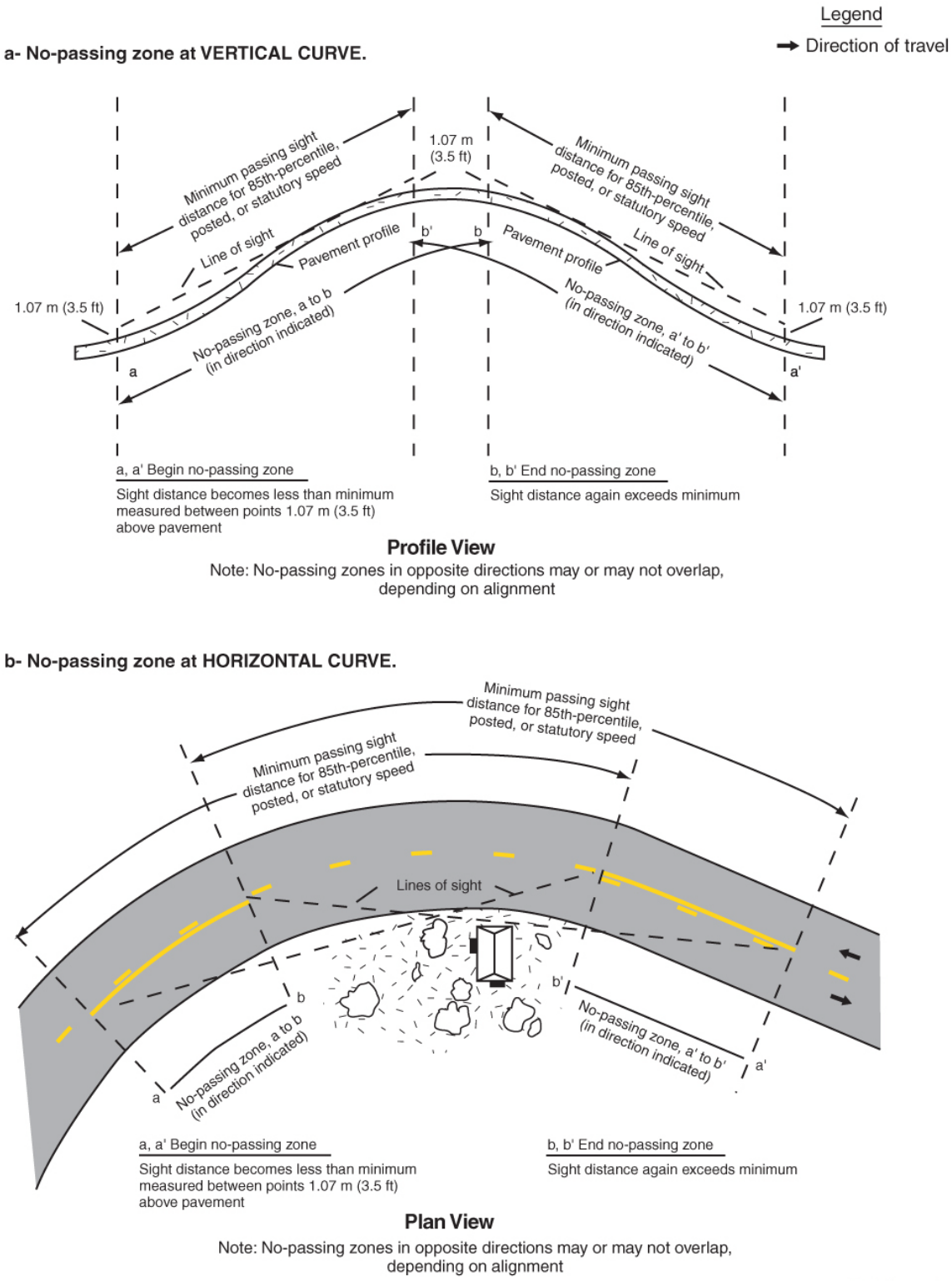


Figure 3B-6. Example of Reversible Lane Marking Application

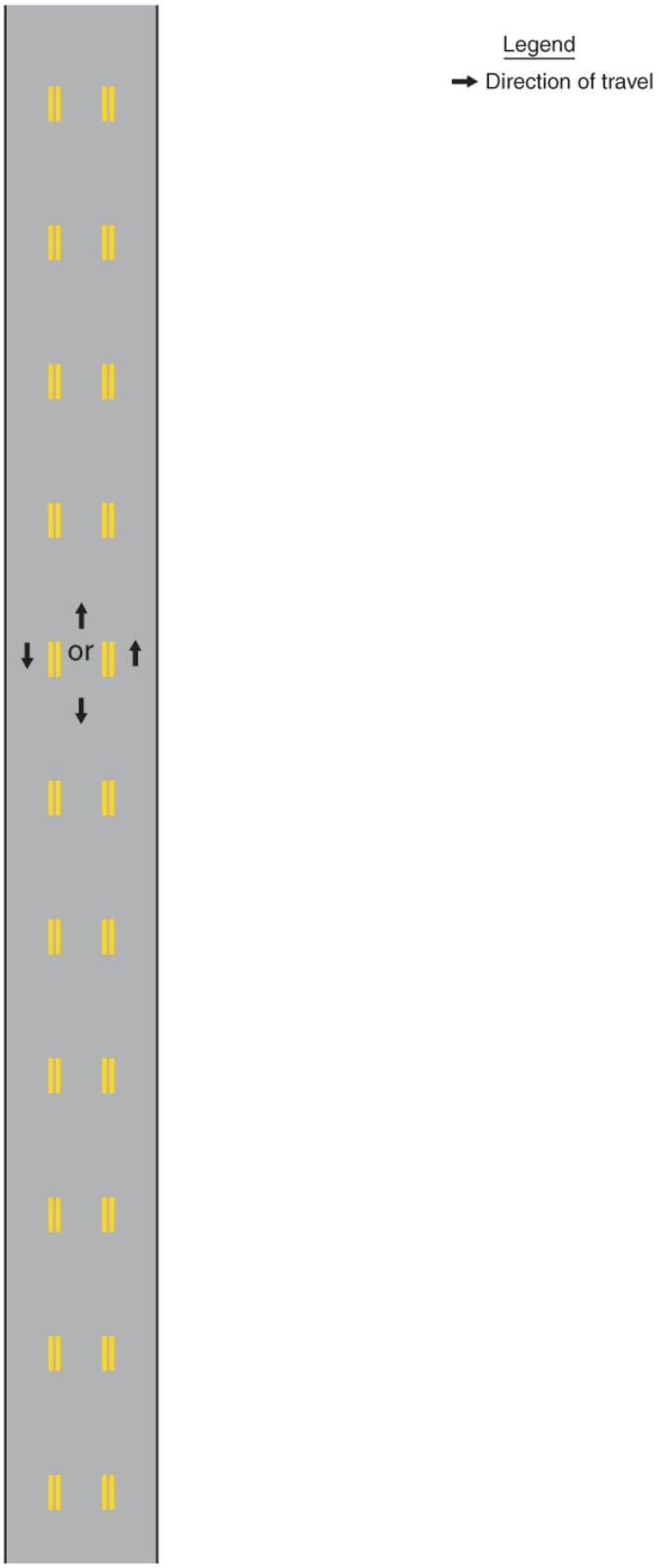


Figure 3B-7. Example of Two-Way Left-Turn Lane Marking Applications

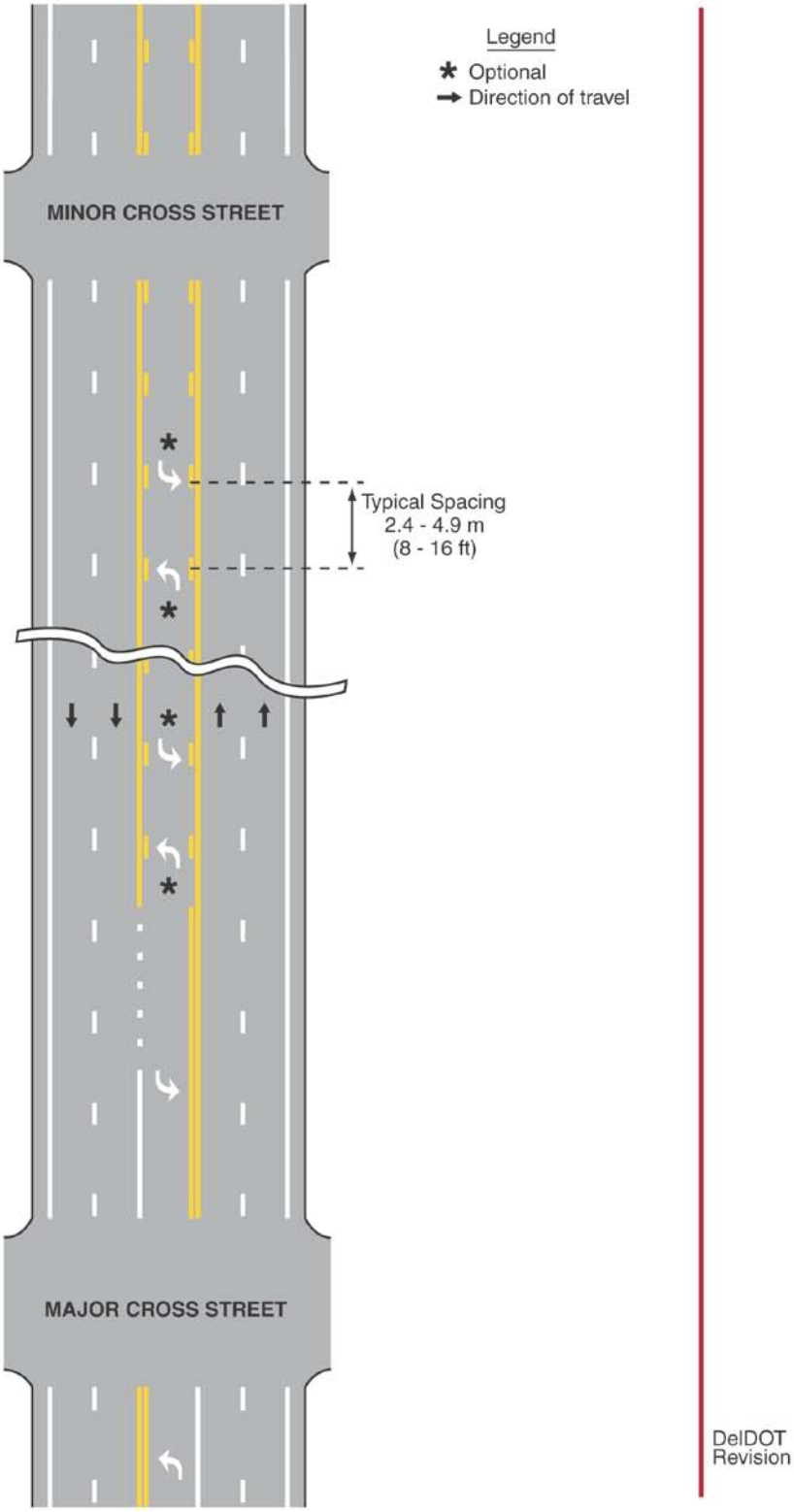


Figure 3B-7A. Examples of Combination Lane and Centerline Markings - Two-way Left Turn Lane.

(DelDOT MUTCD Only)

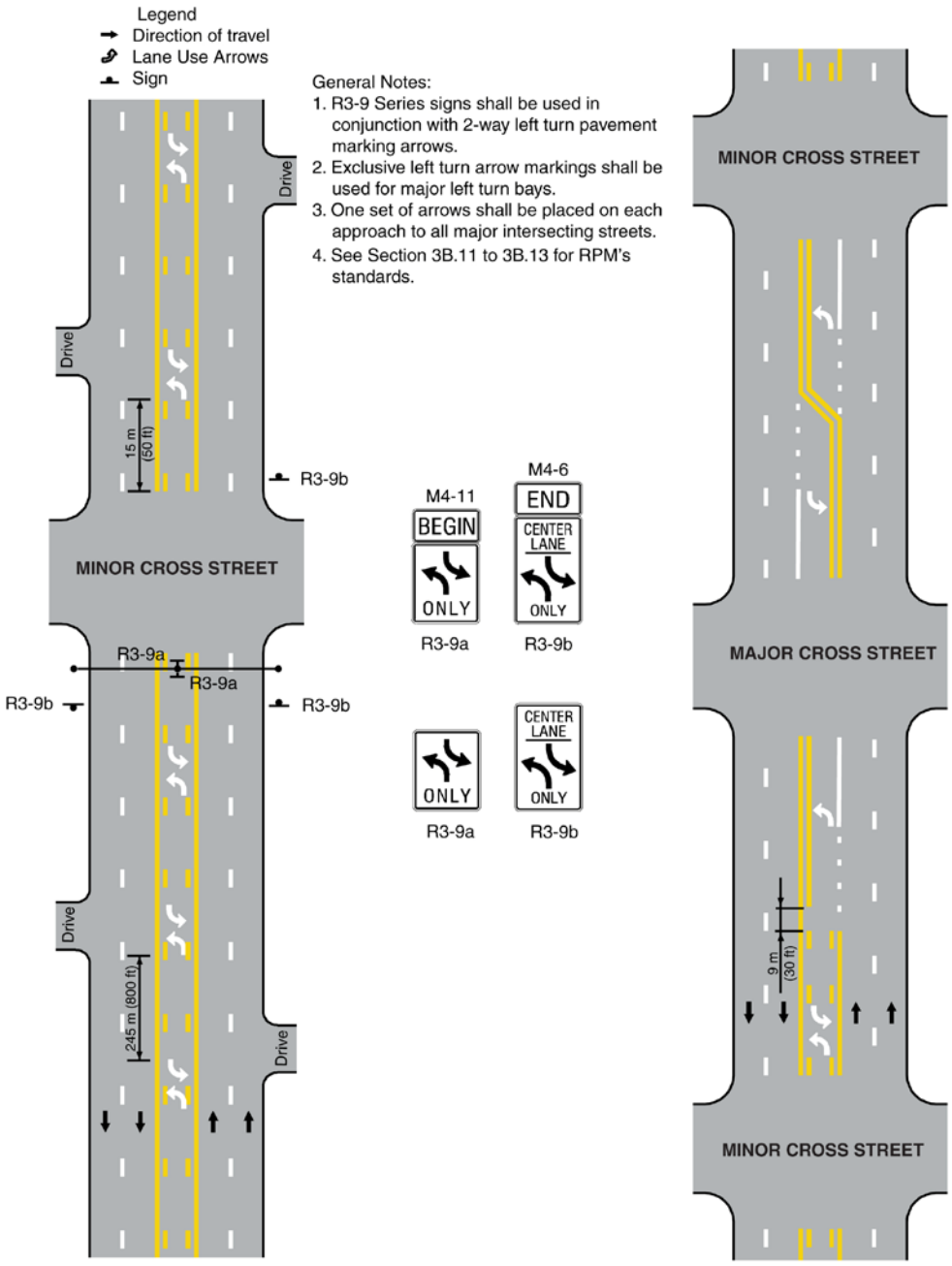


Figure 3B-7B. Example of Turn Lane Marking Application
(DelDOT MUTCD Only)

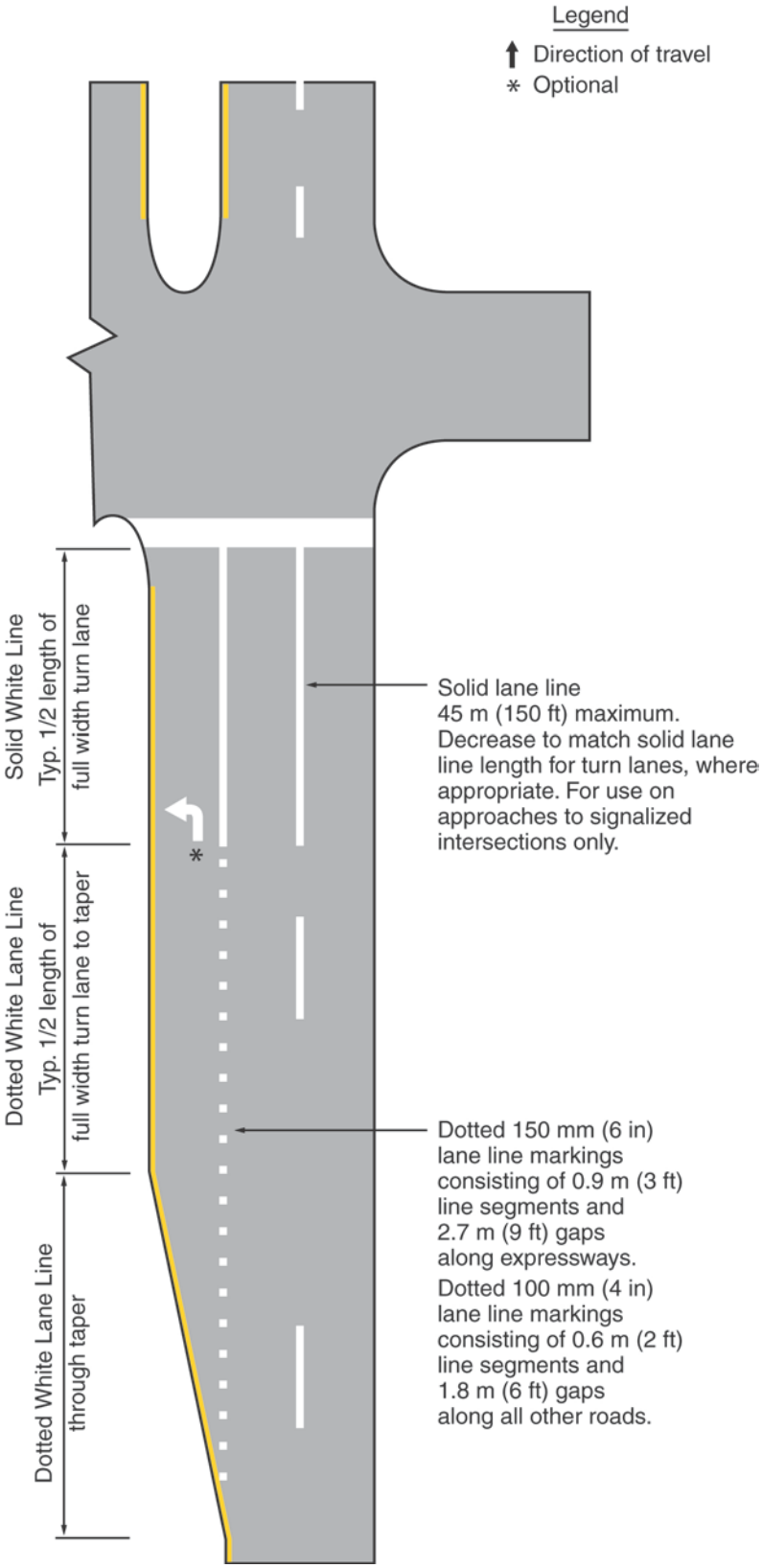
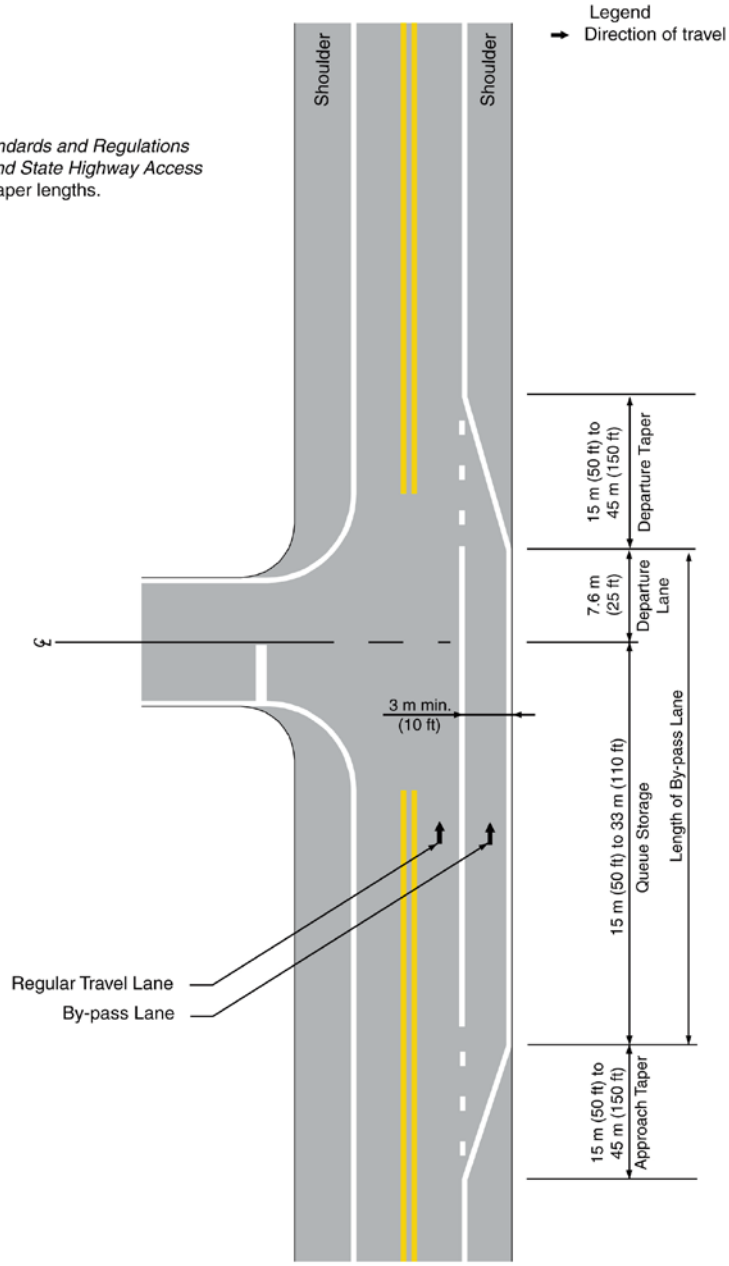


Figure 3B-7C. Examples of Auxiliary Lane Lines - By-pass Lane.
(DelDOT MUTCD Only)

General Notes:
1. Refer to the *DelDOT Standards and Regulations for Subdivision Streets and State Highway Access* for specific storage and taper lengths.



Standard:

If a continuous painted island without hatching formed by pavement markings separating travel in opposite directions is used, two sets of double solid yellow lines shall be used to form the island as shown in Figures 3B-2 and 3B-4. If the center island area includes hatching, colored, or patterned pavement, a single solid yellow line shall be used to form the island as shown in Figures 3B-13 and 3B-13H. For raised median islands, two sets of double solid yellow lines shall be used on the approaches to the median island and a single yellow line shall be used adjacent to the physical median (see Figure 3B-2). Other markings in the median island area shall also be yellow, except crosswalk markings which shall be white (see Section 3B.17). DelDOT Rev.

Section 3B.04 White Lane Line Pavement Markings and Warrants

Standard:

When used, lane line pavement markings delineating the separation of traffic lanes that have the same direction of travel shall be white.

Support:

Examples of lane line markings are shown in Figures 3B-2, 3B-3, 3B-7 through 3B-13, 3B-22, 3B-24, and 3B-26.

Standard:

Where crossing the lane line markings with care is permitted, the lane line markings shall consist of a normal broken white line.

Where crossing the lane line markings is discouraged, the lane line markings shall consist of a normal solid white line.

Guidance:

Lane lines separating through-traffic lanes should not be converted to solid lines approaching intersections except at signalized intersections, where it is advisable to discourage lane changing. A single solid white line should be used to separate a turn lane from the through-traffic lanes (see Figure 3B-7B) at all intersections. DelDOT Rev.

Option:

Solid white lane line markings may be used to separate through traffic lanes from auxiliary lanes, such as uphill truck lanes, by-pass lanes, and preferential lanes.

Wide solid lane line markings may be used for greater emphasis.

Standard:

Where crossing the lane line markings is prohibited, the lane line markings shall consist of two normal solid white lines.

Lane line markings shall be used on all freeways and Interstate highways.

Guidance:

Lane line markings should be used on all roadways with two or more adjacent traffic lanes that have the same direction of travel. Lane line markings should also be used at congested locations where the roadway will accommodate more traffic lanes with lane line markings than without the markings.

Dotted white lane line markings (see Section 3A.05) should be used to alert drivers when they are operating in a non-continuous lane. Non-continuous lanes include acceleration lanes, deceleration lanes, combination accel-decel lanes, mandatory turn lanes, and other lanes reduced downstream.

Dotted white lane lines should be used to separate a by-pass lane and regular travel lane. Typical applications are illustrated in Figure 3B-7C. DelDOT Rev.

Section 3B.05 Other White Longitudinal Pavement Markings

Standard:

A channelizing line shall be 300 mm (12 in) along interstates, freeways, and expressways and 150 mm (6 in) along all other roads. DelDOT Rev.

Option:

Channelizing lines may be used to form channelizing islands where traffic traveling in the same direction is permitted on both sides of the island.

Standard:

Other pavement markings in the channelizing island area shall be white.

Support:

Examples of channelizing line applications are shown in Figures 3B-8, 3B-8A, 3B-9, 3B-9A, 3B-9B, 3B-10, 3B-10A, 3B-10B, 3B-10C, and 3B-13.

Channelizing lines at exit ramps as shown in Figures 3B-8 and 3B-8A define the neutral area, direct exiting traffic at the proper angle for smooth divergence from the main lanes into the ramp, and reduce the probability of colliding with objects adjacent to the roadway.

Channelizing lines at entrance ramps as shown in Figures 3B-9, 3B-9A, and 3B-9B promote reasonably safe and efficient merging with through traffic.

Standard:

For exit ramps, channelizing lines shall be placed along the sides of the neutral area adjacent to the through traffic lane and the ramp lane. With a parallel deceleration lane, a dotted lane line shall be extended from the beginning of the channelizing line upstream to the beginning of the taper as shown in Figures 3B-8 and 3B-8A. **DelDOT Rev.**

Lane drop markings as shown in Figures 3B-10, 3B-10A, 3B-10B, and 3B-10C shall be used in advance of lane drops at exit ramps to distinguish a lane drop from a normal exit ramp or from an auxiliary lane. The lane drop marking shall consist of a white dotted line with line segments 0.9 m (3 ft) in length separated by 2.7 m (9 ft) gaps along interstates, freeways, and expressways. The lane drop marking shall consist of a white dotted line with line segments 0.6 m (2 ft) in length separated by 1.8 m (6 ft) gaps along all other roads.

Guidance:

White chevron markings should be placed in the neutral area for special emphasis as shown in Figures 3B-8, 3B-8A, 3B-10, 3B-10A, 3B-10B, and 3B-10C.

For entrance ramps, a channelizing line should be placed along the side of the neutral area adjacent to the ramp lane.

For entrance ramps with a parallel acceleration lane, a dotted lane line should be extended from the end of the channelizing line for a distance of two-thirds the length of the full-width acceleration lane as shown in Figures 3B-9 and 3B-9A.

Option:

For entrance ramps with a tapered acceleration lane, dotted lane line markings may be placed to extend the channelizing line, but not beyond a point where the tapered lane meets the near side of the through traffic lane as shown in Figures 3B-9 and 3B-9A. **DelDOT Rev.**

Option:

Where lane changes might cause conflicts, a wide solid white channelizing line may extend upstream from the theoretical gore point.

Section 3B.06 Edge Line Pavement Markings

Standard:

If used, edge line pavement markings shall delineate the right or left edges of a roadway.

Except for dotted edge line extensions (see Section 3B.08), edge line markings shall not be continued through intersections or major driveways.

If used on the roadways of divided highways or one-way streets, or on any ramp in the direction of travel, left edge line pavement markings shall consist of a normal solid yellow line to delineate the left edge of a roadway or to indicate driving or passing restrictions left of these markings.

Figure 3B-8. Examples of Channelizing Line Applications for Exit Ramp Markings Along Interstates, Freeways or Expressways *(Sheet 1 of 2)*

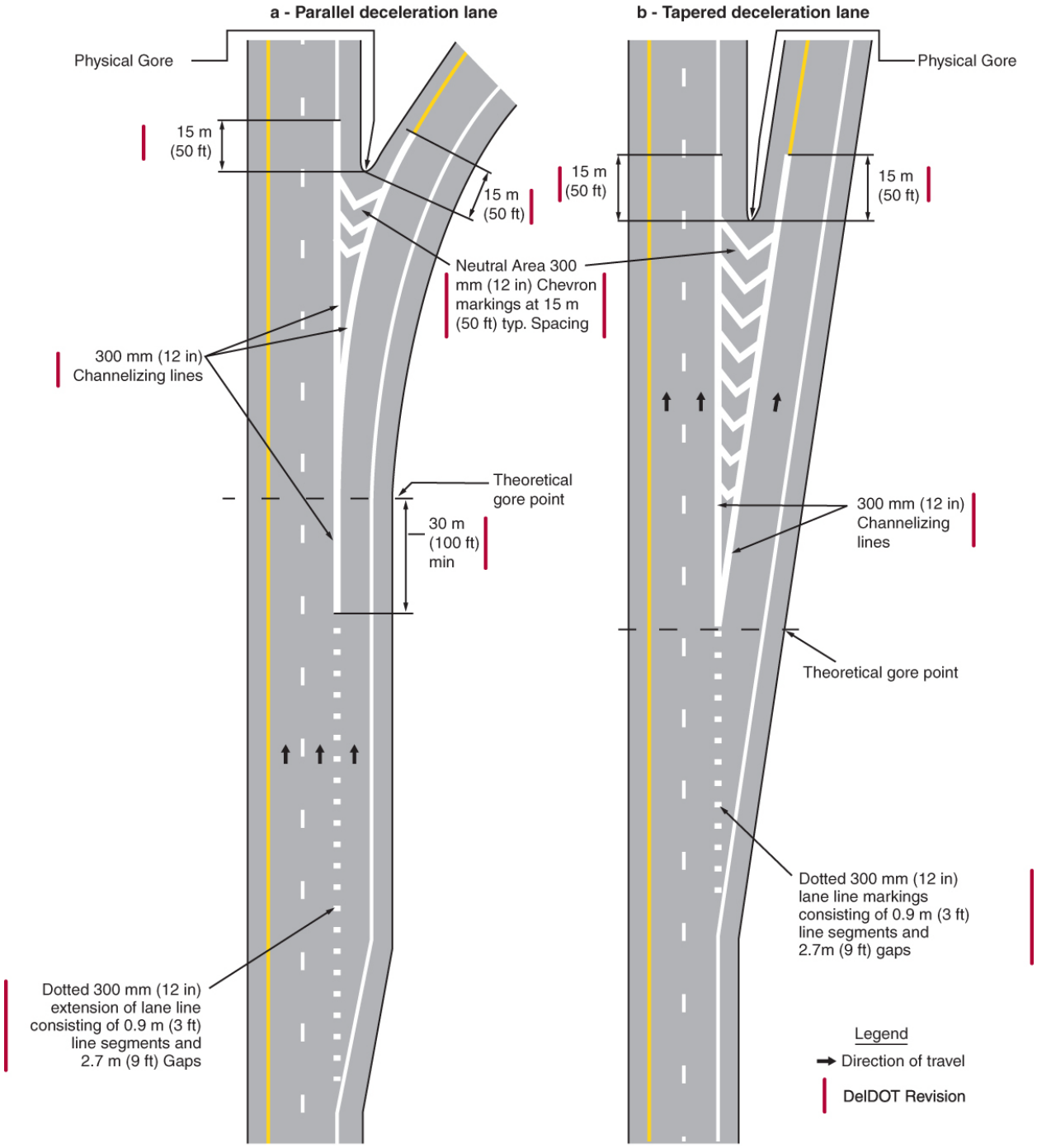


Figure 3B-8. Examples of Channelizing Line Applications for Exit Ramp Markings Along Interstates, Freeways or Expressways *(Sheet 2 of 2)*

c - Auxiliary lane, such as at cloverleaf interchange

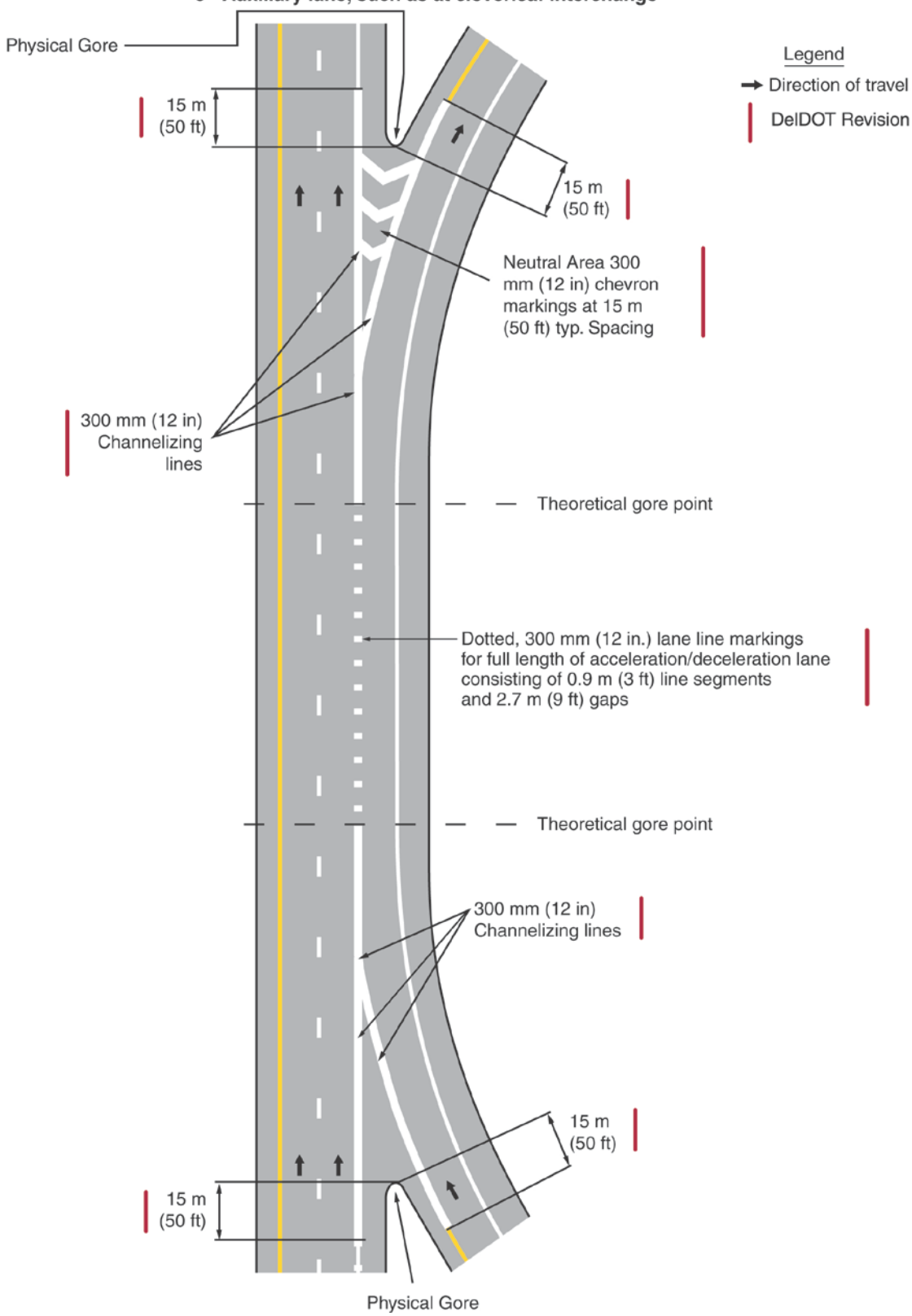


Figure 3B-8A. Examples of Channelizing Line Applications for Exit Ramp Markings Along All Other Roads (NON Interstates, Freeways or Expressways) *(Sheet 1 of 2)*
(DelDOT MUTCD Only)

