# PART 3. MARKINGS

## TABLE OF CONTENTS

### Chapter 3A. GENERAL

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>3A.1</td>
<td>Functions and Limitations</td>
<td>3A-1</td>
</tr>
<tr>
<td>3A.2</td>
<td>Standardization of Application</td>
<td>3A-1</td>
</tr>
<tr>
<td>3A.3</td>
<td>Maintaining Minimum Pavement Marking Retroreflectivity</td>
<td>3A-1</td>
</tr>
<tr>
<td>3A.4</td>
<td>Materials</td>
<td>3A-1</td>
</tr>
<tr>
<td>3A.5</td>
<td>Colors</td>
<td>3A-1</td>
</tr>
<tr>
<td>3A.6</td>
<td>Functions, Widths, and Patterns of Longitudinal Pavement Markings</td>
<td>3A-2</td>
</tr>
</tbody>
</table>

### Chapter 3B. PAVEMENT AND CURB MARKINGS

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>3B.1</td>
<td>Yellow Centerline Pavement Markings and Warrants</td>
<td>3B-1</td>
</tr>
<tr>
<td>3B.2</td>
<td>No-Passing Zone Pavement Markings and Warrants</td>
<td>3B-4</td>
</tr>
<tr>
<td>3B.3</td>
<td>Other Yellow Longitudinal Pavement Markings</td>
<td>3B-6</td>
</tr>
<tr>
<td>3B.4</td>
<td>White Lane Line Pavement Markings and Warrants</td>
<td>3B-8</td>
</tr>
<tr>
<td>3B.5</td>
<td>Other White Longitudinal Pavement Markings</td>
<td>3B-22</td>
</tr>
<tr>
<td>3B.6</td>
<td>Edge Line Pavement Markings</td>
<td>3B-23</td>
</tr>
<tr>
<td>3B.7</td>
<td>Warrants for Use of Edge Lines</td>
<td>3B-23</td>
</tr>
<tr>
<td>3B.8</td>
<td>Extensions Through Intersections or Interchanges</td>
<td>3B-23</td>
</tr>
<tr>
<td>3B.9</td>
<td>Lane Reduction Transition Markings</td>
<td>3B-26</td>
</tr>
<tr>
<td>3B.10</td>
<td>Approach Markings for Obstructions</td>
<td>3B-26</td>
</tr>
<tr>
<td>3B.11</td>
<td>Raised Pavement Markers - General</td>
<td>3B-30</td>
</tr>
<tr>
<td>3B.12</td>
<td>Raised Pavement Markers as Vehicle Positioning Guides with Other Longitudinal Markings</td>
<td>3B-31</td>
</tr>
<tr>
<td>3B.13</td>
<td>Raised Pavement Markers Supplementing Other Markings</td>
<td>3B-31</td>
</tr>
<tr>
<td>3B.14</td>
<td>Raised Pavement Markers Substituting for Pavement Markings</td>
<td>3B-31</td>
</tr>
<tr>
<td>3B.15</td>
<td>Transverse Markings</td>
<td>3B-32</td>
</tr>
<tr>
<td>3B.16</td>
<td>Stop and Yield Lines</td>
<td>3B-32</td>
</tr>
<tr>
<td>3B.17</td>
<td>Do Not Block Intersection Markings</td>
<td>3B-33</td>
</tr>
<tr>
<td>3B.18</td>
<td>Crosswalk Markings</td>
<td>3B-34</td>
</tr>
<tr>
<td>3B.19</td>
<td>Parking Space Markings</td>
<td>3B-38</td>
</tr>
<tr>
<td>3B.20</td>
<td>Pavement Word, Symbol, and Arrow Markings</td>
<td>3B-38</td>
</tr>
<tr>
<td>3B.21</td>
<td>Speed Measurement Markings</td>
<td>3B-44</td>
</tr>
<tr>
<td>3B.22</td>
<td>Speed Reduction Markings</td>
<td>3B-44</td>
</tr>
<tr>
<td>3B.23</td>
<td>Curb Markings</td>
<td>3B-45</td>
</tr>
<tr>
<td>3B.24</td>
<td>Chevron and Diagonal Crosshatch Markings</td>
<td>3B-46</td>
</tr>
<tr>
<td>3B.25</td>
<td>Speed Hump Markings</td>
<td>3B-46</td>
</tr>
<tr>
<td>3B.26</td>
<td>Advance Speed Hump Markings</td>
<td>3B-46</td>
</tr>
</tbody>
</table>
Chapter 3C. ROUNDABOUT MARKINGS
3C.1 General .................................................................................................................. 3C-1
3C.2 White Line Lane Pavement Markings for Roundabouts ........................................... 3C-1
3C.3 Edge Line Pavement Markings for Roundabout Circulatory Roadways .................... 3C-15
3C.4 Yield Lines for Roundabouts .................................................................................. 3C-15
3C.5 Crosswalk Markings at Roundabouts ..................................................................... 3C-15
3C.6 Word, Symbol, and Arrow Pavement Markings for Roundabouts ............................ 3C-15
3C.7 Markings for Other Circular Intersections ......................................................... 3C-15

Chapter 3D. MARKINGS FOR PREFERENTIAL LANES
3D.1 Preferential Lane Word and Symbol Markings ...................................................... 3D-1
3D.2 Preferential Lane Longitudinal Markings for Motor Vehicles ................................. 3D-2

Chapter 3E. MARKINGS FOR TOLL PLAZAS
3E.1 Markings for Toll Plazas ...................................................................................... 3E-1

Chapter 3F. DELINEATORS
3F.1 Delineators ........................................................................................................... 3F-1
3F.2 Delineator Design .................................................................................................. 3F-1
3F.3 Delineator Application .......................................................................................... 3F-1
3F.4 Delineator Placement and Spacing ....................................................................... 3F-3
3F.4.1 Intersection Delineator ................................................................................... 3F-3

Chapter 3G. COLORED PAVEMENTS
3G.1 General ............................................................................................................... 3G-1

Chapter 3H. CHANNELIZING DEVICES USED FOR EMPHASIS OF PAVEMENT MARKING PATTERNS
3H.1 Channelizing Devices .......................................................................................... 3H-1

Chapter 3I. ISLANDS
3I.1 General ............................................................................................................... 3I-1
3I.2 Approach-End Treatment .................................................................................... 3I-1
3I.3 Island Marking Application .................................................................................. 3I-1
3I.4 Island Marking Colors ........................................................................................ 3I-1
3I.5 Island Delineators ............................................................................................... 3I-1
3I.6 Pedestrian Islands and Medians .......................................................................... 3I-2

Chapter 3J. RUMBLE STRIP MARKINGS
3J.1 Longitudinal Rumble Strip Markings .................................................................... 3J-1
3J.2 Transverse Rumble Strip Markings ....................................................................... 3J-1
| 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 | Method of Locating and Determining the Limits of No-Passing Zones at Curves .......... 3B-5 |
| Figure 3B-5 | Example of Application of Three-Lane, Two-Way Marking for Changing Direction of the Center Lane ................................................................. 3B-7 |
| Figure 3B-6 | Example of Reversible Lane Marking Application ..................................................... 3B-8 |
| Figure 3B-7 | Example of Two-Way Left-Turn Lane Marking Application ........................................ 3B-9 |
| Figure 3B-8 | Examples of Dotted Line and Channelizing Line Applications for Exit Ramp Markings (Sheet 1 of 2) .......................................................... 3B-10 |
| Figure 3B-8 | Examples of Dotted Line and Channelizing Line Applications for Exit Ramp Markings (Sheet 2 of 2) .......................................................... 3B-11 |
| Figure 3B-9 | Examples of Dotted Line and Channelizing Line Applications for Entrance Ramp Markings (Sheet 1 of 2) .................................................... 3B-12 |
| Figure 3B-9 | Examples of Dotted Line and Channelizing Line Applications for Entrance Ramp Markings (Sheet 2 of 2) .................................................... 3B-13 |
| Figure 3B-10 | Example of Applications of Freeway and Expressway Lane-Drop Markings (Sheet 1 of 5) ............ 3B-15 |
| Figure 3B-10 | Example of Applications of Freeway and Expressway Lane-Drop Markings (Sheet 2 of 5) ............ 3B-16 |
| Figure 3B-10 | Example of Applications of Freeway and Expressway Lane-Drop Markings (Sheet 3 of 5) ............ 3B-17 |
| Figure 3B-10 | Example of Applications of Freeway and Expressway Lane-Drop Markings (Sheet 4 of 5) ............ 3B-18 |
| Figure 3B-10 | Example of Applications of Freeway and Expressway Lane-Drop Markings (Sheet 5 of 5) ............ 3B-19 |
| Figure 3B-11 | Example of Applications of Conventional Road Lane-Drop Markings (Sheet 1 of 2) ................ 3B-20 |
| Figure 3B-11 | Example of Applications of Conventional Road Lane-Drop Markings (Sheet 2 of 2) ................ 3B-21 |
| Figure 3B-12 | Example of Solid Double White Lines Used to Prohibit Lane Changing ...................... 3B-22 |
| Figure 3B-13 | Examples of Line Extensions through Intersections (Sheet 1 of 2) ............................... 3B-24 |
| Figure 3B-13 | Examples of Line Extensions through Intersections (Sheet 2 of 2) ............................... 3B-25 |
| Figure 3B-14 | Examples of Applications of Lane-Reduction Transition Markings ............................ 3B-27 |
| Figure 3B-15 | Examples of Applications of Markings for Obstructions in the Roadway (Sheet 1 of 2) ........ 3B-28 |
| Figure 3B-15 | Examples of Applications of Markings for Obstructions in the Roadway (Sheet 2 of 2) ........ 3B-29 |
| Figure 3B-16 | Recommended Yield Line Layouts ................................................................................ 3B-33 |
| Figure 3B-17 | Examples of Stop Lines at Unsignalized Midblock Crosswalks .................................. 3B-34 |
| Figure 3B-18 | Do Not Block Intersection Markings ............................................................................. 3B-35 |
| Figure 3B-19 | Examples of Crosswalk Markings ................................................................................ 3B-36 |
| Figure 3B-20 | Examples of Crosswalk Markings for an Exclusive Pedestrian Phase That Permits Diagonal Crossing ......................................................... 3B-36 |
| Figure 3B-21 | Examples of Parking Space Markings ........................................................................... 3B-37 |
| Figure 3B-22 | International Symbol of Accessibility Parking Space Marking .................................... 3B-38 |
Figure 3B-23 Example of Elongated Letters for Word Pavement Markings ........................................ 3B-39
Figure 3B-24 Examples of Standard Arrows for Pavement Markings .................................................. 3B-40
Figure 3B-25 Example of Elongated Route Shields for Pavement Markings ...................................... 3B-41
Figure 3B-26 Yield Ahead Triangle Symbols .......................................................................................... 3B-42
Figure 3B-27 Examples of Lane-Use Control Word and Arrow Pavement Markings .......................... 3B-43
Figure 3B-28 Example of the Application of Speed Reduction Markings ............................................. 3B-45
Figure 3B-29 Pavement Markings for Speed Humps without Crosswalks ........................................ 3B-47
Figure 3B-30 Pavement Markings for Speed Tables or Speed Humps with Crosswalks ....................... 3B-48
Figure 3B-31 Advance Warning Markings for Speed Humps ............................................................... 3B-49
Figure 3C-1 Example of Markings for Approach and Circulatory Roadways at a Roundabout .......... 3C-1
Figure 3C-2 Lane-Use Arrow Pavement Marking Optional for Roundabout Approaches .................. 3C-2
Figure 3C-3 Example of Markings for a One-Lane Roundabout ........................................................... 3C-2
Figure 3C-4 Example of Markings for a Two-Lane Roundabout with One- and Two-Lane Approaches (Sheet 1 of 2) .............................................................. 3C-3
Figure 3C-4 Example of Markings for a Two-Lane Roundabout with One- and Two-Lane Approaches (Sheet 2 of 2) .............................................................. 3C-4
Figure 3C-5 Example of Markings for a Two-Lane Roundabout with One-Lane Exits ..................... 3C-5
Figure 3C-6 Example of Markings for a Two-Lane Roundabout with Two-Lane Exits ..................... 3C-6
Figure 3C-7 Example of Markings for a Two-Lane Roundabout with a Double Left Turn ............... 3C-7
Figure 3C-8 Example of Markings for a Two-Lane Roundabout with a Double Right Turn ............ 3C-8
Figure 3C-9 Example of Markings for a Two-Lane Roundabout with Consecutive Double Left Turns .... 3C-9
Figure 3C-10 Example of Markings for a Three-Lane Roundabout with Two- and Three-Lane Approaches ................................................................................................. 3C-10
Figure 3C-11 Example of Markings for a Three-Lane Roundabout with Three-Lane Approaches ........ 3C-11
Figure 3C-12 Example of Markings for a Three-Lane Roundabout with Two-Lane Exits ............... 3C-12
Figure 3C-13 Example of Markings for Two Linked Roundabouts ...................................................... 3C-13
Figure 3C-14 Example of Markings for a Diamond Interchange with Two Circular-Shaped Roundabout Ramp Terminals ................................................................. 3C-14
Figure 3D-2 Markings for Buffer-Separated Preferential Lanes (Sheet 1 of 2) ...................................... 3D-4
Figure 3D-1 Markings for Barrier-Separated referential Lanes ........................................................... 3D-4
Figure 3D-2 Markings for Buffer-Separated Preferential Lanes (Sheet 2 of 2) ...................................... 3D-5
Figure 3D-3 Markings for Contiguous Preferential Lanes ................................................................... 3D-5
Figure 3D-4 Markings for Counter-Flow Preferential Lanes on Divided Highways ............................. 3D-8
Figure 3F-1 Examples of Delineator Placement .................................................................................... 3F-2
Figure 3F-2 Typical Intersection Delineation Using Cylinder Style Delineators .............................. 3F-5
Figure 3J-1 Examples of Longitudinal Rumble Strip Markings ............................................................ 3J-1

