

TRAFFIC LINE MANUAL

2011 Edition

Revision 1
June 2012



TRAFFIC-ROADWAY SECTION

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OREGON DEPARTMENT OF TRANSPORTATION
Traffic-Roadway Section

Traffic Line Manual
June 2011

Foreword

The purpose of this manual is to establish a guide for uniform traffic lines and pavement markings on the Oregon state highway system. The manual is designed to be used by highway maintenance striping crews, construction inspectors, designers, and others who are involved in the layout and design of traffic lines and pavement markings on state highways.

Striping plans

Striping plans are required for all projects and maintenance activities where existing striping will be modified (such as modernization and retrofit projects). The Engineer of Record should be consulted for layout of traffic lines and pavement markings for these projects.

Striping plans are not required, but are strongly encouraged, for projects and maintenance activities where the existing striping will be replaced in-kind (such as preservation and chip-seal projects). Striping plans for these projects will ensure the existing striping has been verified for conformance to current standards for issues that can be corrected within the existing roadway width (for example, verify and correct no-passing zones, legends, etc.), will aid field personnel during construction, and will lessen the chance for installation errors. In addition, preservation projects are the perfect time to consider changes to the existing striping to address a safety or efficiency issue if the changes can be accomplished within the existing roadway surface (for example changing a traversable median to a two-way left turn refuge). If striping plans are NOT produced, the existing striping shall be verified for conformance to current standards and sufficiently documented to allow for replacement in-kind.

Nonstandard Markings

To a large extent, the traveling public relies heavily on traffic markings for guidance, vehicle positioning, and information. Motorists may be confused and uncertain of the purpose of the marking unless the same markings always convey the same meaning. If markings not conforming to this manual are necessary, they must be reviewed and approved by the Region Traffic Engineer or State Traffic Engineer on state highways, and the appropriate traffic engineering authority on other roads. See Appendix A for Delegated Authority. The ODOT Traffic Manual contains additional details of how to get approval for non-standard applications.

References

The standards presented in this manual have been adapted from the 2009 edition of the Manual on Uniform Traffic Control Devices (MUTCD), Oregon MUTCD Supplements, and ODOT policy and guidelines. Additional information and guidance can be found in Appendix B (ODOT contacts) and in Appendix C (online resources).

Availability

This manual is a web-only document, which can be accessed and printed in its entirety from the ODOT Traffic-Roadway Section publications web site:

http://www.oregon.gov/ODOT/HWY/TS/traffic_line_manual.shtml

Updates

This manual will be updated continually and revisions will be made as necessary, typically on a yearly basis, but could occur anytime. Contact the Traffic Devices Engineer to be placed on the notification distribution list to get notified whenever the manual is updated.

Section A: General Principles

A-1 Functions and Limitations

(MUTCD 3A.01)

Pavement markings have definite and important functions in providing guidance and information for the road user. In some cases, markings are used to supplement other traffic control devices such as traffic signs or signals. Markings may also be used alone in other applications to convey regulations, guidance, or warnings more effectively than is possible with other devices, such as no-passing zones. Uniformity in the pavement markings throughout the state will help produce efficient and safe traffic movements.

Pavement markings have limitations. They may be covered by snow, may not be visible when wet, and may not be very durable when subjected to heavy traffic. In spite of these limitations, they have the advantage of conveying warnings or other information to drivers without diverting their attention from the roadway. Audible and tactile features, such as raised pavement markers, or surface profile changes can be added to alert the road user that a line on the roadway is being crossed.

Deviations from the standards set out in this manual should not be made without approval of the State Traffic Engineer or the person with authority delegated by the State Traffic Engineer. See Appendix A – Delegated Authority for more information.

A-2 Colors

(MUTCD 3A.05)

Pavement markings shall be yellow, white, red, or blue in color. The colors for pavement markings shall conform to the standard highway colors and the following basic concepts:

- **Yellow** lines mark the separation of opposing flows of traffic; the left edge of the roadways of divided and one-way highways and ramps; and the separation of two-way left turn lanes and reversible lanes from other lanes.
- **White** lines separate the lanes of traffic flowing in the same direction or mark the right edge of the travel lanes. Transverse markings (crosswalks, words, symbols, etc.) shall be white unless otherwise specified in this manual.
- **Red** raised pavement markers indicate roadways that shall not be entered or used by the road user facing those markings (i.e. wrong-way treatments). **Use of red raised pavement markers must be approved by the State Traffic Engineer.**
- **Blue** markings indicate facilities for persons with disabilities. Blue raised pavement markers may be used along the roadway to delineate the location of fire hydrants and should be used to delineate approved freeway cross-over locations (see section C-6: RPMs used for freeway median crossovers).
- **Black** is not considered a marking color. It may only be used in combination with the four colors above where a light-colored pavement does not provide sufficient contrast with the markings.

A-3 Colored Pavements

(MUTCD 3G.01)

Use of colored pavements on state highways requires State Traffic Engineer approval when the application does not constitute a traffic control device (for example, colored pavement within the stripes of a crosswalk or colored pavement within the stripes of a bike lane). This includes all applications of colored pavements except the following:

- Yellow colored pavement used for raised median islands separating traffic flows in opposite directions.
- White colored pavement used for raised channelizing islands where traffic passes on both sides in the same general direction.

- Green colored pavement used in marked bicycle lanes and in extensions of bicycle lanes through intersections and other traffic conflict areas.

These applications do not require State Traffic Engineer approval for installation.

A-4 Functions, Widths, and Patterns of Longitudinal Lines (MUTCD 3A.06)

In general, the functions of longitudinal lines are as follows:

- Solid lines discourage or prohibit crossing.
- Double lines indicate maximum or special restrictions.
- Broken lines indicate a permissive condition.
- Dotted lines provide guidance or warning of a downstream change in lane function.

The width of line indicates the degree of emphasis. The widths and patterns of longitudinal lines on state highways shall be as follows:

1. A **normal line** is 4 inches wide.
2. A **wide line** is 8 inches wide.
3. A **double line** consists of two parallel lines separated by a discernible space. Standard dimensions for that space are 4 inches for a narrow double line or 12 inches for a wide double line.
4. A **broken line** consists of normal line segments separated by gaps in the ratio of 1:3. Standard dimensions are 10 ft segments with 30 ft gaps for a 40 ft cycle length.
5. A **dotted line** consists of short line segments separated by gaps in the ratio of 1:3. The width of a dotted line is dependent on the width of the line it extends, either 4 inches or 8 inches. Standard dimensions for a dotted line used for line extension within an intersection or taper area are 2 ft segments with 6 ft gaps for an 8 ft cycle length. Standard dimensions for a dotted line used as a lane line are 3 ft segments with 9 ft gaps for a 12 ft cycle length.
6. A **one-direction no-passing line or a two-way left turn line** consists of a normal line parallel to a broken line separated by a 4-inch space.