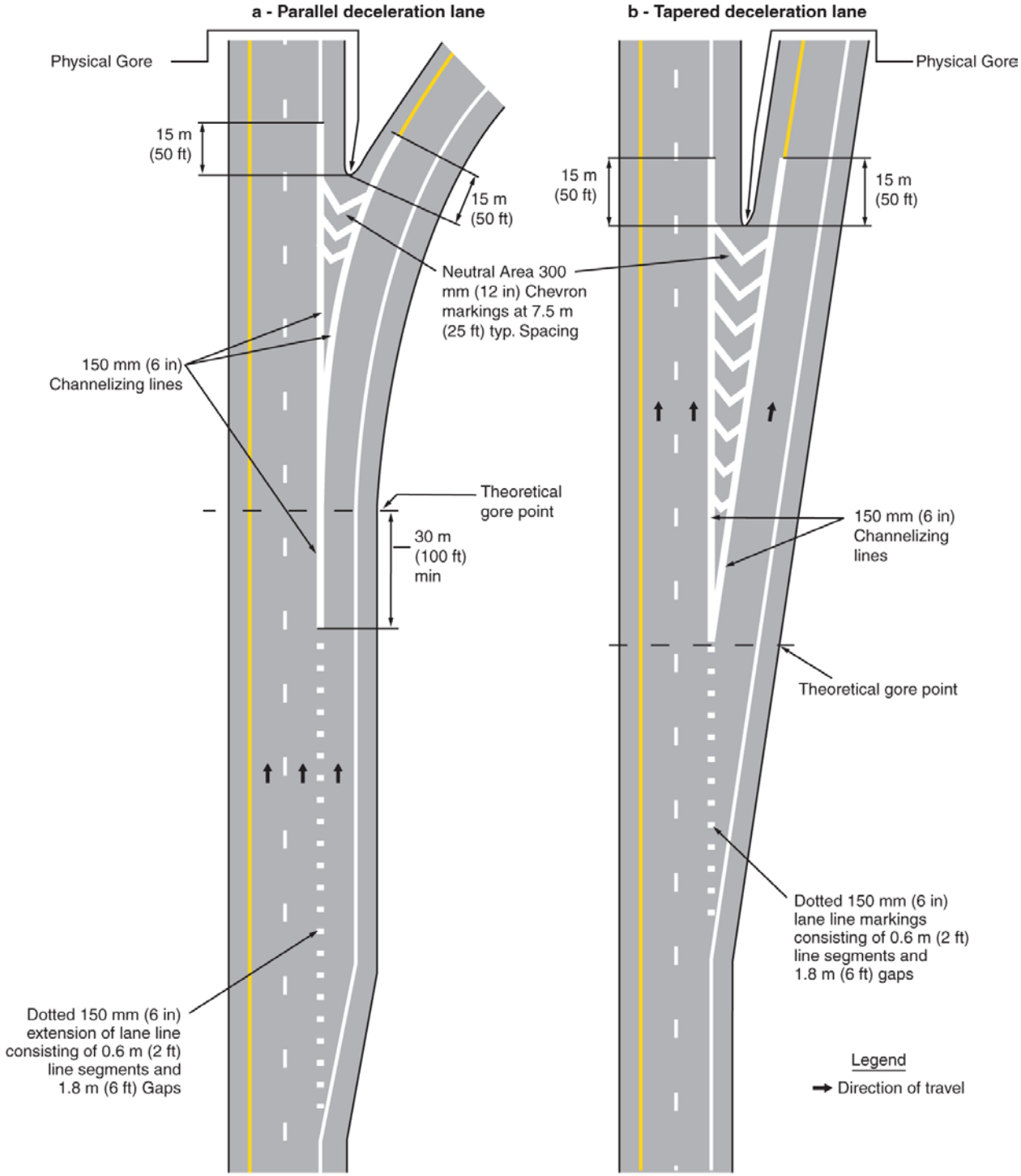


Figure 3B-8A. Examples of Channelizing Line Applications for Exit Ramp Markings Along All Other Roads (NON Interstates, Freeways or Expressways) *(Sheet 2 of 2)*
(DelDOT MUTCD Only)

c - Auxiliary lane, such as at cloverleaf interchange

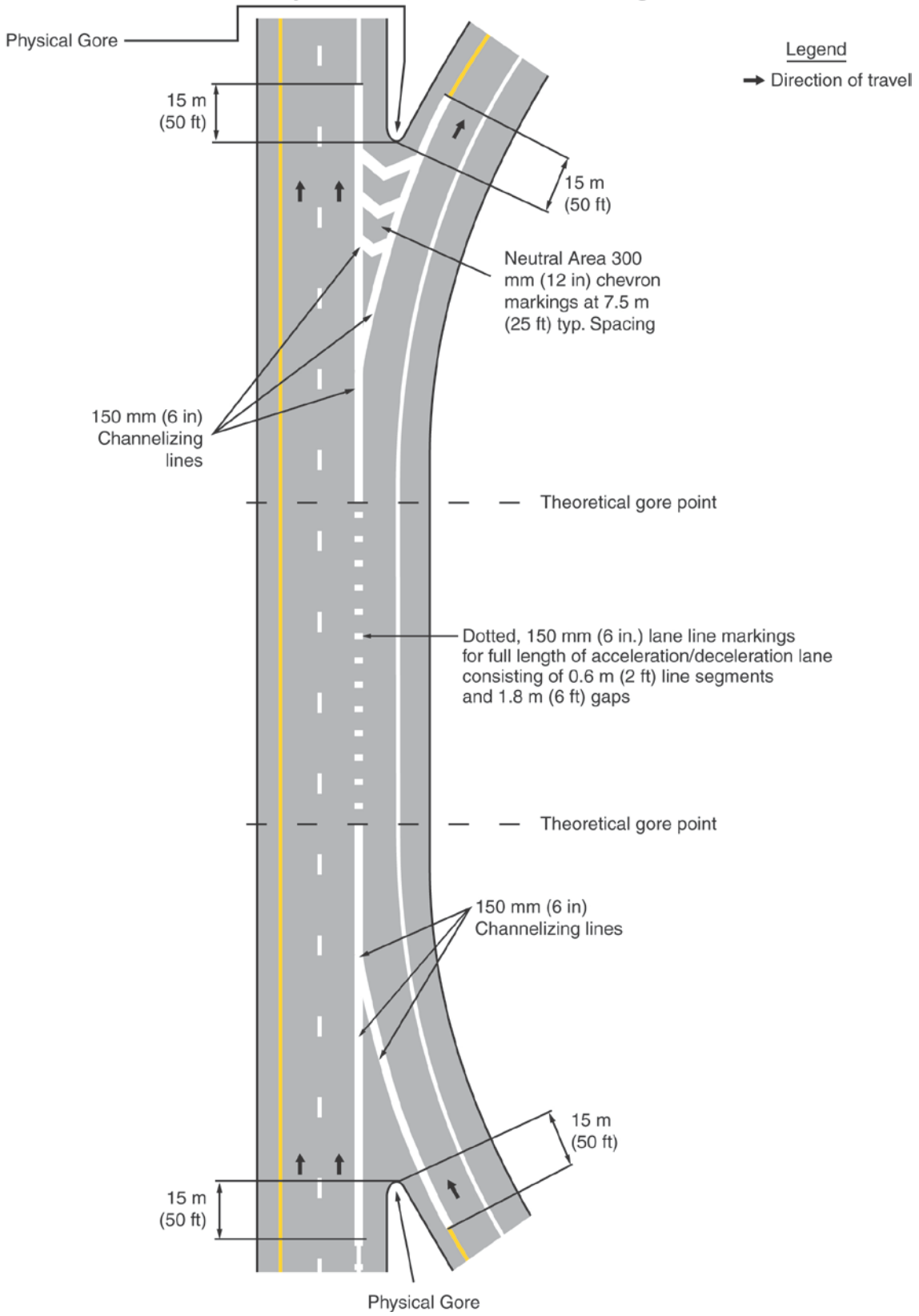


Figure 3B-9. Examples of Channelizing Line Applications for Entrance Ramp Markings Along Interstates, Freeways or Expressways

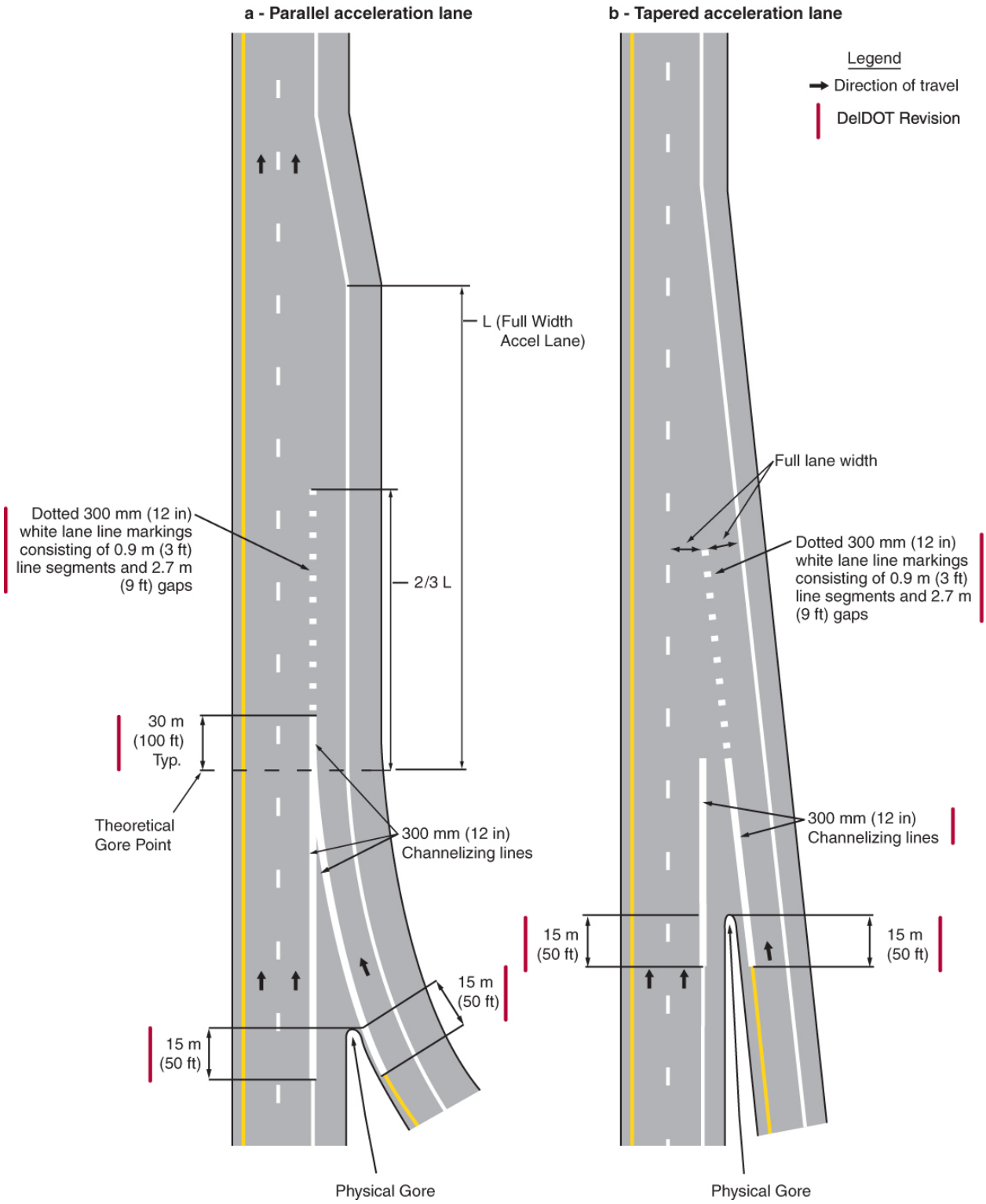


Figure 3B-9A. Examples of Channelizing Line Applications for Entrance Ramp Markings Along All Other Roads (NON Interstates, Freeways or Expressways)
(DelDOT MUTCD Only)

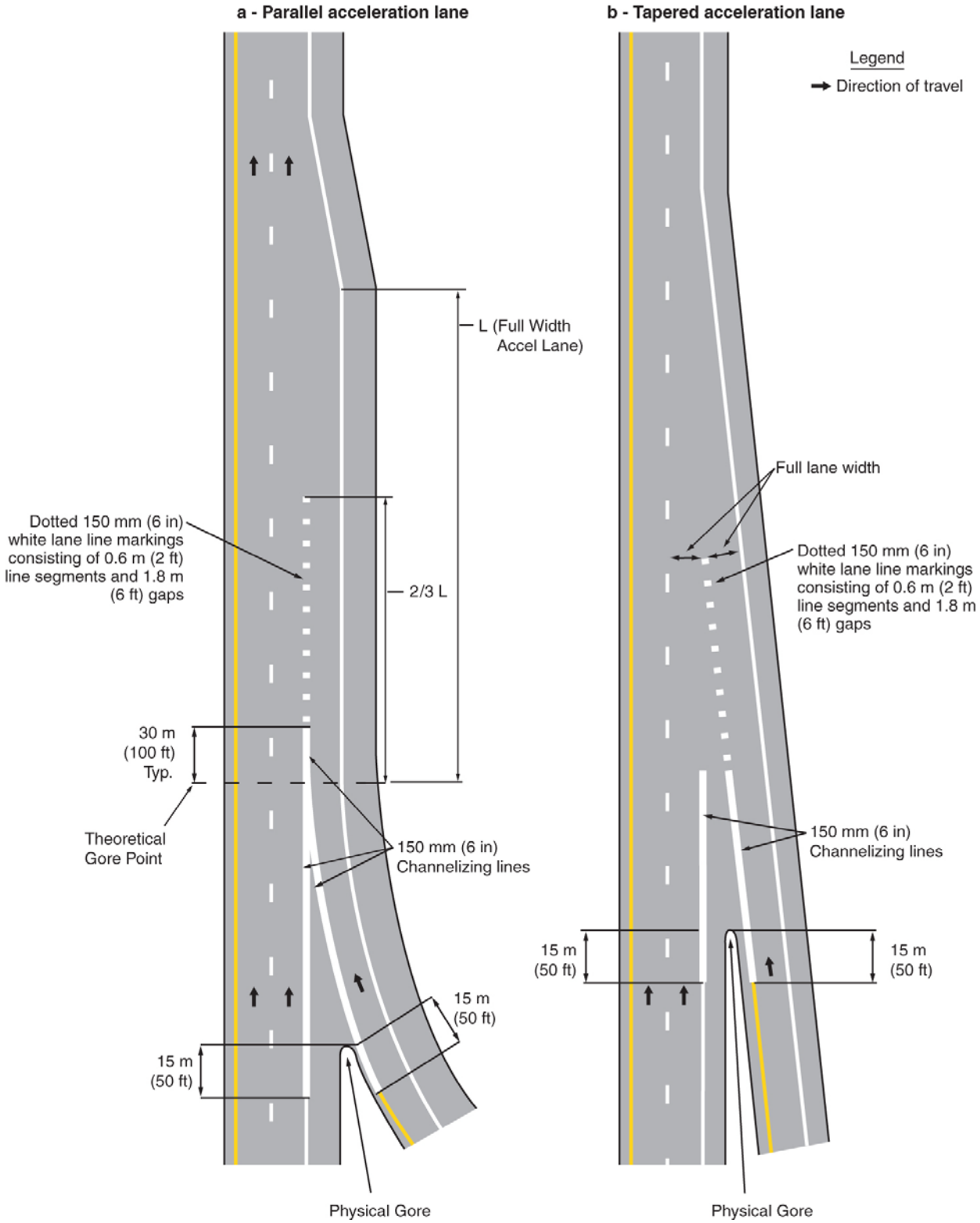


Figure 3B-9B. Example of Channelizing Line Application for Added Lane Entrance Ramp
(DelDOT MUTCD Only)

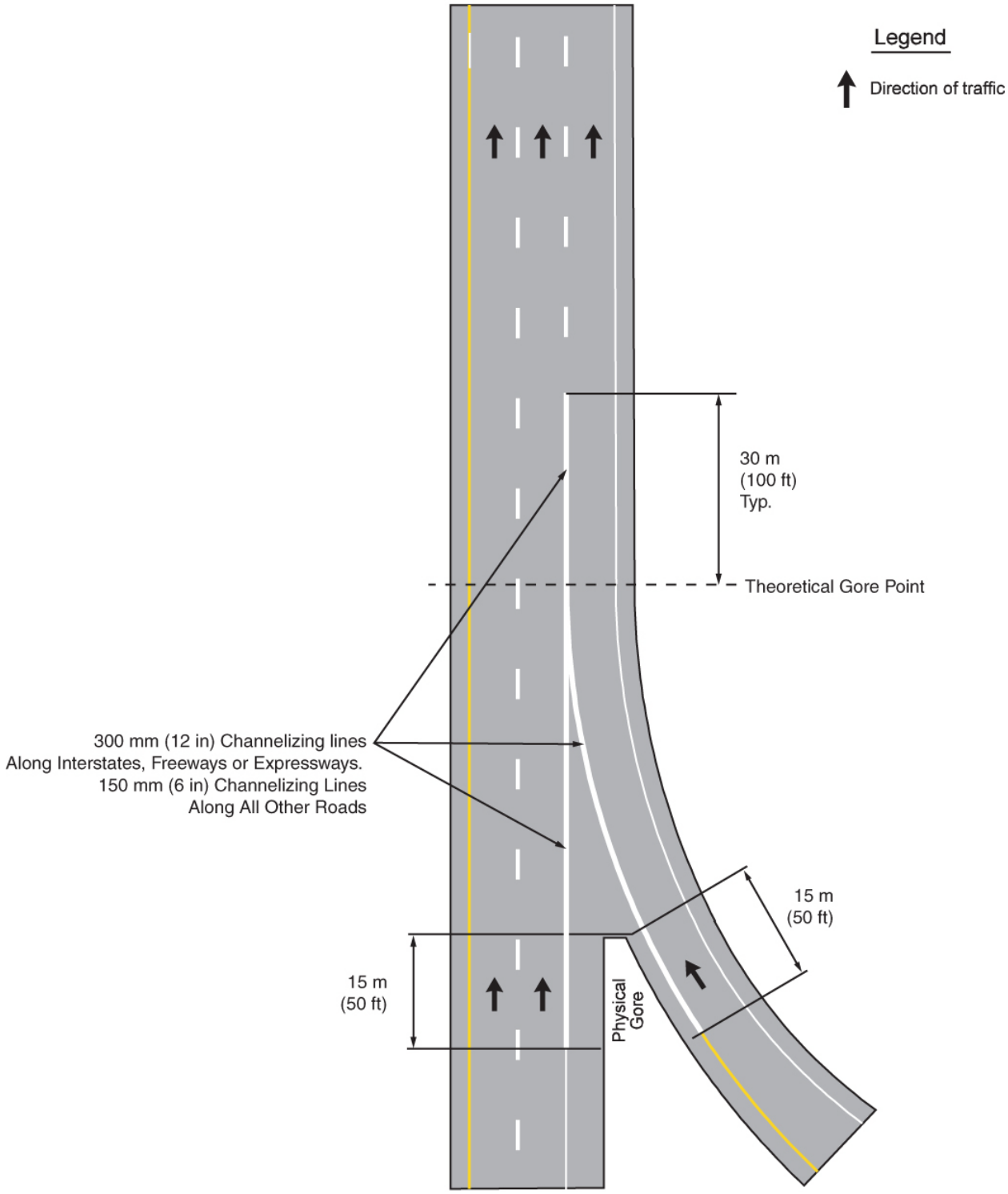


Figure 3B-10. Example of Lane Drop Markings at Exit Ramps Along Interstates, Freeways or Expressways

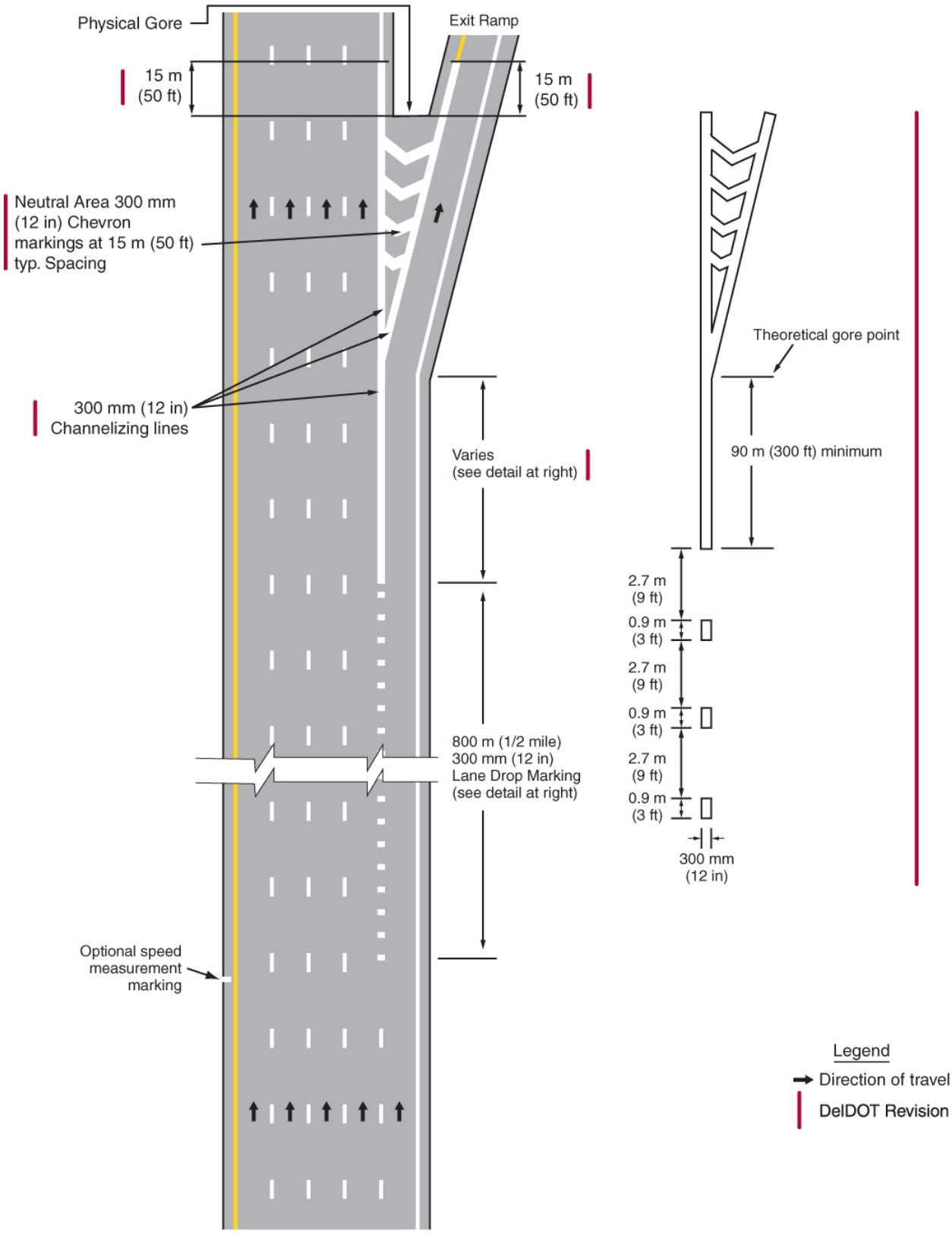


Figure 3B-10A. Example of Lane Drop Markings at Exit Ramps Along All Other Roads (NON Interstates, Freeways or Expressways)
(DelDOT MUTCD Only)

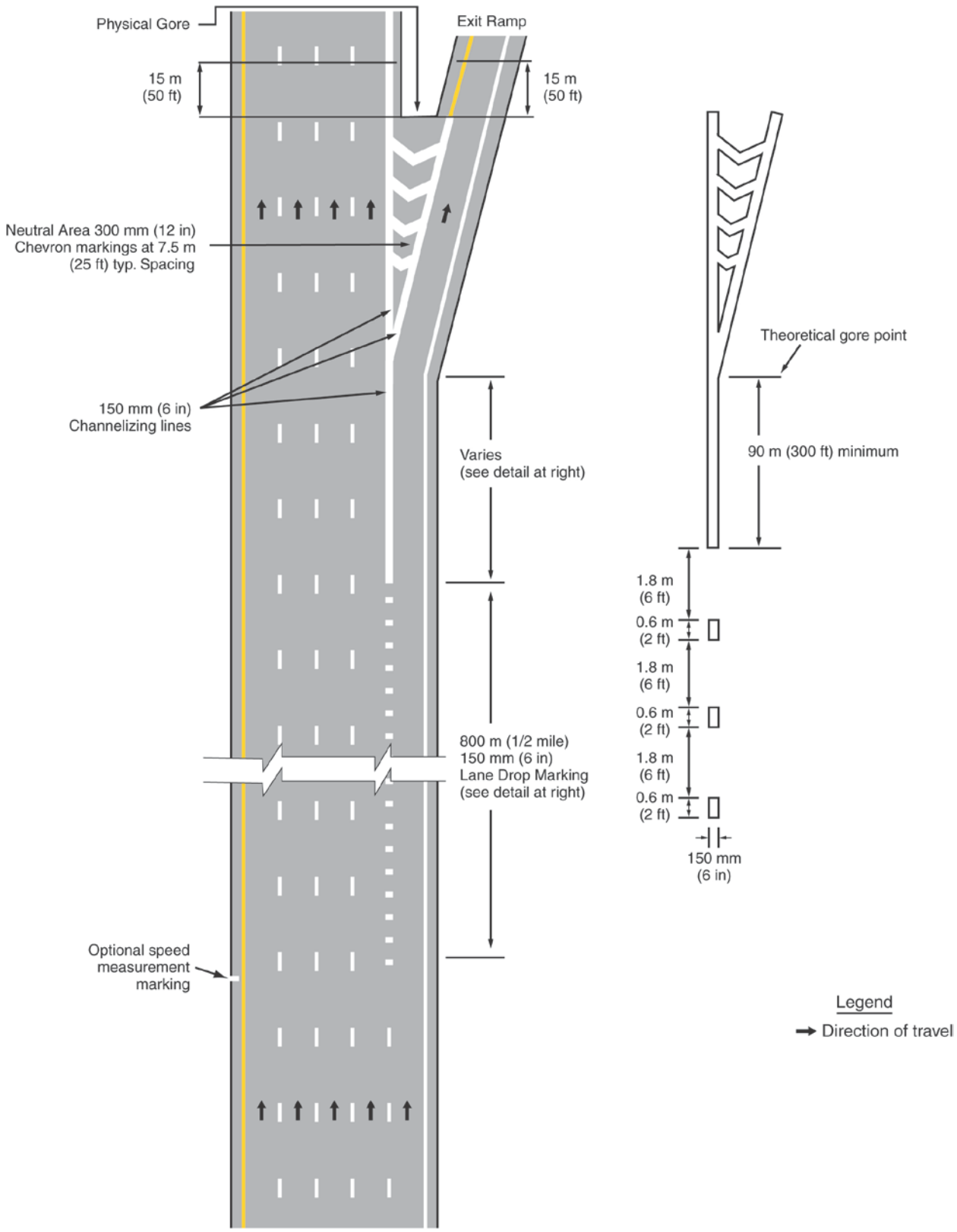


Figure 3B-10B. Example of Combination Choice Lane plus Lane Drop Marking Along Interstates, Freeways or Expressways
(DelDOT MUTCD Only)

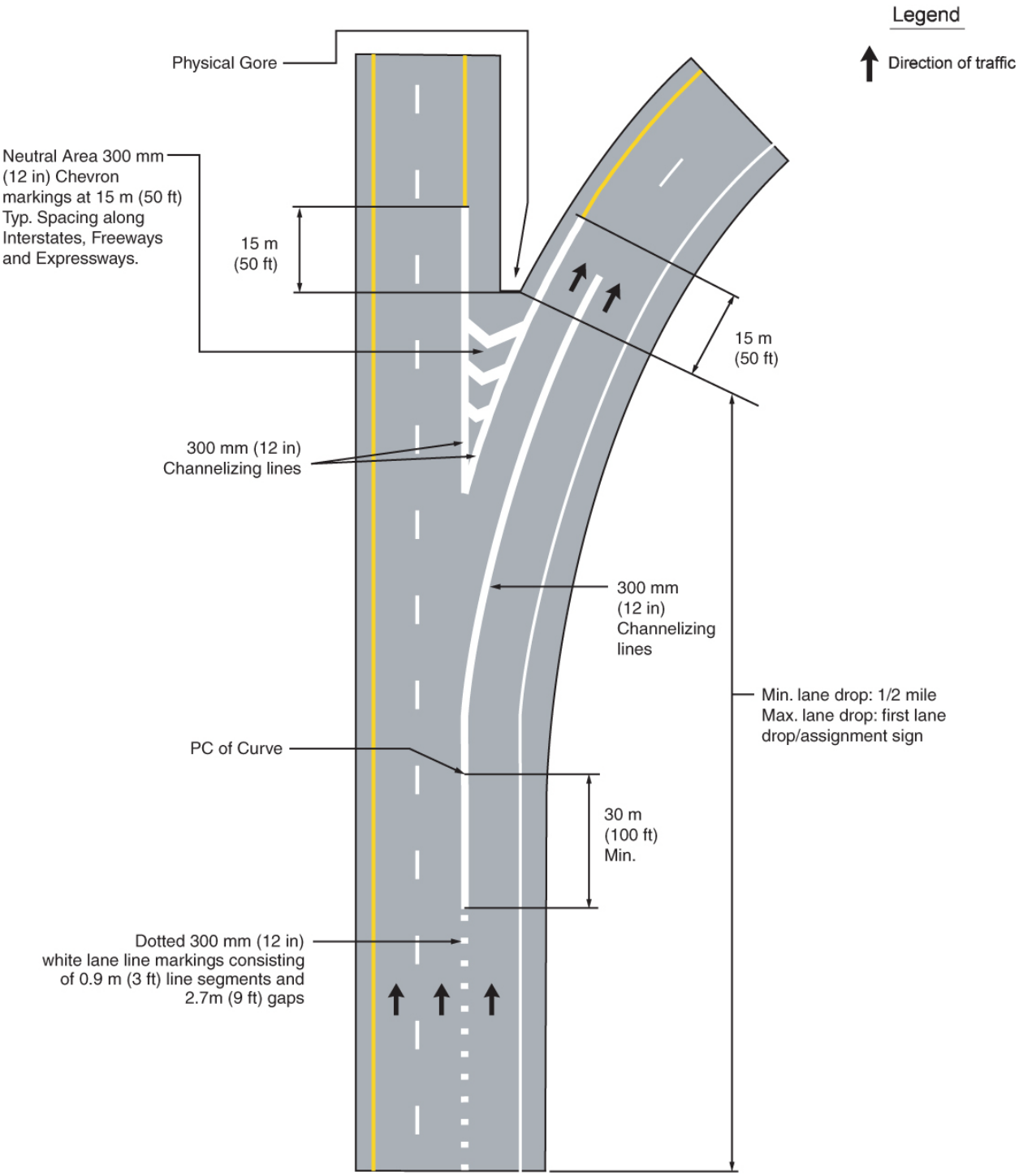


Figure 3B-10C. Example of Channelizing Line Application for Interstate, Freeway or Expressway Split
(DelDOT MUTCD Only)