TABLES

Table 3B-1 Minimum Passing Sight Distances for No-Passing Zone Markings .................................. 3B-4
Table 3D-1 Standard Edge Line and Lane Line Markings for Preferential Lanes ............................. 3D-3
Table 3F-1 Approximate Spacing for Delineators on Horizontal Curves ........................................ 3F-4
3A.1 Functions and Limitations

Support

Markings on highways and on private roads open to public travel have important functions in providing guidance and information for the road user. Major marking types include pavement and curb markings, delineators, colored pavements, 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.

3A.2 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 in this Manual, markings shall conform in all respects to the principles and standards set forth in this Manual.

Guidance

Before any new highway, private road open to public travel (see definition 159 in Section 1A.13), paved detour, or temporary route is opened to public travel, all necessary markings should be in place.

Standard

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.

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.

Option

Until they can be removed or obliterated, markings may be temporarily masked with tape that is approximately the same color as the pavement.

3A.3 Maintaining Minimum Pavement Marking Retroreflectivity

(This Section is reserved for future text based on FHWA rulemaking.)

3A.4 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.

Some marking systems consist of clumps or droplets of material with visible open spaces of bare pavement between the material droplets. These marking systems can function in a manner that is similar to the marking systems that completely cover the pavement surface and are suitable for use as pavement markings if they meet the other pavement marking requirements of the highway agency.

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 road users, including pedestrians, bicyclists, and motorcyclists.

Delineators should not present a vertical or horizontal clearance obstacle for pedestrians.

3A.5 Colors

Standard

Markings shall be yellow, white, red, blue, or purple. The colors for markings shall conform to the standard highway colors. Black in conjunction with one of the colors mentioned in the first sentence of this paragraph shall be a usable color.
3A.6 Functions, Widths, and Patterns of Longitudinal Pavement Markings

**Standard**

The general functions of longitudinal lines shall be:
- 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 or warning of a downstream change in lane function.

The widths and patterns of longitudinal lines shall be as follows:
- A. Normal line - 4 to 6 inches wide.
- B. Wide line - at least twice the width of a normal line.
- C. Double line - two parallel lines separated by a discernible space.
- D. Broken line - normal line segments separated by gaps.
- E. Dotted line - 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.

**Support**

The width of the line indicates the degree of emphasis.

**Guidance**

Broken lines should consist of 10-foot line segments and 30-foot gaps, or dimensions in a similar ratio of line segments to gaps as appropriate for traffic speeds and need for delineation. One alternative is to use a broken line consisting of 10-foot line segments and 40-foot gaps.

Patterns for dotted lines depend on the application (see Sections 3B.4 and 3B.8).

**Guidance**

A dotted line for line extensions within an intersection or taper area should consist of 2-foot line segments and 2- to 6-foot gaps. A dotted line used as a lane line should consist of 3-foot line segments and 9-foot gaps. One alternative is to use a dotted line consisting of 3-foot line segments and 12-foot gaps.
PART 3. MARKINGS
Chapter 3B. Pavement and Curb Markings

3B.1 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 center line pavement markings, short sections may be marked with center line pavement markings to control the position of traffic at specific locations, such as around curves, over hills, on approaches to grade crossings, at 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 double yellow line, one of which is a normal broken yellow line and the other is a normal solid yellow line, where crossing the center line markings for passing with care is permitted for traffic traveling adjacent to the broken line, but is prohibited for traffic traveling adjacent to the solid line; or

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.

A single solid yellow line shall not be used as a center line marking on a two-way roadway.

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.

Support

Sections 11-301(c) and 11-311(c) of the “Uniform Vehicle Code (UVC)” contain information regarding left turns across center line no-passing zone markings and paved medians, respectively. The UVC can be obtained from the National Committee on Uniform Traffic Laws and Ordinances at the address shown on Page i.

Standard

Center line markings shall be placed on all paved urban arterials and collectors that have a traveled way of 20 feet or more in width and an ADT of 6,000 vehicles per day or greater. Center line markings shall also be placed on all paved two-way streets or highways that have three or more lanes for moving motor vehicle traffic.

Guidance

Center line markings should be placed on paved urban arterials and collectors that have a traveled way of 20 feet or more in width and an ADT of 4,000 vehicles per day or greater. Center line markings should also be placed on all rural arterials and collectors that have a traveled way of 18 feet or more in width and an ADT of 3,000 vehicles per day or greater. Center line markings should also be placed on other traveled ways where an engineering study indicates such a need.

Engineering judgment should be used in determining whether to place center line markings on traveled ways that are less than 16 feet 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

Centerline markings may be placed on other paved two-way traveled ways that are 16 feet or more in width.

If a traffic count is not available, the ADTs described in this Section may be estimates that are based on engineering judgment.

3B-1
December, 2011
A - Typical two-lane, two-way marking with passing permitted in both directions

B - Typical two-lane, two-way marking with no-passing zones

Legend

- Direction of travel

Figure 3B-1  Examples of Two-Lane, Two-Way Marking Applications
Figure 3B-2  Examples of Four-or-More Lane, Two-Way Marking Applications.
3B.2 No-Passing Zone Pavement Markings and Warrants

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 in Section 3B.1 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.9) and on approaches to obstructions that must be passed on the right (see Section 3B.10).

On two-way, two- or three-lane roadways where center line 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 roadways with center line markings, no-passing zone markings shall be used at horizontal or vertical curves where the passing sight distance is less than the minimum shown in Table 3B-1 for the 85th-percentile speed or the posted or statutory speed limit. The passing sight distance on a vertical curve is the distance at which an object 3.5 feet above the pavement surface can be seen from a point 3.5 feet above the pavement (see Figure 3B-4). Similarly, the passing sight distance on a horizontal curve is the distance measured along the center line (or right-hand lane line of a three-lane roadway) between two points 3.5 feet 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-4).

<table>
<thead>
<tr>
<th>85th Percentile or Posted or Statutory Speed Limit (mph)</th>
<th>Minimum Passing Sight Distance (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>450</td>
</tr>
<tr>
<td>30</td>
<td>500</td>
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<tr>
<td>35</td>
<td>550</td>
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</tr>
<tr>
<td>65</td>
<td>1100</td>
</tr>
<tr>
<td>70</td>
<td>1200</td>
</tr>
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Table 3B-1 Minimum Passing Sight Distances for No-Passing Zone Markings

Figure 3B-3 Examples of Three-Lane, Two-Way Marking Applications
**A - No-passing zone at VERTICAL CURVE**

Profile View

- **a, a'** Begin no passing zone
  - Sight distance becomes less than minimum measured between points
  - 3.5 feet above pavement

- **b, b'** End no passing zone
  - Sight distance again exceeds minimum

**NOTE:** No-passing zones in opposite directions may or may not overlap, depending on alignment.

**B - No-passing zone at HORIZONTAL CURVE**

Plan View

- **a, a'** Begin no passing zone
  - Sight distance becomes less than minimum measured between points
  - 3.5 feet above pavement

- **b, b'** End no passing zone
  - Sight distance again exceeds minimum

**NOTE:** No-passing zones in opposite directions may or may not overlap, depending on alignment.

*Figure 3B-4  Method of Locating and Determining the Limits of No-Passing Zones at Curves*
Guidance
For three-lane roadways having a posted or statutory speed limit of 45 mph or greater, the lane transition taper length should be computed by the formula \( L = WS \). For roadways where the posted or statutory speed limit is less than 45 mph, the formula \( L = \frac{WS^2}{60} \) should be used to compute the taper length.

Support
Under both formulas, \( L \) equals the taper length in feet, \( W \) equals the width of the center lane or offset distance in feet, and \( S \) equals the 85th-percentile speed or the posted or statutory speed limit, whichever is higher.

Guidance
The minimum lane transition taper length should be 100 feet in urban areas and 200 feet in rural areas.

3B.3 Other Yellow Longitudinal Pavement Markings

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).

Signs (see Section 2B.26), lane-use control signals (see Chapter 4M), 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.

Guidance
White two-way left-turn lane-use arrows (see Figure 3B-7), should be used in conjunction with the longitudinal two-way left-turn markings at the locations described in Section 3B.20.

Signs should be used in conjunction with the two-way left turn markings (see Section 2B.24).
Note:
1. See Section 3B.2 for determining the minimum length of the buffer zone.
2. Lane-reduction arrows are optional for speeds of 40 mph or less.
3. See Figure 3B-14 for lane-reduction transition markings and determination of taper length L.

Figure 3B-5  Example of Application of Three-Lane, Two-Way Marking for Changing Direction of the Center Lane
A dotted white line marking shall be used as the lane line to separate a through lane that continues beyond the interchange or intersection from an adjacent lane for any of the following conditions:

A. A deceleration or acceleration lane,
B. A through lane that becomes a mandatory exit or turn lane,
C. An auxiliary lane 2 miles or less in length between an entrance ramp and an exit ramp, or
D. An auxiliary lane 1 mile or less in length between two adjacent intersections.

For exit ramps with a parallel deceleration lane, a normal width dotted white lane line shall be installed from the upstream end of the full-width deceleration lane to the theoretical gore or to the upstream end of a solid white lane line, if used, that extends upstream from the theoretical gore as shown in Drawings A and C of Figure 3B-8.

Option

For exit ramps with a parallel deceleration lane, a normal width dotted white line extension may be installed in the taper area upstream from the full-width deceleration lane as shown in Drawings A and C of Figure 3B-8.

For an exit ramp with a tapered deceleration lane, a normal width dotted white line extension may be installed from the theoretical gore through the taper area such that it meets the edge line at the upstream end of the taper as shown in Drawing B of Figure 3B-8.

Entrance

For entrance ramps with a parallel acceleration lane, a normal width dotted white lane line shall be installed from the theoretical gore or from the downstream end of a solid white lane line, if used, that extends downstream from the theoretical gore, to a point at least one-half the distance from the theoretical gore to the downstream end of the acceleration taper, as shown in Drawing A of Figure 3B-9.

Option

For entrance ramps with a parallel acceleration lane, a
Figure 3B-7  Example of Two-Way Left-Turn Lane Marking Application

* See Section 3B.20 for use of additional arrows beyond the beginning of the two-way left-turn lane.