A-5 Transverse Markings (MUTCD 3B.15 & 3B.19)

Transverse markings include word and symbol markings, arrows, stop bars, crosswalk bars, speed hump markings, and parking space markings. They are used for the purpose of regulating, warning, and guiding traffic.

Word and symbol markings should be centered within the lane to which they apply. The spacing between markings should be adjusted for approach speeds or as shown in this manual. Messages consisting of more than one line of information should read “up” (i.e., the first word should be located nearest to the driver).

All letters, numerals, and symbols shall be white in color and in conformance with the pavement markings chapter of the FHWA publication “Standard Highway Signs 2004 Edition.”

Section B: Longitudinal Line and Transverse Marking Standards

B-1 Centerlines

(MUTCD 3B.01)

A centerline separates traffic traveling in opposite directions. It need not be at the geometric center of the pavement.

Centerlines shall be provided on:

- All paved highways that have a traveled way of 18 ft or more in width and an Average Daily Traffic (ADT) of 3,000 vehicles per day or greater.
- All paved highways with three or more lanes.

Centerlines should be provided on:

- Other traveled ways where engineering judgment indicates a need (e.g. route continuity demarcation at intersecting routes).

Centerlines may be provided on:

- Other paved two-way traveled ways that are 16 ft or greater in width.

Types (Figure 1a):

- **D:** Referred to as a wide double yellow line, a “two-direction” or “double” no-passing centerline. A wide double yellow line shall be used on undivided highways of four or more lanes and on undivided highways where passing is prohibited for both directions of traffic.
- **ND:** Referred to as narrow double yellow line. Commonly used to delineate a traversable median (Section B-9). It may also be used on narrow two-lane roadways instead of the wide double yellow line.
- **YB:** A normal yellow broken line shall be used on two-lane, two-way highways, where passing is permitted for both directions of travel.
- **Y:** Used to delineate a non-traversable median (Section B-10). Also used as a left edge line to indicate traffic traveling in opposite direction on divided highways (Section B-4).
- **NPL or NPR:** Referred to as a “one direction” no-passing centerline, a double line consisting of a yellow broken line and a normal yellow solid line is used where passing is permitted for traffic adjacent to the broken line and prohibited for traffic adjacent to the solid line. A NPL or NPR is determined by the lateral location of the solid line with respect to the broken line when you are looking in the direction of increasing stationing or increasing mile point (NPL has the solid line located to the left of the broken line. NPR has the solid line located to the right of the broken line).

When used, centerline markings shall:

- **NOT** continue across intersections and major driveways, including private driveways with substantial approach volumes (Figure 1b).

When used, centerline markings should:

- Continue across minor driveways (public or private) and alleys (Figure 1b).

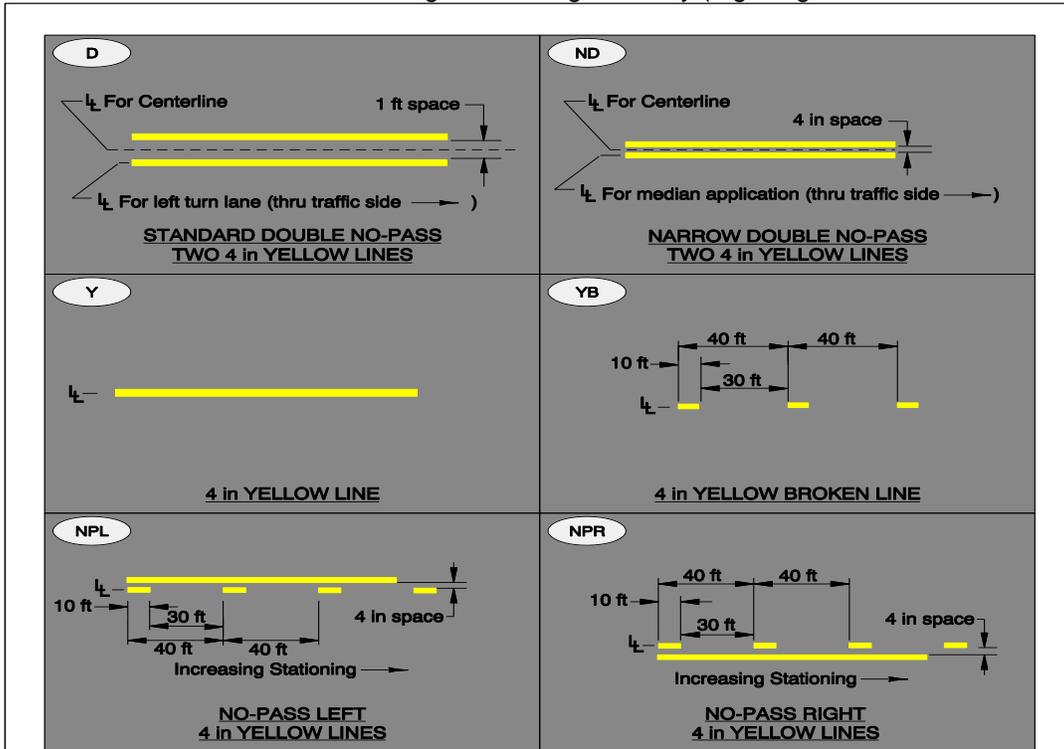
Discussion:

Breaking the striping at major access points such as intersections and major driveways (including private driveways with substantial approach volumes) is an important visual/wayfinding cue to motorists to help them identify where an access point is located, especially in inclement weather. It is not applied to minor access points such as driveways (public or private) and alleys because there is little need to identify access points that are not used by the majority of the motoring public and it would make the treatment less effective at major access points. Some access points are easy to define and stripe accordingly (e.g. signalized intersections and major route intersections), but some are not.

The following may be considered when determining whether or not to break the striping for access points those are less easily defined.

- **Intersection indicators:**
 - The area of a roadway created when two or more public ways join together at any angle. Junction of an alley or driveway with a public way shall not constitute an intersection (as interpreted from MUTCD Section 1A.13 and Oregon Law ORS 801.320).

- Curb returns and/or significant radii.
 - A street name sign on the intersecting roadway or ability to locate the intersecting roadway on a city/county map. The intersecting roadway may be gravel (more common in regions 4 & 5).
 - A stop sign (typically with stop bar) on the intersecting roadway.
 - Left or right turn lanes present on the major roadway at the intersecting roadway.
- **Major Driveway indicators (public or private):**
 - Curb returns and/or significant radii rather than a dustpan design or curb cut.
 - A stop sign (typically with stop bar) at the driveway.
 - Multiple approach lanes on the driveway.
 - Left or right turn lanes present on the major roadway at the driveway.
 - Substantial volumes entering and leaving the driveway.
- **Minor driveway or alley indicators:**
 - Dustpan design, curb cut or small radii.
 - Narrow width of intersecting roadway.
 - Minor amount of traffic entering and leaving driveway (e.g. single home or small business).