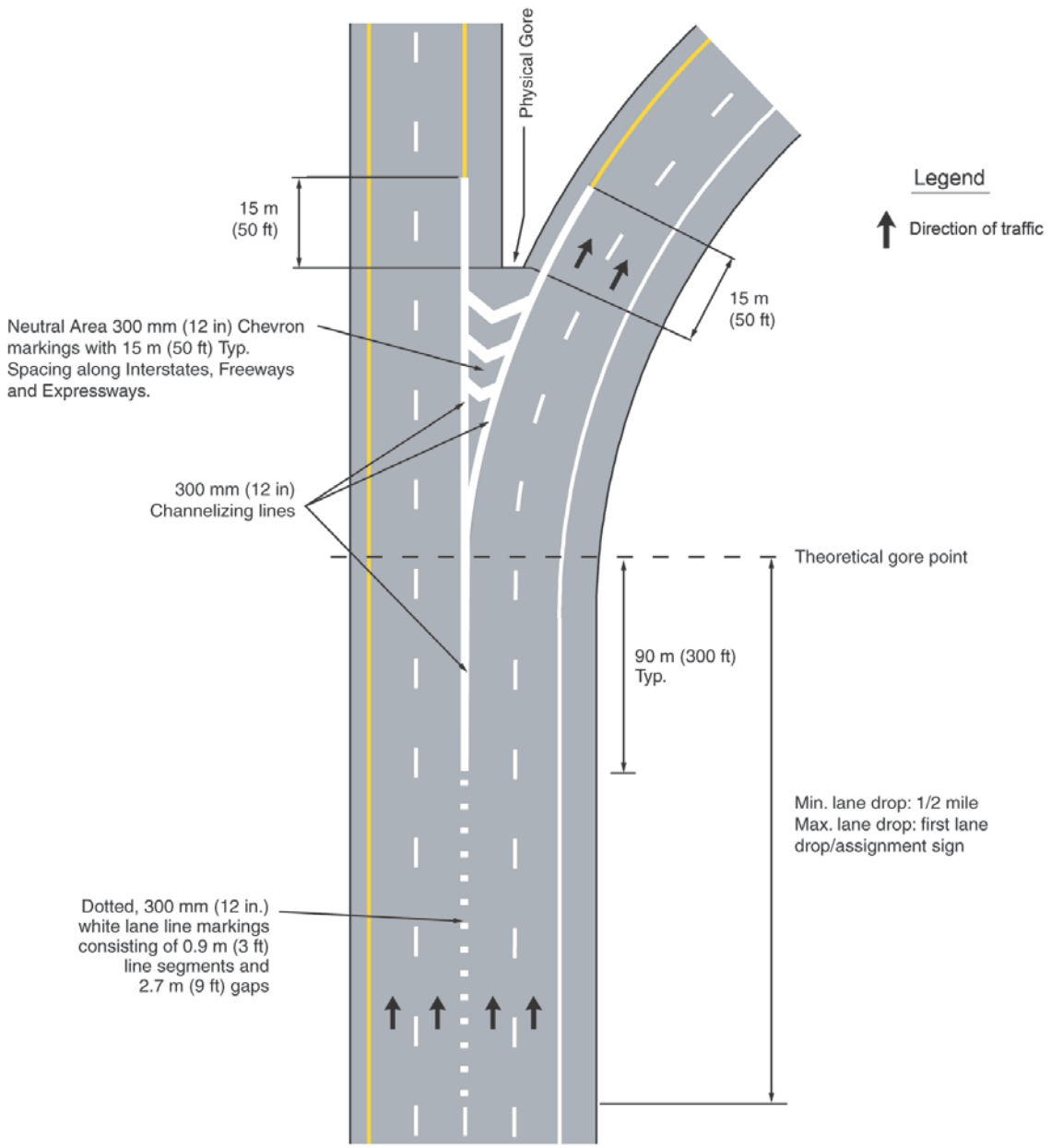
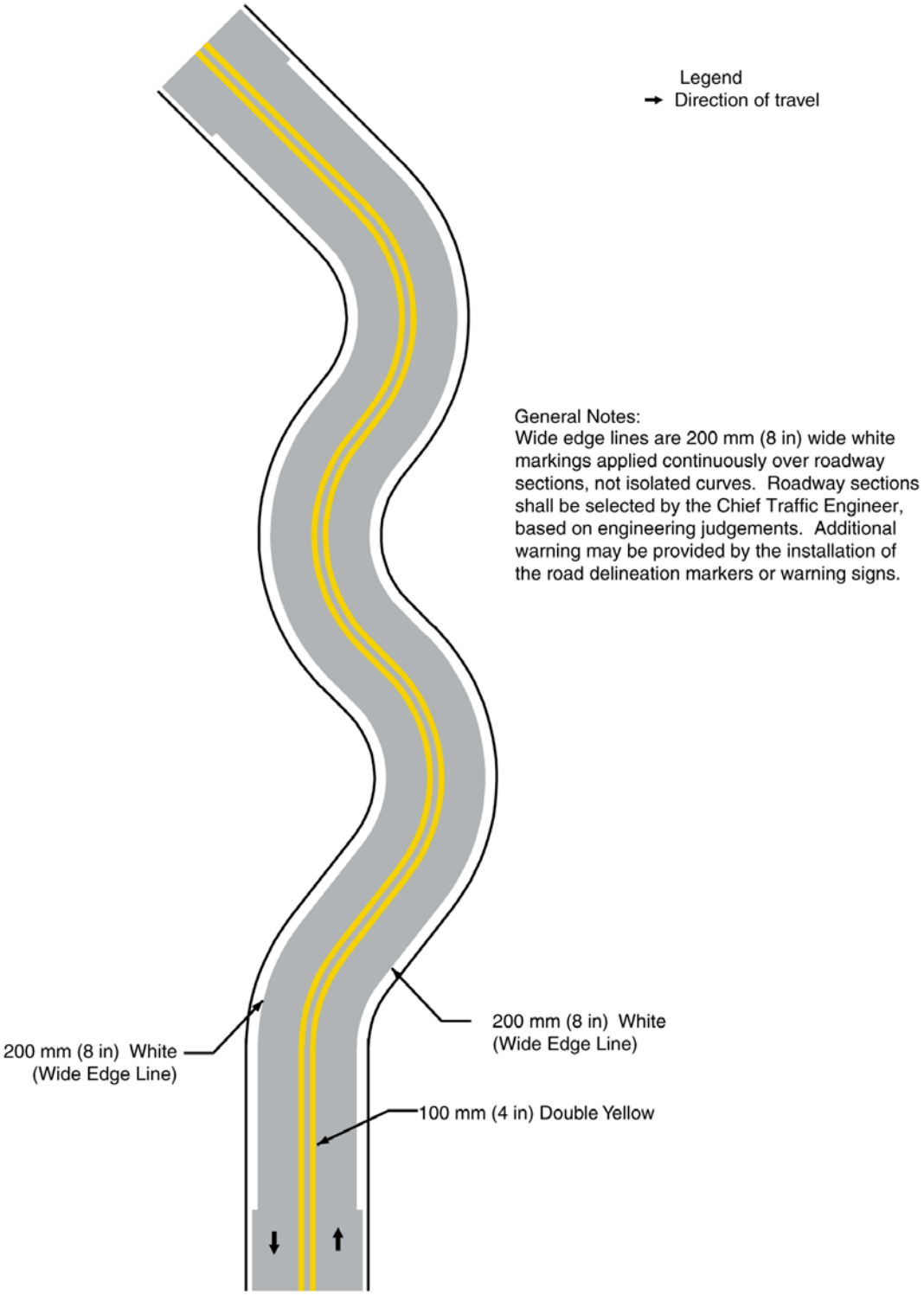


Figure 3B-10D. Example of Wide Edge Lines

(DelDOT MUTCD Only)



If used, the right edge line pavement markings shall consist of a normal solid white line to delineate the right edge of the roadway.

Guidance:

Edge line markings should not be broken for minor driveways.

Support:

Edge line markings have unique value as visual references to guide road users during adverse weather and visibility conditions.

Option:

Wide solid edge line markings may be used for greater emphasis where an engineering study indicates a need.

DelDOT Rev.

Standard:

When wide solid edge line markings are used on roadways other than interstates, freeways, or expressways, they shall be 200 mm (8 in) wide (see Figure 3B-10D).

Section 3B.07 <u>Warrants for Use of Edge Lines</u>

Standard:

Edge line markings shall be placed on all paved and surface treated streets or paved highways with the following characteristics:

A. Interstates;
B. Freeways;
C. Expressways; and
D. Roads 6.1 m (20 ft) or more in width and an ADT of 3,000 vehicles per day or greater.

DelDOT Rev.

Guidance:

Edge line markings should also be placed on all other paved and surface treated streets or paved highways where an engineering study indicates a need for edge line markings.

Edge line markings should not be placed where an engineering study or engineering judgment indicates that providing them is likely to decrease safety.

Option:

Edge line markings may be placed on streets and highways with or without centerline markings.

Edge line markings may be excluded, based on engineering judgment, for reasons such as if the traveled way edges are delineated by curbs, parking, bicycle lanes, or other markings.

Edge line markings may be used where edge delineation is desirable to minimize unnecessary driving on paved shoulders or on refuge areas that have lesser structural pavement strength than the adjacent roadway.

Section 3B.08 <u>Extensions Through Intersections or Interchanges</u>

Standard:

Pavement markings extended into or continued through an intersection or interchange area shall be the same color and at least the same width as the line markings they extend (see Figure 3B-11).

Option:

A normal line may be used to extend a wide line through an intersection.

Guidance:

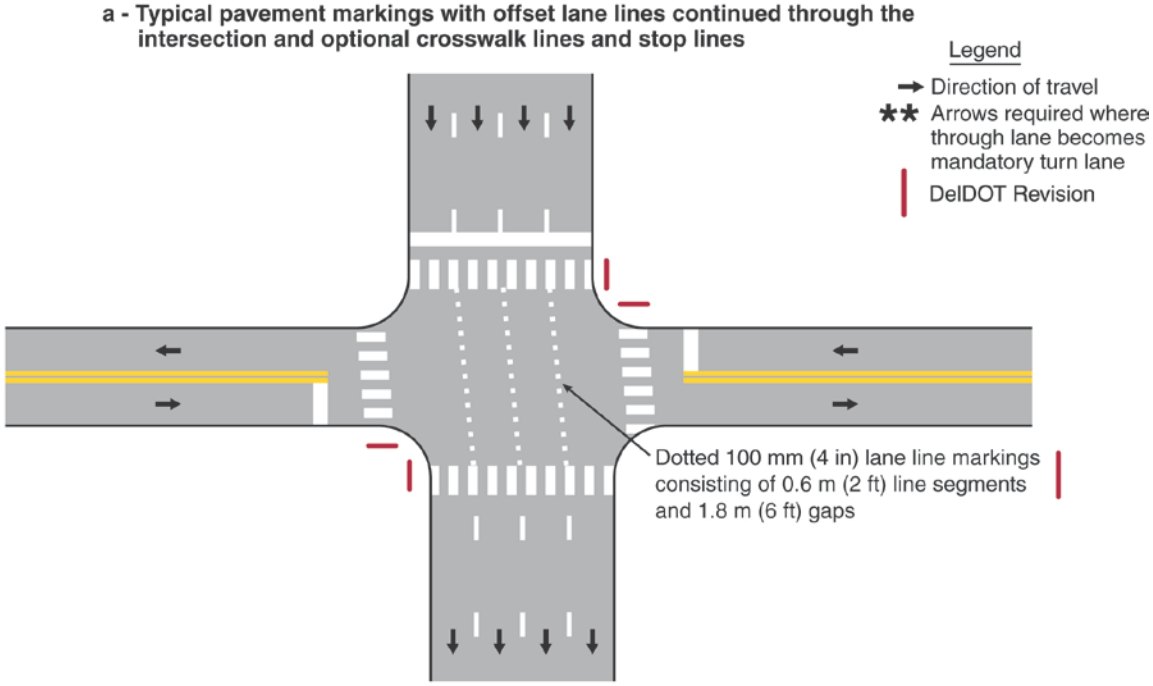
Where highway design or reduced visibility conditions make it desirable to provide control or to guide vehicles through an intersection or interchange, such as at offset, skewed, complex, or multilegged intersections, on curved roadways, or where multiple turn lanes are used, dotted line markings should be used to extend longitudinal line markings through an intersection or interchange area.

Option:

Dotted edge line extensions may be placed through intersections or major driveways.

Figure 3B-11. Examples of Extensions through Intersections Along All Other Roads (NON Interstates, Freeways or Expressways) *(Sheet 1 of 2)*

a - Typical pavement markings with offset lane lines continued through the intersection and optional crosswalk lines and stop lines



b - Typical pavement markings with optional double-turn lane lines, lane-use turn arrows, crosswalk lines, and stop lines

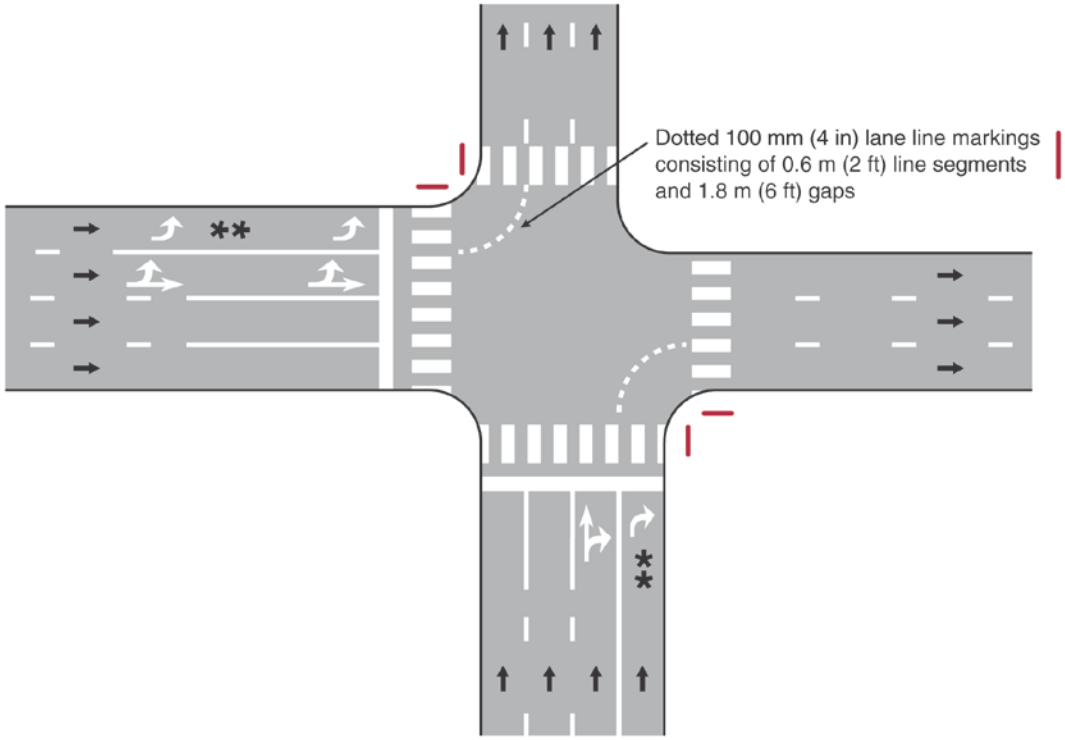
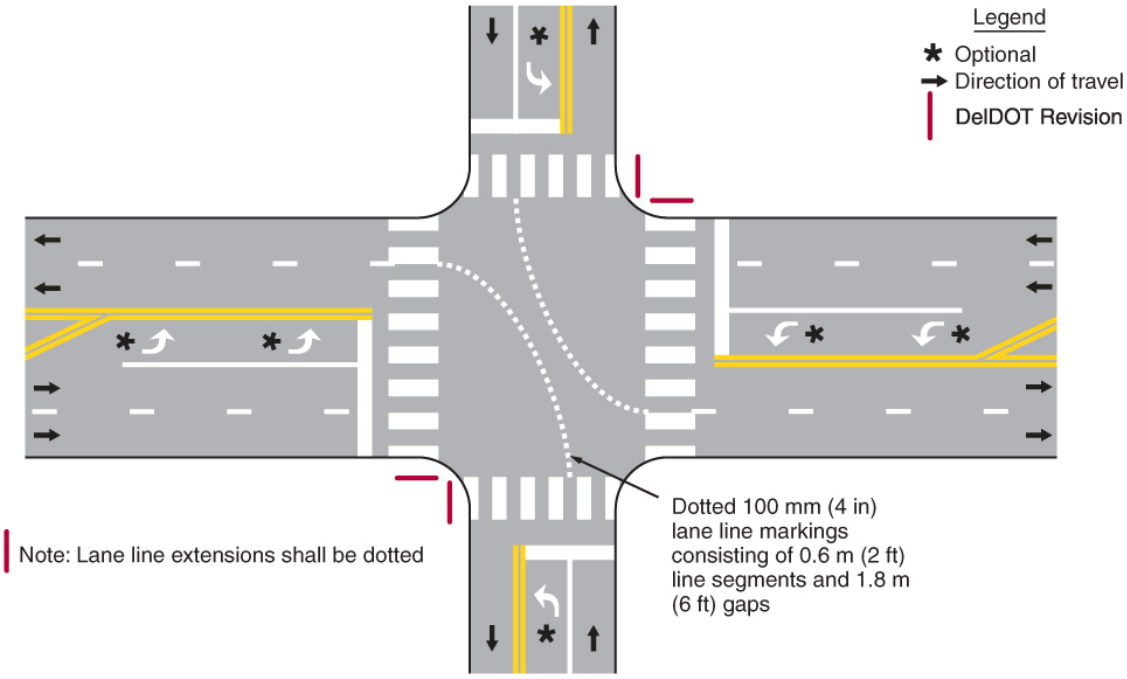
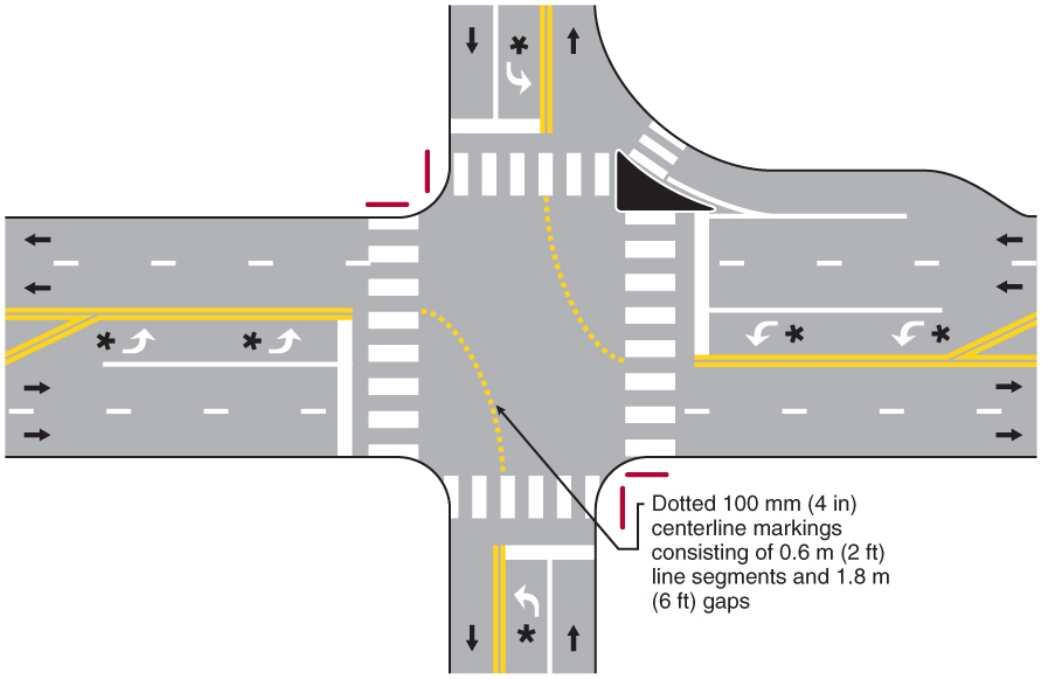


Figure 3B-11. Examples of Extensions through Intersections Along All Other Roads (NON Interstates, Freeways or Expressways) *(Sheet 2 of 2)*

c - Typical dotted line markings to extend longitudinal lane line markings



d - Typical dotted line markings to extend longitudinal centerline markings



Guidance:

A single line of equal width to one of the lines of the double line should be used to extend a double line through an intersection. **DelDOT Rev.**

To the extent possible, pavement marking extensions through intersections should be designed in a manner that minimizes potential confusion for drivers in adjacent or opposing lanes.

Section 3B.09 <u>Lane Reduction Transition Markings</u>

Standard:

Lane reduction transition markings shall be used to guide traffic through transition areas where the number of through lanes is reduced, as shown in Figures 3B-12, 3B-12A, 3B-12B, and 3B-12C. On two-way roadways, no-passing zone markings shall be used to prohibit passing in the direction of the convergence, and shall continue through the transition area. **DelDOT Rev.**

Guidance:

For roadways having a posted or statutory speed limit of 70 km/h (45 mph) or greater, the transition taper length for a lane reduction should be computed by the formula L = 0.62 WS for speeds in km/h (L = WS for speeds in mph). For roadways where the posted or statutory speed limit is less than 70 km/h (45 mph), the formula $L = WS^2/155$ for speeds in km/h ($L = WS^2/60$ for speeds in mph) should be used to compute taper length. Under both formulas, L equals the taper length in meters (feet), W equals the width of the lane or offset distance in meters (feet), and S equals the 85th-percentile speed or the posted or statutory speed limit, whichever is higher. **DelDOT Rev.**

Where observed speeds exceed posted or statutory speed limits, longer tapers should be used.

Option:

On new construction, where no posted or statutory speed limit is established, the design speed may be used in the transition taper length formula.

Guidance:

Lane line markings should be discontinued where the transition taper begins. **DelDOT Rev.**

Support:

Pavement markings at lane reduction transitions supplement the standard signs.

Section 3B.10 <u>Approach Markings for Obstructions</u>

Standard:

Pavement markings shall be used to guide traffic away from fixed obstructions within a paved roadway. Approach markings for bridge supports, refuge islands, median islands, and raised channelization islands shall consist of a tapered line or lines extending from the centerline or the lane line to a point 0.3 to 0.6 m (1 to 2 ft) to the right side, or to both sides, of the approach end of the obstruction (see Figure 3B-13).

Guidance:

For roadways having a posted or statutory speed limit of 70 km/h (45 mph) or greater, the taper length of the tapered line markings should be computed by the formula L = 0.62 WS for speeds in km/h (L = WS for speeds in mph). For roadways where the posted or statutory speed limit is less than 70 km/h (45 mph), the formula $L = WS^2/155$ for speeds in km/h ($L = WS^2/60$ for speeds in mph) should be used to compute taper length. Under both formulas, L equals the taper length in meters (feet), W equals the width of the lane or offset distance in meters (feet), and S equals the 85th-percentile speed or the posted or statutory speed limit, whichever is higher. **DelDOT Rev.**

Standard:

The minimum taper length shall be 30 m (100 ft) in urban areas and 60 m (200 ft) in rural areas.

Support:

Examples of approach markings for obstructions in the roadway are shown in Figure 3B-13.

Option:

Where observed speeds exceed posted or statutory speed limits, longer tapers may be used.

Standard:

If traffic is required to pass only to the right of the obstruction, the markings shall consist of a two-direction no-passing zone marking at least twice the length of the diagonal portion as determined by the appropriate taper formula (see Figure 3B-13).

Option:

If traffic is required to pass only to the right of the obstruction, yellow diagonal approach markings may be placed in the neutral area between the no-passing zone markings as shown in Figure 3B-13. Other markings, such as yellow delineators, raised pavement markers, and white crosswalk pavement markings, may also be placed in the neutral area.

Standard:

If traffic can pass either to the right or left of the obstruction, the markings shall consist of two channelizing lines diverging from the lane line, one to each side of the obstruction. In advance of the point of divergence, a solid wide white line or solid double normal white line shall be extended in place of the broken lane line for a distance equal to the length of the diverging lines (see Figure 3B-13).

Option:

If traffic can pass either to the right or left of the obstruction, additional white markings may be placed in the neutral area between the channelizing lines as shown in Figure 3B-13.

Section 3B.11 Raised Pavement Markers

Standard:

A raised pavement marker shall be a device with a height of at least 10 mm (0.4 in) mounted on or in a road surface that is intended to be used as a positioning guide or to supplement or substitute for pavement markings or to mark the position of a fire hydrant.

The color of raised pavement markers under both daylight and nighttime conditions shall conform to the color of the marking for which they serve as a positioning guide, or for which they supplement or substitute.

Raised pavement markers shall be installed on interstates, freeways, and principal arterials.

Guidance:

Raised pavement markers should be considered for use on two-lane, two-way arterials roads under the following conditions:

A. Roadways with posted speed limits of 45 miles per hour or greater, with horizontal and/or vertical curves, and poor lighting

B. Locations with a history of run-off-the-road crashes

C. Locations with advisory speed postings

D. Locations where a barrier or parapet is less than 6 feet from the edge of the travel lane. **DelDOT Rev.**

Raised pavement markers should also be installed on other roadways when an engineering study indicates a need.

See Figures 3B-13A through 3B-13H for guidance on spacing of raised pavement markers.

Other than to delineate off ramps and gore areas, raised pavement markers should not to be installed along edge lines (right or left) unless there is a history of run-off-the-road and/or nighttime, inclement weather-related crashes. Raised pavement markers should only be installed on the edge line if other measures have been taken and the location continue to experience crashes. If overhead lighting is present, even if other measure have been taken, raised pavement markers should not be placed on the edgelines because they lose their effectiveness under overhead lighting.

Option:

Blue raised pavement markers may be used to mark the positions of fire hydrants.

Support:

Retroreflective and internally illuminated raised pavement markers are available in monodirectional and bidirectional configurations. The bidirectional marker is capable of displaying the applicable color for each direction of travel.

Guidance:

Nonretroreflective raised pavement markers should not be used alone, without supplemental retroreflective or internally illuminated markers, as a substitute for other types of pavement markings.

Directional configurations should be used to maximize correct information and to minimize confusing information provided to the road user. Directional configurations also should be used to avoid confusion resulting from visibility of markers that do not apply to the road user.

The spacing of raised pavement markers used to supplement or substitute for other types of longitudinal markings should correspond with the pattern of broken lines for which the markers supplement or substitute.

Standard:

The value of N for the spacing of raised pavement markers for a broken or dotted line shall equal the length of one line segment plus one gap. The value of N referenced for solid lines shall equal the N for the broken or dotted lines that might be adjacent to or might extend the solid lines (see Sections 3B.13 and 3B.14).

Support:

Figures 9-20 through 9-22 in the "Traffic Control Devices Handbook" (see Section 1A.11) contain additional information regarding the spacing of raised pavement markers on longitudinal markings.

Section 3B.12 Raised Pavement Markers as Vehicle Positioning Guides with Other Longitudinal Markings

Option:

Raised pavement markers may be used as positioning guides with longitudinal line markings without necessarily conveying information to the road user about passing or lane-use restrictions. In such applications, markers may be positioned between the two lines of a one-way or two-way no-passing zone marking or positioned in line with or immediately adjacent to single solid or broken centerline or lane line markings.

Support:

A typical spacing for such applications is 2N, where N equals the length of one line segment plus one gap (see Section 3B.11).

Option:

Where it is desired to alert the road user to changes in the travel path, such as on sharp curves or on transitions that reduce the number of lanes or that shift traffic laterally, the spacing may be reduced to N or less.

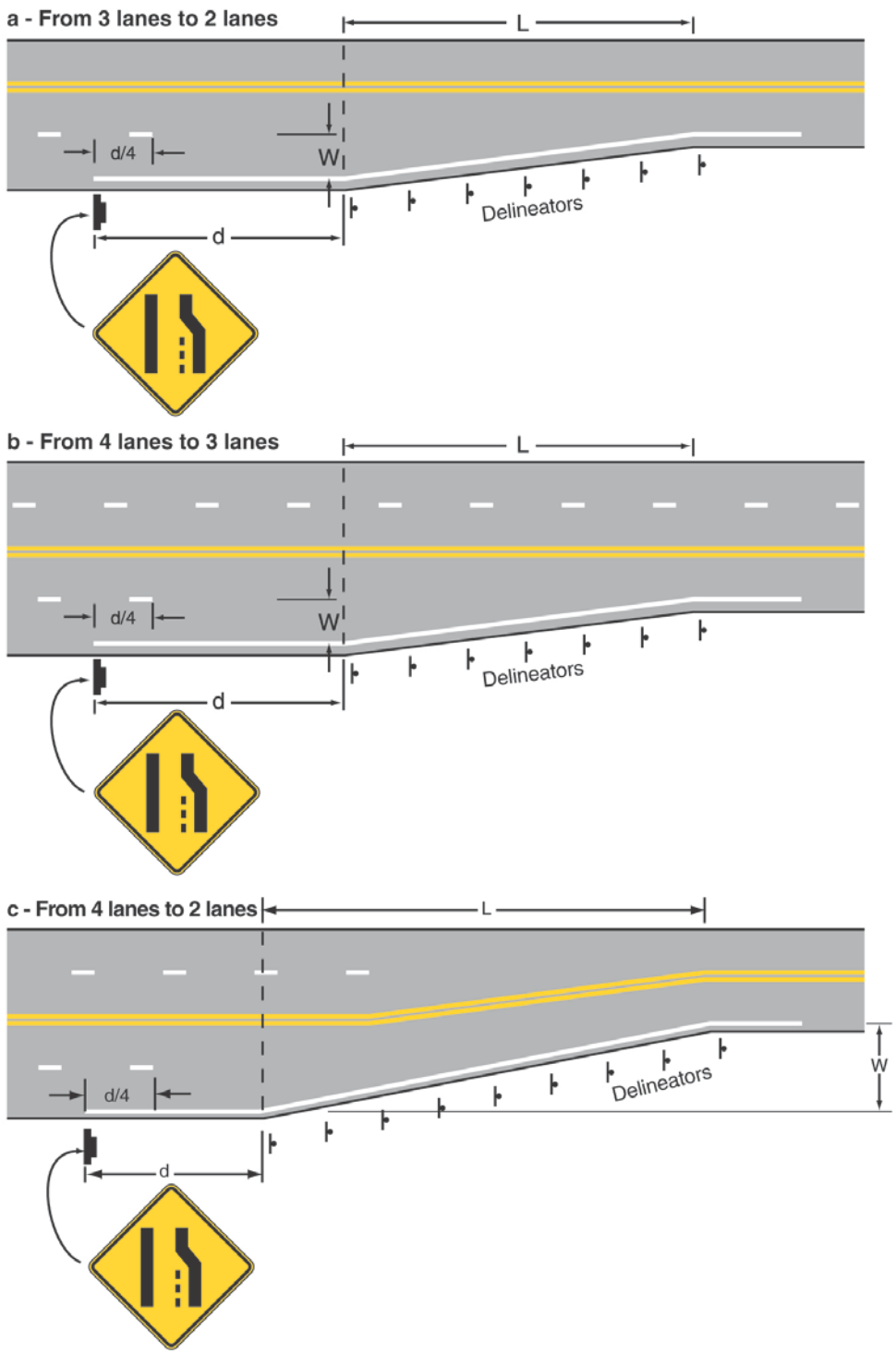
Section 3B.13 Raised Pavement Markers Supplementing Other Markings

Guidance:

The use of raised pavement markers for supplementing longitudinal line markings should conform to the following:

A. Lateral Positioning
   1. When supplementing double line markings, pairs of raised pavement markers placed laterally in line with or immediately outside of the two lines should be used.

Figure 3B-12. Examples of Lane Reduction Markings



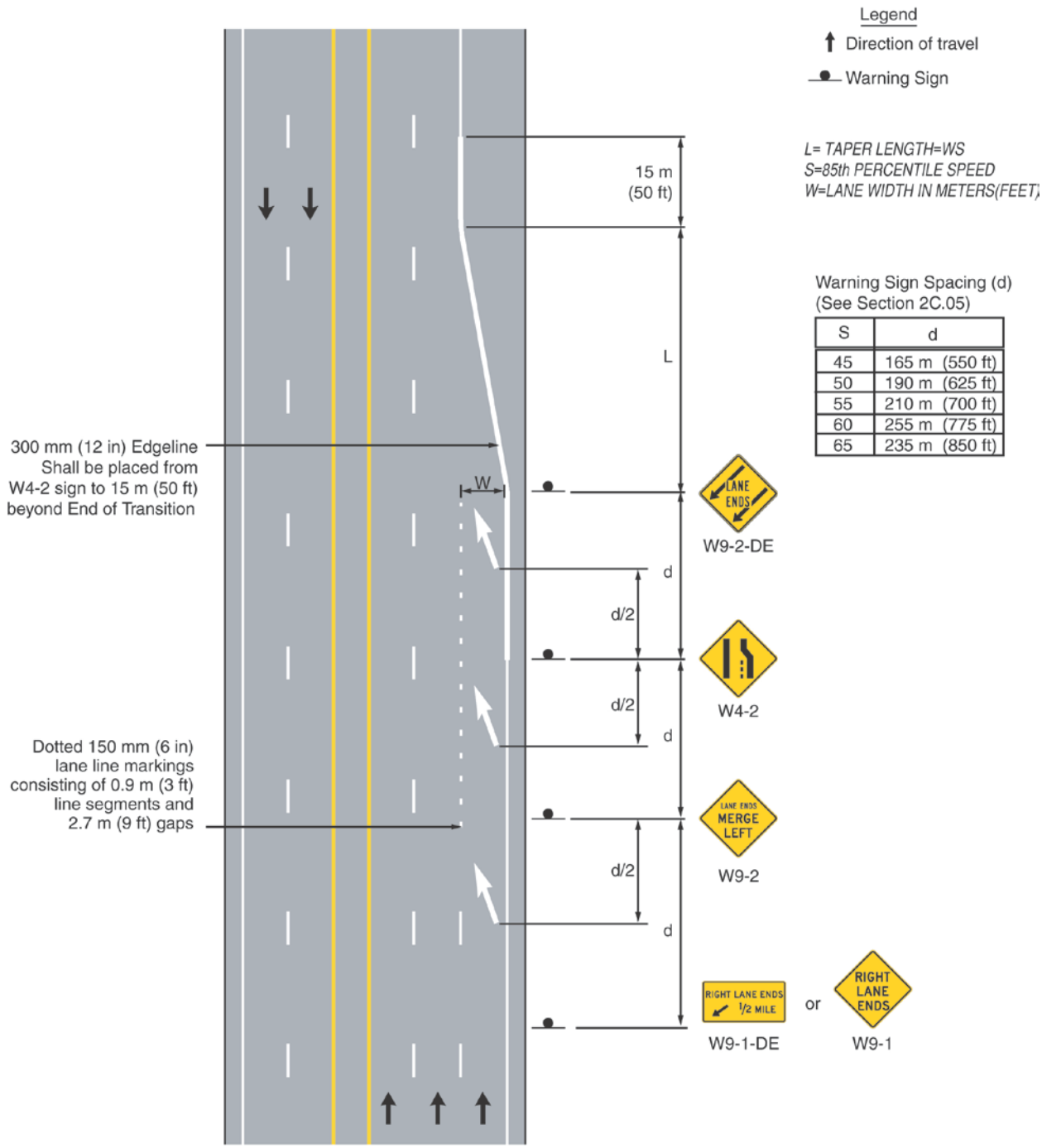
L = Length in meters (feet)
S = Posted, 85th-percentile, or statutory speed in km/h (mph)
W = Lane Width in meters (feet)
d = Advance warning distance (see Section 2C.05)

See Section 3D.04 for delineator spacing.