Note:
Single-direction left-turn arrows shall not be used in lanes bordered on both sides by two-way left-turn lane markings.

8 - 16 feet
Figure 3B-8  Examples of Dotted Line and Channelizing Line Applications for Exit Ramp Markings
(Sheet 1 of 2)
C - Parallel deceleration lane at a multi-lane exit ramp having an optional exit lane that also carries the through route

Figure 3B-8  Examples of Dotted Line and Channelizing Line Applications for Exit Ramp Markings (Sheet 2 of 2)
Figure 3B-9  Examples of Dotted Line and Channelizing Lane Applications for Entrance Ramp Markings (Sheet 1 of 2)
Figure 3B-9  Examples of Dotted Line and Channelizing Lane Applications for Entrance Ramp Markings
(Sheet 2 of 2)
normal width dotted white line extension may be installed from the downstream end of the dotted white lane line to the downstream end of the acceleration taper, as shown in Drawing A of Figure 3B-9.

For entrance ramps with a tapered acceleration lane, a normal width dotted white lane extension may be installed from the downstream end of the channelizing line adjacent to the through lane to the downstream end of the acceleration taper, as shown in Drawings B and C of Figure 3B-9.

**Standard**

A wide dotted white lane line shall be used:

A. As a lane drop marking in advance of lane drops at exit ramps to distinguish a lane drop from a normal exit ramp (see Drawings A, B, and C of Figure 3B-10),

B. In advance of freeway route splits with dedicated lanes (see Drawing D of Figure 3B-10),

C. To separate a through lane that continues beyond an interchange from an adjacent auxiliary lane between an entrance ramp and an exit ramp (see Drawing E of Figure 3B-10),

D. As a lane drop marking in advance of lane drops at intersections to distinguish a lane drop from an intersection through lane (see Drawing A of Figure 3B-11), and

E. To separate a through lane that continues beyond an intersection from an adjacent auxiliary lane between two intersections (see Drawing B of Figure 3B-11).

**Guidance**

Lane drop markings used in advance of lane drops at freeway and expressway exit ramps should begin at least 1/2 mile in advance of the theoretical gore.

On the approach to a multi-lane exit ramp having an optional exit lane that also carries through traffic, lane line markings should be used as illustrated in Drawing B of Figure 3B-10. In this case, if the right-most exit lane is an added lane such as a parallel deceleration lane, the lane drop marking should begin at the upstream end of the full-width deceleration lane, as shown in Drawing C of Figure 3B-8.

Lane drop markings used in advance of lane drops at intersections should begin a distance in advance of the intersection that is determined by engineering judgment as suitable to enable drivers who do not desire to make the mandatory turn to move out of the lane being dropped prior to reaching the queue of vehicles that are waiting to make the turn. The lane drop marking should begin no closer to the intersection than the most upstream regulatory or warning sign associated with the lane drop.

The dotted white lane lines that are used for lane drop markings and that are used as a lane line separating through

lanes from auxiliary lanes should consist of line segments that are 3 feet in length separated by 9-foot gaps. One alternative is to use line segments that are 3 feet in length separated by 12-foot gaps.

**Support**

Section 3B.20 contains information regarding other markings that are associated with lane drops, such as lane-use arrow markings and ONLY word markings.

Section 3B.9 contains information about the lane line markings that are to be used for transition areas where the number of through lanes is reduced.

**Standard**

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

**Option**

Where it is intended to discourage lane changing on the approach to an exit ramp, a wide solid white lane line may extend upstream from the theoretical gore or, for multi-lane exits, as shown in Drawing B of Figure 3B-10, for a distance that is determined by engineering judgment.

Where lane changes might cause conflicts, a wide or normal solid white lane line may extend upstream from an intersection.

In the case of a lane drop at an exit ramp or intersection, such a solid white line may replace a portion, but not all of, the length of the wide dotted white lane line.

**Guidance**

On approaches to intersections, a solid white lane line marking should be used to separate a through lane from an added mandatory turn lane.

**Option**

On approaches to intersections, solid white lane line markings may be used to separate adjacent through lanes or adjacent mandatory turn lanes from each other.

Where the median width allows the left-turn lanes to be separated from the through lanes to give drivers on opposing approaches a less obstructed view of opposing through traffic, white pavement markings may be used to form channelizing islands as shown in Figure 2B-17.

Solid white lane line markings may be used to separate through traffic lanes from auxiliary lanes, such as an added uphill truck lane or a preferential lane (see Section 3D.2).

Wide solid lane line markings may be used for greater emphasis.
A - Lane drop at a single lane exit ramp

Figure 3B-10  Example of Applications of Freeway and Expressway Lane-Drop Markings (Sheet 1 of 5)
B - Lane drop at a multi-lane exit ramp having an optional exit lane that also carries the through route

Figure 3B-10  Example of Applications of Freeway and Expressway Lane-Drop Markings (Sheet 2 of 5)
Figure 3B-10  Example of Applications of Freeway and Expressway Lane-Drop Markings (Sheet 3 of 5)
D - Route split with dedicated lanes

Figure 3B-10  Example of Applications of Freeway and Expressway Lane-Drop Markings (Sheet 4 of 5)
Figure 3B-10  Example of Applications of Freeway and Expressway Lane-Drop Markings (Sheet 5 of 5)

E - Auxiliary lane, such as at cloverleaf Ramps

Legend

Direction of travel

Physical gore

Optional white chevron markings in neutral area

Neutral area

White channelizing lines

Wide solid white lane line (optional, variable length) or wide dotted white lane line

Theoretical gore point

Wide solid white lane line for full length of auxiliary lane between the theoretical gores of the entrance and exit ramps or between the upstream and downstream ends of the optional wide solid white lane lines

Physical gore

Optional white chevron markings in neutral area

White channelizing lines

Theoretical gore

Wide solid white lane line (optional, variable length) or wide dotted white lane line
Figure 3B-11 Example of Applications of Conventional Road Lane-Drop Markings (Sheet 1 of 2)
Figure 3B-11  Example of Applications of Conventional Road Lane-Drop Markings (Sheet 2 of 2)
Channelizing lines at entrance ramps as shown in Figures 3B-9 and 3B-10 promote orderly and efficient merging with the through traffic.

**Standard**
Where crossing the lane line markings is prohibited, the lane line markings shall consist of a solid double white line (see Figure 3B.12).

### 3B.5 Other White Longitudinal Pavement Markings

**Standard**
A channelizing line shall be a wide or double solid white line.

**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-9, and 3B-10, and in Drawing C of Figure 3B-15.

Channelizing lines at exit ramps as shown in Figures 3B-8 and 3B-10 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.

**Option**
For entrance ramps with tapered acceleration lanes, the channelizing lines may extend to the theoretical gore as shown in Drawing B of Figure 3B-9.

**Standard**
For exit ramps and for entrance ramps with parallel acceleration lanes, channelizing lines shall be placed on both sides of the neutral area (see Figures 3B-8 and 3B-10 and Drawing A of Figure 3B-9).

For entrance ramps with tapered acceleration lanes, channelizing lines shall be placed along both sides of the neutral area to a point at least one-half of the distance to the theoretical gore (see Drawing C of Figure 3B-9).

**Option**
White chevron crosshatch markings (see Section 3B.24) may be placed in the neutral area of exit ramp and entrance ramp gores for special emphasis as shown in Figures 3B-8 and 3B-10 and Drawing A of Figure 3B-9.

The channelizing lines and the optional chevron crosshatch markings at exit ramp and entrance ramp gores may be supplemented with white retroreflective or internally illuminated raised pavement markers (see Sections 3B.11 and 3B.13) for enhanced nighttime visibility.
3B.6 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.8), 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 (see Section 3B.6), 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.

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 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.

3B.7 Warrants for Use of Edge Lines

**Standard**

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

A. Freeways;
B. Expressways; and
C. Rural arterials with a traveled way of 20 feet or more in width and an ADT of 6,000 vehicles per day or greater.

**Guidance**

Edge line markings should be placed on paved streets or highways with the following characteristics:

A. Rural arterials and collectors with a traveled way of 20 feet or more in width and an ADT of 3,000 vehicles per day or greater.
B. On other paved streets and 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 center line 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, or other markings.

If a bicycle lane is marked on the outside portion of the traveled way, the edge line that would mark the outside edge of the bicycle lane may be omitted.

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.

3B.8 Extensions Through Intersections or Interchanges

**Standard**

Except as provided in the following Option, 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-13).

**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 multi-legged intersections, on curved roadways, where multiple turn lanes are used, or where offset left turn lanes might cause driver confusion, dotted line extension markings consisting of 2-foot line segments and 2- to 6-foot gaps 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.

**Guidance**

Where greater restriction is required, solid lane lines or channelizing lines should be extended into or continued through intersections or major driveways.

**Standard**

Solid lines shall not be used to extend edge lines into or through intersections or major driveways.
A - Typical pavement markings with offset lane lines continued through the intersection and optional crosswalk lines and stop lines

Legend

← Direction of travel

Note: Lane line extensions in the intersection may be dotted or solid white lines

B - Typical pavement markings with double-turn lanes, lane-use turn arrows, and optional crosswalk lines, stop lines, and line extensions into intersection for double turns

Optional dotted line

Note: Lane line extensions in the intersection may be dotted or solid white lines

Figure 3B-13  Examples of Line Extensions through Intersections  (Sheet 1 of 2)
Figure 3B-13  Examples of Line Extensions through Intersections (Sheet 2 of 2)
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 one-quarter of the distance between the Lane Ends sign (see Section 2C.42) and the point where the transition taper begins.

Except as provided in the first Option for low-speed urban roadways, the edge line markings shown in Figure 3B-14 should be installed from the location of the Lane Ends warning sign to beyond the beginning of the narrower roadway.

Support

Pavement markings at lane-reduction transitions supplement the standard signs. See Section 3B.20 for provisions regarding use of lane-reduction arrows.

3B.10 Approach Markings for Obstructions

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, toll plaza islands, and raised channelization islands shall consist of a tapered line or lines extending from the center line or the lane line to a point 1 to 2 feet to the right-hand side, or to both sides, of the approach end of the obstruction (see Figure 3B-15).

Support

See Chapter 3E for additional information on approach markings for toll plaza islands.

Guidance

For roadways having a posted or statutory speed limit of 45 mph or greater, the taper length of the tapered line markings should be computed by the formula \[ L = WS \]. For roadways where the posted or statutory speed limit is less than 45 mph, the formula \[ L = W S^2 / 60 \] should be used to compute the taper length.

Support

Under both formulas, \( L \) equals the taper length in feet, \( W \) equals the width of the offset distance in feet, and \( S \) equals the 85th-percentile speed or the posted or statutory speed limit, whichever is higher.

Guidance

Where observed speeds exceed posted or statutory speed limits, longer tapers should be used.
Figure 3B-14  Examples of Applications of Lane-Reduction Transition Markings

Notes:
1. Lane-reduction arrows are optional for speeds of less than 45 mph.
2. See Section 3F.4 for delineator spacing.
3. L=WS for speeds of 45 mph or greater and L= WS^2/60 for speeds of less than 45 mph, where:
   - L = Length of taper in feet
   - S = Posted, 85th-percentile, or statutory speed in mph
   - W = Offset in feet
4. d = Advance warning distance (see Section 2C.5)
Figure 3B-15  Examples of Applications of Markings for Obstructions in the Roadway (Sheet 1 of 2)

A - Center of two-lane road

Legend

- Direction of travel
- Obstruction

B - Center of four-lane road

Notes:
For speeds of 45 mph or greater: $L = WS$
For speeds less than 45 mph: $L = W S^2 / 60$
$S$ = Posted, 85th-percentile, or statutory speed in mph
$W$ = Offset distance in feet

Minimum length of: $L = 100$ feet in urban areas
$L = 200$ feet in rural areas

Length "L" should be extended as required by sight distance conditions
C - Traffic passing in the same direction on both sides of an obstruction

For speeds 45 mph or more  \( L = WS \)
For speeds of less than 45 mph  \( L = WS/60 \)
\( S = \) Posted, 85th percentile, or statutory speed limit in mph
\( W = \) Offset distance in feet

Minimum length of:  
- \( L = 100 \) feet in urban areas
- \( L = 200 \) feet in rural areas

Length “\( L \)” should be extended as required by sight distance conditions

Figure 3B-15  Examples of Applications of Markings for Obstructions in the Roadway (Sheet 2 of 2)
3B-11 Raised Pavement Markers - General

Standard

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.