— Lane line dimensions are shown on the striping plans.

Figure 1a Centerline Types

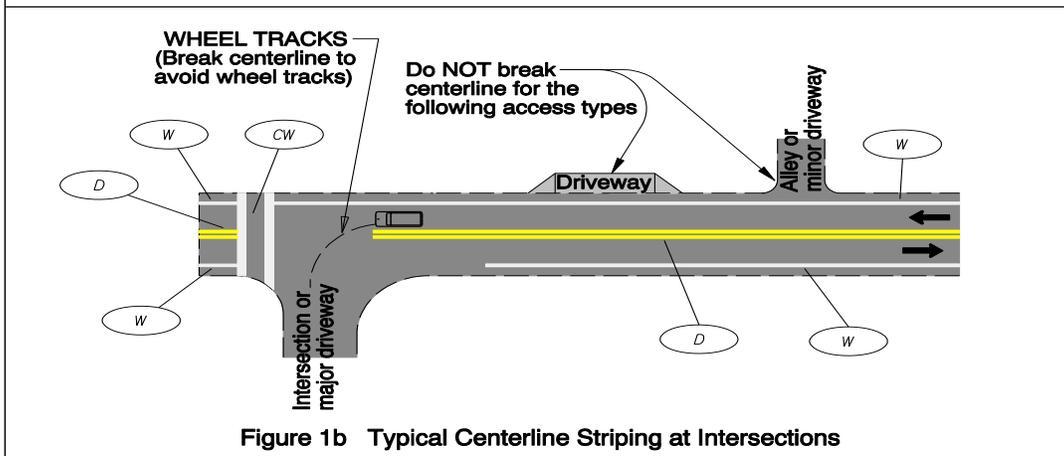


Figure 1b Typical Centerline Striping at Intersections

**APPROVAL
REQUIRED!**

An engineering study & Region Traffic Engineer approval is required for:

- No-passing zone markings for any location not listed below

No-passing zone markings legally establish the limits where vehicles are prohibited from crossing the centerline, except to turn left onto or from an intersection, alley, private road, or driveway. Roadways without centerline markings do NOT require no-passing zone markings.

No-passing zones shall be established at:

- Undivided highways of four or more lanes. A double no-passing centerline (D) is required in these locations (Figure 2a).
- Vertical curves, horizontal curves, and elsewhere on two- and three-lane highways where passing must be prohibited because of inadequate sight distances. Refer to pages 7 thru 9 for details.
- Lane reduction transitions (Figure 2b).
- Lane addition transitions and undivided three-lane highways (Figure 2c).
- Approaches to obstructions that must be passed on the right (Figure 2d).
- Approaches to highway-rail grade crossings (Figure 2e).
- Approaches to a traversable median, non-traversable median, or left turn lane where traffic is required to keep to the right (Figure 2f). Approaches to intersections without a median or left turn lane do **NOT** require no-passing zone markings.

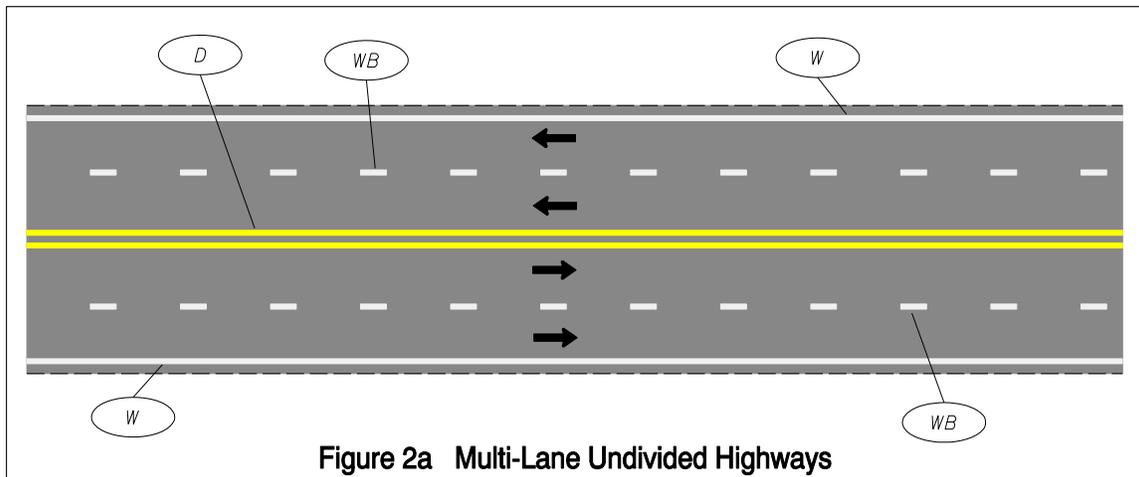


Figure 2a Multi-Lane Undivided Highways

Where no-passing zone markings are established:

- They should generally be 500 ft or longer. Where necessary, the no-passing marking should be extended at the beginning of the zone to obtain the 500 ft minimum.
- The distance between successive no-passing zones for one direction of traffic should not be less than 400 ft. If the distance is less than 400 ft, the appropriate no-passing marking should connect the zones.

Discussion:

It is ODOT's policy not to mark no-passing zones approaching unchanneled intersections. For additional information see Section 6.23.3 of the ODOT Traffic Manual.

ODOT has historically (since at least 1990, as stated in the Traffic Line Manual) provided guidance that no-passing zone markings should generally be 500 ft or longer. This is done to ensure that all of the no-passing zones are long enough to command respect from the motoring public. Research has shown that short passing zones (those 400 ft to 800 ft) in length contribute little to the operational efficiency of two-lane roads, but they may be used for flying passes and for passing slow moving vehicles such as farm equipment. The research also indicated that there was an absence of indication that these short passing zones resulted in poor safety performance. For additional information see NCHRP Report 605.