For speeds 70 km/h (45 mph) or more:
$L = 0.62\ WS \quad (L=WS)$

For speeds less than 70 km/h (45 mph):
$L = \frac{WS^2}{155} \quad \left(L = \frac{WS^2}{60}\right)$

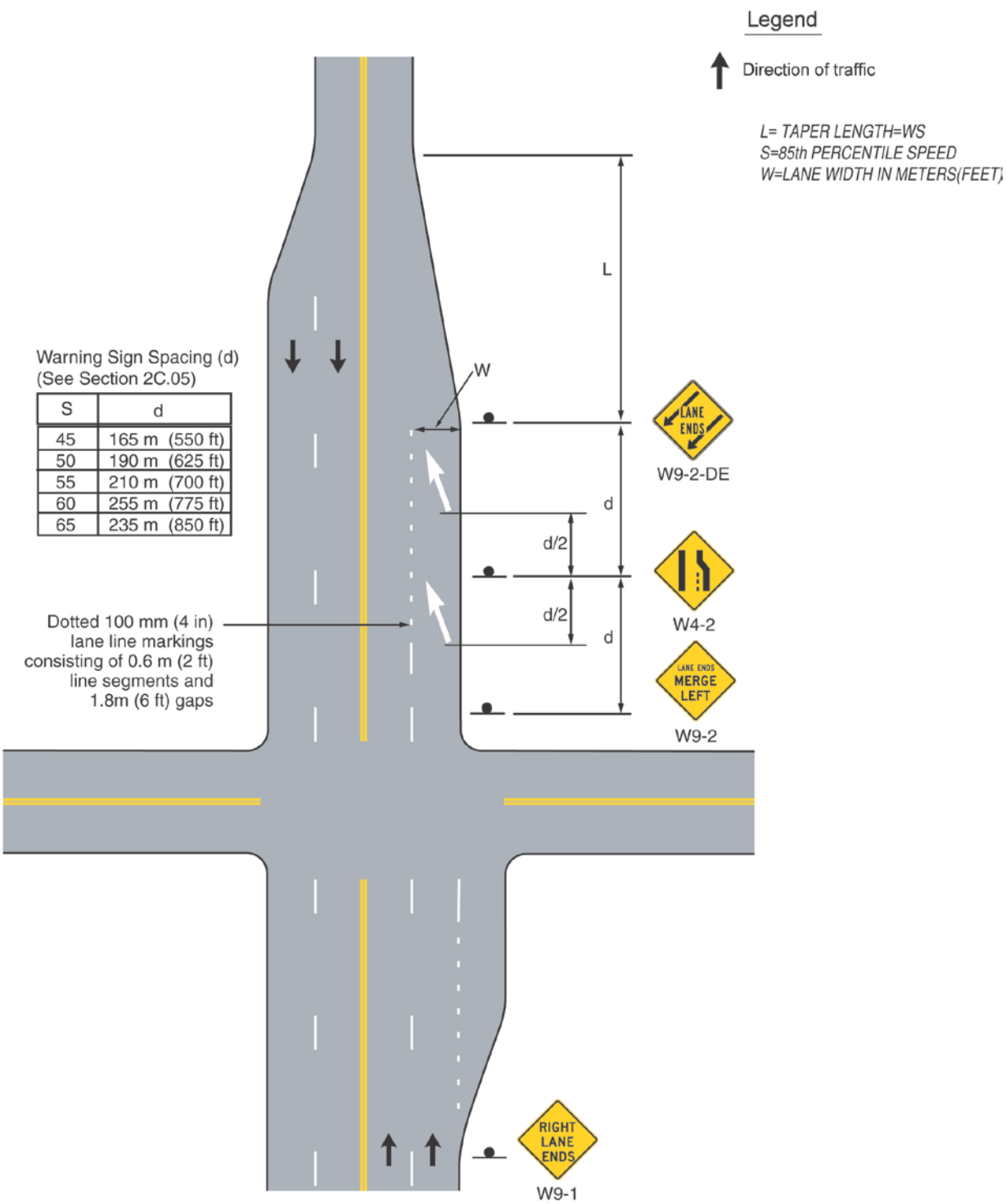
Figure 3B-12A. Example of Lane Reduction Markings for Interstates, Freeways or Expressways (45 mph or more)
(DelDOT MUTCD Only)



Warning Sign Spacing (d)
(See Section 2C.05)

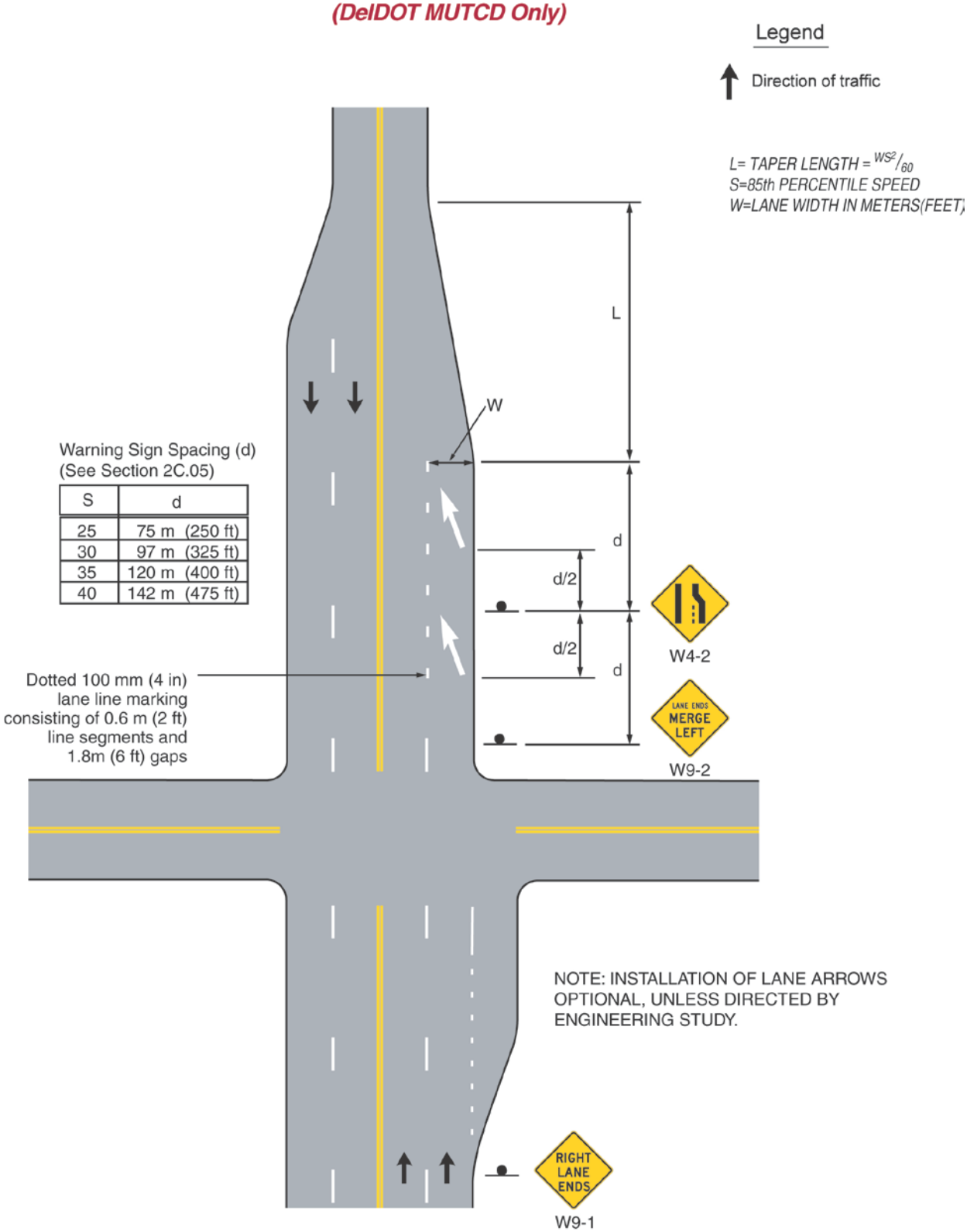
S	d
45	165 m (550 ft)
50	190 m (625 ft)
55	210 m (700 ft)
60	255 m (775 ft)
65	235 m (850 ft)

Figure 3B-12B. Example of Lane Reduction Beyond Intersection Marking Application Along All Other Roads (NON Interstates, Freeways or Expressways) (45 mph or more)
(DelDOT MUTCD Only)



S	d
45	165 m (550 ft)
50	190 m (625 ft)
55	210 m (700 ft)
60	255 m (775 ft)
65	235 m (850 ft)

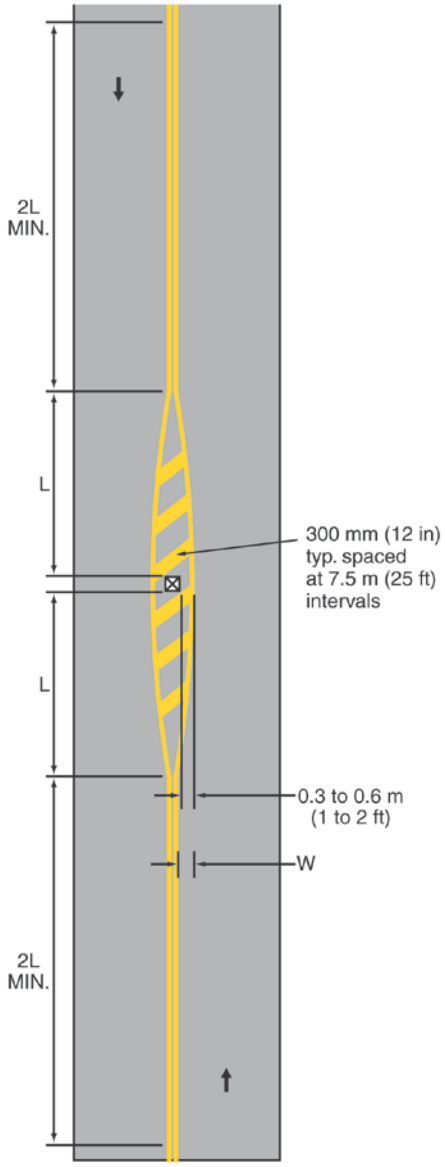
Figure 3B-12C. Example of Lane Reduction Beyond Intersection Marking Application Along All Other Roads (NON Interstates, Freeways or Expressways) (Less than 45 mph)
(DelDOT MUTCD Only)



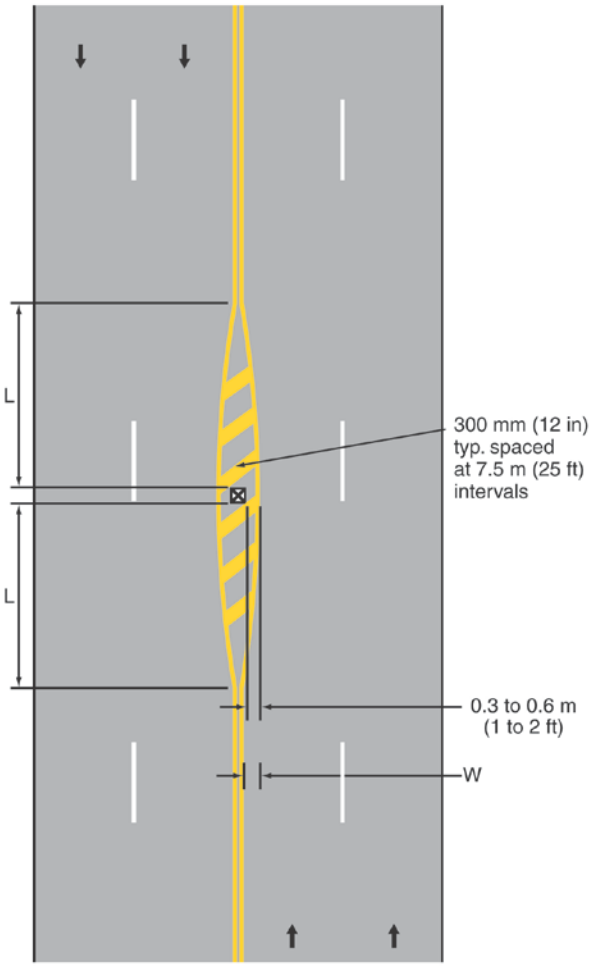
S	d
25	75 m (250 ft)
30	97 m (325 ft)
35	120 m (400 ft)
40	142 m (475 ft)

Figure 3B-13. Examples of Markings for Obstructions in the Roadway
(Sheet 1 of 2)

a - Center of two-lane road



b - Center of four-lane road



For speeds 70 km/h (45 mph) or more L=0.62 WS (L=WS)
For speeds less than 70 km/h (45 mph) L = $WS^2/155$ ($L=WS^2/60$)
S = Posted, 85th-percentile, or statutory speed in km/h (mph)
W = Offset distance in meters (ft)

Minimum length of : L = 30 m (100 ft) in urban areas
L = 60 m (200 ft) in rural areas

Length "L" should be extended as required by sight distance conditions

Legend

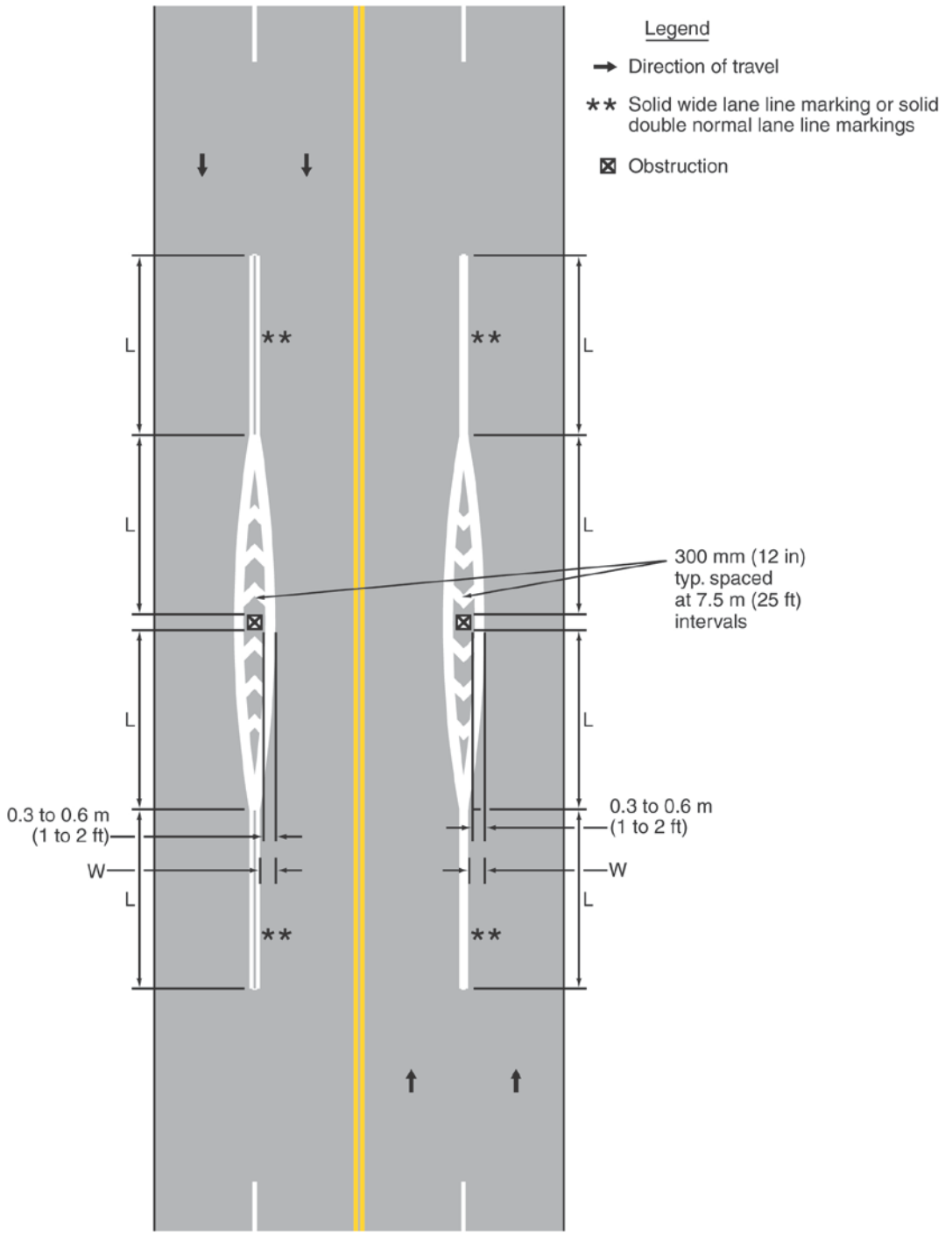
→ Direction of travel

⊠ Obstruction

DelDOT Revision

Figure 3B-13. Examples of Markings for Obstructions in the Roadway
(Sheet 2 of 2)

c - Traffic passing both sides of obstruction

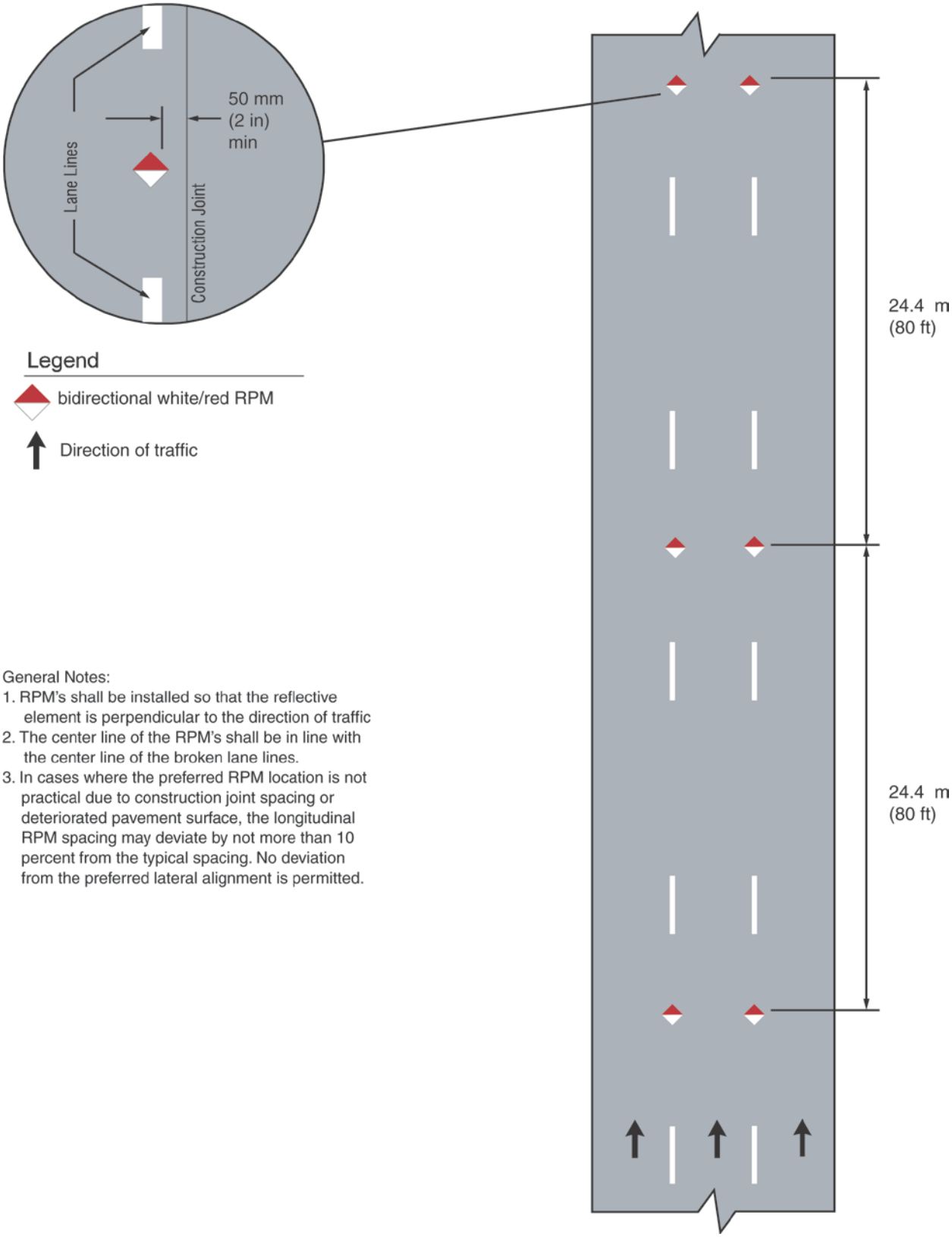


For speeds 70 km/h (45 mph) or more L=0.62 WS (L=WS)
For speeds less than 70 km/h (45 mph) $L = WS^2/155$ ($L=WS^2/60$)
S = Posted, 85th-percentile, or statutory speed in km/h (mph)
W = Offset distance in meters (ft)

Minimum length of : L = 30 m (100 ft) in urban areas
L = 60 m (200 ft) in rural areas

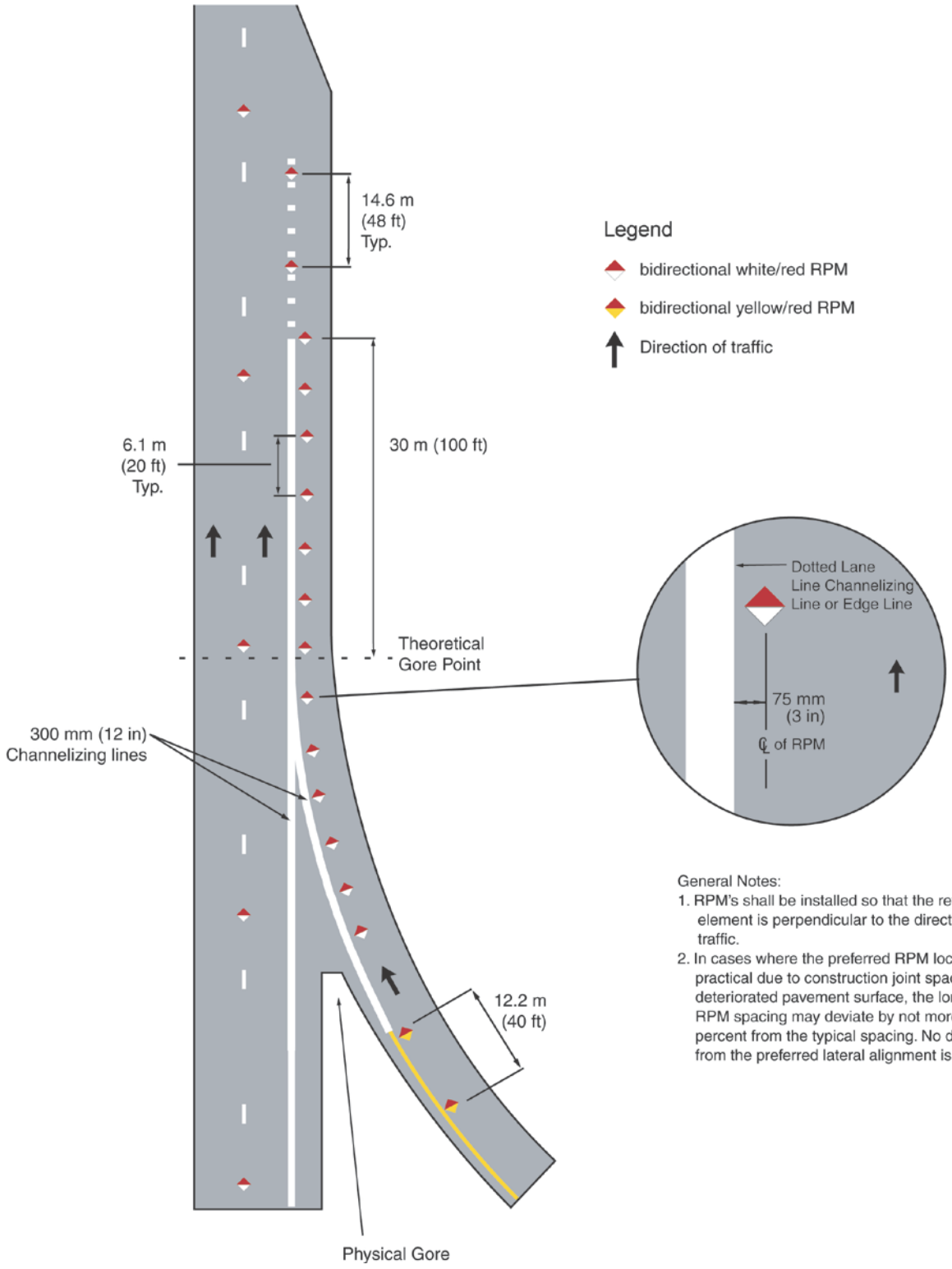
Length "L" should be extended as required by sight distance conditions

Figure 3B-13A. Example of Raised Pavement Marker (RPM) Application on Interstates, Freeways or Expressways
(DelDOT MUTCD Only)



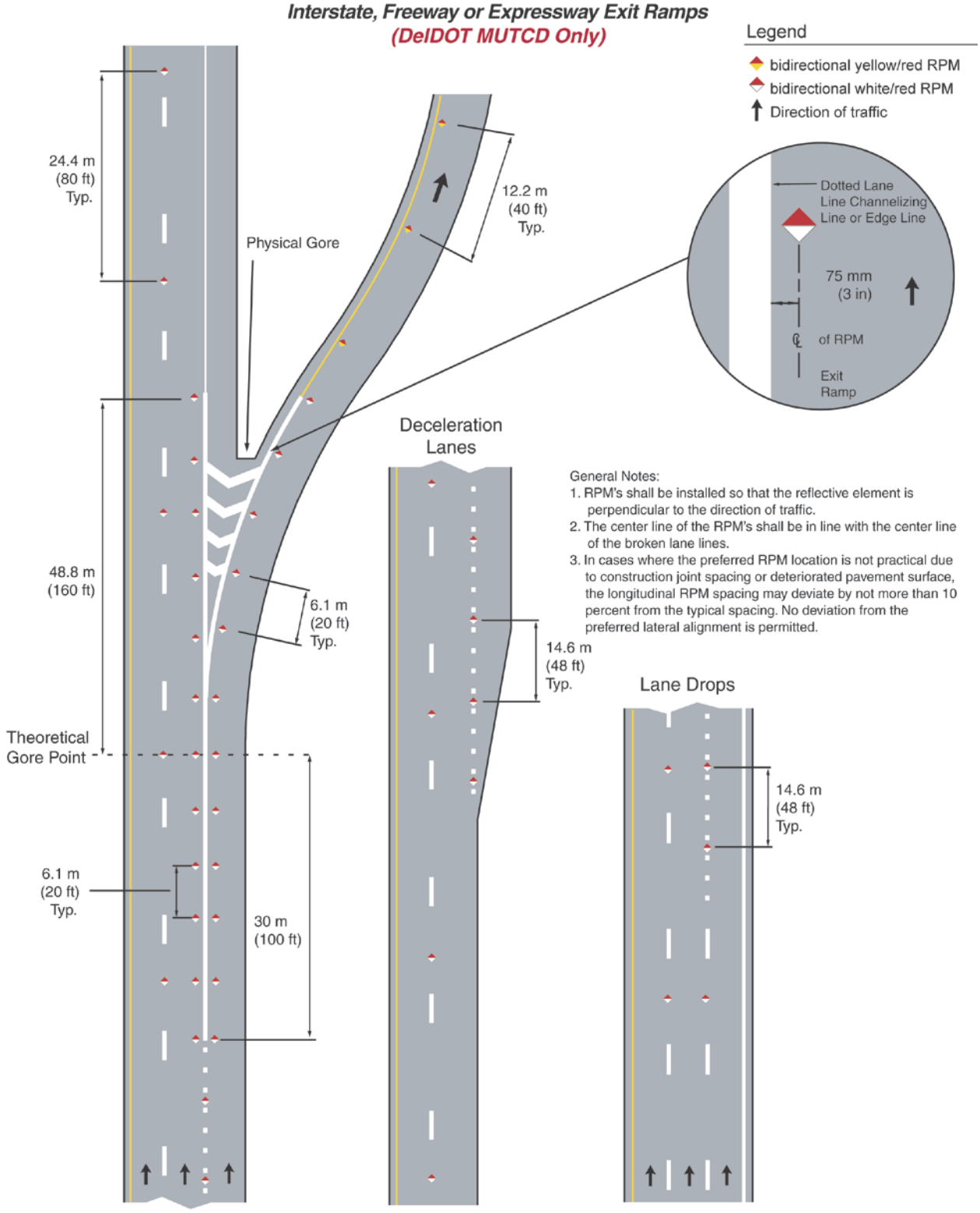
General Notes:
1. RPM's shall be installed so that the reflective element is perpendicular to the direction of traffic
2. The center line of the RPM's shall be in line with the center line of the broken lane lines.
3. In cases where the preferred RPM location is not practical due to construction joint spacing or deteriorated pavement surface, the longitudinal RPM spacing may deviate by not more than 10 percent from the typical spacing. No deviation from the preferred lateral alignment is permitted.

Figure 3B-13B. Example of Raised Pavement Marker (RPM) Application on Interstate, Freeway or Expressway Entrance Ramps
(DelDOT MUTCD Only)



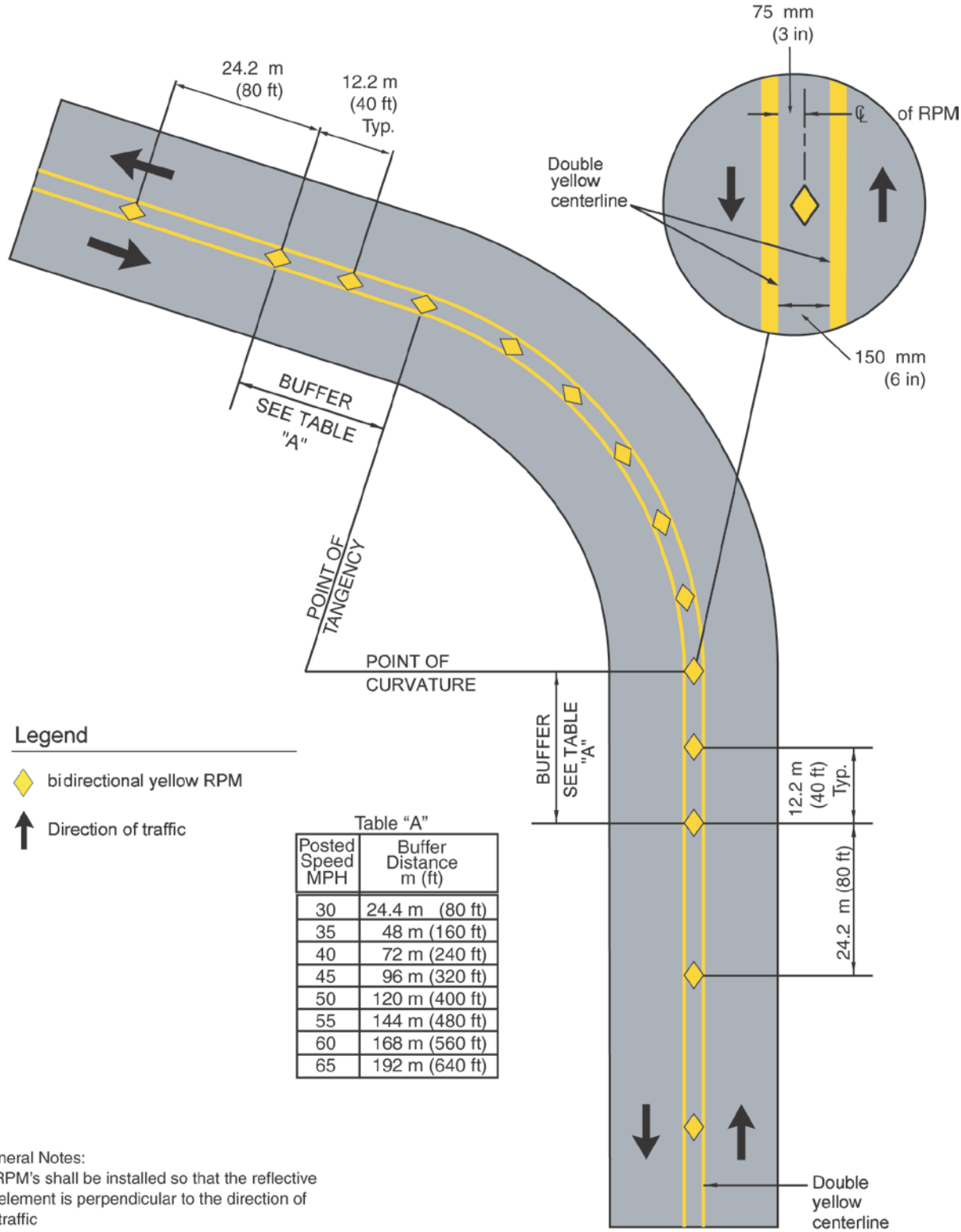
General Notes:
1. RPM's shall be installed so that the reflective element is perpendicular to the direction of traffic.
2. In cases where the preferred RPM location is not practical due to construction joint spacing or deteriorated pavement surface, the longitudinal RPM spacing may deviate by not more than 10 percent from the typical spacing. No deviation from the preferred lateral alignment is permitted.