Option

The side of a raised pavement marker that is visible to traffic proceeding in the wrong direction may be red (see Section 3A.5).

Support

Examples of approach markings for obstructions in the roadway are shown in Figure 3B-15.

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 Drawing A of Figure 3B-15).

Option

If traffic is required to pass only to the right of the obstruction, yellow diagonal crosshatch markings (see Section 3B.24) may be placed in the flush median area between the no-passing zone markings as shown in Drawings A and B of Figure 3B-15. Other markings, such as yellow delineators, yellow channelizing devices, yellow raised pavement markers, and white crosswalk pavement markings, may also be placed in the flush median 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 wide solid white line or normal solid double white line shall be extended in place of the broken lane line for a distance equal to the length of the diverging lines (see Drawing C of Figure 3B-15).

Option

If traffic can pass either to the right or left of the obstruction, additional white chevron crosshatch markings (see Section 3B.24) may be placed in the flush median area between the channelizing lines as shown in Drawing C of Figure 3B-15. Other markings, such as white delineators, white channelizing devices, white raised pavement markers, and white crosswalk markings may also be placed in the flush median area.

3B-12 Raised Pavement Markers - General

Standard

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.

Option

The side of a raised pavement marker that is visible to traffic proceeding in the wrong direction may be red (see Section 3A.5).

Support

Examples of approach markings for obstructions in the roadway are shown in Figure 3B-15.

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 Drawing A of Figure 3B-15).

Option

If traffic is required to pass only to the right of the obstruction, yellow diagonal crosshatch markings (see Section 3B.24) may be placed in the flush median area between the no-passing zone markings as shown in Drawings A and B of Figure 3B-15. Other markings, such as yellow delineators, yellow channelizing devices, yellow raised pavement markers, and white crosswalk pavement markings, may also be placed in the flush median 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 wide solid white line or normal solid double white line shall be extended in place of the broken lane line for a distance equal to the length of the diverging lines (see Drawing C of Figure 3B-15).

Option

If traffic can pass either to the right or left of the obstruction, additional white chevron crosshatch markings (see Section 3B.24) may be placed in the flush median area between the channelizing lines as shown in Drawing C of Figure 3B-15. Other markings, such as white delineators, white channelizing devices, white raised pavement markers, and white crosswalk markings may also be placed in the flush median area.
information regarding the spacing of raised pavement markers on longitudinal markings.

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

Option
Retroreflective or internally illuminated 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 in line with or immediately adjacent to a single line marking, or positioned between the two lines of a double center line or double lane line marking.

Guidance
The spacing for such applications should be 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.

On freeways and expressways, a spacing of 3N may be used for relatively straight and level roadway segments where engineering judgment indicates that such spacing will provide adequate delineation under wet night conditions.

3B.13 Raised Pavement Markers Supplementing Other Markings

Guidance
The use of retroreflective or internally illuminated raised pavement markers for supplementing longitudinal line markings should comply with 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.
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 no greater than N/2 should be used.
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 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.

Raised pavement markers should not supplement right-hand edge lines unless an engineering study or engineering judgment indicates the benefits of enhanced delineation of a curve or other location would outweigh possible impacts on bicycles using the shoulder, and the spacing of raised pavement markers on the right-hand edge is close enough to avoid misinterpretation as a broken line during wet night conditions.

Option
Retroreflective or internally illuminated raised pavement markers, or nonretroreflective raised pavement markers supplemented by retroreflective or internally illuminated markers, may be substituted for markings of other types.

Guidance
If used, the pattern and color of the raised pavement markers should simulate the pattern and color of the markings for which they substitute.

Option
The side of a raised pavement marker that is visible to traffic proceeding in the wrong direction may be red.
3B.16 Stop and Yield Lines

**Guidance**

Stop lines should be used to indicate the point behind which vehicles are required to stop in compliance with a traffic control signal.

**Option**

A stop line may be omitted on an approach to a traffic control signal if a crosswalk line of at least 24 inches in width is in place for that approach.

**Stop lines may be omitted prior to Freeway Entrance Ramp Control Signals.**

Stop lines may be used to indicate the point behind which vehicles are required to stop in compliance with a STOP (R1-1) sign, a Stop Here For Pedestrians (R1-5b or R1-5c) sign, or some other traffic control device that requires vehicles to stop, except YIELD signs that are not associated with passive grade crossings.

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

**Standard**

Except as provided in Section 8B.28, stop lines shall not be used at locations where drivers are required to stop in compliance with a STOP (R1-1) sign, a Stop Here For Pedestrians (R1-5b or R1-5c) sign, or some other traffic control device that requires vehicles to stop, except YIELD signs that are not associated with passive grade crossings.

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

**Standard**

Except as provided in Section 8B.28, stop lines shall not be used at locations where drivers are required to yield in compliance with a YIELD (R1-2) sign.

Yield lines shall not be used at locations where drivers are required to stop in compliance with a STOP (R1-1) sign, a Stop Here For Pedestrians (R1-5b or R1-5c) sign, a traffic control signal, or some other traffic control device.

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.

Yield lines (see Figure 3B-16) 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.

**Guidance**

Stop lines should be 12 to 24 inches wide.

The individual triangles comprising the yield line should have a base of 12 to 24 inches wide and a height equal to 1.5 times the base. The space between the triangles should be 3 to 12 inches.

If used, stop and yield lines should be placed a minimum of 4 feet in advance of the nearest crosswalk line at controlled intersections, except for yield lines at roundabouts as provided for in Section 3C.4 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 not be placed more than 30 feet or less than 4 feet from the nearest edge of the intersecting traveled way.

February, 2018
When drivers yield or stop too close to crosswalks that cross uncontrolled multi-lane approaches, they place pedestrians at risk by blocking other drivers’ views of pedestrians and by blocking pedestrians’ views of vehicles approaching in the other lanes.

3B.17 Do Not Block Intersection Markings

Option

Do Not Block Intersection markings may be used to mark the edges of an intersection area that is in close proximity to a signalized intersection, railroad crossing, or other nearby traffic control that might cause vehicles to stop within the intersection and impede other traffic entering the intersection. If authorized by law, Do Not Block Intersection markings with appropriate signs may also be used at other locations.

Standard

If used, Do Not Block Intersection markings (see Figure 3B-18) shall consist of one of the following alternatives:

Support

When drivers yield or stop too close to crosswalks that cross uncontrolled multi-lane approaches, they place pedestrians at risk by blocking other drivers’ views of pedestrians and by blocking pedestrians’ views of vehicles approaching in the other lanes.

Stop lines at midblock signalized locations should be placed at least 40 feet in advance of the nearest signal indication (see Section 4D.14).

If yield or stop lines are used at a crosswalk that crosses an uncontrolled multi-lane approach, the yield lines or stop lines should be placed 20 to 50 feet in advance of the nearest crosswalk line, and parking should be prohibited in the area between the yield or stop line and the crosswalk (see Figure 3B-17).

Standard

If stop lines are used at a crosswalk that crosses an uncontrolled multi-lane approach, Stop Here For Pedestrians (R1-5 series) signs (see Section 2B.11) shall be used.

Guidance

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

Figure 3B-16  Recommended Yield Line Layouts
Support

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

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

At non-intersection locations, crosswalk markings legally establish the crosswalk.

A. Wide solid white lines that outline the intersection area that vehicles must not block;
B. Wide solid white lines that outline the intersection area that vehicles must not block and a white word message such as DO NOT BLOCK or KEEP CLEAR;
C. Wide solid white lines that outline the intersection area that vehicles must not block and white crosshatching within the intersection area; or
D. A white word message, such as DO NOT BLOCK or KEEP CLEAR, within the intersection area that vehicles must not block.

Do Not Block Intersection markings shall be accompanied by one or more Do Not Block Intersection (DRIVEWAY) (CROSSING) (R10-7) signs (see Section 2B.53), one or more Do Not Stop On Tracks (R8-8) signs (see Section 8B.9), or one or more similar signs.
At locations controlled by traffic control signals or on approaches controlled by STOP or YIELD signs, crosswalk lines should be installed where engineering judgment indicates they are needed to direct pedestrians to the proper crossing path(s).

Crosswalk lines should not be used indiscriminately. An engineering study should be performed before a marked crosswalk is installed at a location away from a traffic control signal or an approach controlled by a STOP or YIELD sign. The engineering study should consider the number of lanes, the presence of a median, the distance from adjacent signalized intersections, the pedestrian volumes and delays, the average daily traffic (ADT), the posted or statutory speed limit or 85th-percentile speed, the geometry of the location, the possible consolidation of multiple

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**Figure 3B-18  Do Not Block Intersection Markings**

**Standard**

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

**Guidance**

If transverse lines are used to mark a crosswalk, the gap between the lines should not be less than 6 feet. If diagonal or longitudinal lines are used without transverse lines to mark a crosswalk, the crosswalk should be not less than 6 feet wide.

Crosswalk lines, if used on both sides of the crosswalk, should extend across the full width of pavement to the edge of the intersecting crosswalk to discourage diagonal walking between crosswalks (see Figure 3B-17 and 3B-19).
For added visibility, the area of the crosswalk may be marked with white diagonal lines at a 45-degree angle to the line of the crosswalk or with white longitudinal lines parallel to traffic flow as shown in Figure 3B-19.

When diagonal or longitudinal lines are used to mark a crosswalk, the transverse crosswalk lines may be omitted. This type of marking may be used at locations where substantial numbers of pedestrians cross without any other traffic control device, at locations where physical conditions are such that added visibility of the crosswalk is desired, or at places where a pedestrian crosswalk might not be expected.

Guidance

If used, the diagonal or longitudinal lines should be 12 to 36 inches wide and separated by gaps of 12 to 60 inches. The design of the lines and gaps should avoid the wheel paths if possible, and the gap between the lines should not exceed 2.5 times the width of the diagonal or longitudinal lines.

Option

When an exclusive pedestrian phase that permits diagonal crossing is provided at a traffic control signal, a marking as shown in Figure 3B-20 may be used for the crosswalk.

Support

Chapter 4F contains information on Pedestrian Hybrid Beacons. Section 4L.3 contains information regarding Warning Beacons to provide active warning of a pedestrian’s presence. Section 4N.2 contains information regarding In-Roadway Warning Lights at crosswalks. Chapter 7D contains information regarding school crossing supervision.

Guidance

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

Support

Section 3B.16 contains information regarding placement of stop line markings near crosswalk markings.
Figure 3B-21 Examples of Parking Space Markings
**Guidance**

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

**Support**

Detectable warning surfaces mark boundaries between pedestrian and vehicular ways where there is no raised curb. Detectable warning surfaces are required by 49 CFR, Part 37 and by the Americans with Disabilities Act (ADA) where curb ramps are constructed at the junction of sidewalks and the roadway, for marked and unmarked crosswalks. Detectable warning surfaces contrast visually with adjacent walking surfaces, either light-on-dark, or dark-on-light. The “Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG)” (see Section 1A.11) contains specifications for design and placement of detectable warning surfaces.

3B.19 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-21.

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![Figure 3B-22 International Symbol of Accessibility Parking Space Marking](image)

**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.20 and illustrated in Figure 3B-22. The design and layout of accessible parking spaces for persons with disabilities is provided in the “Americans with Disabilities Act Accessibility Guidelines (ADAAG)” (see Section 1A.11).

3B.20 Pavement Word, Symbol, and Arrow Markings

**Support**

Word, symbol, and arrow markings on the pavement are used for the purpose of guiding, warning, or regulating traffic. These pavement markings can be helpful to road users in some locations by supplementing signs and providing additional emphasis for important regulatory, warning, or guidance messages, because the markings do not require diversion of the road user’s attention from the roadway surface. Symbol messages are preferable to word messages.