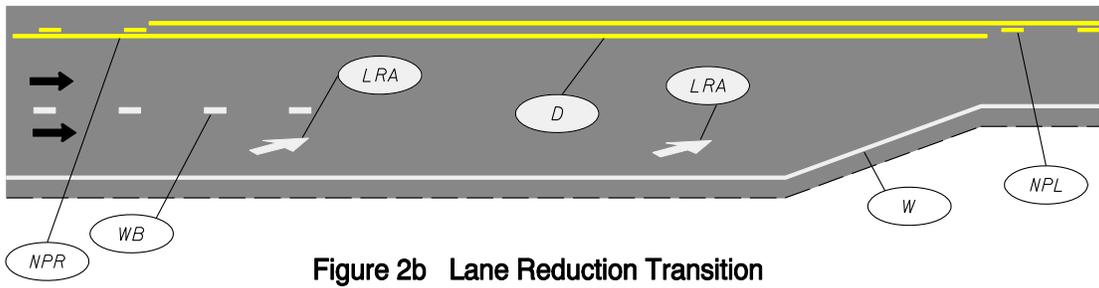


Figure 2b Lane Reduction Transition
(For details, see Section B-7)

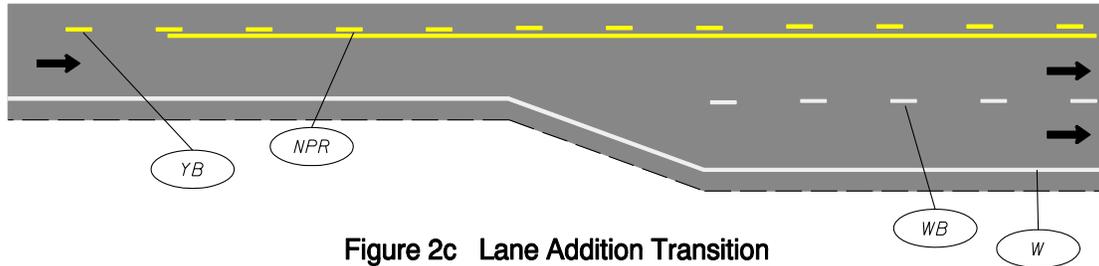


Figure 2c Lane Addition Transition
(For details, see Section B-7)

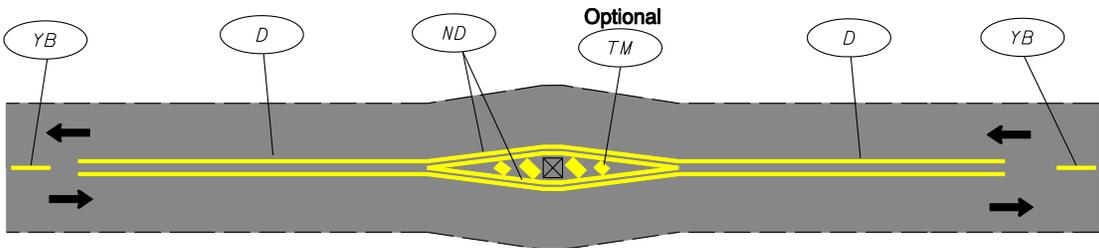


Figure 2d Approach to Obstruction (Must Pass on the Right)
(For details, see Section B-20)

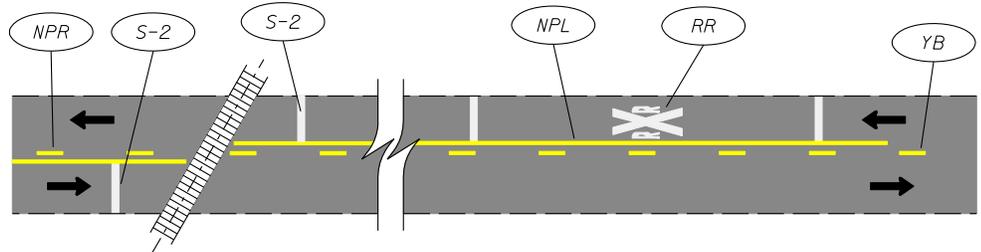


Figure 2e Approach to Railroad Grade Crossing
(For details, see Section B-28)

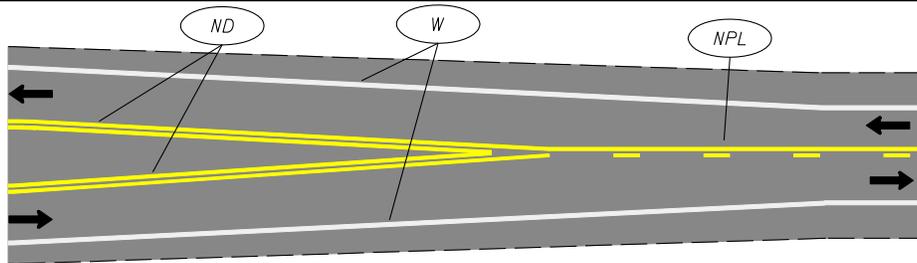


Figure 2f Approach to Traversable Median, Non-Traversable Median, or Left Turn Lane
(For details, see Sections B-9 & B-14)

Vertical and horizontal curve no-passing requirements:

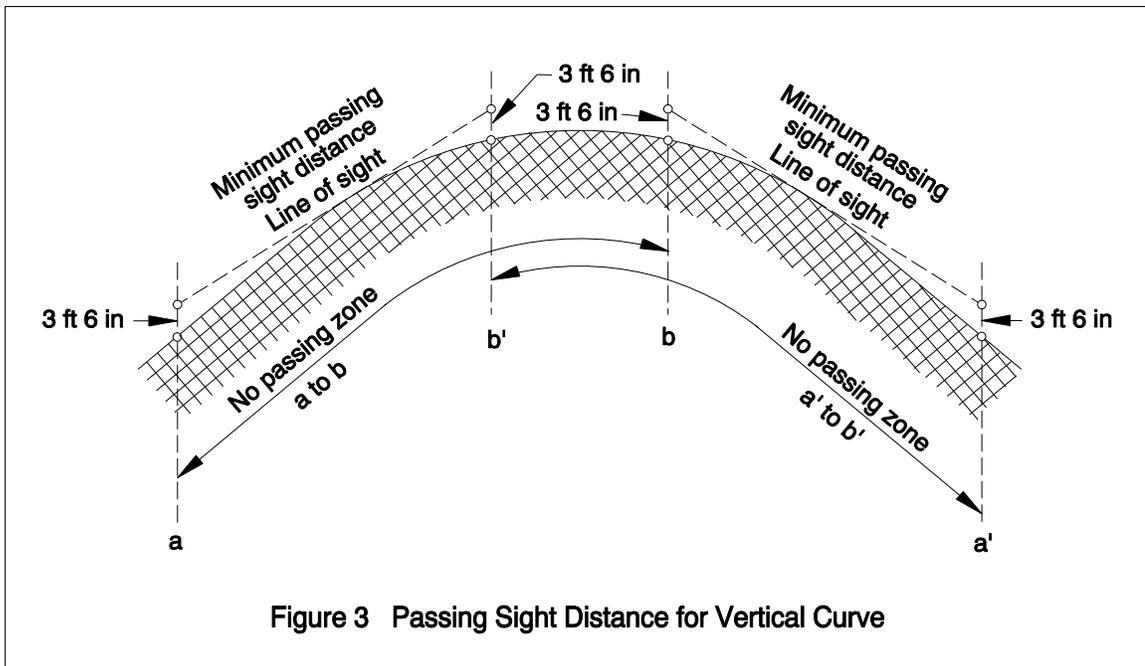
- Where no-passing zones are established on horizontal or vertical curves, no-passing markings shall begin and continue as long as the sight distance is less than the distance listed in Table 1.
- The beginning of a no-passing zone (point “a” in Figures 3, 4a, and 4b) is that point at which the sight distance first becomes less than that specified in Table 1 below. The end of the zone (point “b” in Figures 3, 4a, and 4b) is that point at which the sight distance again becomes greater than the minimum specified.