Figure 3B-13C. Example of Raised Pavement Marker (RPM) Application on Interstate, Freeway or Expressway Exit Ramps
(DelDOT MUTCD Only)



General Notes:
1. RPM's shall be installed so that the reflective element is perpendicular to the direction of traffic.
2. The center line of the RPM's shall be in line with the center line of the broken lane lines.
3. In cases where the preferred RPM location is not practical due to construction joint spacing or deteriorated pavement surface, the longitudinal RPM spacing may deviate by not more than 10 percent from the typical spacing. No deviation from the preferred lateral alignment is permitted.

Figure 3B-13D. Example of Raised Pavement Marker (RPM) Application on Arterial and Other Two Lane Roads
(DelDOT MUTCD Only)



Legend

- bidirectional yellow RPM
- Direction of traffic

Table "A"

Posted Speed MPH	Buffer Distance m (ft)
30	24.4 m (80 ft)
35	48 m (160 ft)
40	72 m (240 ft)
45	96 m (320 ft)
50	120 m (400 ft)
55	144 m (480 ft)
60	168 m (560 ft)
65	192 m (640 ft)

General Notes:

1. RPM's shall be installed so that the reflective element is perpendicular to the direction of traffic
2. In cases where the preferred RPM location is not practical due to construction joint spacing or deteriorated pavement surface, the longitudinal RPM spacing may deviate by not more than 10 percent from the typical spacing. No deviation from the preferred lateral alignment is permitted.

Figure 3B-13E. Example of Raised Pavement Marker (RPM) Application on Multi-Lane Arterial Roads
(DelDOT MUTCD Only)

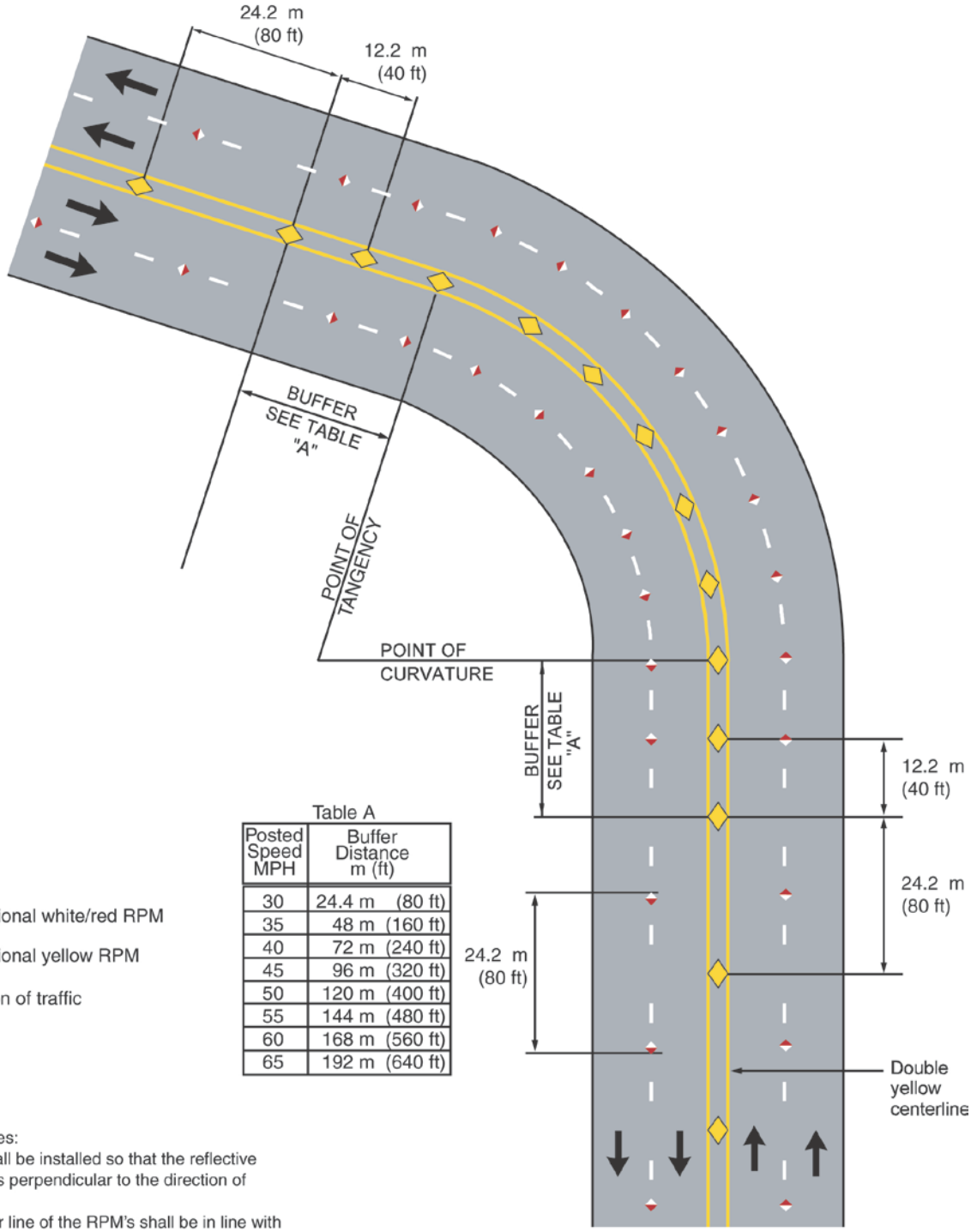


Table A

Posted Speed MPH	Buffer Distance m (ft)
30	24.4 m (80 ft)
35	48 m (160 ft)
40	72 m (240 ft)
45	96 m (320 ft)
50	120 m (400 ft)
55	144 m (480 ft)
60	168 m (560 ft)
65	192 m (640 ft)

Legend

- bidirectional white/red RPM
- bidirectional yellow RPM
- Direction of traffic

General Notes:

1. RPM's shall be installed so that the reflective element is perpendicular to the direction of traffic.
2. The center line of the RPM's shall be in line with the center line of the broken lane lines.
3. In cases where the preferred RPM location is not practical due to construction joint spacing or deteriorated pavement surface, the longitudinal RPM spacing may deviate by not more than 10 percent from the typical spacing. No deviation from the preferred lateral alignment is permitted.

Figure 3B-13F. Example of Raised Pavement Marker (RPM) Application for Left Turn Lane
(DelDOT MUTCD Only)

Notes:

1. RPM's supplementing the double solid yellow centerline are installed so that all markers are installed between the double solid lines, and oriented as shown in detail below.
2. RPM's supplementing the yellow centerline along the left turn lane are spaced 6.1 m (20 ft) apart for the entire length of the turn lane if equal to or less than 60 m (200 ft). If the turn lane is greater then 60 m (200 ft) than RPM's are spaced at 12.2 m (40 ft) throughout the entire length of the turn lane.
3. In cases where the preferred RPM location is not practical due to construction joint spacing or deteriorated pavement surface, the longitudinal RPM spacing may deviate by not more than 10 percent from the typical spacing. No deviation from the preferred lateral alignment is permitted.
4. RPM spacing for dotted 150 mm (6 in) lane lanes consisting of 0.9 m (3 ft) line segments and 2.7 (9 ft) gaps shall be 14.6 m (48 ft).
5. RPM's supplementing solid lines shall be installed adjacent to solid line. See inset in Figure 3B-13B for placement.

Legend

- bidirectional white/red RPM
- bidirectional yellow RPM
- Direction of traffic

Table "A"

Posted Speed MPH	Buffer Distance m (ft)
30	24.4 m (80 ft)
35	48 m (160 ft)
40	72 m (240 ft)
45	96 m (320 ft)
50	120 m (400 ft)
55	144 m (480 ft)
60	168 m (560 ft)
65	192 m (640 ft)

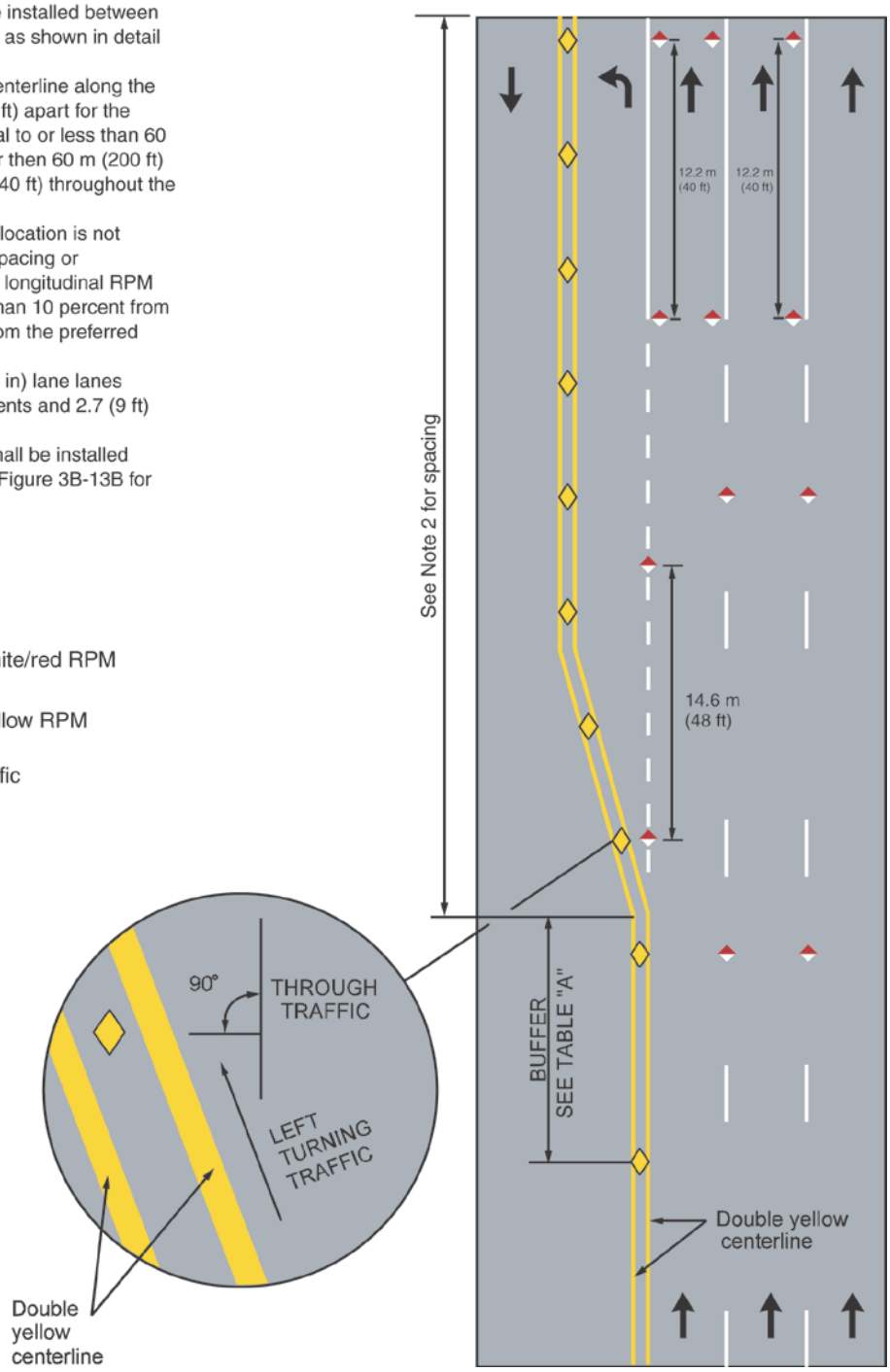
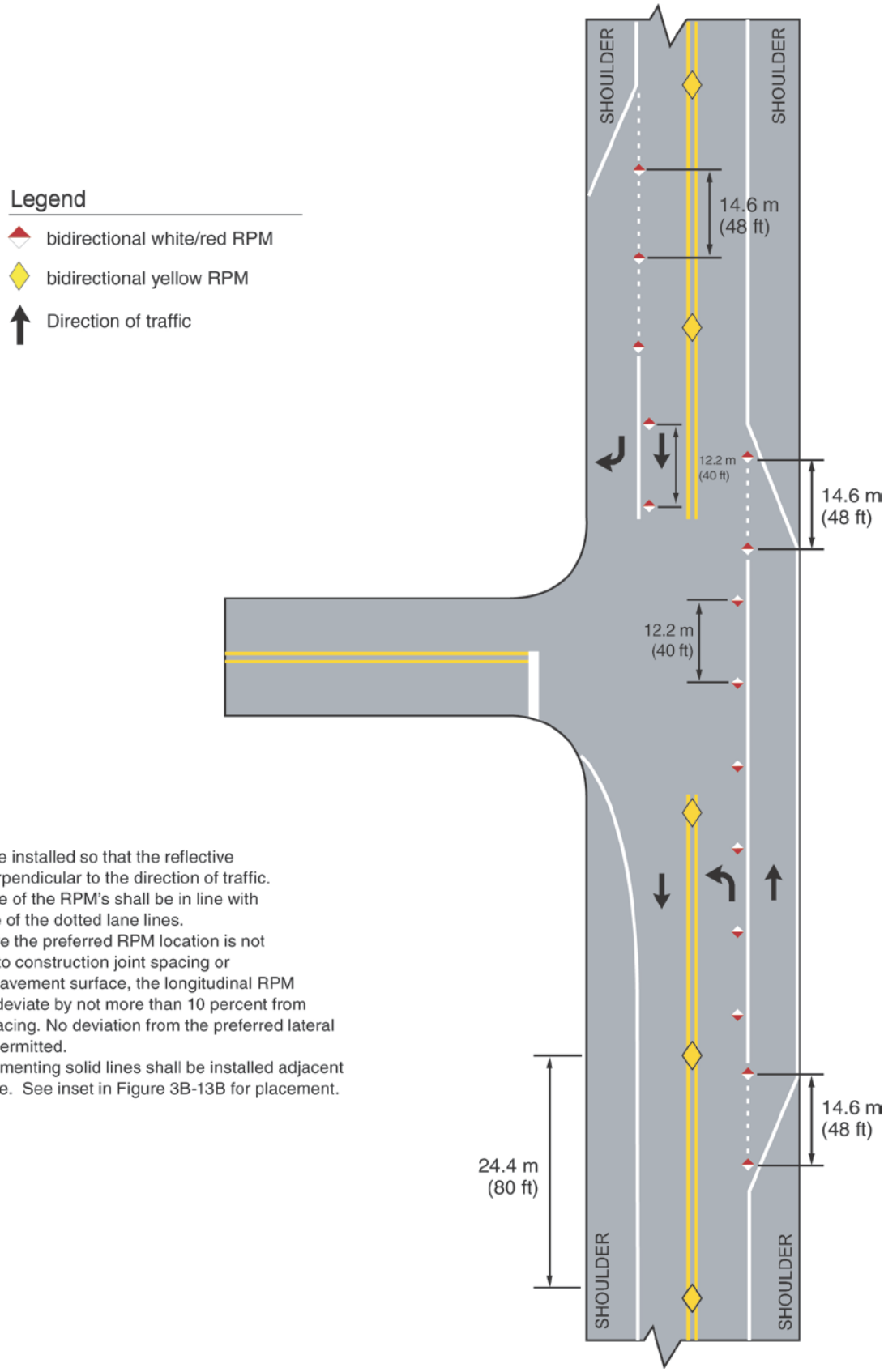


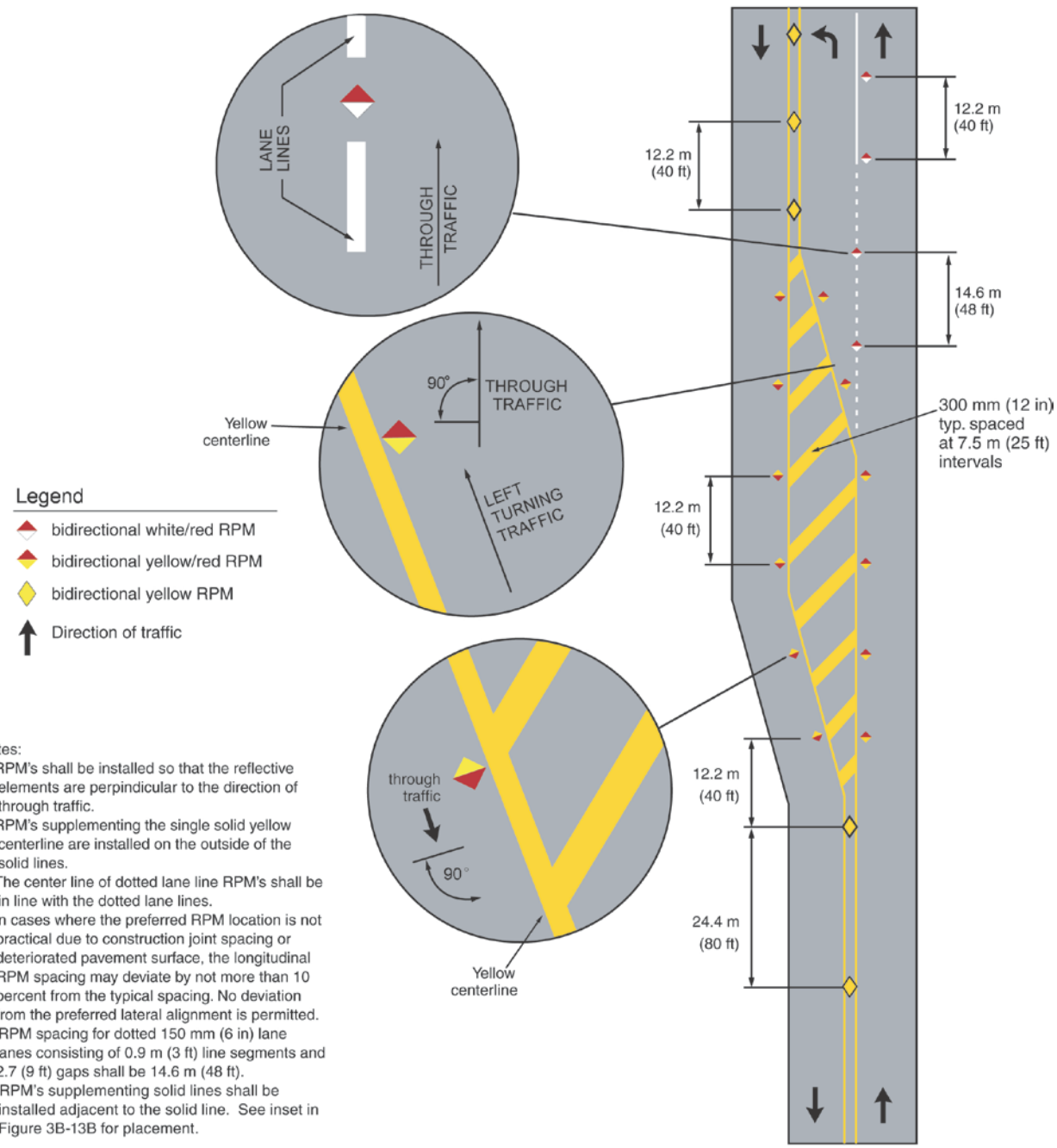
Figure 3B-13G. Example of Raised Pavement Marker (RPM) Application for Deceleration and By-pass Lanes
(DelDOT MUTCD Only)



General Notes:

1. RPM's shall be installed so that the reflective element is perpendicular to the direction of traffic.
2. The center line of the RPM's shall be in line with the center line of the dotted lane lines.
3. In cases where the preferred RPM location is not practical due to construction joint spacing or deteriorated pavement surface, the longitudinal RPM spacing may deviate by not more than 10 percent from the typical spacing. No deviation from the preferred lateral alignment is permitted.
4. RPM's supplementing solid lines shall be installed adjacent to the solid line. See inset in Figure 3B-13B for placement.

Figure 3B-13H. Example of Raised Pavement Marker (RPM) Application for Left Turn Lane with Flush Median
(DelDOT MUTCD Only)



Notes:
1. RPM's shall be installed so that the reflective elements are perpindicular to the direction of through traffic.
2. RPM's supplementing the single solid yellow centerline are installed on the outside of the solid lines.
3. The center line of dotted lane line RPM's shall be in line with the dotted lane lines.
4. In cases where the preferred RPM location is not practical due to construction joint spacing or deteriorated pavement surface, the longitudinal RPM spacing may deviate by not more than 10 percent from the typical spacing. No deviation from the preferred lateral alignment is permitted.
5. RPM spacing for dotted 150 mm (6 in) lane lanes consisting of 0.9 m (3 ft) line segments and 2.7 (9 ft) gaps shall be 14.6 m (48 ft).
6. RPM's supplementing solid lines shall be installed adjacent to the solid line. See inset in Figure 3B-13B for placement.

2. When supplementing wide line markings, pairs of raised pavement markers placed laterally adjacent to each other should be used.

B. Longitudinal Spacing

1. When supplementing solid line markings, raised pavement markers at a spacing no greater than N (see Section 3B.11) should be used, except when supplementing left edge line markings, a spacing of no greater than N/2 should be used. Raised markers should not supplement right edge line markings.
2. When supplementing broken line markings, a spacing no greater than 3N should be used. However, when supplementing broken line markings identifying reversible lanes, a spacing of no greater than N should be used.
3. When supplementing dotted line markings, a spacing appropriate for the application should be used.
4. When supplementing longitudinal line markings through at-grade intersections, one raised pavement marker for each short line segment should be used.
5. When supplementing edge line extensions through freeway interchanges, a spacing of no greater than N should be used.

Option:

Raised pavement markers also may be used to supplement other markings for channelizing islands or approaches to obstructions.

Section 3B.14 <u>Raised Pavement Markers Substituting for Pavement Markings</u>
(NOT APPLICABLE IN DELAWARE)

DelDOT Rev.

Section 3B.15 <u>Transverse Markings</u>

Standard:

Transverse markings, which include shoulder markings, word and symbol markings, stop lines, yield lines, crosswalk lines, speed measurement markings, speed hump markings, parking space markings, and others, shall be white unless otherwise specified herein.

Guidance:

Because of the low approach angle at which pavement markings are viewed, transverse lines should be proportioned to provide visibility equal to that of longitudinal lines.

Standard:

Pavement marking letters, numerals, and symbols shall be installed in accordance with the Pavement Markings chapter of the "Standard Highway Signs" book (see Section 1A.11).

Section 3B.16 <u>Stop and Yield Lines</u>

Standard:

If used, stop lines shall consist of solid white lines extending across approach lanes to indicate the point at which the stop is intended or required to be made.

If used, yield lines (see Figure 3B-14) shall consist of a row of solid white isosceles triangles pointing toward approaching vehicles extending across approach lanes to indicate the point at which the yield is intended or required to be made.

Stop lines shall be placed on all approaches to signalized intersections.

Guidance:

DelDOT Rev.

Stop lines should be 400 mm (16 in) wide.

Stop lines should be used to indicate the point behind which vehicles are required to stop, in compliance with a STOP (R1-1) sign, traffic control signal, or some other traffic control device, except YIELD signs.

Stop lines should be placed on the STOP-controlled approaches of unsignalized intersections of two state-maintained roadways.

The individual triangles comprising a yield line should typically have a base of 600 mm (24 in) wide and a height equal to 1.5 times the base. The space between the triangles should be 300 mm (12 in).

DelDOT Rev.

Guidance:

Yield lines should not be used for a right-turn lane that also has a YIELD sign and crosswalk markings. **DelDOT Rev.**

Option:

Yield lines may be used to indicate the point behind which vehicles are required to yield in compliance with a YIELD (R1-2) sign or a Yield Here to Pedestrians (R1-5) sign.

Guidance:

If used, stop and yield lines should be placed a minimum of 1.2 m (4 ft) in advance of the nearest crosswalk line at controlled intersections, except for yield lines at roundabout intersections as provided for in Section 3B.24 and at midblock crosswalks. In the absence of a marked crosswalk, the stop line or yield line should be placed at the desired stopping or yielding point, but should be placed no more than 9 m (30 ft) nor less than 1.2 m (4 ft) from the nearest edge of the intersecting traveled way. Stop lines should be placed to allow sufficient sight distance to all other approaches to an intersection.

When necessary to add emphasis to a YIELD sign or to mark the location where a stop might be made in compliance with a motorist's responsibility at a YIELD sign, a YIELD line should be used.

Option:

Yield lines may be used at the approach to the second roadway of a divided highway or entrance to a roundabout (see Figure 3B-16A). **DelDOT Rev.**

Guidance:

If used at an unsignalized midblock crosswalk, yield lines should be placed adjacent to the Yield Here to Pedestrians sign located 6.1 to 15 m (20 to 50 ft) in advance of the nearest crosswalk line, and parking should be prohibited in the area between the yield line and the crosswalk (see Figure 3B-15).

Stop lines at midblock signalized locations should be placed at least 12 m (40 ft) in advance of the nearest signal indication (see Section 4D.15).

Support:

Drivers who yield too close to crosswalks on multi-lane approaches place pedestrians at risk by blocking other drivers' views of pedestrians.

Section 3B.17 Crosswalk Markings

Support:

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

Crosswalk markings also serve to alert road users of a pedestrian crossing point across roadways not controlled by highway traffic signals or STOP signs.

At nonintersection locations, crosswalk markings legally establish the crosswalk.

Standard:

When crosswalk markings are used, they shall consist of 600 mm (24 in) wide solid white longitudinal lines spaced at 600 mm (24 in) apart and placed parallel to the travel lanes to avoid the wheel paths. They shall not be less than 1.8 m (6 ft) in length (see Figure 3B-16).

When patterned pavement or other similar treatments are used to depict crosswalks, 300 mm (12 in) solid white lines shall be used to define the crosswalk. **DelDOT Rev.**

Guidance:

Crosswalk markings 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-15 and 3B-16).

Crosswalks should be marked at all intersections where there is substantial conflict between vehicular and pedestrian movements.

Figure 3B-14. Example of Yield Line Layouts

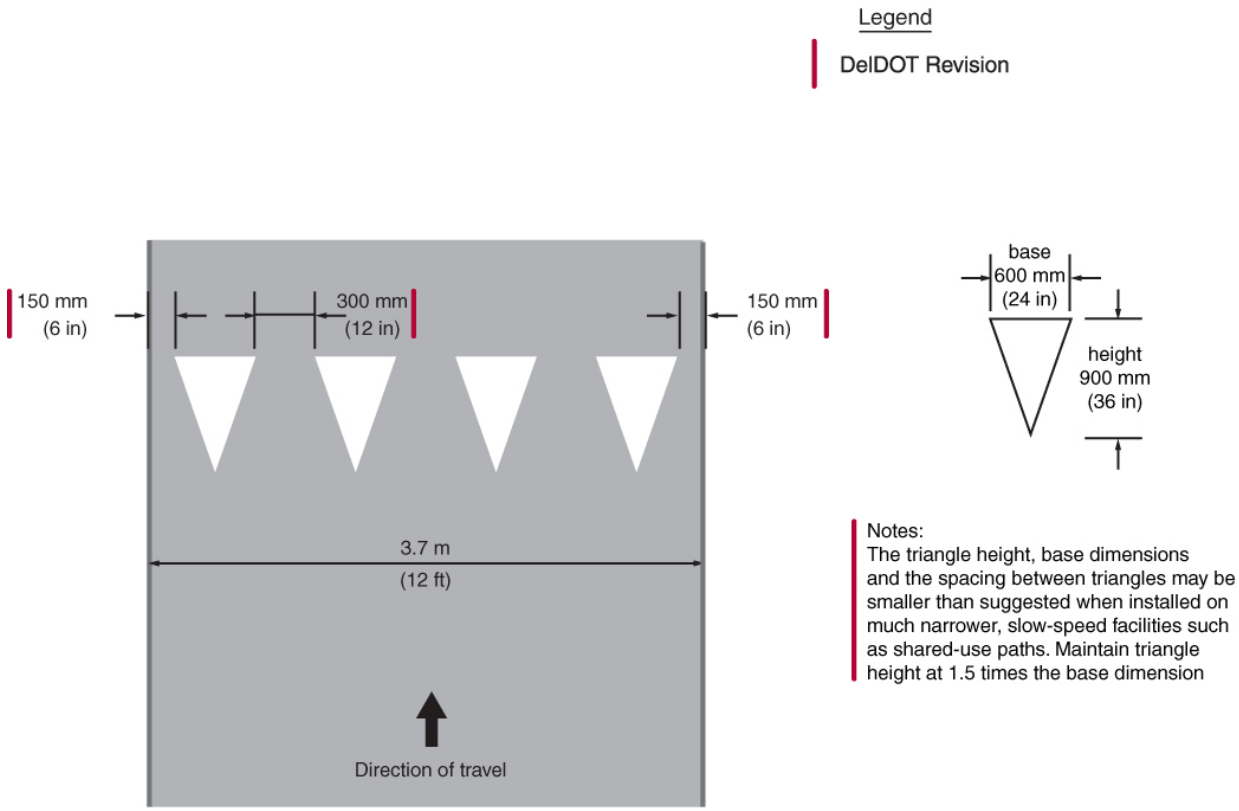
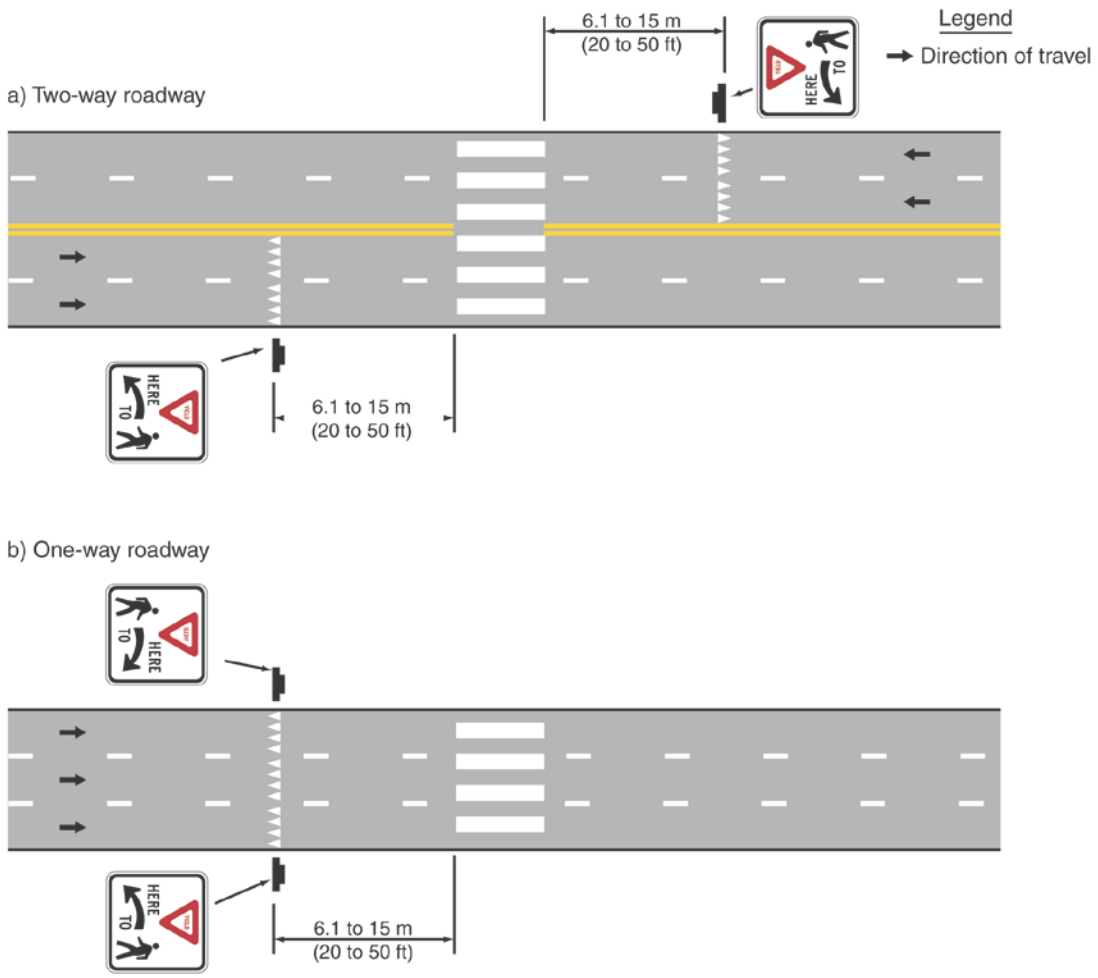


Figure 3B-15. Examples of Yield Lines at Unsignalized Midblock Crosswalks



DelDOT Revision

Marked crosswalks also should be provided at other appropriate points of pedestrian concentration, such as at loading islands, midblock pedestrian crossings, or where pedestrians could not otherwise recognize the proper place to cross.

Crosswalk markings should not be used indiscriminately. An engineering study should be performed before they are installed at locations away from highway traffic signals or STOP signs. **DelDOT Rev.**

Because nonintersection pedestrian crossings are generally unexpected by the road user, warning signs (see Section 2C.41) should be installed and adequate visibility should be provided by parking prohibitions.