Examples of standard word and arrow pavement markings are shown in Figures 3B-23 and 3B-24.
Option

Word, symbol, and arrow markings, including those contained in the MnDOT “Standard Signs Manual” and the FHWA “Standard Highway Signs and Markings” book (see Section 1A.11), may be used as determined by engineering judgment to supplement signs and/or to provide additional emphasis for regulatory, warning, or guidance messages. Among the word, symbol, and arrow markings that may be used are the following:

A. Regulatory:
1. STOP
2. YIELD
3. RIGHT (LEFT) TURN ONLY
4. 25 MPH
5. Lane-use and wrong-way arrows
6. Diamond symbol for HOV lanes
7. Other preferential lane word markings

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
11. Lane-reduction arrows

C. Guide:
1. Route numbers (route shield pavement marking symbols and/or words such as I-81, US 40, STATE 135, or ROUTE 10)
2. Cardinal directions (NORTH, SOUTH, EAST, or WEST)
3. TO
4. Destination names or abbreviations thereof

Standard

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

Figure 3B-23 Example of Elongated Letters for Word Pavement Markings
Notes:
1. 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.
2. The narrow elongated arrow designs shown in drawings A, B, and C are optional.
3. For proper proportion, see the MnDOT "Standard Signs Manual" and the FHWA "Standard Highway Signs and Markings" book (see Section 1A.11).

Figure 3B-24  Examples of Standard Arrows for Pavement Markings
Pavement marking letters, numerals, symbols, and arrows shall be installed in accordance with the design details in the Pavement Markings chapter of the “Standard Highway Signs and Markings” book (see Section 1A.11).

**Guidance**

Letters and numerals should be 6 feet or more in height.

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.

Except for the SCHOOL word marking (see Section 7C.3), pavement word, symbol, and arrow markings should be no more than one lane in width.

Pavement word, symbol, and arrow markings should be proportionally scaled to fit within the width of the facility upon which they are applied.

**Option**

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

Pavement markings simulating Interstate, U.S., State, and other official highway route shield signs (see Figure 2D-3) with appropriate route numbers, but elongated for proper proportioning when viewed as a marking, may be used to guide road users to their destinations (see Figure 3B-25).

**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.5). At the ends of aisles in parking lots, the word STOP shall not be used on the pavement unless accompanied by a stop line.

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

**Guidance**

Letters and numerals should be 6 feet or more in height.

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.

Except for the SCHOOL word marking (see Section 7C.3), pavement word, symbol, and arrow markings should be no more than one lane in width.

Pavement word, symbol, and arrow markings should be proportionally scaled to fit within the width of the facility upon which they are applied.

**Option**

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

Pavement markings simulating Interstate, U.S., State, and other official highway route shield signs (see Figure 2D-3) with appropriate route numbers, but elongated for proper proportioning when viewed as a marking, may be used to guide road users to their destinations (see Figure 3B-25).

**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.5). At the ends of aisles in parking lots, the word STOP shall not be used on the pavement unless accompanied by a stop line.

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

**Guidance**

Letters and numerals should be 6 feet or more in height.

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.

Except for the SCHOOL word marking (see Section 7C.3), pavement word, symbol, and arrow markings should be no more than one lane in width.

Pavement word, symbol, and arrow markings should be proportionally scaled to fit within the width of the facility upon which they are applied.

**Option**

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

Pavement markings simulating Interstate, U.S., State, and other official highway route shield signs (see Figure 2D-3) with appropriate route numbers, but elongated for proper proportioning when viewed as a marking, may be used to guide road users to their destinations (see Figure 3B-25).

**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.5). At the ends of aisles in parking lots, the word STOP shall not be used on the pavement unless accompanied by a stop line.

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

**Guidance**

Letters and numerals should be 6 feet or more in height.

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.

Except for the SCHOOL word marking (see Section 7C.3), pavement word, symbol, and arrow markings should be no more than one lane in width.

Pavement word, symbol, and arrow markings should be proportionally scaled to fit within the width of the facility upon which they are applied.

**Option**

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

Pavement markings simulating Interstate, U.S., State, and other official highway route shield signs (see Figure 2D-3) with appropriate route numbers, but elongated for proper proportioning when viewed as a marking, may be used to guide road users to their destinations (see Figure 3B-25).

**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.5). At the ends of aisles in parking lots, the word STOP shall not be used on the pavement unless accompanied by a stop line.

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

**Guidance**

Letters and numerals should be 6 feet or more in height.

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.

Except for the SCHOOL word marking (see Section 7C.3), pavement word, symbol, and arrow markings should be no more than one lane in width.

Pavement word, symbol, and arrow markings should be proportionally scaled to fit within the width of the facility upon which they are applied.

**Option**

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

Pavement markings simulating Interstate, U.S., State, and other official highway route shield signs (see Figure 2D-3) with appropriate route numbers, but elongated for proper proportioning when viewed as a marking, may be used to guide road users to their destinations (see Figure 3B-25).

**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.5). 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.

**Option**

A yield-ahead triangle symbol (see Figure 3B-26) 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.

**Standard**

The yield-ahead triangle symbol or YIELD AHEAD word pavement marking shall not be used unless a YIELD sign (see Section 2B.8) is in place at the intersection. The yield ahead symbol marking shall be as shown in Figure 3B-26.

**Guidance**

Where opposing offset channelized left-turn lanes exist, lane-use arrow markings should be placed near the downstream terminus of the offset left-turn lanes to reduce wrong-way movements (see Figure 2B-17).

**Option**

A yield-ahead triangle symbol (see Figure 3B-26) 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.

**Standard**

The yield-ahead triangle symbol or YIELD AHEAD word pavement marking shall not be used unless a YIELD sign (see Section 2B.8) is in place at the intersection. The yield ahead symbol marking shall be as shown in Figure 3B-26.

**Guidance**

The International Symbol of Accessibility parking space markings may be placed in each parking space designated for use by persons with disabilities.

**Option**

A blue background with white border may supplement the wheelchair symbol as shown in Figure 3B-22.

**Support**

Lane-use arrow markings (see Figure 3B-24) are used to indicate the mandatory or permissible movements in certain lanes (see Figure 3B-27) and in two-way left-turn lanes (see Figure 3B-7).

Lane-use arrow markings (see Figure 3B-24) should be used in lanes designated for the exclusive use of a turning movement, including turn bays, except where engineering judgment determines that physical conditions or other markings (such as a dotted extension of the lane line through the taper into the turn bay) clearly discourage unintentional use of a turn bay by through vehicles. Lane-use arrow markings should also be used in lanes from which movements are allowed that are contrary to the normal rules of the road (see Drawing B of Figure 3B-13). When used in turn lanes, at least two arrows should be used, one at or near the upstream end of the full-width turn lane and one an appropriate distance upstream from the stop line or intersection (see Drawing A of Figure 3B-11).

**Option**

An additional arrow or arrows may be used in a turn lane. When arrows are used for a short turn lane, the second (downstream) arrow may be omitted based on engineering judgment.

**Guidance**

Where opposing offset channelized left-turn lanes exist, lane-use arrow markings should be placed near the downstream terminus of the offset left-turn lanes to reduce wrong-way movements (see Figure 2B-17).

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**Figure 3B-26  Yield Ahead Triangle Symbols**
Where through lanes approaching an intersection become mandatory turn lanes, ONLY word markings (see Figure 3B-23) should be used in addition to the required lane-use arrow markings and signs (see Sections 2B.19 and 2B.20). These markings and signs should be placed well in advance of the turn and should be repeated as necessary to prevent entrapment and to help the road user select the appropriate lane in advance of reaching a queue of waiting vehicles (see Drawing A of Figure 3B-11).

**Support**

An arrow at the downstream end of a turn lane can help to prevent wrong way movements.

**Standard**

Where through traffic lanes approaching an intersection become mandatory turn lanes, lane-use arrow markings (see Figure 3B-24) shall be used and shall be accompanied by standard signs.

---

Figure 3B-27  Examples of Lane-Use Control Word and Arrow Pavement Markings
Option
On freeways or expressways where a through lane becomes a mandatory exit lane, lane-use arrow markings may be used on the approach to the exit in the dropped lane and in an adjacent optional through-or-exit lane if one exists.

Guidance
A two-way left-turn lane-use arrow pavement marking, with opposing arrows spaced as shown in Figure 3B-7, should be used at or just downstream from the beginning of a two-way left-turn lane.

Option
Additional two-way left-turn lane-use arrow markings may be used at other locations along a two-way left-turn lane where engineering judgment determines that such additional markings are needed to emphasize the proper use of the lane.

Standard
A single-direction lane-use arrow shall not be used in a lane bordered on both sides by yellow two-way left-turn lane longitudinal markings.

Lane use, lane reduction, and wrong-way arrow markings shall be designed as shown in Figure 3B-24 and in the “Standard Highway Signs and Markings” book (see Section 1A.11).

Option
The ONLY word marking (see Figure 3B-23) may be used to supplement the lane-use arrow markings in lanes that are designated for the exclusive use of a single movement (see Figure 3B-27) or to supplement a preferential lane word or symbol marking (see Section 3D.1).

Standard
The ONLY word marking shall not be used in a lane that is shared by more than one movement.

Guidance
Where a lane-reduction transition occurs on a roadway with a speed limit of 45 mph or more, the lane-reduction arrow markings shown in Drawing f in Figure 3B-24 should be used (see Figure 3B-14). Except for acceleration lanes, where a lane-reduction transition occurs on a roadway with a speed limit of less than 45 mph, the lane-reduction arrow markings shown in Drawing f in Figure 3B-24 should be used if determined to be appropriate based on engineering judgment.

Option
Lane-reduction arrow markings may be used in long acceleration lanes based on engineering judgment.

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 2B-18).

Option
The wrong-way arrow markings shown in Drawing D in Figure 3B-24 may be placed near the downstream terminus of a ramp as shown in Figures 2B-18 and 2B-19, or at other locations where lane-use arrows are not appropriate, to indicate the correct direction of traffic flow and to discourage drivers from traveling in the wrong direction.

3B.21 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 24 inches in width.

Option
Speed measurement markings may extend 24 inches on either side of the center line or 24 inches on either side of edge line markings at 1/4-mile intervals over a 1-mile length of roadway. When paved shoulders of sufficient width are available, the speed measurement markings may be placed entirely on these shoulders (see Drawing A of Figure 3B-10). Advisory signs may be used in conjunction with these markings.

3B.22 Speed Reduction Markings
Support
Speed reduction markings (see Figure 3B-28) are transverse markings that are placed on the roadway within a lane (along both edges of the lane) in a pattern of progressively reduced spacing to give drivers the impression that their speed is increasing. These markings might be placed in advance of an unexpectedly severe horizontal or vertical curve or other roadway feature where drivers need to decelerate prior to reaching the feature and where the desired reduction in speeds has not been achieved by the installation of warning signs and/or other traffic control devices.
Curb Markings

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

Standard
Where curbs are marked to convey parking regulations in areas where curb markings are frequently obscured by snow and ice accumulation, signs shall be used with the curb markings except as provided in the following Option.

Guidance
Except as provided in the following 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, YIELD sign, driveway, fire hydrant, or crosswalk.

Local highway agencies may prescribe special colors for curb markings to supplement standard signs for parking regulation.
Since yellow and white curb markings are frequently used for curb delineation and visibility, it is advisable to establish parking regulations through the installation of standard signs (see Sections 2B.46 through 2B.48).

Where curbs are marked for delineation or visibility purposes, the colors shall comply with the general principles of markings (see Section 3A.5).

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

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

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.

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

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

When crosshatch markings are used in paved areas that separate traffic flows in the same general direction, they shall be white and they shall be shaped as chevron markings, with the point of each chevron facing toward approaching traffic, as shown in Figure 3B-8, Drawing A of Figure 3B-9, Figure 3B-10, and Drawing C of Figure 3B-15.

When crosshatch markings are used in paved areas that separate opposing directions of traffic, they shall be yellow diagonal markings that slant away from traffic in the adjacent travel lanes, as shown in Figures 3B-2 and 3B-5 and Drawings A and B of Figure 3B-15.