Table 1: Guide for Minimum Passing Sight Distance

Posted or 85 Percentile Speed (mph)	Minimum Passing Sight Distance Needed (ft)
25	450
30	500
35	550
40	600
45	700
50	800
55	900
60	1000
65	1100
70	1200

Determining passing sight distance on a vertical curve:

- Passing sight distance on a vertical curve is the distance at which an object 3.5 ft above the pavement surface can be seen from a point 3.5 ft above the pavement (Figure 3).
- Based on the geometry of the vertical crest curve, the required no-passing zones may or may not overlap at the crest of the curve.



Determining passing sight distance on a horizontal curve:

Two methods are acceptable for determining passing sight distance on a horizontal curve:

1. The Standard Method

The sight distance is measured along the centerline between two points 3.5 ft above the pavement on a line tangent to the edge of pavement (Figure 4a). This method results in longer no-passing zones than the alternative method described below. However, changing field conditions (such as growing vegetation, future buildings, etc.) will NOT impact the limits of the no-passing zones.

2. The Alternative Method

The alternative method should be used with engineering judgment. The sight distance is measured along the centerline between two points 3.5 ft above the pavement on a line tangent to an obstruction that cuts off the view on the inside of the curve (Figure 4b). This method allows more passing opportunities than the standard method described above. However, the original line of sight may be compromised over time. Field conditions (such as growing vegetation, future buildings, etc.) should be maintained and verified on a regular basis to ensure that no-passing zones are still appropriate.

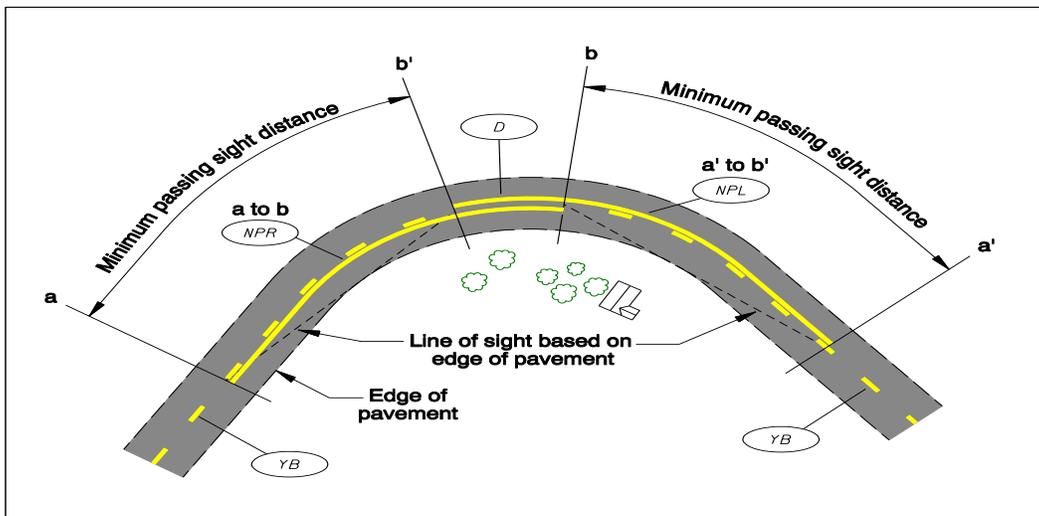


Figure 4a Standard Method: Passing Sight Distance for Horizontal Curve (Based on Edge of Pavement)

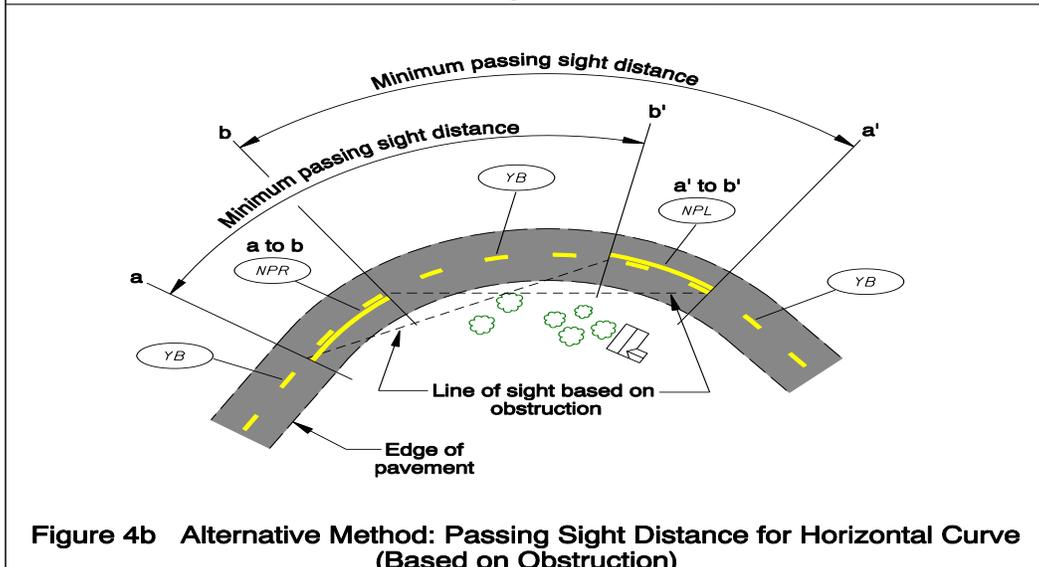
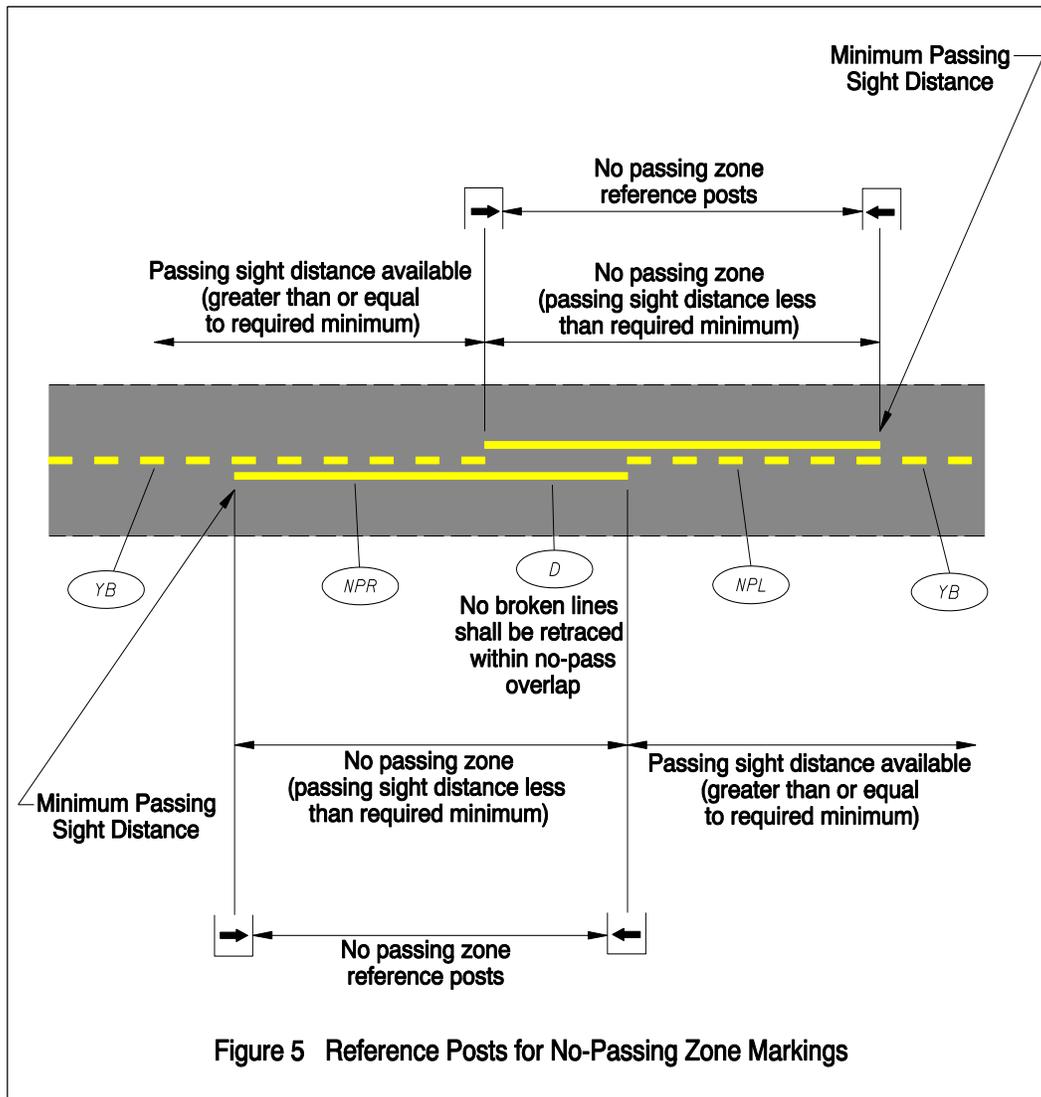