Support:

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

Section 3B.18 Parking Space Markings

Support:

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-18.

Standard:

Parking space markings shall be white.

Option:

Blue lines may supplement white parking space markings of each parking space designated for use only by persons with disabilities.

Support:

Additional parking space markings for the purpose of designating spaces for use only by persons with disabilities are discussed in Section 3B.19 and illustrated in Figure 3B-19.

Section 3B.19 Pavement Word and Symbol Markings

Support:

Word and symbol markings on the pavement are used for the purpose of guiding, warning, or regulating traffic. Symbol messages are preferable to word messages. Examples of standard word and arrow pavement markings are shown in Figures 3B-20 and 3B-21.

Standard:

Word and symbol markings shall be white, except as otherwise noted in this Section.

Guidance:

Letters and numerals should be 2.4 m (8 ft) or more in height unless an engineering study indicates the need for 1.8 m (6 ft), the minimum acceptable height for paved and surface treated streets or paved highways. **DelDOT Rev.**

Word and symbol markings should not exceed three lines of information.

If a pavement marking word message consists of more than one line of information, it should read in the direction of travel. The first word of the message should be nearest to the road user.

Except for the two opposing arrows of a two-way left-turn lane marking (see Figure 3B-7), the longitudinal space between word or symbol message markings, including arrow markings, should be at least four times the height of the characters for low-speed roads, but not more than ten times the height of the characters under any conditions.

The number of different word and symbol markings used should be minimized to provide effective guidance and avoid misunderstanding.

Figure 3B-16. Example of Crosswalk Markings

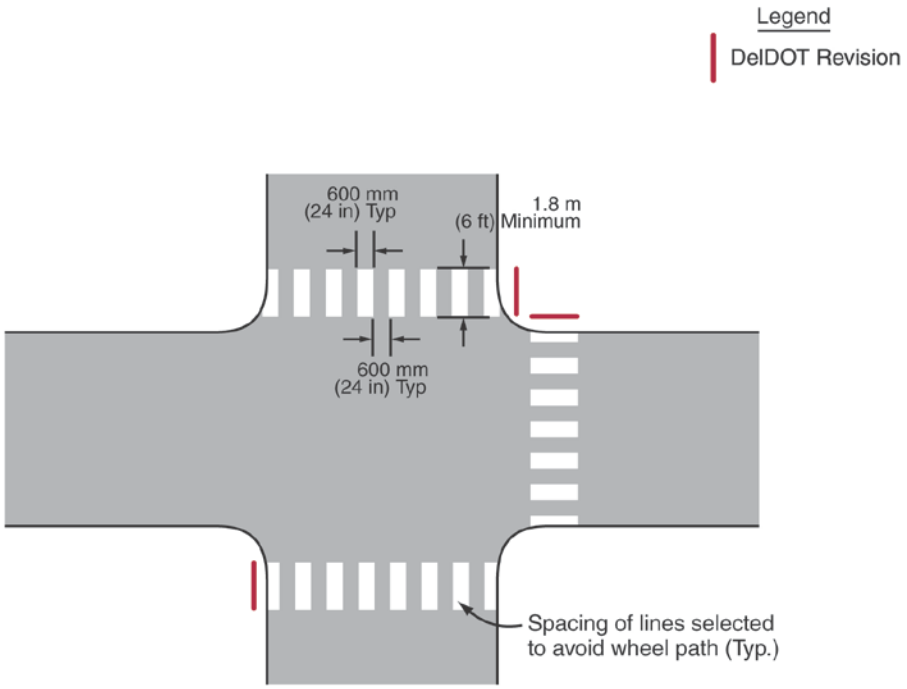
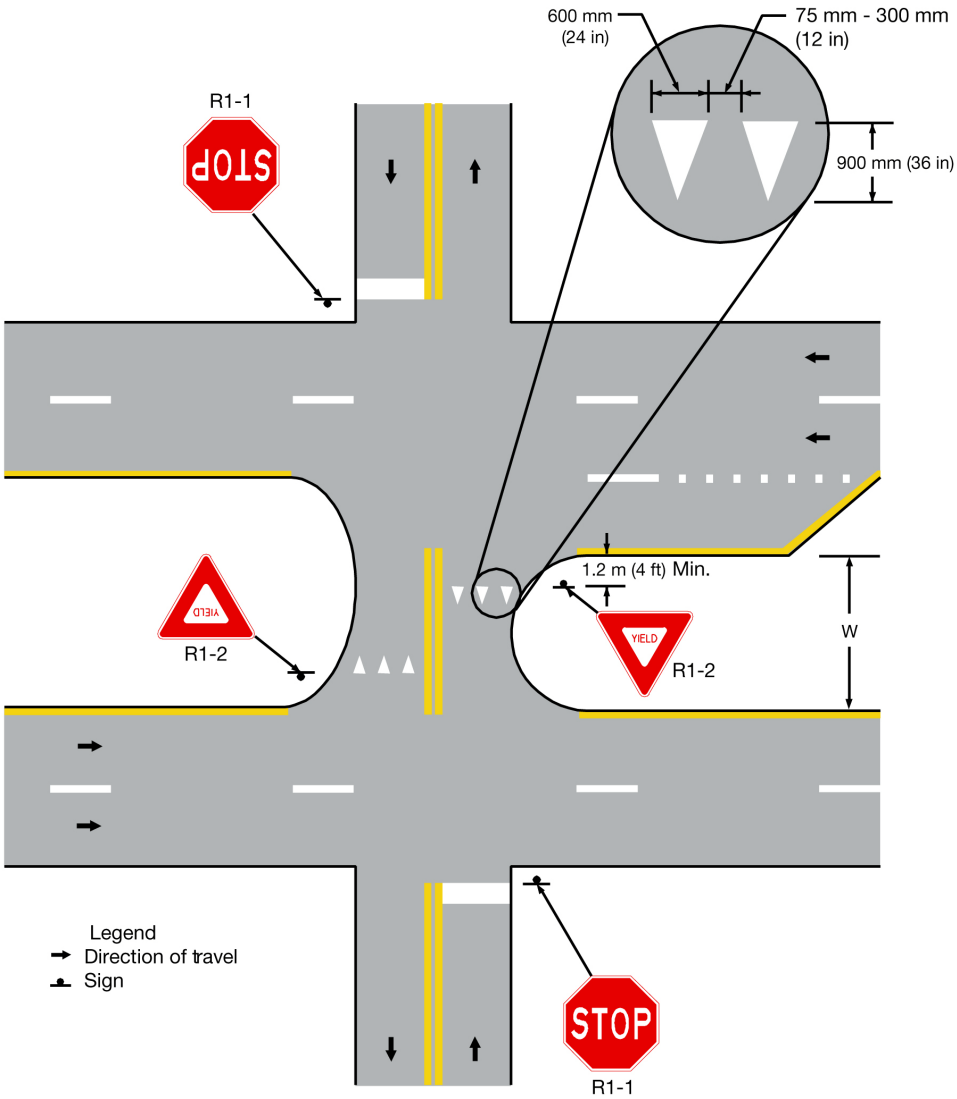


Figure 3B-16A. Examples of YIELD Sign at Second Roadway of Divided Highway Yield Lines
(DelDOT MUTCD Only)



Notes:
1. The Yield sign placement and location is based on:
   - Width of median opening, W ≥ 9 m (30 ft)
   - Turning radius
   - Storage length in median opening
2. Double yellow pavement markings should be placed in the median if W ≥ 15 m (50 ft). Engineering judgment should be used to determine whether double yellow pavement markings should be placed in the median if W ≥ 9 m (30 ft) and W < 15 m (50 ft).

Figure 3B-17. Example of Crosswalk Markings for Exclusive Pedestrian Phase That Permits Diagonal Crossing
(Not Applicable in Delaware)

Figure 3B-18. Examples of Parking Space Markings

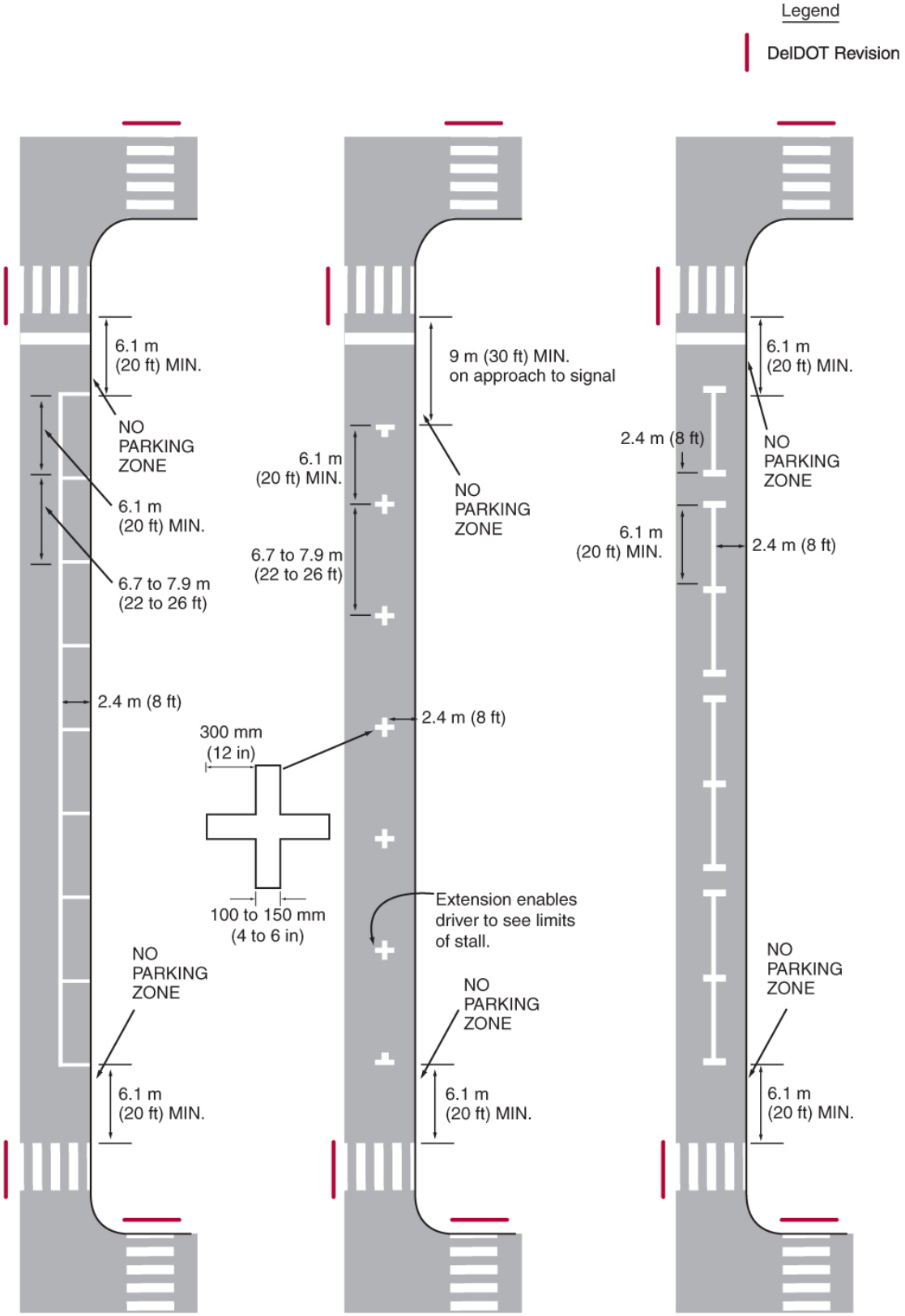
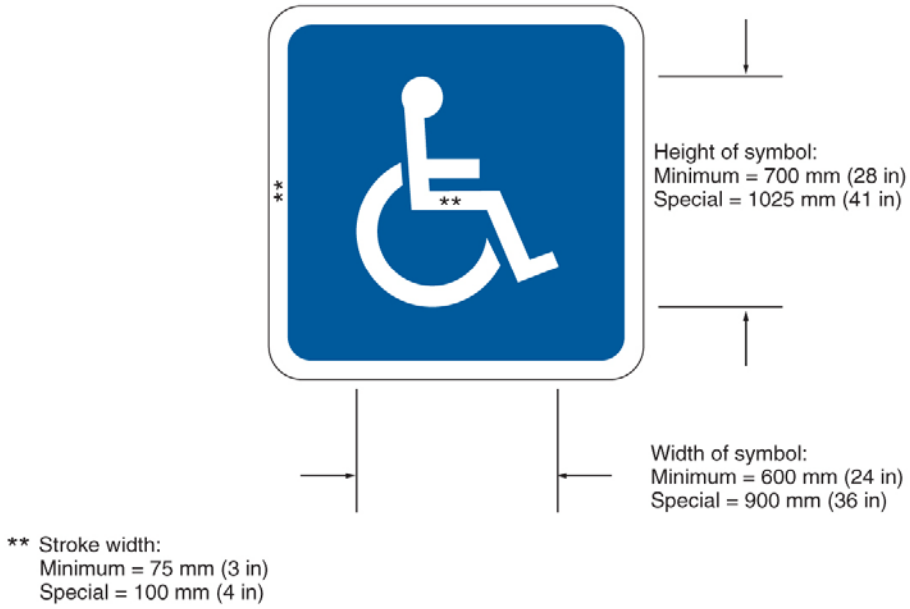


Figure 3B-19. International Symbol of Accessibility Parking Space Marking with Blue Background and White Border Options



Except as noted in the Option, pavement word and symbol markings should be no more than one lane in width.

Option:

The SCHOOL word marking may extend to the width of two approach lanes (see Section 7C.06).

Guidance:

When the SCHOOL word marking is extended to the width of two approach lanes, the characters should be 3 m (10 ft) or more in height (see Section 7C.06).

Pavement word and symbol markings should be proportionally scaled to fit within the width of the lane upon which they are applied. **DelDOT Rev.**

Option:

On narrow, low-speed shared-use paths, the pavement words and symbols may be smaller than suggested, but to the relative scale.

The International Symbol of Accessibility parking space markings may be placed in each parking space designated for use by persons with disabilities. A blue background with white border may supplement the wheelchair symbol as shown in Figure 3B-19.

Standard:

Where through traffic lanes approaching an intersection become mandatory turn lanes, word and arrow markings (see Figure 3B-21A) shall be used and shall be accompanied by standard signs to prevent entrapment and to help the road user select the appropriate lane in advance of reaching a queue of waiting vehicles. **DelDOT Rev.**

Lane use, lane reduction, and wrong-way arrow markings shall be designed as shown in Figure 3B-21.

Option:

Lane-use arrow markings (see Figures 3B-21 and 3B-21A) may be used to convey either guidance or mandatory messages. **DelDOT Rev.**

The ONLY word marking (see Figure 3B-20) may be used to supplement lane-use arrow markings at lane drops (see Figures 3B-21A and 3B-22) and are typically used only at lane drops. **DelDOT Rev.**

In situations where a lane reduction transition occurs, the lane reduction arrow markings shown in Figure 3B-21 may be used.

Guidance:

Where crossroad channelization or ramp geometrics do not make wrong-way movements difficult, a lane-use arrow should be placed in each lane of an exit ramp near the crossroad terminal where it will be clearly visible to a potential wrong-way road user (see Figure 3B-23).

Option:

The wrong-way arrow markings shown in Figure 3B-21 may be placed near the downstream terminus of a ramp as shown in Figures 3B-23 and 3B-24 to indicate the correct direction of traffic flow and to discourage drivers from traveling in the wrong direction.

A yield-ahead triangle symbol or YIELD AHEAD word pavement marking may be used on approaches to intersections where the approaching traffic will encounter a YIELD sign at the intersection (see Figure 3B-25).

Support:

Lane-use arrow markings are often used to provide guidance in turn bays (see Figures 3B-21B and 3B-22), where turns may or may not be mandatory, and in two-way left-turn lanes (see Figure 3B-7). **DelDOT Rev.**

Option:

Word and symbol markings may include, but are not limited to, the following. Other words or symbols may also be used under certain conditions.

A. Regulatory:
   1. STOP
   2. RIGHT (LEFT) TURN ONLY
   3. 40 km/h (25 MPH)
   4. Arrow Symbols
B. Warning:
   1. STOP AHEAD
   2. YIELD AHEAD
   3. YIELD AHEAD Triangle Symbol
   4. SCHOOL XING
   5. SIGNAL AHEAD
   6. PED XING
   7. SCHOOL
   8. R X R
   9. BUMP
   10. HUMP
C. Guide:
   1. US 40
   2. STATE 135
   3. ROUTE 40

Standard:

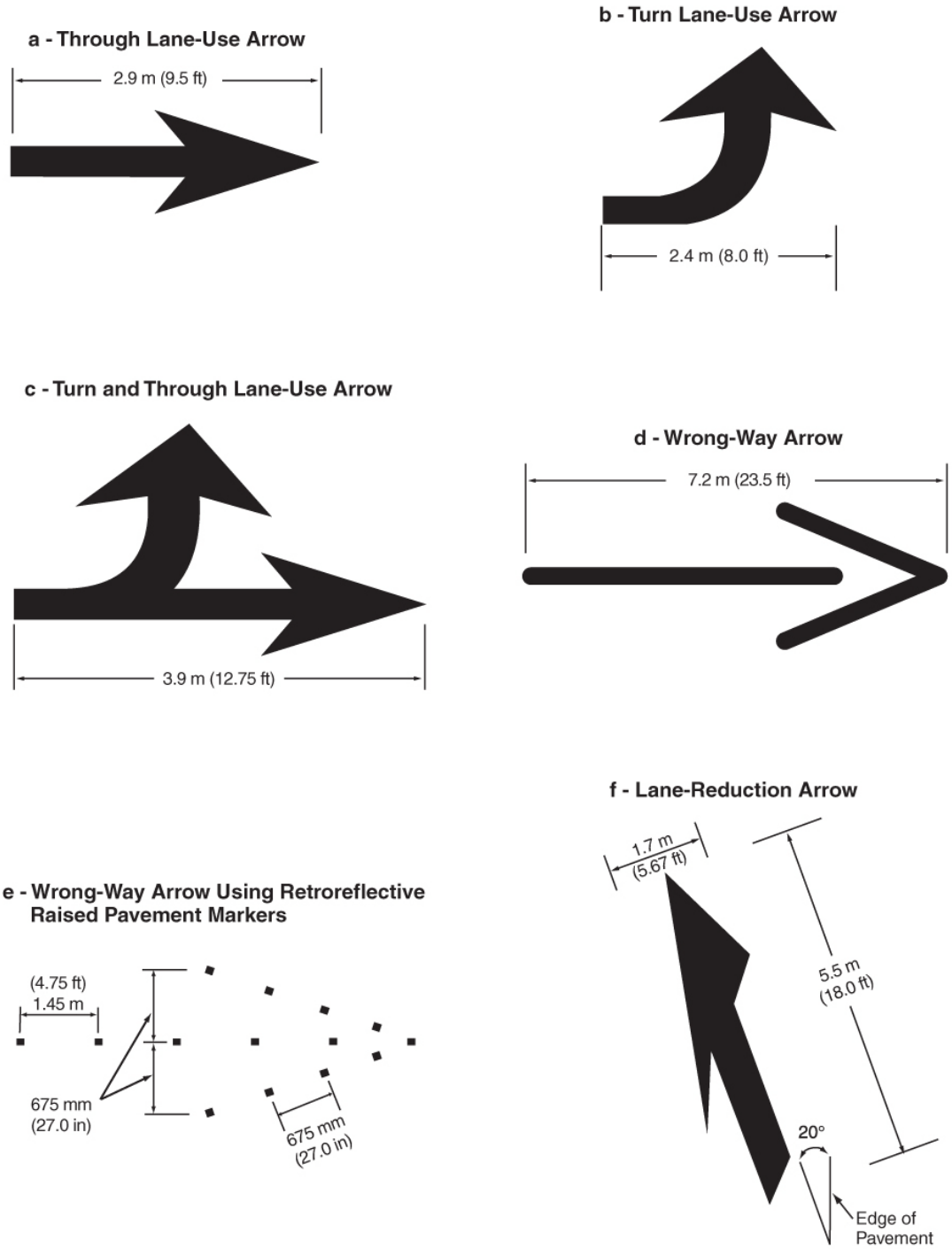
Except at the ends of aisles in parking lots, the word STOP shall not be used on the pavement unless accompanied by a stop line (see Section 3B.16) and STOP sign (see Section 2B.04). At the ends of aisles in parking lots, the word STOP shall not be used on the pavement unless accompanied by a stop line.

The word STOP shall not be placed on the pavement in advance of a stop line, unless every vehicle is required to stop at all times.

The yield-ahead triangle symbol or YIELD AHEAD word pavement marking shall not be used unless a YIELD sign (see Section 2B.08) is in place at the intersection. The yield-ahead symbol marking shall be as shown in Figure 3B-25.

Figure 3B-20. Example of Elongated Letters for Word Pavement Markings

Figure 3B-21. Examples of Standard Arrows for Pavement Markings



Typical sizes for normal installation; sizes may be reduced approximately one-third for low-speed urban conditions; larger sizes may be needed for freeways, above average speeds, and other critical locations. A narrow elongated arrow design is optional. For proper proportion, see the Pavement Markings chapter of the "Standard Highway Signs" book (see Section 1A.11).

Figure 3B-21A. Examples of Word and Arrow Pavement Markings used in Lane Drop Marking Applications
(DelDOT MUTCD Only)

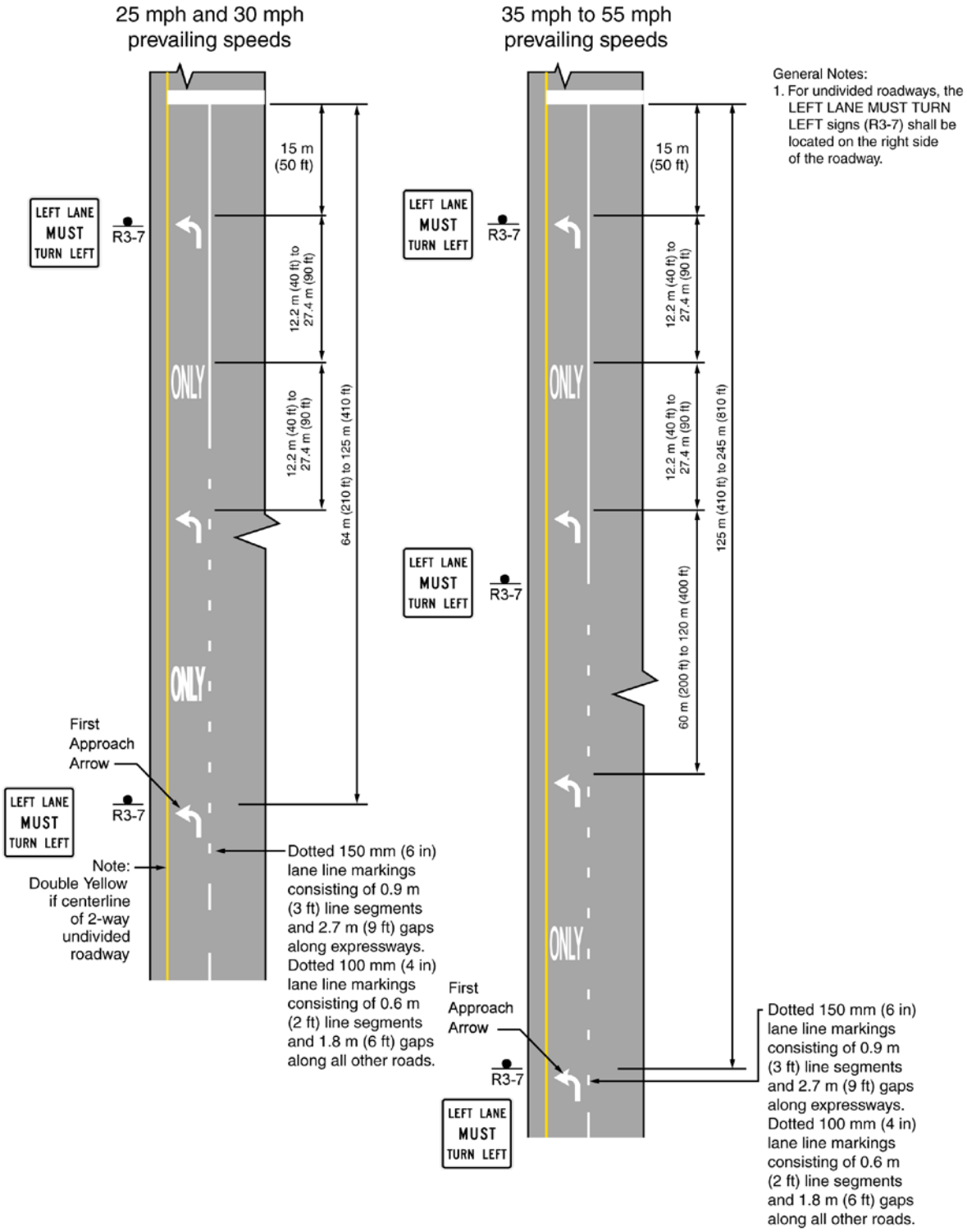
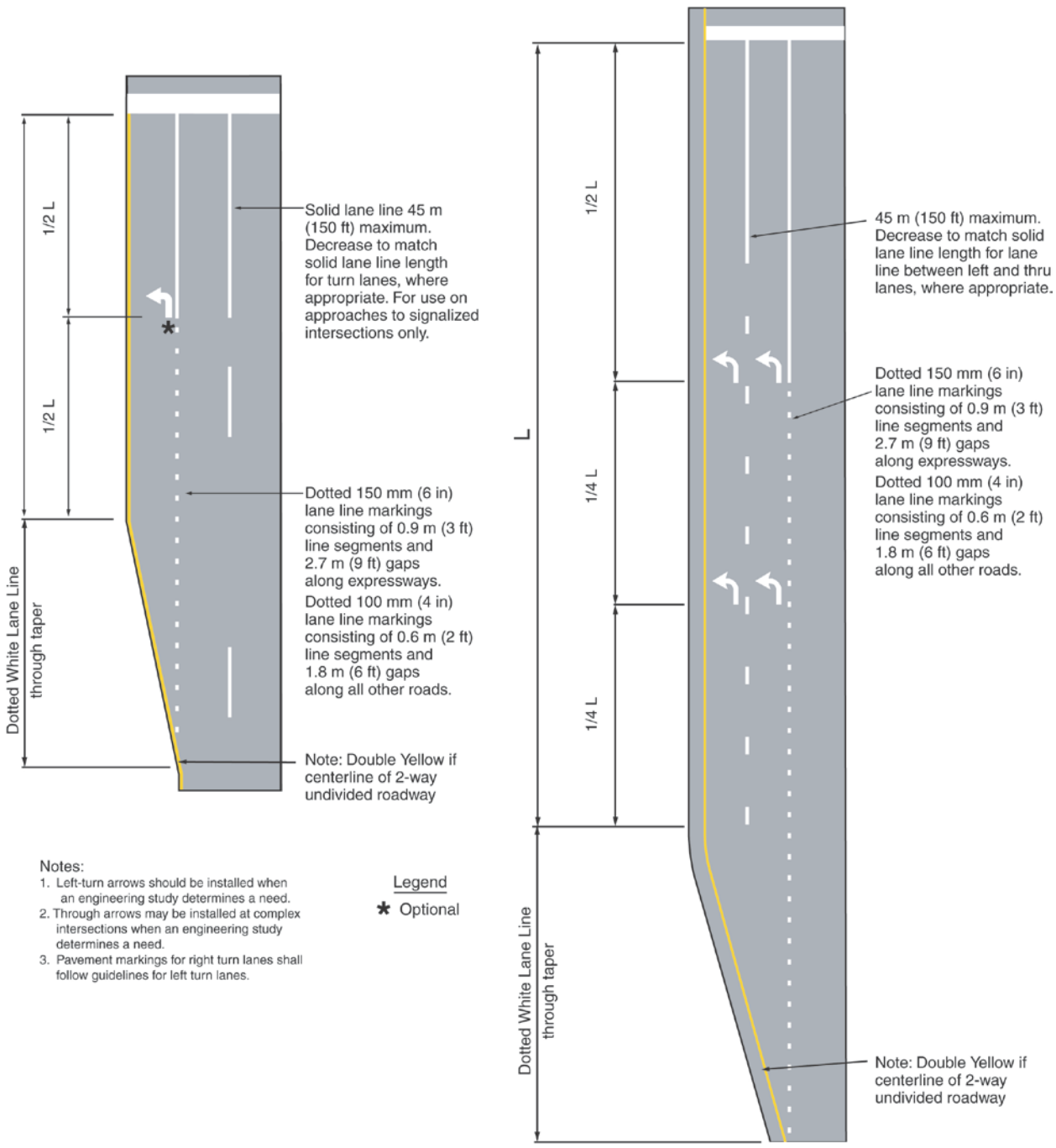


Figure 3B-21B. Example of Arrow Pavement Markings used in Turn Lane Applications
(DelDOT MUTCD Only)



Notes:
1. Left-turn arrows should be installed when an engineering study determines a need.
2. Through arrows may be installed at complex intersections when an engineering study determines a need.
3. Pavement markings for right turn lanes shall follow guidelines for left turn lanes.