When crosshatch markings are used on paved shoulders, they shall be diagonal markings that slant away from traffic in the adjacent travel lane. The diagonal markings shall be yellow when used on the left-hand shoulders of the roadways of divided highways and on the left-hand shoulders of one-way streets or ramps. The diagonal markings shall be white when used on right-hand shoulders.

The chevrons and diagonal lines used for crosshatch markings should be at least 12 inches wide for roadways having a posted or statutory speed limit of 45 mph or greater, and at least 8 inches wide for roadways having posted or statutory speed limit of less than 45 mph. The longitudinal spacing of the chevrons or diagonal lines should be determined by engineering judgment considering factors such as speeds and desired visual impacts.

The chevrons and diagonal lines should form an angle of approximately 30 to 45 degrees with the longitudinal lines that they intersect.

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

If markings are used for a speed hump that also functions as a crosswalk or speed Table, the markings shall comply with Option A or B shown in Figure 3B-30.

Advance speed hump markings (see Figure 3B-31) may be used in advance of speed humps or other engineered vertical roadway deflections such as dips where added visibility is desired or where such deflection is not expected.
Figure 3B-29  Pavement Markings for Speed Humps without Crosswalks
Advance pavement wording such as BUMP or HUMP (see Section 3B.20) may be used on the approach to a speed hump either alone or in conjunction with advance speed hump markings. Appropriate advance warning signs may be used in compliance with Section 2C.29.

**Standard**

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

**Guidance**

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

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*Figure 3B-30  Pavement Markings for Speed Tables or Speed Humps with Crosswalks*
Figure 3B-31  Advance Warning Markings for Speed Humps

Legend
Direction of travel

Centerline of travel lane

100 feet

12-inch white pavement markings
(see detail on this sheet)

6 feet

5 feet

4 feet

3 feet

2 feet

1 foot

16 feet

14 feet

12 feet

10 feet

8 feet

20 feet

18 feet

16 feet

100 feet

Leading edge of speed hump

Center of speed hump *

Speed hump design width

12-inch white pavement markings
(see detail on this sheet)

Width varies
(see detail on this sheet)

* See Figures 3B-29 and 3B-30 for pavement marking on speed humps

DETAIL - SPEED HUMP ADVANCE WARNING MARKINGS
3C.1 General

Support
A roundabout (see definition in Section 1A.13) is a specific type of circular intersection designed to control speeds and having specific traffic control features.

Guidance
Pavement markings and signing for a roundabout should be integrally designed to correspond to the geometric design and intended lane use of a roundabout.

Markings on the approaches to a roundabout and on the circular roadway should be compatible with each other to provide a consistent message to road users and should facilitate movement through the roundabout such that vehicles do not have to change lanes within the circulatory roadway in order to exit the roundabout in a given direction.

Support
Figure 3C-1 provides an example of the pavement markings for approach and circulatory roadways at a roundabout. Figure 3C-2 shows the options that are available for lane-use pavement marking arrows on approaches to roundabouts.

Figure 3C-3 through 3C-14 illustrate examples of markings for roundabouts of various geometric and lane-use configurations.

Traffic control signals or pedestrian hybrid beacons (see Part 4) are sometimes used at roundabouts to facilitate the crossing of pedestrians or to meter traffic.

Section 8C.12 contains information about roundabouts that contain or are in close proximity to grade crossings.

3C.2 White Lane Line Pavement Markings for Roundabouts

Standard
Multi-lane approaches to roundabouts shall have lane lines.

A through lane on a roadway that becomes a dropped lane (mandatory turn lane) at a roundabout shall be marked with a dotted white lane line in accordance with Section 3B.04.

Guidance
Multi-lane roundabouts should have lane line markings within the circulatory roadway to channelize traffic to the appropriate exit lane.

Figure 3C-1 Example of Markings for Approach and Circulatory Roadways at a Roundabout
Figure 3C-2  Lane-Use Arrow Pavement Marking Optional for Roundabout Approaches

Figure 3C-3  Example of Markings for a One-Lane Roundabout
A - Unextended central island

Figure 3C-4  Example of Markings for a Two-Lane Roundabout with One- and Two-Lane Approaches (Sheet 1 of 2)
Figure 3C-4  Example of Markings for a Two-Lane Roundabout with One- and Two-Lane Approaches (Sheet 2 of 2)
Figure 3C-5  Example of Markings for a Two-Lane Roundabout with One-Lane Exits

Note: The marking configuration shown on this figure required U-turning drivers to change lanes within the circulatory roadway.

Optional diagonal yellow crosshatch markings
Figure 3C-6  Example of Markings for a Two-Lane Roundabout with Two-Lane Exits
Optional if the turn lane is an added lane, but recommended if the turn lane is a through lane that becomes a mandatory turn lane at the roundabout.
Optional if the turn lane is an added lane, but recommended if the turn lane is a through lane that becomes a mandatory turn lane at the roundabout.

* Figure 3C-8  Example of Markings for a Two-Lane Roundabout with a Double Right Turn
Figure 3C-9  Example of Markings for a Two-Lane Roundabout with Consecutive Double Left Turns

Optional diagonal yellow crosshatch markings

* Optional if the turn lane is an added lane, but recommended if the turn lane is a through lane that becomes a mandatory turn lane at the roundabout.
Figure 3C-10  Example of Markings for a Three-Lane Roundabout with Two- and Three-Lane Approaches
Figure 3C-11  Example of Markings for a Three-Lane Roundabout with Three-Lane Approaches
Figure 3C-12  Example of Markings for a Three-Lane Roundabout with Two-Lane Exits
Optional diagonal yellow crosshatch markings

Notes:
1. Pedestrian facilities are not shown
2. The marking configuration shown on this figure requires U-turning drivers to change lanes within the circulatory roadway.

Lanes are channelized to the outside to prevent trapping movement at next roundabout.

Figure 3C-13 Example of Markings for Two Linked Roundabouts
Figure 3C-14 Example of Markings for a Diamond Interchange with Two Circular-Shaped Roundabout Ramp Terminals

Note: Design assumes rural conditions with no pedestrian activity.
Continuous concentric lane lines shall not be used within the circulatory roadway of roundabouts.

Section 9C.4 contains information regarding bicycle lane markings at roundabouts.

**3C.3 Edge Line Pavement Markings for Roundabout Circulatory Roadways**

A white edge line should be used on the outer (right-hand) side of the circulatory roadway.

Where a white edge line is used for the circulatory roadway, it should be as follows (see Figure 3C-1):

A. A solid line adjacent to the splitter island, and
B. A wide dotted line across the lane(s) entering the roundabout.

Edge lines and edge line extensions shall not be placed across the exits from the circulatory roadway at roundabouts.

A yellow edge line may be placed around the inner (left-hand) edge of the circulatory roadway (see Figure 3C-1) and may be used to channelize traffic (see Drawing B of Figure 3C-4).

**3C.4 Yield Lines for Roundabouts**

A yield line (see Section 3B.16) may be used to indicate the point behind which vehicles are required to yield at the entrance to a roundabout (see Figure 3C-1).

**3C.5 Crosswalk Markings at Roundabouts**

Pedestrian crosswalks shall not be marked to or from the central island of roundabouts.

If pedestrian facilities are provided, crosswalks (see Section 3B.18) should be marked across roundabout entrances and exits to indicate where pedestrians are intended to cross.

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

Various arrangements of crosswalks at roundabouts are illustrated in the figures in this Chapter.

**3C.6 Word, Symbol, and Arrow Pavement Markings for Roundabouts**

Lane-use arrows may be used on any approach to and within the circulatory roadway of any roundabout.

YIELD (word) and YIELD AHEAD (symbol or word) pavement markings (see Figure 3C-1) may be used on approaches to roundabouts.

Word and/or route shield pavement markings may be used on an approach to or within the circulatory roadway of a roundabout to provide route and/or destination guidance information to road users (see Figure 3C-14).

Within the circulatory roadway of multi-lane roundabouts, normal lane-use arrows (see Section 3B.20 and Figure 3B-24) should be used.

On multi-lane approaches with double left-turn and/or double right-turn lanes, lane-use arrows as shown in Figures 3C-7 and 3C-8 should be used.

If used on approaches to a roundabout, lane-use arrows may be either normal or fish-hook arrows, either with or without an oval symbolizing the central island, as shown in Figure 3C-2.

**3C.7 Markings for Other Circular Intersections**

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

The markings shown in this Chapter may be used at other circular intersections if engineering judgment indicates that their presence will benefit drivers, pedestrians, or other road users.
3D.1 Preferential Lane Word and Symbol Markings

Support
Preferential lanes are established for one or more of a wide variety of special uses, including, but not limited to, high-occupancy vehicle (HOV) lanes, ETC lanes, high occupancy toll (HOT) lanes, bicycle lanes, bus only lanes, taxi only lanes, and light rail transit only lanes.

Standard
When a lane is assigned full or part time to a particular class or classes of vehicles, the preferential lane word and symbol markings described in this Section and the preferential lane longitudinal markings described in Section 3D.02 shall be used.

All longitudinal pavement markings, as well as word and symbol pavement markings, associated with a preferential lane shall end where the Preferential Lane Ends (R3-12a or R3-12c) sign (see Section 2G.7) designating the downstream end of the preferential only lane restriction is installed.

Static or changeable message regulatory signs (see Sections 2G.3 to 2G.7) shall be used with preferential lane word or symbol markings.

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

Where a preferential lane use exists contiguous to a general-purpose lane or is separated from a general-purpose lane by a flush buffered space that can be traversed by motor vehicles, the preferential lane shall be marked with one or more of the following symbol or word markings for the preferential lane use specified:

A. HOV lane-the preferential lane-use marking for high occupancy vehicle lanes shall consist of white lines formed in a diamond shape symbol or the word message HOV. The diamond shall be at least 2.5 feet wide and 12 feet in length. The lines shall be at least 6 inches in width.

B. HOT lane or ETC Account-Only lane-except as provided in the following Option, the preferential lane-use marking for a HOT lane or an ETC Account-Only lane shall consist of a word marking using the name of the ETC payment system required for use of the lane, such as MnPASS ONLY.

C. Bicycle lane - the preferential lane use marking for a bicycle lane shall consist of a bicycle symbol shown in Figure 9C-3.B or the word marking BIKE LANE shown in Figure 9C-3.C. A less preferable option would consist of a bicycle symbol shown in Figure 9C-3.A. See Chapter 9C and Figures 9C-1 and 9C-3 through 9C-6 for design and placement of these symbols.

D. Bus only lane-the preferential lane-use marking for a bus only lane shall consist of the word marking BUS ONLY.

E. Taxi only lane-the preferential lane-use marking for a taxi only lane shall consist of the word marking TAXI ONLY.

F. Light rail transit lane-the preferential lane-use marking for a light rail transit lane shall consist of the word marking LRT ONLY.

G. Other type of preferential lane-the preferential lane use markings shall consist of a word marking appropriate to the restriction.

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.

Option
Preferential lane-use symbol or word markings may be omitted at toll plazas where physical conditions preclude the use of the markings (see Section 3E.1).

Guidance
The spacing of the markings should be based on engineering judgment that considers the prevailing speed, block lengths, distance from intersections, and other factors that affect clear communication to the road user.

Support
Markings spaced as close as 80 feet apart might be appropriate on city streets, while markings spaced as far as 1,000 feet apart might be appropriate for freeways.

Guidance
In addition to a regular spacing interval, the preferential lane marking should be placed at strategic locations such as major decision points, direct exit ramp departures from the preferential lane, and along access openings to and from adjacent general-purpose lanes. At decision points, the preferential lane marking should be placed on all applicable lanes and should be visible to approaching traffic for all available departures. At direct exits from preferential lanes where extra emphasis is needed, the use of word markings (such as “EXIT” or “EXIT ONLY”) in the deceleration lane...
for the direct exit and/or on the direct exit ramp itself just beyond the exit gore should be considered.