Figure 4b Alternative Method: Passing Sight Distance for Horizontal Curve (Based on Obstruction)

Reference posts:

- The ends of no-passing zone solid lines on state highways are usually marked with white reference posts placed on the side of the roadway corresponding to the placement of the no-passing solid line.
- Arrows on the posts indicate the beginning and ending of the solid line (Figure 5).
- If the posts are no longer in place or appear to be incorrect (typically following a construction project with roadway alignment changes), follow the guidelines set forth in Section B-2, pages 6-8 to determine if an existing passing or no-passing zone is still appropriate prior to re-stripping. Contact the Region Traffic Engineer when in doubt.



Modification of existing passing zones:

It may be necessary to change an existing passing permitted section to a passing prohibited section based on changing roadway conditions or the results of an engineering investigation. When this occurs:

- Any existing broken line markings between double solid lines shall be removed or obliterated as soon as practicable.
- Broken line markings shall not be retraced or marked between the double solid lines.

Lane lines separate lanes of traffic traveling in the same direction.

Lane widths shall:

- Be 10 ft minimum to 14 ft maximum (12 ft typical), unless otherwise approved or shown in this manual.
- Be as shown on the project plans for new construction, or as directed by the Region Traffic Engineer.

Types (Figure 6a):

- **WB:** A white broken line shall be used when crossing of the lane line markings with care is permitted.
- **W-2:** A wide solid white line shall be used when crossing of the lane line is discouraged. Typical applications include; separating thru lanes from left and right turn lanes, bike lanes, in tunnels or on bridges having narrow lane widths, and interchange areas where lane changing disrupts traffic flow.
- **NDW:** A double solid white line shall be used when crossing of the lane line is prohibited. Appropriate regulatory signs should be installed (OR22-15: NO LANE CHANGE AHEAD, OR22-16: NO LANE CHANGE NEXT XXXX FT., and/or OR22-17: NO LANE CHANGE NEXT ½ MILE).

When used, lane lines shall:

- **NOT** continue across intersections and major driveways, including private drive approaches with substantial approach volumes. The T-intersection is an exception, where the lane line on the far side of the intersection is not broken (Figure 6b).

When used, lane lines should:

- Continue across minor driveways (public or private), and alleys (Figure 6b).