Legend
* Optional

Figure 3B-22. Example of Lane Use Control Word and Symbol Markings

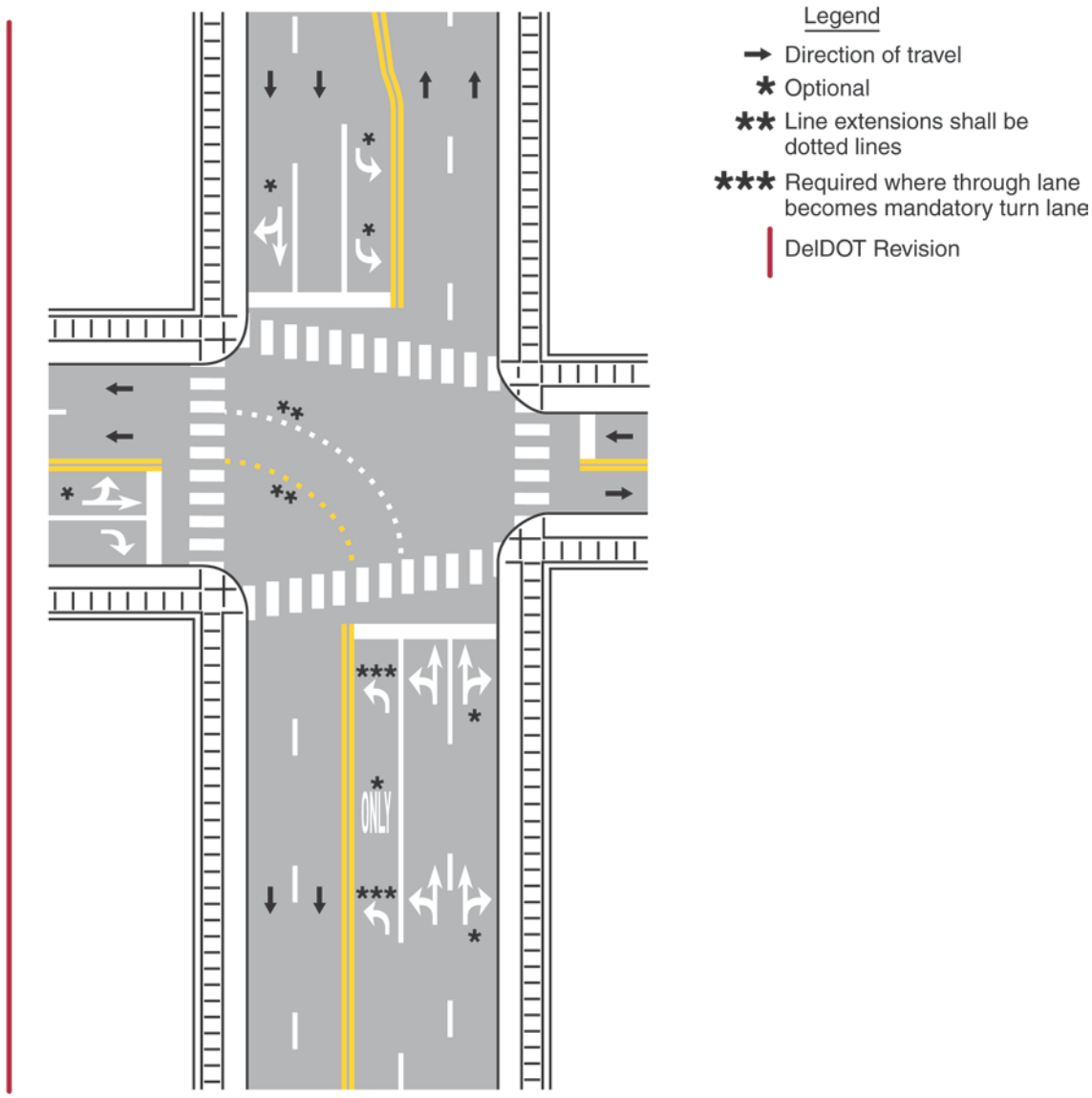


Figure 3B-23. Example of Arrow Markings at Exit Ramp Terminals

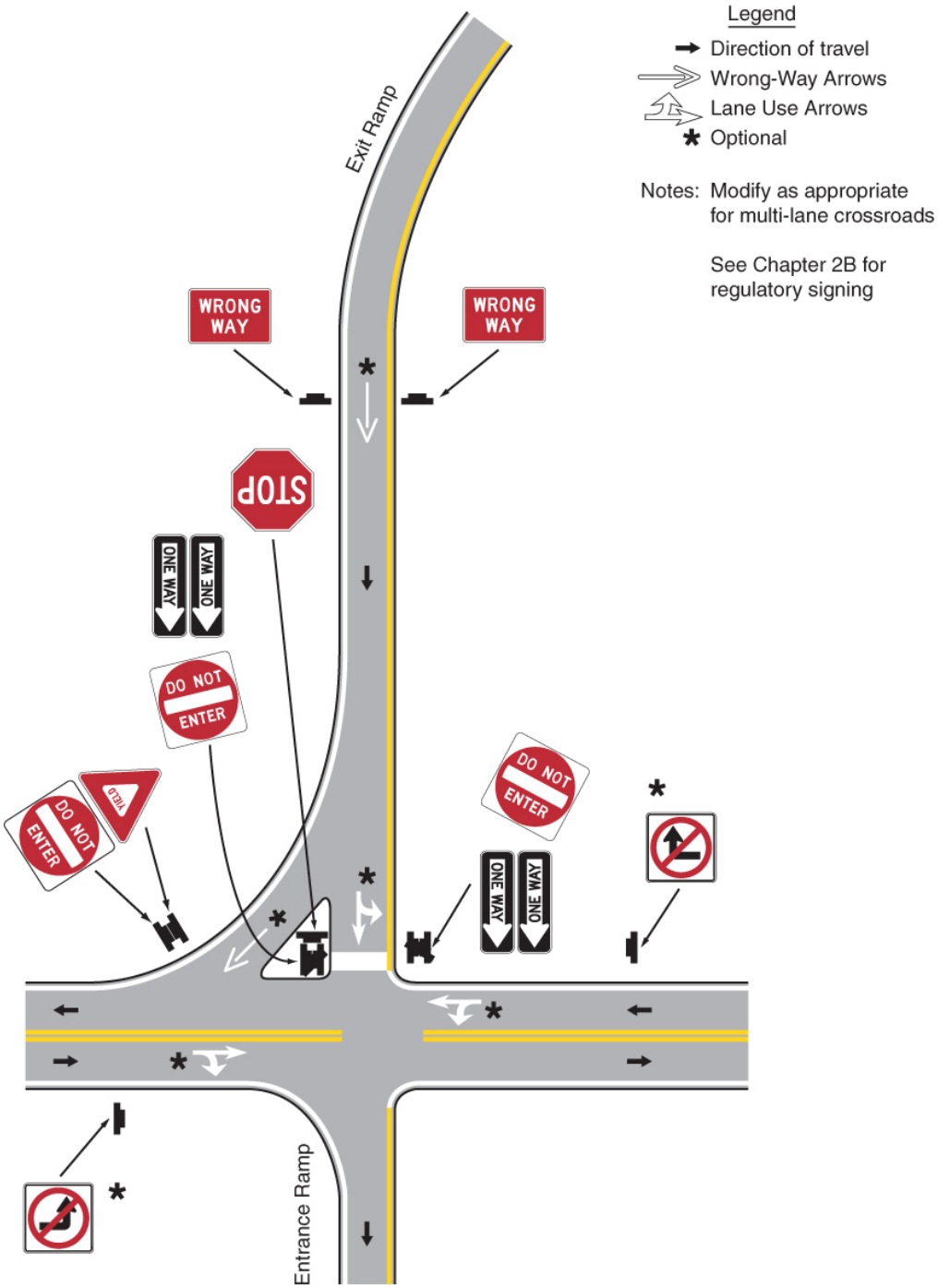


Figure 3B-24. Example of Arrow Markings at Entrance Ramp Terminals

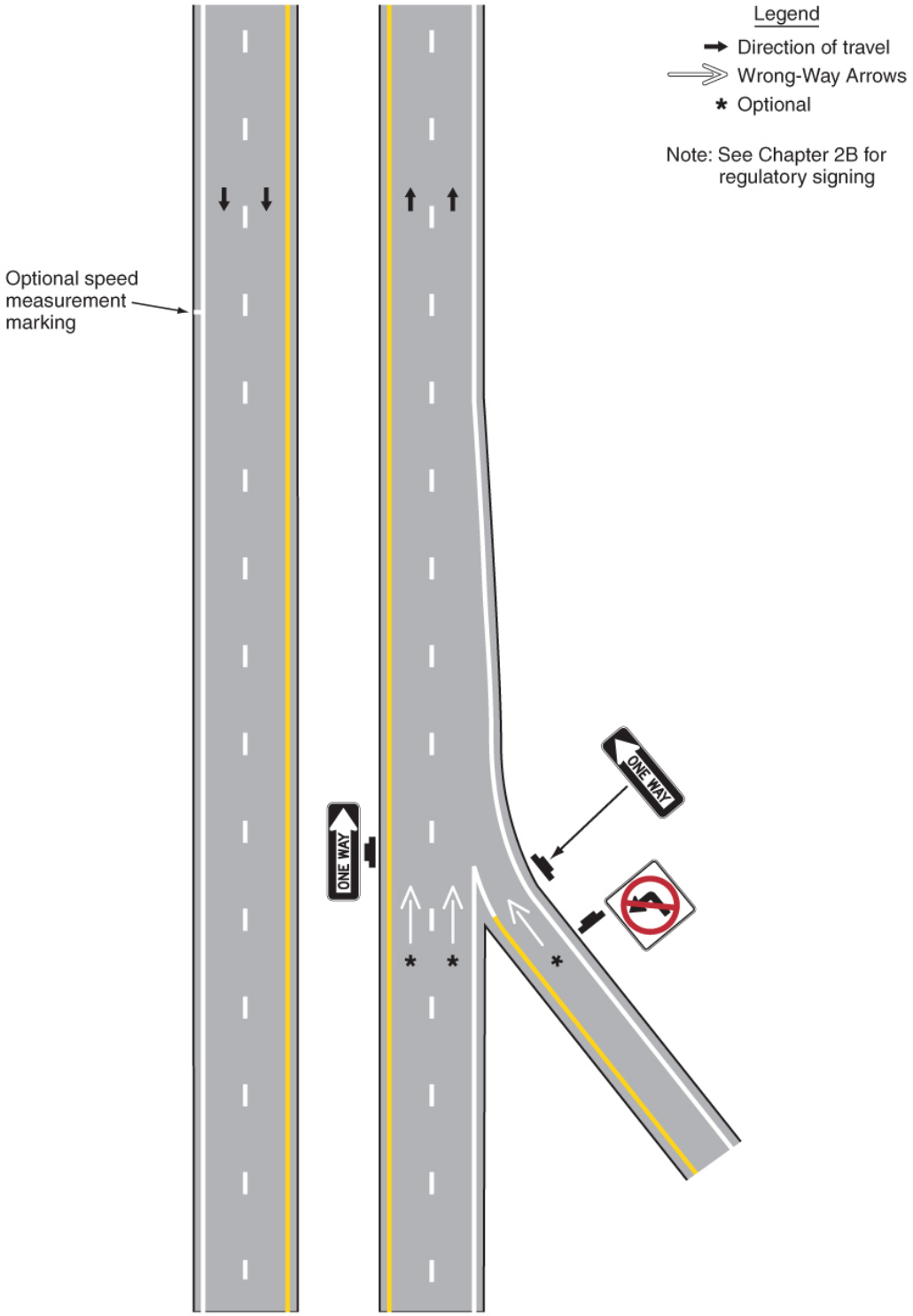
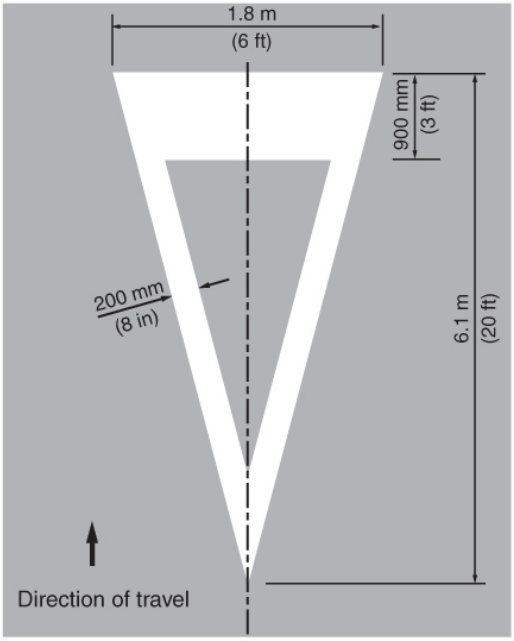
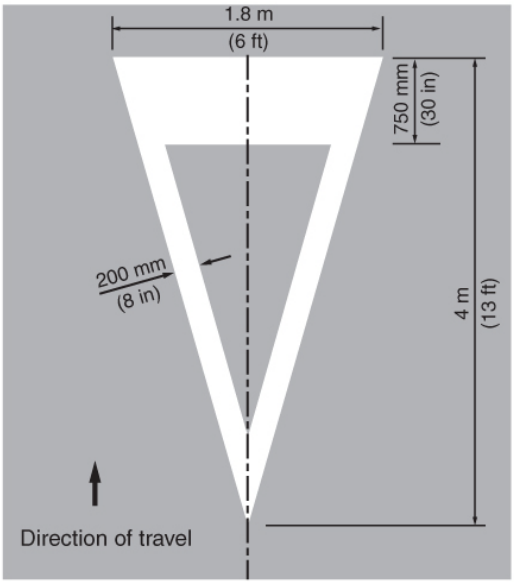


Figure 3B-25. Examples of Yield Ahead Triangle Symbols

a - Posted or Statutory Speed Limit 70 km/h (45 mph) or greater



b - Posted or Statutory Speed Limit less than 70 km/h (45 mph)



Section 3B.20 Speed Measurement Markings

Support:

A speed measurement marking is a transverse marking placed on the roadway to assist the enforcement of speed regulations.

Standard:

Speed measurement markings, if used, shall be white, and shall not be greater than 600 mm (24 in) in width.

Option:

Speed measurement markings may extend 600 mm (24 in) on either side of the centerline or 600 mm (24 in) on either side of edge line markings at 400 m (0.25 mi) intervals over a 1.6 km (1 mi) length of roadway. When paved shoulders of sufficient width are available, the speed measurements markings may be placed entirely on these shoulders. Advisory signs may be used in conjunction with these markings (see Figure 3B-10).

Section 3B.21 Curb Markings

Support:

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

Standard:

Signs shall be used with curb markings in those areas where curb markings are frequently obliterated by snow and ice accumulation unless the no parking zone is controlled by statute or local ordinance.

Where curbs are marked, the colors shall conform to the general principles of markings (see Section 3A.04).

Guidance:

Except as noted in the Option, 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:

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, driveway, fire hydrant, or crosswalk.

Guidance:

Retroreflective solid yellow markings should be placed on the noses 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.

Retroreflective solid white markings should be used when traffic may pass on either side of the island (see Figure 3B-13). **DelDOT Rev.**

Option:

Local highway agencies may prescribe special colors for curb markings to supplement standard signs for parking regulation.

Support:

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.39 through 2B.41).

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.

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

Section 3B.22 Preferential Lane Word and Symbol Markings

Standard:

When a lane is assigned full or part time to a particular class or classes of vehicles, preferential lane markings shall be used.

Signs or signals shall be used with preferential lane word or symbol markings.

All preferential lane word and symbol markings shall be white.

All preferential lane word and symbol markings shall be positioned laterally in the center of the preferred-use lane.

Standard:

Where a preferential lane use is established, the preferential lane shall be marked with one or more of the following symbol or word markings for the preferential lane use specified:

A. Bicycle lane—the preferential lane use marking for a bicycle lane shall consist of a bicycle symbol (see Chapter 9C and Figures 9C-1 and 9C-3 through 9C-6).

B. Other preferential lane use markings (i.e. EZPass Dedicated lanes) shall be identified in accordance with Section 3B.23.

DelDOT Rev.

If two or more preferential lane uses are permitted in a single lane, the symbol or word marking for each preferential lane use shall be installed.

Guidance:

Engineering judgment should determine the need for supplemental devices such as tubular markers, traffic cones, or flashing lights.

Support:

The spacing of the markings is an engineering judgment that is based on the prevailing speed, block lengths, distance from intersections, and other factors that affect clear communication to the road user. Markings spaced as close as 24 m (80 ft) apart might be appropriate on City streets, while markings spaced 300 m (1,000 ft) might be appropriate for freeways.

DelDOT Rev.

Section 3B.23 Preferential Lane Longitudinal Markings for Motor Vehicles

Standard:

Preferential lane longitudinal markings for motor vehicles shall be marked with the appropriate word or symbol pavement markings in accordance with Section 3B.22.

Support:

Preferential lanes can take many forms depending on the level of usage and the design of the facility. They might be physically separated from the other travel lanes by a barrier, median, or painted neutral area, or they might be concurrent with other travel lanes and be separated only by longitudinal pavement markings. Further, physically separated preferential lanes might operate in the same direction or be reversible.

Option:

Preferential lanes may be operated either full-time (24 hours per day on all days), for extended periods of the day, or part-time (restricted usage during specific hours on specified days).

Standard:

The following four items are presented in tabular form in Table 3B-2:

A. Physically separated, nonreversible preferential lane—the longitudinal pavement markings for preferential lanes that are physically separated from the other travel lanes by a barrier, median, or painted neutral area shall consist of a single normal solid yellow line at the left edge of the travel lane(s), a single normal solid white line at the right edge of the travel lane(s), and if there are two or more preferential lanes, the preferential travel lanes shall be separated with a normal broken white line (see Figure 3B-26a).

B. Physically separated, reversible preferential lane—the longitudinal pavement markings for reversible preferential lanes that are physically separated from the other travel lanes by a

barrier, median, or painted neutral area shall consist of a single normal solid white line at both edges of the travel lane(s), and if there are two or more preferential lanes, the preferential travel lanes shall be separated with a normal broken white line (see Figure 3B-26a).

C. Concurrent flow (left side) preferential lane—the longitudinal pavement markings for a full-time or part-time preferential lane on the left side of the other traveled lanes shall consist of a single normal solid yellow line at the left edge of the preferential travel lane(s) and one of the following at the right edge of the preferential travel lane(s):

1. A double solid wide white line where crossing is prohibited (see Figure 3B-26b).
2. A single solid wide white line where crossing is discouraged (see Figure 3B-26c).
3. A single broken wide white line where crossing is permitted (see Figure 3B-26d).

If there are two or more preferential lanes, the preferential travel lanes shall be separated with a normal broken white line.

D. Concurrent flow (right side) preferential lane (see Figure 3B-26e)—the longitudinal pavement markings for a full-time or part-time preferential lane on the right of the other travel lanes shall consist of a single normal solid white line at the right edge of the preferential travel lane(s) if warranted and one of the following at the left edge of the preferential travel lane(s):

1. A double solid wide white line where crossing is prohibited.
2. A single solid wide white line where crossing is discouraged.
3. A single broken wide white line where crossing is permitted.
4. A single dotted normal white line where crossing is permitted for any vehicle to perform a right turn maneuver.

DelDOT Rev.

If there are two or more preferential lanes, the preferential travel lanes shall be separated with a normal broken white line.

Guidance:

When concurrent flow preferential lanes and other travel lanes are separated by more than 1.2 m (4 ft), chevron markings should be placed in the neutral area. The chevron spacing should be 30 m (100 ft) or greater.

Option:

For full-time or part-time concurrent flow preferential lanes, the spacing or skip pattern of the single broken wide white line may be reduced. The width of the single broken wide white line may be increased.

Section 3B.24 Markings for Roundabout Intersections

Support:

Roundabout intersections are distinctive circular roadways that have the following three critical characteristics:

A. A requirement to yield at entry which gives a vehicle on the circular roadway the right-of-way;
B. A deflection of the approaching vehicle around the central island; and
C. A flare or widening of the approach to allow for proper operation as needed.

Examples of markings for roundabout intersections are shown in Figures 3B-27 and 3B-28.

Option:

A yellow edge line may be placed around the inner (left) edge of the circular roadway.

Table 3B-2 Standard Edge Line Markings for Preferential Lanes

Type of Preferential Lane	Left Edge Line	Right Edge Line
Physically Separated, Nonreversible	A single normal solid yellow line	A single normal solid white line
Physically Separated, Reversible	A single normal solid white line	A single normal solid white line
Concurrent Flow – Left Side	A single normal solid yellow line	A double solid wide white line where crossing is prohibited (see Figure 3B-26b) A single solid wide white line where crossing is discouraged (see Figure 3B-26c) A single broken wide white line where crossing is permitted (see Figure 3B-26d)
Concurrent Flow – Right Side	A double solid wide white line where crossing is prohibited (see Figure 3B-26e) A single solid wide white line where crossing is discouraged (see Figure 3B-26e) A single broken wide white line where crossing is permitted (see Figure 3B-26e) A single dotted normal white line where crossing is permitted for any vehicle to perform a right-turn maneuver (see Figure 3B-26e)	A single normal solid white line

Figure 3B-26. Examples of Markings for Preferential Lanes
(Sheet 1 of 2)

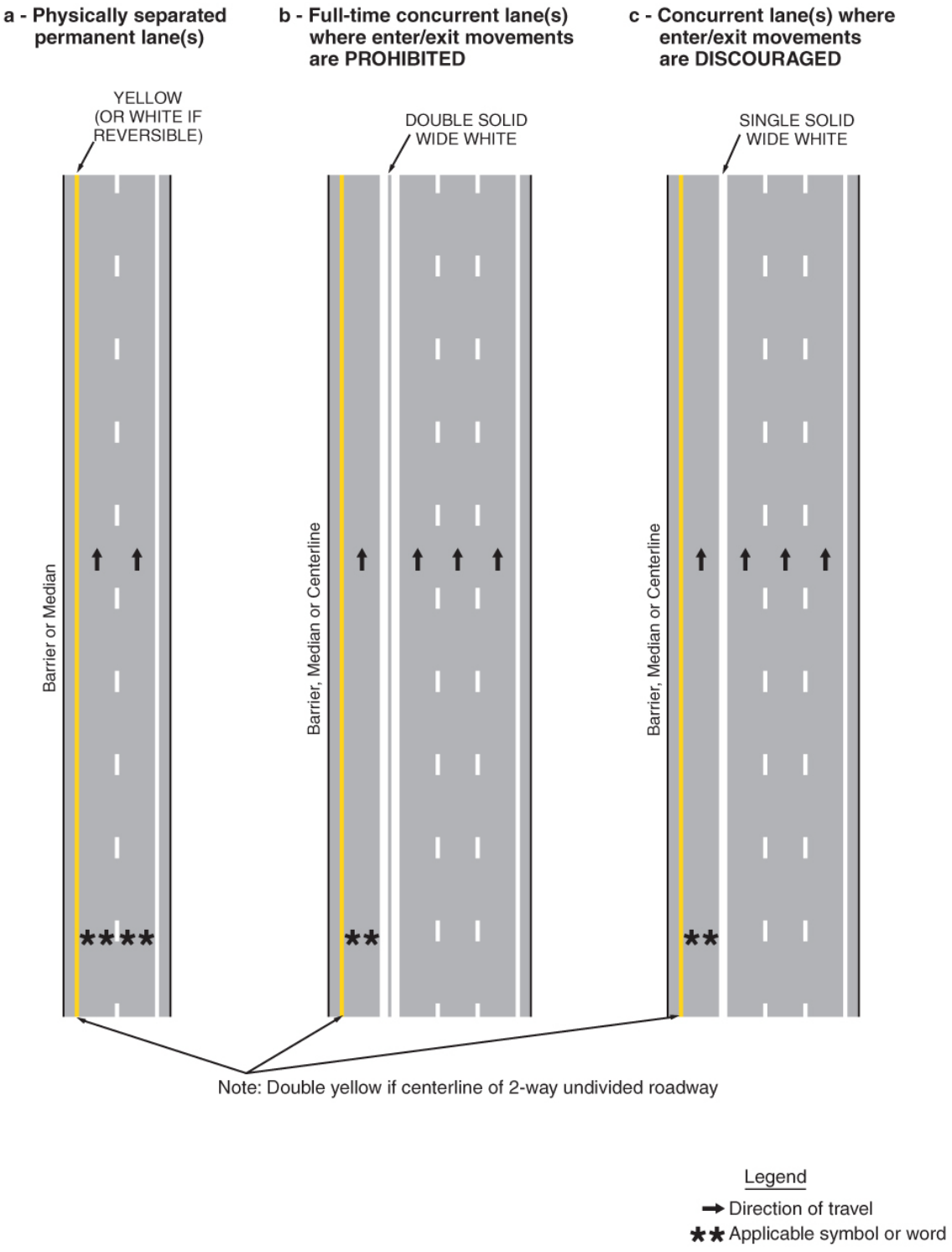
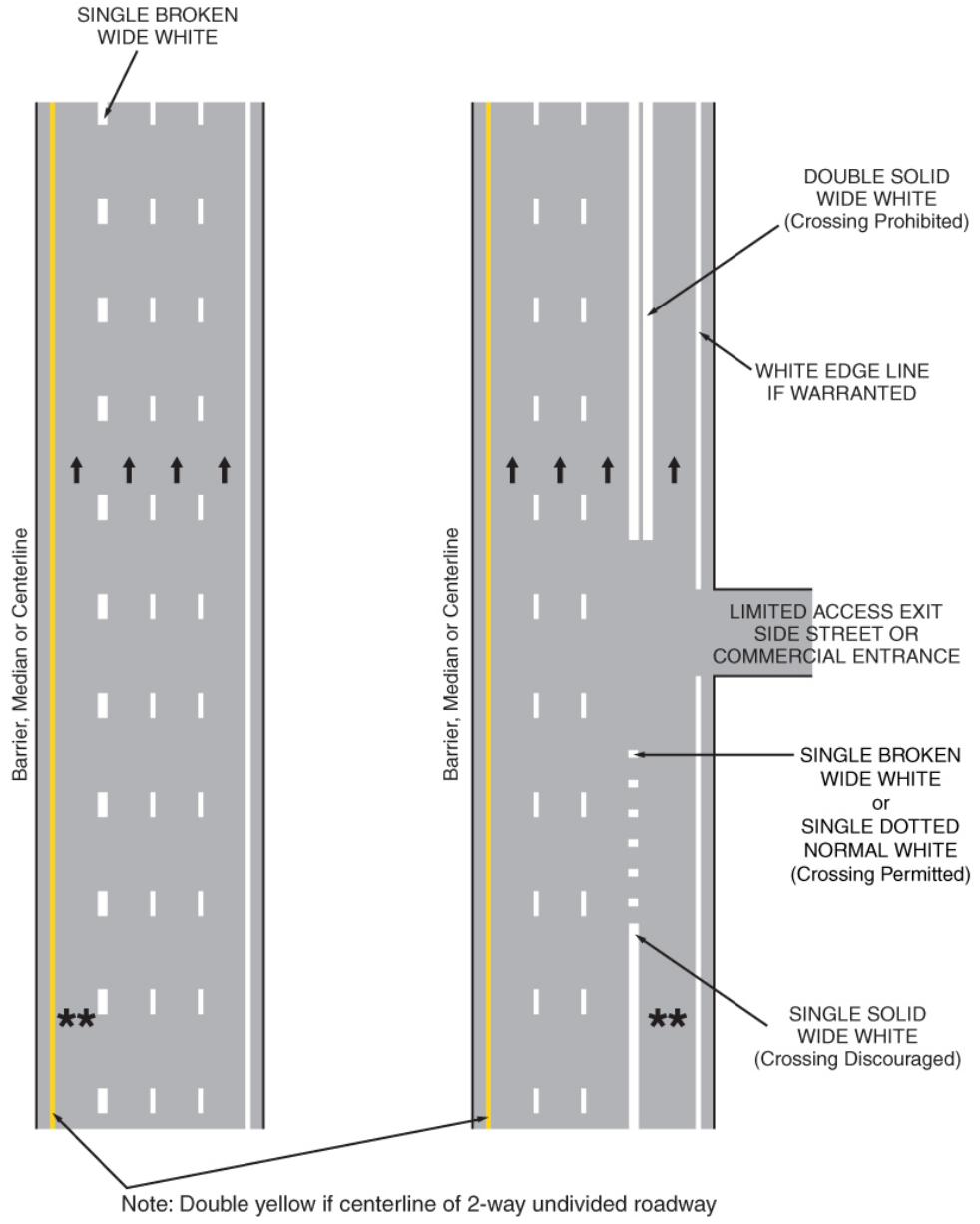


Figure 3B-26. Examples of Markings for Preferential Lanes
(Sheet 2 of 2)

d - Full-time concurrent lane(s) where enter/exit movements are PERMITTED

e - Right Side Concurrent Lane(s)



Legend

→ Direction of travel

** Applicable symbol or word

Guidance:

A white line should be used on the outer (right) side of the circular roadway as follows: a solid line along the splitter island and a dotted line across the lane(s) entering the roundabout intersection.

Edge line extensions should not be placed across the exits from the circular roadway.

Where crosswalk markings are used, these markings should be located a minimum of 7.6 m (25 ft) upstream from the yield line, or, if none, from the dotted white line.

For complex roundabouts, DelDOT's Traffic Division should be contacted for additional guidance. **DelDOT Rev.**

Option:

Lane lines may be used on the circular roadway if there is more than one lane.

Standard:

A yield line (see Section 3B.16) shall be used to indicate the point behind which vehicles are required to yield at the entrance to a roundabout intersection. **DelDOT Rev.**

Bicycle lane markings shall not be provided on the circular roadway of a roundabout intersection.

Section 3B.25 Markings for Other Circular Intersections

Support:

Other circular intersections include but are not limited to rotaries, traffic circles, and residential traffic calming designs.

Option:

The markings shown in Figures 3B-27 and 3B-28 may be used at other circular intersections when engineering judgment indicates that their presence will benefit drivers or pedestrians.

Section 3B.26 Speed Hump Markings

Standard:

If used, speed hump markings shall be a series of white markings placed on a speed hump to identify its location.

Option:

Speed humps, except those used for crosswalks, may be marked in accordance with Figure 3B-29. The markings shown in Figure 3B-30 may be used where the speed hump also functions as a crosswalk or speed table.

Section 3B.27 Advance Speed Hump Markings

Standard:

If used, advance speed hump markings shall be a special white marking placed in advance of speed humps or other engineered vertical roadway deflections such as dips.

Option:

Advance speed hump markings may be used in advance of an engineered vertical roadway deflection where added visibility is desired or where such deflection is not expected (see Figure 3B-31).

Advance pavement wording such as BUMP or HUMP (see Section 3B.19) 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 conformance with Section 2C.24.

Guidance:

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

Figure 3B-27. Examples of Markings for Roundabout Intersections with One-Lane Approaches

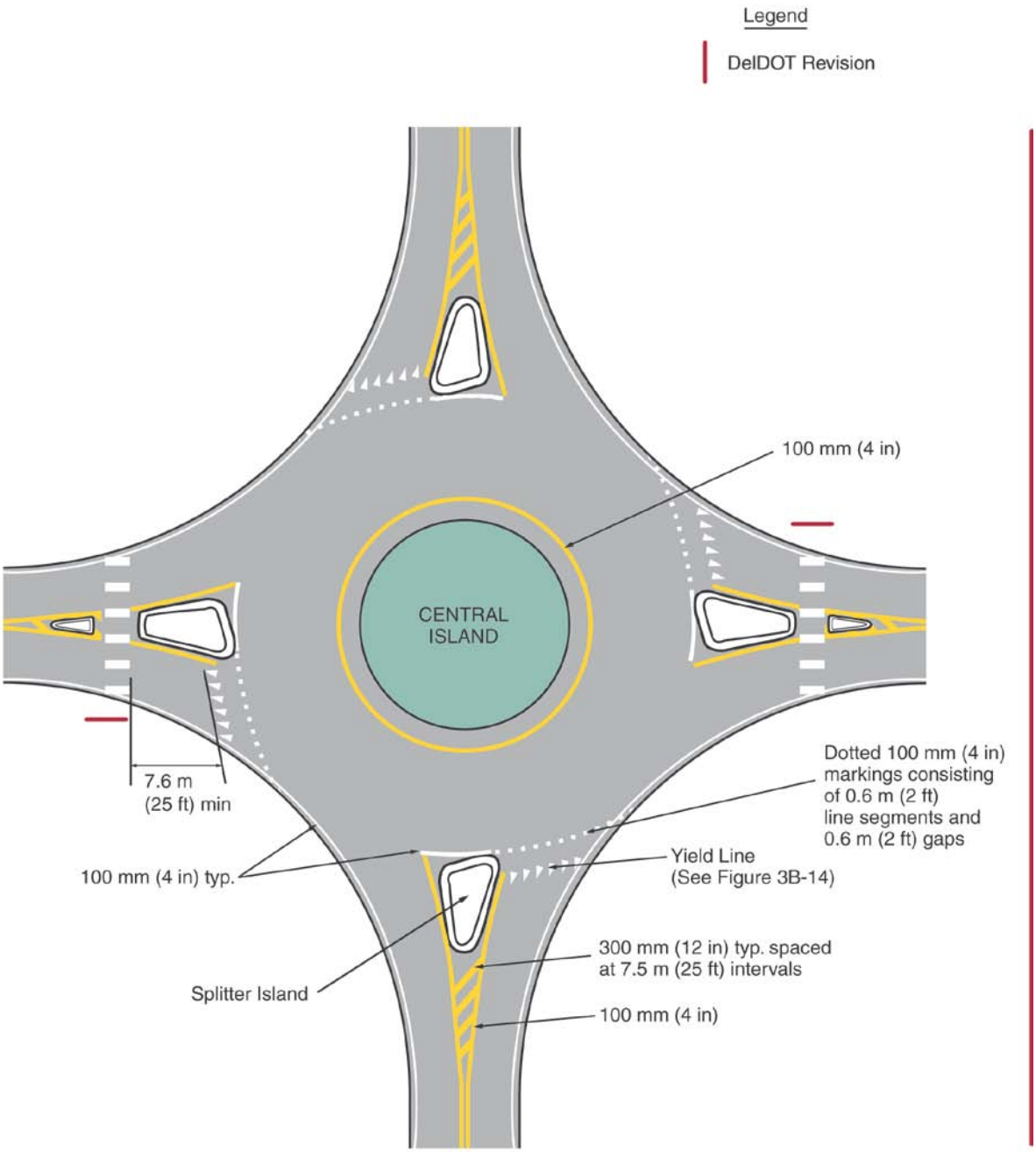


Figure 3B-28. Examples of Markings for Roundabout Intersections with Two-Lane Approaches

Legend

DelDOT Revision

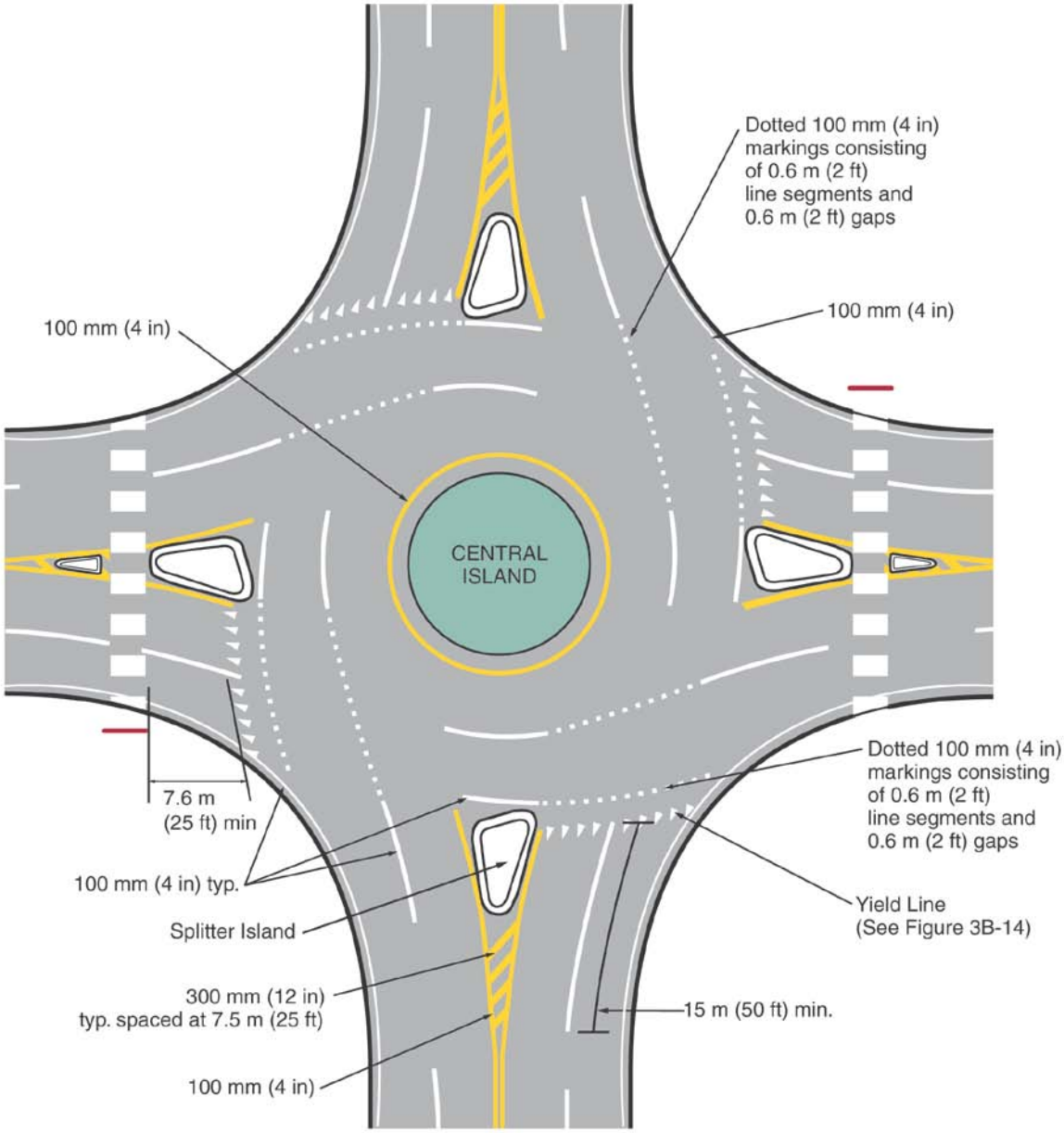
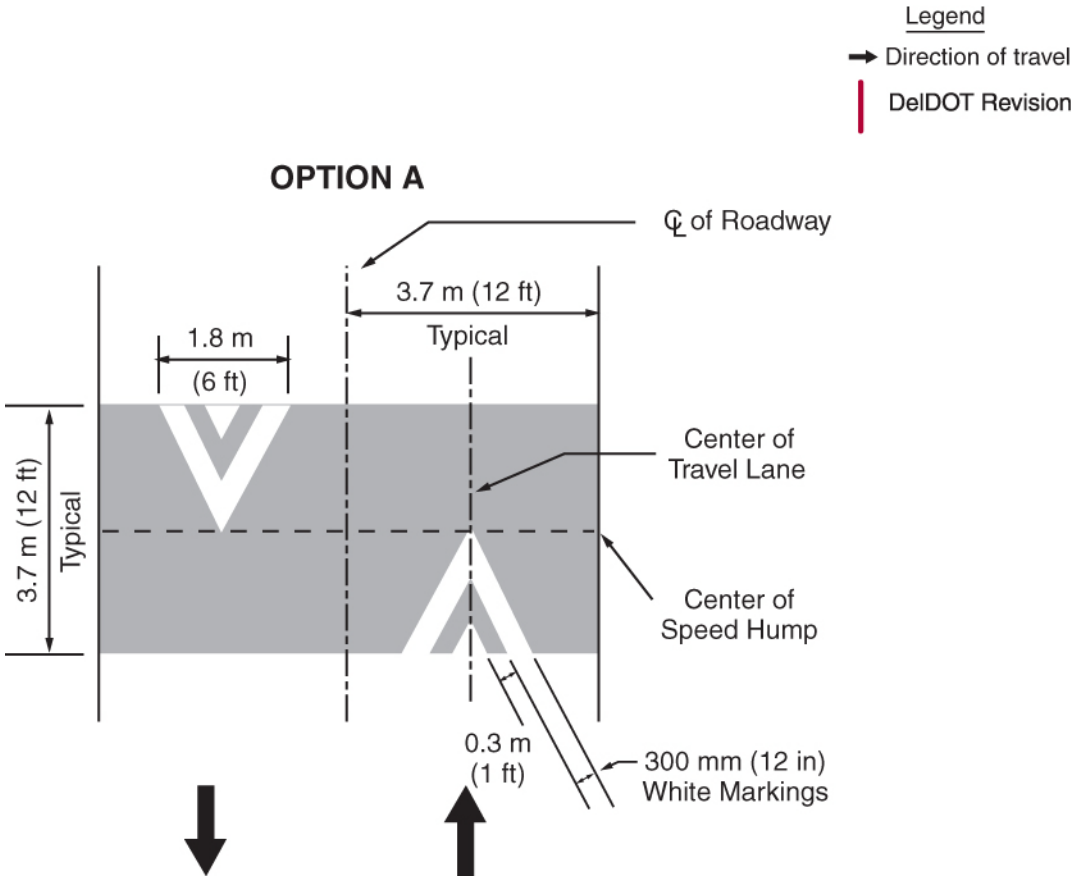