**Option**

The vehicle occupancy requirements established for a high-occupancy vehicle lane may be included in sequence after the diamond symbol or HOV word message.

**Guidance**

Engineering judgment should determine the need for supplemental devices such as tubular markers, traffic cones, or other channelizing devices (see Chapter 3H).

### 3D.2 Preferential Lane Longitudinal Markings for Motor Vehicles

**Support**

Preferential lanes can take many forms depending on the level of usage and the design of the facility. They might be barrier-separated or buffer-separated from the adjacent general-purpose lanes, or they might be contiguous with the adjacent general-purpose lanes. Barrier-separated preferential lanes might be operated in a constant direction or be operated as reversible lanes. Some reversible preferential lanes on a divided highway might be operated counter-flow to the direction of traffic on the immediately adjacent general-purpose lanes. See Section 1A.13 for definitions of terms.

Preferential lanes might be operated full-time (24 hours per day on all days), for extended periods of the day, part-time (restricted usage during specific hours on specified days), or on a variable basis (such as a strategy for a managed lane).

**Standard**

Longitudinal pavement markings for preferential lanes shall be as follows (these same requirements are presented in tabular form in Table 3D-1):

A. Barrier-separated, non-reversible preferential lane-the longitudinal pavement markings for preferential lanes that are physically separated from the other travel lanes by a barrier or median shall consist of a normal solid single yellow line at the left-hand edge of the travel lane(s), and a normal solid single white line at the right-hand edge of the travel lane(s) (see Drawing A in Figure 3D-1).

B. Barrier-separated, reversible preferential lane-the longitudinal pavement markings for reversible preferential lanes that are physically separated from the other travel lanes by a barrier or median shall consist of a normal solid single white line at both edges of the travel lane(s) (see Drawing B in Figure 3D-1).

C. Buffer-separated (left-hand side) preferential lane-the longitudinal pavement markings for a full-time or part-time preferential lane on the left-hand side of and separated from the other travel lanes by a neutral buffer space shall consist of a normal solid single yellow line at the left-hand edge of the preferential travel lane(s) and one of the following at the right-hand edge of the preferential travel lane(s):
   1. A wide solid double white line along both edges of the buffer space where crossing the buffer space is prohibited (see Drawing A in Figure 3D-2).
   2. A wide solid single white line along both edges of the buffer space where crossing the buffer space is discouraged (see Drawing B in Figure 3D-2).
   3. A wide broken single white line along both edges of the buffer space, or a wide broken single white lane line within the allocated buffer space (resulting in wider lanes), where crossing the buffer space is permitted (see Drawing C in Figure 3D-2).

D. Buffer-separated (right-hand side) preferential lane-the longitudinal pavement markings for a full-time or part-time preferential lane on the right-hand side of and separated from the other travel lanes by a neutral buffer space shall consist of a normal solid single white line at the right-hand edge of the preferential travel lane(s) if warranted (see Section 3B.7) and one of the following at the left-hand edge of the preferential travel lane(s) (see Drawing D in Figure 3D-2):
   1. A wide solid double white line along both edges of the buffer space where crossing the buffer space is prohibited.
   2. A wide solid single white line along both edges of the buffer space where crossing the buffer space is discouraged.
   3. A wide broken single white line along both edges of the buffer space, or a wide broken single white line within the allocated buffer space (resulting in wider lanes), where crossing the buffer space is permitted.
   4. A wide dotted single white lane line within the allocated buffer space (resulting in wider lanes) where crossing the buffer space is permitted for any vehicle to perform a right-turn maneuver.

E. Contiguous (left-hand side) preferential lane-the longitudinal pavement markings for a full-time or part-time preferential lane on the left-hand side of and contiguous to the other travel lanes shall consist of a normal solid single yellow line at the left-hand edge of the preferential travel lane(s) and one of the following at the right-hand edge of the preferential travel lane(s):
<table>
<thead>
<tr>
<th>Type of Preferential Lane</th>
<th>Left-Hand Edge Line</th>
<th>Right-Hand Edge Line</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barrier-Separated, Non-Reversible</td>
<td>A normal solid single yellow line</td>
<td>A normal solid single white line (see Drawing A of Figure 3D-1)</td>
</tr>
<tr>
<td>Barrier-Separated, Reversible</td>
<td>A normal solid single white line</td>
<td>A normal solid single white line (see Drawing B of Figure 3D-1)</td>
</tr>
<tr>
<td>Buffer-Separated, Left-Hand Side</td>
<td>A normal solid single yellow line</td>
<td>A wide solid double white line along both edges of the buffer space where crossing is prohibited (see Drawing A of Figure 3D-2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A wide solid single white line along both edges of the buffer space where crossing is discouraged (see Drawing B of Figure 3D-2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A wide broken single white line along both edges of the buffer space, or a wide broken single white line within the buffer space (resulting in wider lanes), where crossing is permitted (see Drawing C of Figure 3D-2)</td>
</tr>
<tr>
<td>Buffer-Separated, Right-Hand Side</td>
<td>A wide solid double white line along both edges of the buffer space where crossing is prohibited (see Drawing D of Figure 3D-2)</td>
<td>A wide solid single white line (if warranted)</td>
</tr>
<tr>
<td></td>
<td>A wide solid single white line along both edges of the buffer space where crossing is discouraged (see Drawing D of Figure 3D-2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A wide broken single white line along both edges of the buffer space, or a wide broken single white line within the buffer space (resulting in wider lanes), where crossing is permitted (see Drawing D of Figure 3D-2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A wide dotted single white line within the buffer space where crossing is permitted for any vehicle to perform a right-turn maneuver (see Drawing D of Figure 3D-2)</td>
<td></td>
</tr>
<tr>
<td>Contiguous, Left-Hand Side</td>
<td>A normal solid single yellow line</td>
<td>A wide solid double white line where crossing is prohibited (see Drawing A of Figure 3D-3)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A wide solid single white line where crossing is discouraged (see Drawing B of Figure 3D-3)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A wide broken single white line where crossing is permitted (see Drawing C of Figure 3D-3)</td>
</tr>
<tr>
<td>Contiguous, Right-Hand Side</td>
<td>A wide solid double white line where crossing is prohibited (see Drawing D of Figure 3D-3)</td>
<td>A normal solid single white line</td>
</tr>
<tr>
<td></td>
<td>A wide solid single white line where crossing is discouraged (see Drawing D of Figure 3D-3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A wide broken single white line where crossing is permitted (see Drawing D of Figure 3D-3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A wide dotted single white line where crossing is permitted for any vehicle to perform a right-turn maneuver (see Drawing D of Figure 3D-3)</td>
<td></td>
</tr>
</tbody>
</table>

Notes: 1. If there are two or more preferential lanes, the lane between the preferential lanes shall be normal broken white lines.
2. The standard lane markings listed in this table are provided in a tabular format for reference.
3. This information is also described in the first Standard of Section 3D.2.

*Table 3D-1 Standard Edge Line and Lane Line Markings for Preferential Lanes*
A - Non-reversible

Barrier or median

Example of electronic toll collection only lane word markings

B - Reversible

Barrier or median

Legend

Direction of Travel

Figure 3D-1  Markings for Barrier-Separated Preferential Lanes

A - Full-time preferential lane(s) where enter/exit movements are PROHIBITED

Barrier or median

Double solid double white lane lines

Buffer space

White chevron markings if buffer space is wider than 4 feet

Space at 1/4-mile intervals or as determined by engineering judgement (see Section 3D.1)

B - Preferential lane(s) where enter/exit movements are DISCOURAGED

Barrier or median

Legend

Direction of Travel

* If no barrier or median is present and the left-hand side of the lane is the center line of a two-way roadway, use a double yellow center line.

** Example of HOV only lane symbol markings

Figure 3D-2  Markings for Buffer-Separated Preferential Lanes (Sheet 1 of 2)
Figure 3D-2  Markings for Buffer-Separated Preferential Lanes (Sheet 2 of 2)
A - Full-time preferential lane(s) where enter/exit movements are PROHIBITED

Barrier or median

Wide solid double white lane line

Wide broken single white lane line

Space at 1/4-mile intervals

B - Preferential lane(s) where enter/exit movements are DISCOURAGED

Barrier or median

Wide solid single white lane line

C - Preferential lane(s) where enter/exit movements are PERMITTED

Barrier or median

Wide broken single white lane line

D - Right-hand side preferential lane(s)

Barrier or median

Wide solid double white lane line (crossing PROHIBITED)

Wide solid single white lane line (crossing DISCOURAGED)

Wide dotted single white lane line (crossing PERMITTED to make a right turn)

Limited access exit, side street, or commercial entrance

White edge line (if warranted)

Legend

Direction of Travel

* If no barrier or median is present and then left-hand side of the lane is the center line of a two-way roadway, use a double yellow center line.

** Example of HOV only lane symbol markings

*** Example of bus lane word markings

Figure 3D-3  Markings for Contiguous Preferential Lanes
1. A wide solid double white lane line where crossing is prohibited (see Drawing A in Figure 3D-3).
2. A wide solid single white lane line where crossing is discouraged (see Drawing B in Figure 3D-3).
3. A wide broken single white lane line where crossing is permitted (see Drawing C in Figure 3D-3).

F. Contiguous (right-hand side) preferential lane-the longitudinal pavement markings for a full-time or part-time preferential lane on the right-hand side of and contiguous to the other travel lanes shall consist of a normal solid single white line at the right-hand edge of the preferential travel lane(s) if warranted (see Section 3B.7) and one of the following at the left-hand edge of the preferential travel lane(s) (see Drawing D in Figure 3D-3):

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

Guidance
Where preferential lanes and other travel lanes are separated by a buffer space wider than 4 feet and crossing the buffer space is prohibited, chevron markings (see Section 3B.24) should be placed in the buffer area (see Drawing A in Figure 3D-2). The chevron spacing should be 100 feet or greater.

Option
If a full-time or part-time contiguous preferential lane is separated from the other travel lanes by a wide broken single white line (see Drawing C in Figure 3D-3), the spacing or skip pattern of the line may be reduced and the width of the line may be increased.

Standard
If there are two or more preferential lanes for traffic moving in the same direction, the lane lines between the preferential lanes shall be normal broken white lines.

Preferential lanes for motor vehicles shall also be marked with the appropriate word or symbol pavement markings in accordance with Section 3D.1 and shall have appropriate regulatory signs in accordance with Sections 2G.3 through 2G.7.

Guidance
At direct exits from a preferential lane, dotted white line markings should be used to separate the tapered or parallel deceleration lane for the direct exit (including the taper) from the adjacent continuing preferential through lane, to reduce the chance of unintended exit maneuvers.

Standard
On a divided highway, a part-time counter-flow preferential lane that is contiguous to the travel lanes in the opposing direction shall be separated from the opposing direction lanes by the standard reversible lane longitudinal marking, a normal width broken double yellow line (see Section 3B.03 and Drawing A of Figure 3D-4). If a buffer space is provided between the part-time counter-flow preferential lane and the opposing direction lanes, a normal width broken double yellow line shall be placed along both edges of the buffer space (see Drawing B of Figure 3D-4). Signs (see Section 2B.26), lane-use control signals (see Chapter 4M), or both shall be used to supplement the reversible lane markings.

On a divided highway, a full-time counter-flow preferential lane that is contiguous to the travel lanes in the opposing direction shall be separated from the opposing direction lanes by a solid double yellow center line marking (see Drawing C of Figure 3D-4). If a buffer space is provided between the full-time counter-flow preferential lane and the opposing direction lanes, a normal width solid double yellow line shall be placed along both edges of the buffer space (see Drawing D of Figure 3D-4).

Option
Cones, tubular markers, or other channelizing devices (see Chapter 3H) may also be used to separate the opposing lanes when a counter-flow preferential lane operation is in effect.
Figure 3D-4  Markings for Counter-Flow Preferential Lanes on Divided Highways
3E.1 Markings for Toll Plazas

Support
At toll plazas, pavement markings help road users identify the proper lane(s) to use for the type of toll payment they plan to use, to channelize movements into the various lanes, and to delineate obstructions in the roadway.