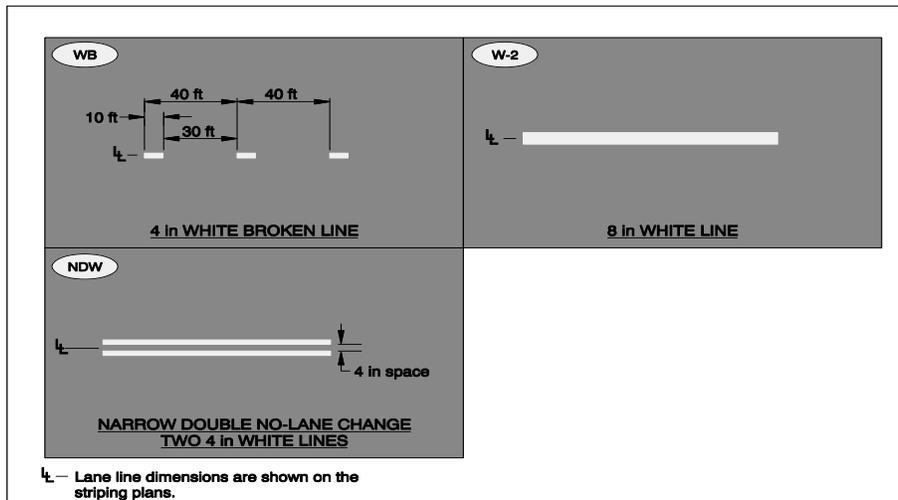


Figure 6a Lane Line Types

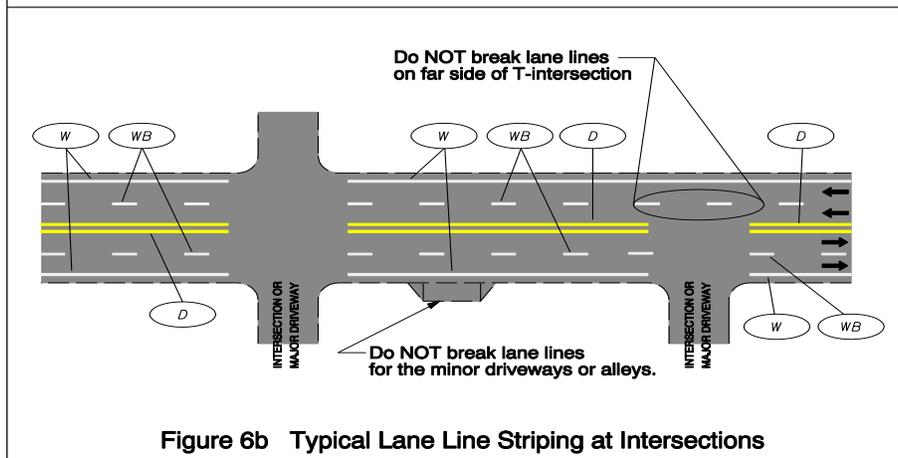


Figure 6b Typical Lane Line Striping at Intersections

Edge lines delineate the right or left edge of a roadway. They serve as an important visual reference to guide motorists during adverse visibility conditions.

Edge lines shall be provided on:

- Interstate highways
- Freeways
- Expressways
- Rural multi-lane divided highways
- Rural highways with a traveled way of 20 ft or more in width and an ADT of 3,000 vehicles per day or greater.

Edge lines should be provided on:

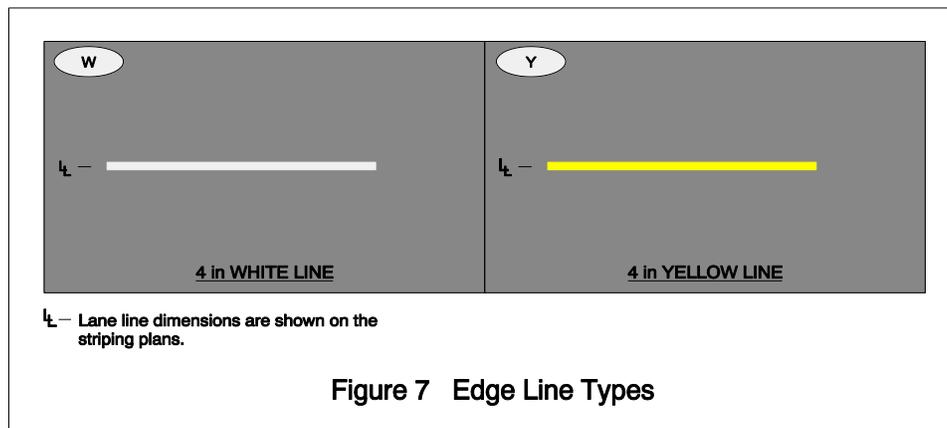
- Any highway where engineering judgment determines a need (such as route continuity demarcation at intersecting routes).
- Locations where lateral positioning of vehicles may be difficult without an edge line as guidance (for example, for lane reduction transitions from the beginning of the advance warning sign to beyond the beginning of the narrower roadway).
- Rural highways with ADT greater than 3,000.
- Roadways that have shoulders with lesser structural pavement strength than the adjacent roadway (to minimize unnecessary driving on paved shoulders or on refuge areas).
- Any new paved two-way, two-lane roads having a width of 24 ft or more, with adequate surfaced shoulder.

Edge lines may be provided on:

- Roadways with a nominal paved width of 20 ft (two 10 ft lanes) contingent on sufficient existing shoulder width for the operation of traffic line equipment.

Types (Figure 7):

- **W:** The right and left edge lines of two-way highways and right edge line of divided highways shall be white solid lines.
- **Y:** The left edge line of divided highways or one-way streets, including any ramp, shall be a yellow solid line.



When used, edge lines shall:

- Be white, except for the following cases, in which the edge line shall be yellow:
 - On the left edge of the freeway and other divided highway sections (Figure 8a).
 - On the left edge of interchange ramps up to the neutral area (white gore point markings) (Figure 8a).
- **NOT** continue across intersections and major driveways, including private drive approaches with substantial approach volumes. The T-intersection is an exception, where edge line on the far side of the intersection is not broken (Figure 8b).

When used, edge lines should:

- Continue across minor driveways (public or private) and alleys (Figure 8b).
- Be omitted at narrow bridges (Figure 8c).
- **NOT** typically be installed in urban sections or in areas that have marked parking stalls.

When used, edge lines may:

- Be omitted where the traveled way edges are delineated by curbs, parking, bicycle lanes, or other markings.
- Be placed on streets and highways with or without centerline markings.
- Be extended across wide, complex intersections, or intersections located on a horizontal curve using a dotted line (Figure 8b).