Figure 3B-29. Example of Pavement Markings for Speed Humps Without Crosswalks



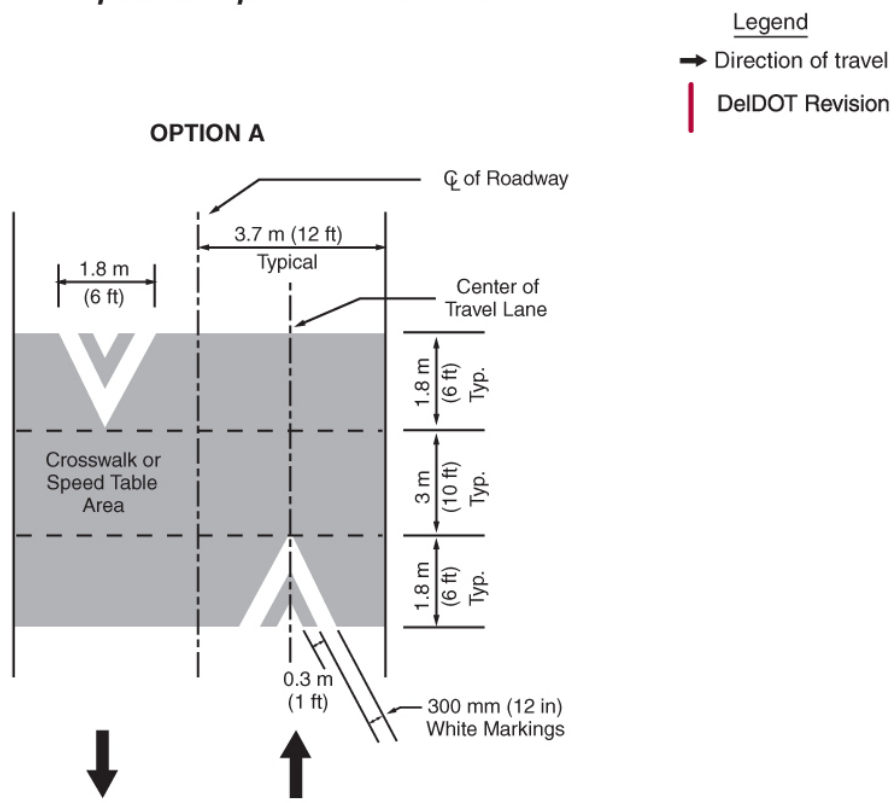
OPTION B

NOT APPLICABLE IN DELAWARE

OPTION C

NOT APPLICABLE IN DELAWARE

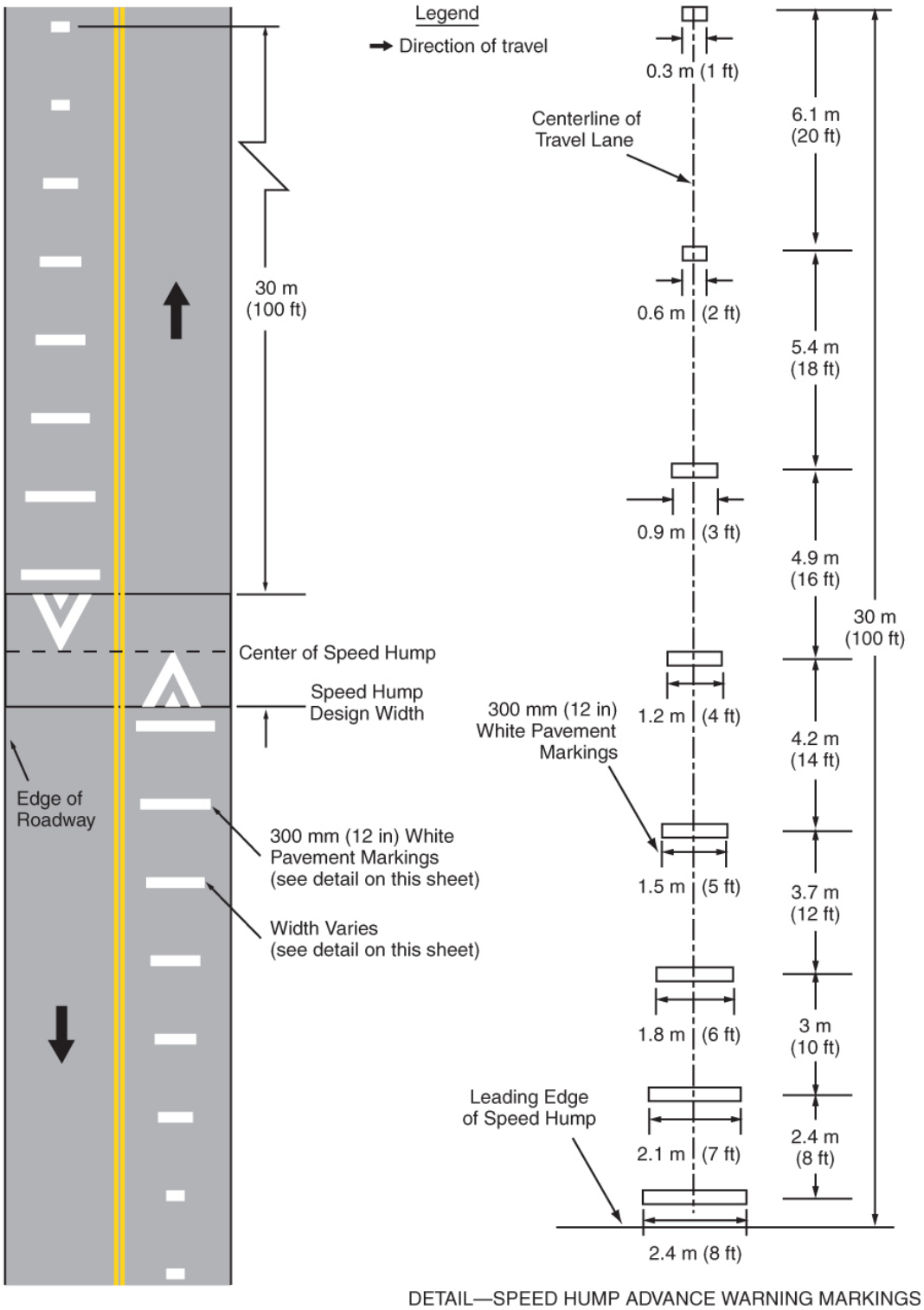
Figure 3B-30. Example of Pavement Markings for Speed Tables or Speed Humps with Crosswalks



OPTION B

NOT APPLICABLE IN DELAWARE

Figure 3B-31. Example of Advance Warning Markings for Speed Humps



DETAIL—SPEED HUMP ADVANCE WARNING MARKINGS

CHAPTER 3C. OBJECT MARKERS

Section 3C.01 Object Marker Design and Placement Height

Support:

Object markers are used to mark obstructions within or adjacent to the roadway.

Standard:

When used, object markers (see Figure 3C-1) shall consist of an arrangement of one or more of the following types:

Type 1—an all-yellow retroreflective diamond panel (OM1-3) 450 mm (18 in) or more on a side.

Type 2—an all-yellow horizontal or vertical retroreflective panel (OM2-2V or OM2-2H), measuring at least 150 x 300 mm (6 x 12 in). DelDOT Rev.

Type 3—a striped marker, 300 x 900 mm (12 x 36 in), consisting of a vertical rectangle with alternating black and retroreflective yellow stripes sloping downward at an angle of 45 degrees toward the side of the obstruction on which traffic is to pass. The minimum width of the yellow and black stripes shall be 75 mm (3 in).

Support:

A better appearance can be achieved if the black stripes are wider than the yellow stripes.

Type 3 object markers with stripes that begin at the upper right side and slope downward to the lower left side are designated as right object markers (OM-3R or OM-3R-DE). Object markers with stripes that begin at the upper left side and slope downward to the lower right side are designated as left object markers (OM-3L or OM-3L-DE). DelDOT Rev.

Guidance:

When used for marking objects in the roadway or objects that are 2.4 m (8 ft) or less from the shoulder or curb, the mounting height to the bottom of the object marker should be at least 1.2 m (4 ft) above the surface of the nearest traffic lane.

When used to mark objects more than 2.4 m (8 ft) from the shoulder or curb, the mounting height to the bottom of the object marker should be at least 1.2 m (4 ft) above the ground.

Option:

When object markers or markings are applied to an object that by its nature requires a lower or higher mounting, the vertical mounting height may vary according to need.

Section 3C.02 Markings for Objects in the Roadway

Standard:

Obstructions within the roadway shall be marked with a Type 1 or Type 3 object marker. In addition to markers on the face of the obstruction, warning of approach to the obstruction shall be given by appropriate pavement markings (see Section 3B.10).

Option:

To provide additional emphasis, large surfaces such as bridge piers may be painted with diagonal stripes, 300 mm (12 in) or greater in width, similar in design to the Type 3 object marker.

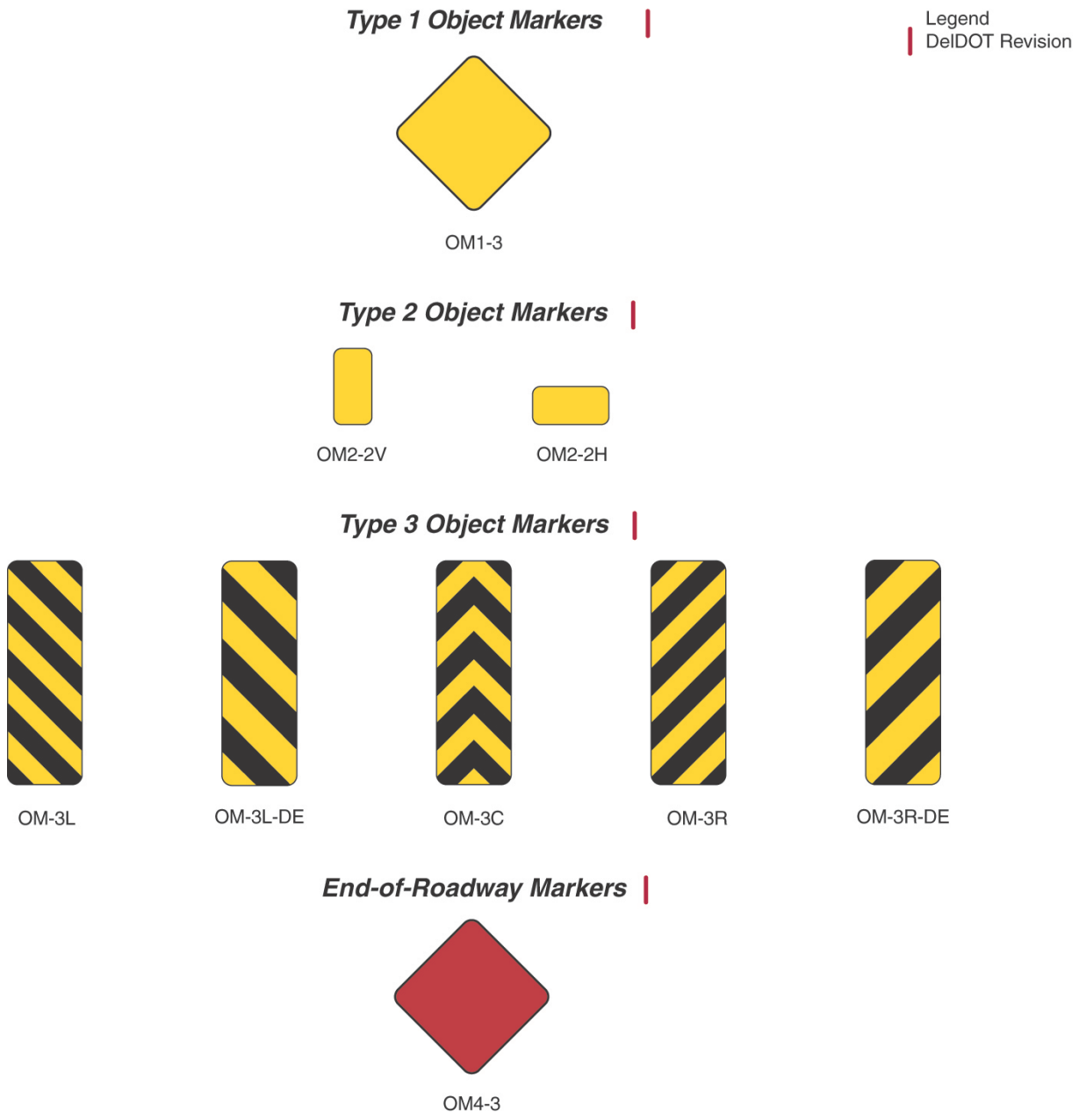
Standard:

The alternating black and retroreflective yellow stripes (OM-3L, OM-3L-DE, OM-3R, OM-3R-DE) shall be sloped down at an angle of 45 degrees toward the side on which traffic is to pass the obstruction. If traffic can pass to either side of the obstruction, the alternating black and retroreflective yellow stripes (OM-3C) shall form chevrons that point upwards. DelDOT Rev.

Option:

Appropriate signs (see Sections 2B.33 and 2C.20) directing traffic to one or both sides of the obstruction may be used instead of the object marker.

Figure 3C-1. Object Markers and End-of-Roadway Markers



Section 3C.03 Markings for Objects Adjacent to the Roadway

Support:

Objects not actually in the roadway are sometimes so close to the edge of the road that they need a marker. These include underpass piers, bridge abutments, handrails, and culvert headwalls. In other cases there might not be a physical object involved, but other roadside conditions exist, such as narrow shoulders, drop-offs, gores, small islands, and abrupt changes in the roadway alignment, that might make it undesirable for a road user to leave the roadway, and therefore would create a need for a marker.

Option:

Type 2 or Type 3 object markers may be used at locations such as those described in the preceding Support paragraph.

Standard:

If used, the inside edge of the marker shall be in line with the inner edge of the obstruction.

Guidance:

Standard warning signs (see Chapter 2C) should also be used where applicable.

Section 3C.04 End-of-Roadway Markers

Support:

The end-of-roadway marker is used to warn and alert road users of the end of a roadway in other than construction or maintenance areas.

Standard:

The end-of-roadway marker (see Figure 3C-1) shall be a retroreflective red diamond panel (OM4-3), 450 mm (18 in) or more on a side. **DelDOT Rev.**

Option:

The end-of-roadway marker may be used in instances where there are no alternate vehicular paths.

Where conditions warrant, more than one marker, or a larger marker with or without a Type III barricade (see Section 3F.01), may be used at the end of the roadway.

Standard:

The minimum mounting height to the bottom of an end-of-roadway marker shall be 1.2 m (4 ft) above the edge of the pavement.

Guidance:

Appropriate advance warning signs (see Chapter 2C) should be used.

CHAPTER 3D. DELINEATORS

Section 3D.01 Delineators

Support:

Delineators are particularly beneficial at locations where the alignment might be confusing or unexpected, such as at lane reduction transitions and curves. Delineators are effective guidance devices at night and during adverse weather. An important advantage of delineators in certain locations is that they remain visible when the roadway is wet or snow covered.

Delineators are considered guidance devices rather than warning devices.

Option:

Delineators may be used on long continuous sections of highway or through short stretches where there are changes in horizontal alignment.

Section 3D.02 Delineator Design

Standard:

Delineators shall be retroreflective devices mounted above the roadway surface and along the side of the roadway in a series to indicate the alignment of the roadway. Delineators shall consist of retroreflector units that are capable of clearly retroreflecting light under normal atmospheric conditions from a distance of 300 m (1,000 ft) when illuminated by the high beams of standard automobile lights.

Retroreflective elements for delineators shall have a minimum dimension of 75 mm (3 in).

Option:

Elongated retroreflective units of appropriate size may be used in place of two retroreflectors mounted as a unit.

Section 3D.03 Delineator Application

Standard:

The color of delineators shall conform to the color of edge lines stipulated in Section 3B.06.

Single delineators shall be provided on the outside of curves on interchange ramps.

Single delineators shall be provided on the right side of interstates, freeways, or expressways, except in the following cases where delineators are optional: **DelDOT Rev.**

A. On tangent sections of interstates, freeways, or expressways when all of the following conditions are met:
   1. Raised pavement markers are used continuously on lane lines throughout all curves and on all tangents to supplement pavement markings.
   2. Roadside delineators are used to lead into all curves.

B. On sections of roadways where continuous lighting is in operation between interchanges.

Option:

Delineators may be provided on all other roads (non-interstates, freeways, or expressways) if raised pavement markers are used continuously. If raised pavement markers or roadway lighting is absent, right side delineators should be placed if prevailing speeds are greater than 90 km/h (50 mph). Left side delineation is optional. **DelDOT Rev.**

Guidance:

Where median crossovers are provided for official or emergency use on divided highways and where these crossovers are to be marked, a double yellow delineator should be placed on the left side of the through roadway on the far side of the crossover for each roadway.

Double or vertically elongated delineators should be installed at 30 m (100 ft) intervals along acceleration and deceleration lanes.

Option:

Red delineators may be used on the reverse side of any delineator where it would be viewed by a road user traveling in the wrong direction on that particular ramp or roadway.

Delineators of the appropriate color may be used to indicate a lane reduction transition where either an outside or inside lane merges into an adjacent lane.

Guidance:

For lane reduction transitions, the delineators should be used adjacent to the lane or lanes reduced for the full length of the transition and should be so placed and spaced to show the reduction (see Figure 3B-12).

Support:

Delineators are not necessary for traffic moving in the direction of a wider pavement or on the side of the roadway where the alignment is not affected by the lane reduction transition.

Guidance:

On a highway with continuous delineation on either or both sides, delineators should be carried through transitions.

Option:

On a highway with continuous delineation on either or both sides, the spacing between a series of delineators may be closer.

Standard:

When used on a truck escape ramp, delineators shall be red.

Guidance:

Red delineators should be placed on both sides of truck escape ramps. The delineators should be spaced at 15 m (50 ft) intervals for a distance sufficient to identify the ramp entrance. Delineator spacing beyond the ramp entrance should be adequate for guidance according to the length and design of the escape ramp.

Section 3D.04 Delineator Placement and Spacing

Guidance:

Post mounted delineators should be mounted on suitable supports so that the top of the highest retroreflector is 1.2 m (4 ft) above the near roadway edge. They should be placed 0.6 to 2.4 m (2 to 8 ft) outside the outer edge of the shoulder, or if appropriate, in line with the roadside barrier that is 2.4 m (8 ft) or less outside the outer edge of the shoulder. Barrier wall mounted markers and guardrail mounted markers should be mounted so that the top of the delineator is 800 mm (32 in) above the near roadway edge. **DelDOT Rev.**

Delineators should be placed at a constant distance from the edge of the roadway, except that where an obstruction intrudes into the space between the pavement edge and the extension of the line of the delineators, the delineators should be transitioned to be in line with or inside the innermost edge of the obstruction. If the obstruction is a guardrail, the delineators should be transitioned to be either just behind, directly above (in line with), or on the innermost edge of the guardrail.

Post mounted delineators should be spaced 80 m (264 ft) apart on mainline tangent sections. Permanent barrier wall mounted markers (barrier walls within 4.6 m (15 ft) of travel lane) should be spaced at 30 m (100 ft) apart on mainline tangent sections. Guardrail mounted delineators (guardrail within 1.8 m (6 ft) of shoulder) should be spaced at 30 m (100 ft) apart on mainline tangent sections. Delineators should be spaced 30 m (100 ft) apart on ramp tangent sections. **DelDOT Rev.**

Support:

Examples of delineator installations are shown in Figure 3D-1.

Option:

When uniform spacing is interrupted by such features as driveways and intersections, delineators which would ordinarily be located within the features may be relocated in either direction for a distance

not exceeding one quarter of the uniform spacing. Delineators still falling within such features may be eliminated.

Delineators may be transitioned in advance of a lane transition or obstruction as a guide for oncoming traffic.

In residential areas, post mounted delineators may be mounted at a height so that the top of the highest reflector is less than 1.2 m (4 ft) above the near roadway edge. **DelDOT Rev.**

Guidance:

The spacing of delineators should be adjusted on approaches to and throughout horizontal curves so that several delineators are always simultaneously visible to the road user. The approximate spacing shown in Table 3D-1 should be used.

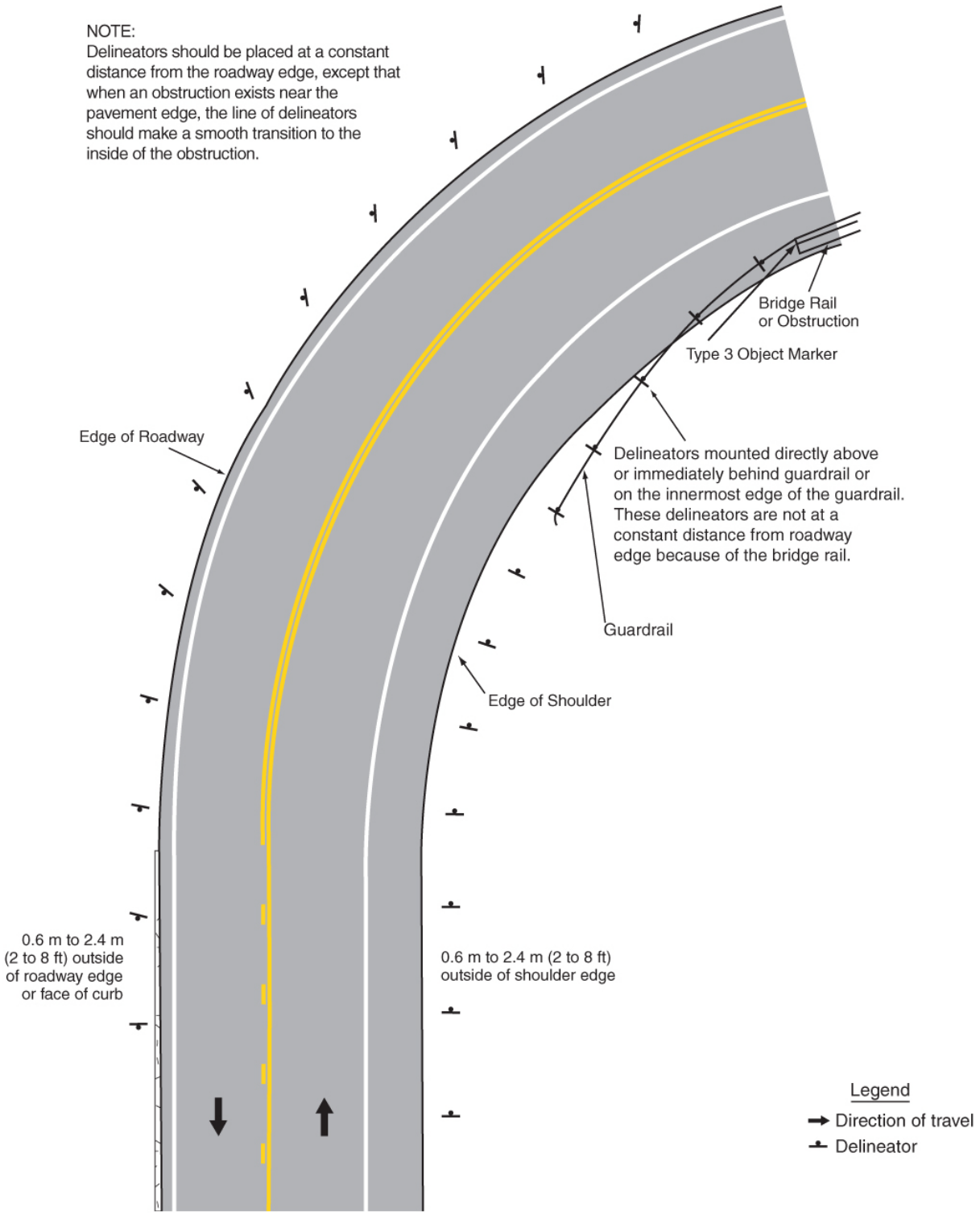
Table 3D-1. Approximate Spacing for Delineators on Horizontal Curves

Radius (R) of Curve (meters)	Approximate Spacing (S) on Curve (meters)	Radius (R) of Curve (feet)	Approximate Spacing (S) on Curve (feet)
15	6	50	20
35	8	115	25
55	11	180	35
75	13	250	40
95	15	300	50
125	18	400	55
155	20	500	65
185	22	600	70
215	24	700	75
245	26	800	80
275	27	900	85
305	29	1,000	90

Distances in feet were rounded to the nearest 5 feet.

Spacing for specific radii may be interpolated from table. The minimum spacing should be 6.1 m (20 ft). The spacing on curves should not exceed 90 m (300 ft). In advance of or beyond a curve, and proceeding away from the end of the curve, the spacing of the first delineator is 2S, the second 3S, and the third 6S but not to exceed 90m (300 ft). S refers to the delineator spacing for specific radii computed from the formula S=1.7/R-15 for metric units and S=3/R-50 for English units.

Figure 3D-1. Example of Delineator Placement



CHAPTER 3E. COLORED PAVEMENTS

Section 3E.01 General

Support:

When used for guidance or regulation of traffic, colored pavements are traffic control devices. Colored pavements also are sometimes used to supplement other traffic control devices.

Colored pavement located between crosswalk lines to emphasize the presence of the crosswalk is not considered to be a traffic control device.

Guidance:

Colored pavements used as traffic control devices should be used only where they contrast significantly with adjoining paved areas.

Colors that degrade the contrast of white crosswalk lines, or that might be mistaken by road users as a traffic control application, should not be used for colored pavement located between crosswalk lines.

Standard:

Colored pavements shall not be used as a traffic control device, unless the device is applicable at all times.

Colored pavements used as traffic control devices shall be limited to the following colors and applications:

A. Yellow shall be used only for flush or raised median islands separating traffic flows in opposite directions.

B. White shall be used for delineation on shoulders, and for flushed or raised channelizing islands where traffic passes on both sides in the same general direction.

CHAPTER 3F. BARRICADES AND CHANNELIZING DEVICES

Section 3F.01 Barricades

Standard:

When used to warn and alert road users of the terminus of a roadway in other than temporary traffic control zones, barricades shall meet the design criteria of Section 6F.63 for a Type III barricade, except that the colors of the stripes shall be retroreflective white and retroreflective red.

Option:

An end-of-roadway marker or markers may be used as described in Section 3C.04. Barricades may be used to mark any of the following conditions:

A. A roadway ends;
B. A ramp or lane closed for operational purposes; or
C. The permanent or semipermanent closure or termination of a roadway.

Guidance:

Appropriate advance warning signs (see Chapter 2C) should be used.

Section 3F.02 Channelizing Devices

Option:

Channelizing devices, such as traffic cones and tubular markers, may be used for general traffic control purposes such as adding emphasis to reversible lane delineation, channelizing lines, or islands.

Standard:

Channelizing devices shall conform to Section 6F.58 and shall be a minimum of 450 mm (18 in) in height.

The minimum height of cones shall be 700 mm (28 in) for use on freeways and other high-speed roadways, and on all facilities when used during hours of darkness or whenever more conspicuous guidance is needed.

The color of channelizing devices used outside of temporary traffic control zones shall be either orange or the same color as the pavement marking that they supplement, or for which they are substituted.

For nighttime use, channelizing devices shall be retroreflective.

Retroreflection of tubular markers shall be a minimum of two 75 mm (3 in) white bands placed a maximum of 50 mm (2 in) from the top with a maximum of 150 mm (6 in) between the bands.

Retroreflection of cones shall be provided by a minimum 150 mm (6 in) white band placed a minimum of 75 mm (3 in) but no more than 100 mm (4 in) from the top.

Retroreflective material shall have a smooth, sealed outer surface that will display a similar color during both day and night.

When 700 mm (28 in) or larger size cones are used, the standard 150 mm (6 in) band shall be supplemented with an additional 100 mm (4 in) white band spaced a minimum of 50 mm (2 in) below the 150 mm (6 in) band.

Guidance:

Channelizing devices should be kept clean and bright to maximize target value.

CHAPTER 3G. ISLANDS

Section 3G.01 General

Support:

Chapter 3G addresses the characteristics of islands as traffic-control devices. Criteria for the design of islands are set forth in "A Policy on Geometric Design of Highways and Streets" (see Section 1A.11).

Standard:

An island for traffic control purposes shall be the defined area between traffic lanes for control of vehicular movements or for pedestrian refuge. Within an intersection area, a median or an outer separation shall be an island.

Option:

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

Section 3G.02 Approach-End Treatment

Guidance:

The ends of islands first approached by traffic should be preceded by a gradually diverging marking on the roadway surface, to guide vehicles into desired paths of travel along the island edge.

Option:

Approach-end markings that can be readily crossed even at considerable speed may contain slightly raised (usually less than 25 mm (1 in) high) sections of coarse aggregate or other suitable materials to create rumble sections that provide increased visibility of the marked areas and that produce an audible warning to road users traveling across them.

Standard:

Rumble strips or other devices, when used in advance of islands having raised curbs, shall not be placed in such a manner as to constitute an unexpected obstacle.

Guidance:

Bars or buttons should not project more than 25 to 75 mm (1 to 3 in) above the pavement surface and should be designed so that any wheel encroachment within the area will be obvious to the vehicle operator, but will not result in loss of control of the vehicle.

Option:

Bars or buttons may be preceded by rumble sections, or their height may be gradually increased as approached by traffic.

Pavement markings may be used with raised bars to better designate the island area.

Section 3G.03 Island Marking Application

Standard:

Markings, as related to islands, shall consist only of pavement and curb markings, object markers, and delineators.

On the approach to islands, the triangular neutral area in advance of the end of the island shall include pavement markings as described in Section 3B.10.

Option:

As indicated in Section 3G.02, rumble sections, or other similar traffic control designs which contrast with the pavement surface, may also be applied in the triangular neutral area in advance of the end of an island.

Guidance:

When raised bars or buttons are used in these neutral areas, they should be marked with white or yellow retroreflective materials, as determined by the direction or directions of travel they separate.

Section 3G.04 Island Marking Colors

Guidance:

Islands outlined by curbs or pavement markings should be marked with retroreflective white or yellow material as determined by the direction or directions of travel they separate (see Section 3A.04).

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

Option:

On long islands, curb retroreflection may be discontinued such that it does not extend for the entire length of the curb, especially if the island is illuminated or marked with delineators or edge lines.

Section 3G.05 Island Object Markers

Option:

Object markers may be installed alone or in combination with signs (such as KEEP RIGHT, KEEP LEFT, double arrows, or guide signs) located within the island.

Section 3G.06 Island Delineators

Standard:

Delineators installed on islands shall be the same colors as the related edge lines except that, when facing wrong-way traffic, they shall be red (see Section 3D.03).

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