Standard
When a lane on the approach to a toll plaza is restricted to use only by vehicles with registered ETC accounts, the ETC Account-Only lane word markings described in Section 3D.1 and the preferential lane longitudinal markings described in Section 3D.2 shall be used. When one or more ORT lanes that are restricted to use only by vehicles with registered ETC accounts bypass a mainline toll plaza on a separate alignment, these word markings and longitudinal markings shall be used on the approach to the point where the ORT lanes diverge from the lanes destined for the mainline toll plaza.

Option
Preferential lane-use symbol or word markings may be omitted at toll plazas where physical conditions preclude the use of the markings.

Guidance
If an ORT lane that is immediately adjacent to a mainline toll plaza is not separated from adjacent cash payment toll plaza lanes by a curb or barrier, then channelizing devices (see Section 3H.1), and/or longitudinal pavement markings that discourage or prohibit lane changing should be used to separate the ORT lane from the adjacent cash payment lane. This separation should begin on the approach to the mainline toll plaza at approximately the point where the vehicle speeds in the adjacent cash lanes drop below 30 mph during off-peak periods and should extend downstream beyond the toll plaza approximately to the point where the vehicles departing the toll plaza in the adjacent cash lanes have accelerated to 30 mph.

Option
For a toll plaza approach lane that is restricted to use only by vehicles with registered ETC accounts, the solid white lane line or edge line on the right-hand side of the ETC Account-Only lane and the solid white lane line or solid yellow edge line on the left-hand side of the ETC Account-Only lane may be supplemented with purple solid longitudinal markings placed contiguous to the inside edges of the lines defining the lane.

Standard
If used, the purple solid longitudinal marking described in the previous paragraph shall be a minimum of 3 inches in width and a maximum width equal to the width of the line it supplements, and ETC Account-Only preferential lane word markings (see Section 3D.1) shall be installed within the lane.

Toll booths and the islands on which they are located are considered to be obstructions in the roadway and they shall be provided with markings that comply with the provisions of Section 3B.10 and Chapter 3G.

Option
Longitudinal pavement markings may be omitted alongside toll booth islands between the approach markings and any departure markings.
PART 3. MARKINGS
Chapter 3F. Delineators

3F.1  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.

3F.2  Delineator Design

Standard
Delineators shall consist of retroreflective units that are capable of clearly retroreflecting light under normal atmospheric conditions from a distance of 1,000 feet when illuminated by the high beams of standard automobile lights.

Retroreflective elements for delineators shall have a minimum dimension of 3 inches.

Support
Within a series of delineators along a roadway, delineators for a given direction of travel at a specific location are referred to as single delineators if they have one retroreflective element for that direction, double delineators if they have two identical retroreflective elements for that direction mounted together, or vertically elongated delineators if they have a single retroreflective element with an elongated vertical dimension to approximate the vertical dimension of two separate single delineators.

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

3F.3  Delineator Application

Standard
The color of delineators shall comply with the color of edge lines stipulated in Section 3B.6.

A series of single delineators shall be provided on the right-hand side of freeways and expressways and on at least one side of interchange ramps, except sections of roadways where continuous lighting is in operation between interchanges.

Option
Delineators may be provided on other classes of roads. Single delineators may be provided on the left side of roadways.

Standard
Delineators on the left-hand side of a two-way roadway shall be white (see Figure 3F-1).

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

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 100-foot intervals along acceleration and deceleration lanes.

A series of delineators should be used wherever guardrail or other longitudinal barriers are present along a roadway or ramp.

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.
NOTE:
Delineators should be placed at a constant distance from the roadway edge, except that when an obstruction exists near the pavement edge, the line of delineators should make a smooth transition to the inside of the obstruction.

NOTE:
All delineators shown on this figure are white, including the delineators on the outside edge of the curve facing northbound drivers.

**Figure 3F-1**  **Examples of Delineator Placement**
When used 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-14).

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.

On a highway with continuous delineation on either or both sides, delineators should be carried through transitions. When mounted on the face of or on top of guardrails or other longitudinal barriers, delineators may be mounted at a lower elevation than the normal delineator height recommended in the previous Guidance paragraph.

Delineators should be mounted on suitable supports at a mounting height, measured vertically from the bottom of the lowest retroreflective device to the elevation of the near edge of the roadway, of approximately 4 feet. When mounted on the face of or on top of guardrails or other longitudinal barriers, delineators may be mounted at a lower elevation than the normal delineator height recommended in the previous Guidance paragraph.

Delineators should be placed 2 to 12 feet outside the outer edge of the shoulder, or if appropriate, in line with the roadside barrier that is 12 feet or less outside the outer edge of the shoulder. 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 or longitudinal barrier.

Delineators should be spaced 200 to 530 feet apart on mainline tangent sections. Delineators should be spaced 100 feet apart on ramp tangent sections.

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

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.

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 3F-1 should be used.

When needed for special conditions, delineators of the appropriate color may be mounted in a closely-spaced manner on the face of or on top of guardrails or other longitudinal barriers to form a continuous or nearly continuous “ribbon” of delineation.

Delineators may be used to guide motorists through unlit or poorly lit intersections.

If used, delineators shall be of the same color as the corresponding edge line.
One such design is based on a single 6 or 8 inch diameter tube, 9 to 12 inches tall. The tube should have a black background or be painted black and have two 3-inch white retroreflective bands of applied 3 inches apart. (see Figure 3F-2).

When mounted such that the post is inside of the tube, it will provide delineation equally in all directions.

**Guidance**

When used, at least one delineator of this type should be used in each corner of an intersection. (see Figure 3F-2).

---

**Table 3F-1 Approximate Spacing for Delineators on Horizontal Curves**

<table>
<thead>
<tr>
<th>Radius (R) of Curve feet</th>
<th>Approximate Spacing (S) on Curve feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>20</td>
</tr>
<tr>
<td>115</td>
<td>25</td>
</tr>
<tr>
<td>180</td>
<td>35</td>
</tr>
<tr>
<td>250</td>
<td>40</td>
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<tr>
<td>300</td>
<td>50</td>
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<tr>
<td>400</td>
<td>55</td>
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<tr>
<td>500</td>
<td>65</td>
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<td>600</td>
<td>70</td>
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<td>700</td>
<td>75</td>
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<tr>
<td>800</td>
<td>80</td>
</tr>
<tr>
<td>900</td>
<td>85</td>
</tr>
<tr>
<td>1,000</td>
<td>90</td>
</tr>
</tbody>
</table>

Notes: 1. Spacing for specific radii may be interpolated from table.
2. The minimum spacing should be 20 feet.
3. The spacing on curves should not exceed 300 feet.
4. 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 300 feet.
5. S refers to the delineator spacing for specific radii computed from the formula S = 3\sqrt{R-50}
6. The distances for S shown in the table above were rounded to the nearest 5 feet.
Figure 3F-2  Typical Intersection Delineation Using Cylinder Style Delineators
3G.1 General

Support
Colored pavements consist of differently colored road paving materials, such as colored asphalt or concrete, or paint or other marking materials applied to the surface of a road or island to simulate a colored pavement.

If non-retroreflective colored pavement, including bricks and other types of patterned surfaces, is used as a purely aesthetic treatment and is not intended to communicate a regulatory, warning, or guidance message to road users, the colored pavement is not considered to be a traffic control device, even if it is located between the lines of a crosswalk.

Standard
If colored pavement is used within the traveled way, on flush or raised islands, or on shoulders to regulate, warn, or guide traffic or if retroreflective colored pavement is used, the colored pavement is considered to be a traffic control device and 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 flush or raised channelizing islands where traffic passes on both sides in the same general direction.

Guidance
Colored pavements shall not be used as a traffic control device, unless the device is applicable at all times. Colored pavements use 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.
PART 3. MARKINGS

Chapter 3H. Channelizing Devices Used for Emphasis of Pavement Marking Patterns

3H.1 Channelizing Devices

Option

Channelizing devices, as described in Sections 6F.63 through 6F.73, and 6F.75, and as shown in Figure 6F-7, such as traffic cones and tubular markers, vertical panels, drums, lane separators, and raised islands, may be used for general traffic control purposes such as adding emphasis to reversible lane delineation, channelizing lines, or islands.

Channelizing devices may also be used along a center line to preclude turns or along lane lines to preclude lane changing, as determined by engineering judgment.

Standard

Except for color, the design of channelizing devices, including but not limited to retroreflectivity, minimum dimensions, and mounting height, shall comply with the provisions of Chapter 6F.

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 (as described in Part 6) or internally illuminated. On channelizing devices used outside of temporary traffic control zones, retroreflective sheeting or bands shall be white if the devices separate traffic flows in the same direction and shall be yellow if the devices separate traffic flows in the opposite direction or are placed along the lefthand edge line of a one-way roadway or ramp.

Guidance

Channelizing devices should be kept clean and bright to maximize target value.
PART 3. MARKINGS

Chapter 3I. Islands

3I.1 General

Support
This Chapter addresses the characteristics of islands (see definition in Section 1A.13) 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).

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

3I.2 Approach-End Treatment

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

Support
The neutral area between approach-end markings that can be readily crossed even at considerable speed sometimes contains slightly raised (usually less than 1 inch 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.

For additional discouragement to driving in the neutral area, bars or buttons projecting 1 to 3 inches above the pavement surface are sometimes placed in the neutral area. These bars or buttons are designed so that any wheel encroachment within the area will be obvious to the vehicle operator, but will result in only minimal effects on control of the vehicle. Such bars or buttons are sometimes preceded by rumble sections or their height is gradually increased as approached by traffic.

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.

3I.3 Island Marking Application

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

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

3I.4 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.5).

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.

3I.5 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.3).

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

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

31.6 Pedestrian Islands and Medians

Support

Raised islands or medians of sufficient width that are placed in the center area of a street or highway can serve as a place of refuge for pedestrians who are attempting to cross at a midblock or intersection location. Center islands or medians allow pedestrians to find an adequate gap in one direction of traffic at a time, as the pedestrians are able to stop, if necessary, in the center island or median area and wait for an adequate gap in the other direction of traffic before crossing the second half of the street or highway. The minimum widths for accessible refuge islands and for design and placement of detectable warning surfaces are provided in the “Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG)” (see Section 1A.11).
3J.1 Longitudinal Rumble Strip Markings

**Support**
Longitudinal rumble strips consist of a series of rough textured or slightly raised or depressed road surfaces intended to alert inattentive drivers through vibration and sound that their vehicle has left the travel lane. Shoulder rumble strips are typically installed along the shoulder near the travel lane. On divided highways, rumble strips are sometimes installed on the median side (left-hand side) shoulder as well as on the outside (right-hand side) shoulder. On two-way roadways, rumble strips are sometimes installed along the center line.

This Manual contains no provisions regarding the design and placement of longitudinal rumble strips. The provisions in this Manual address the use of markings in combination with a longitudinal rumble strip.

**Option**
An edge line or center line may be located over a longitudinal rumble strip to create a rumble stripe.

**Standard**
The color of an edge line or center line associated with a longitudinal rumble stripe shall be in accordance with Section 3A.5.

An edge line shall not be used in addition to a rumble stripe that is located along a shoulder.

**Support**
Figure 3J-1 illustrates markings used with or near longitudinal rumble strips.

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3J.2 Transverse Rumble Strip Markings

**Support**
Transverse rumble strips consist of intermittent narrow, transverse areas of rough-textured or slightly raised or depressed road surface that extend across the travel lanes to alert drivers to unusual vehicular traffic conditions.

Through noise and vibration, they attract the attention of road users to features such as unexpected changes in alignment and conditions requiring a reduction in speed or a stop.

This Manual contains no provisions regarding the design and placement of transverse rumble strips that approximate the color of the pavement. The provisions in this Manual address the use of markings in combination with a transverse rumble strip.

**Standard**
Except as otherwise provided in Section 6F.87 for TTC zones, if the color of a transverse rumble strip used within a travel lane is not the color of the pavement, the color of the transverse rumble strip shall be either black or white.

**Guidance**
White transverse rumble strips used in a travel lane should not be placed in locations where they could be confused with other transverse markings such as stop lines or crosswalks.