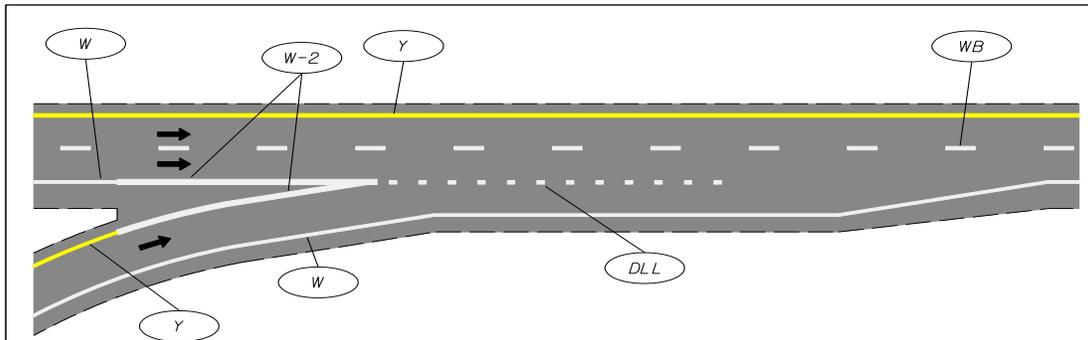


Figure 8a Typical Edge Line Striping for Freeway Section

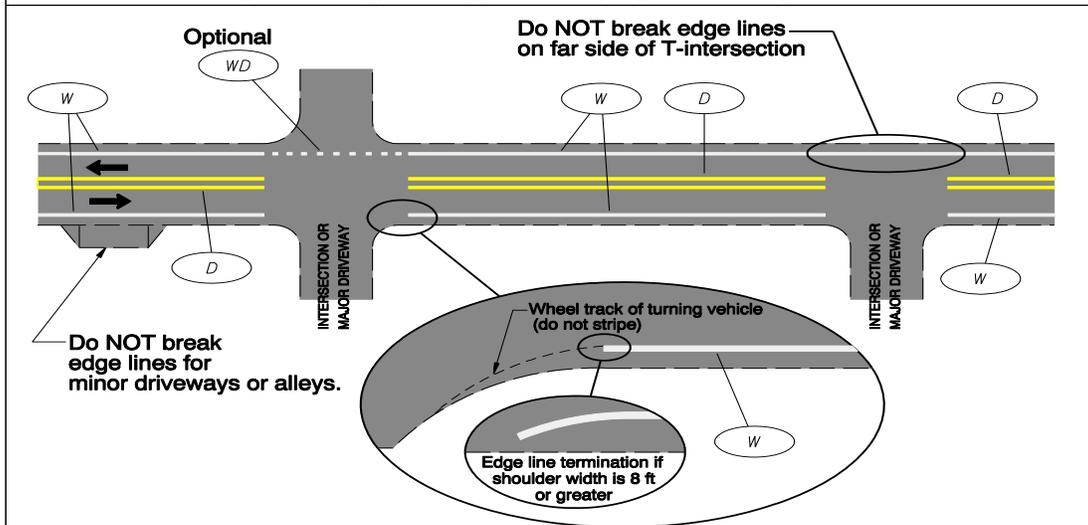


Figure 8b Typical Edge Line Striping at Intersections

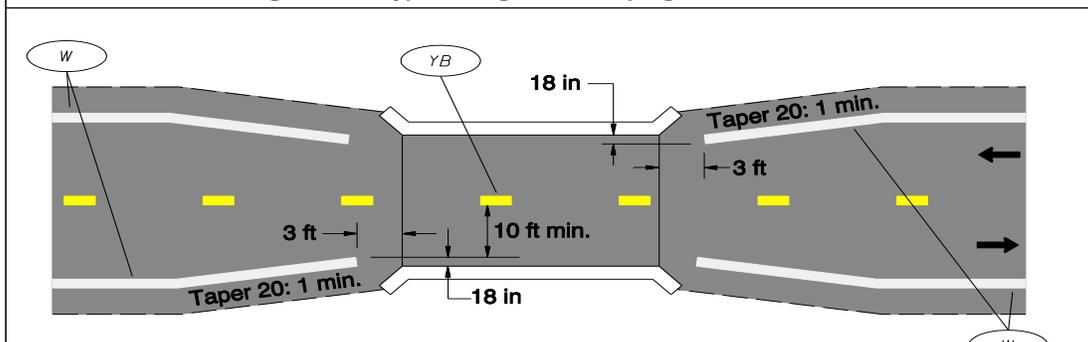


Figure 8c Typical Pavement Edge Line Striping at Narrow Bridge

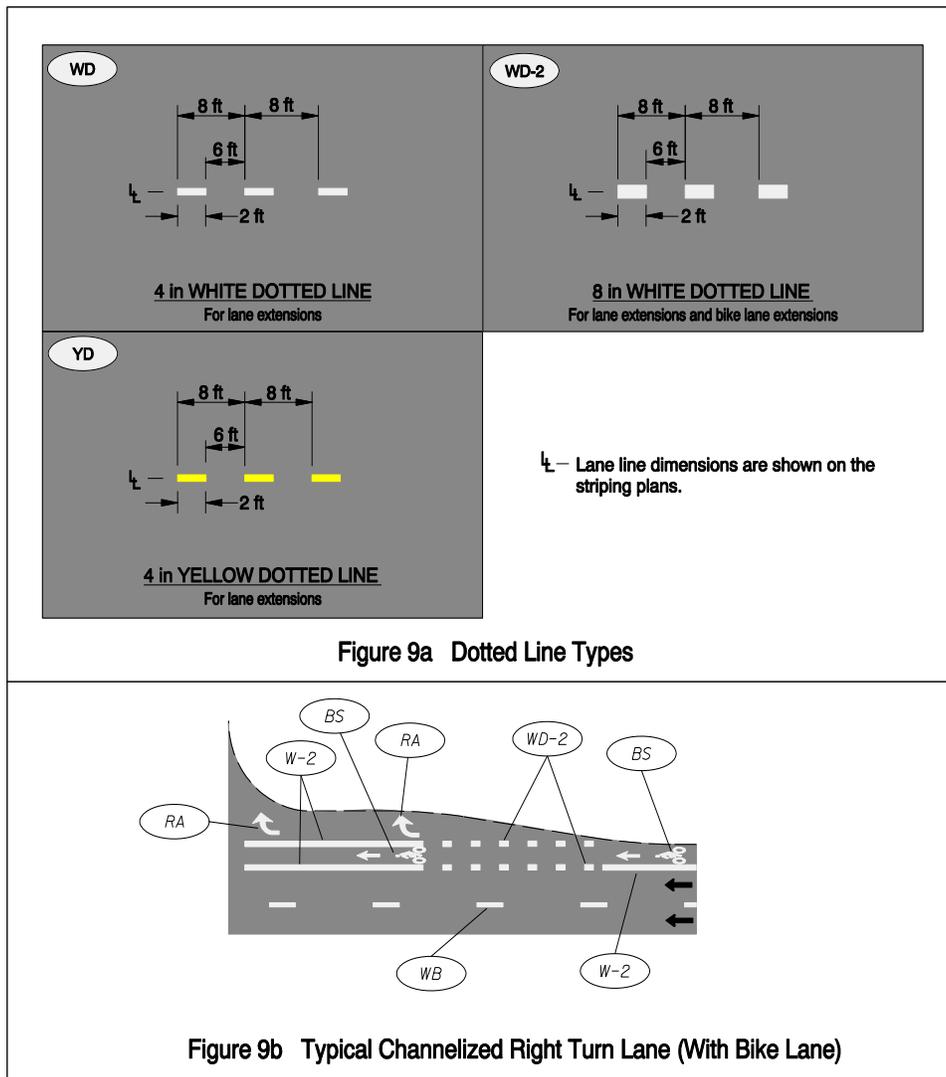
Dotted lines are used either for line extensions or as lane lines. Dotted lines for lane extensions provide guidance through breaks in a line marking and are normally used in situations where the intended path may be uncertain to road users, such as at skewed intersections, intersections with multiple turn lanes, and developed right turn lanes with or without bike lanes. Dotted lines used as lane lines are discussed in Section B-6.

Types (Figure 9a):

- **WD:** A normal white dotted line is typically used to extend an edge line or lane line.
- **WD-2:** A wide white dotted line is typically used to extend multiple turn lanes and bike lanes.
- **YD:** A normal yellow dotted line is typically used to extend centerline.

Dotted lines shall be used:

- To mark an area where vehicles may be crossing a bike lane, such as development of a right turn only lane (Figure 9b).



Dotted lines should be used:

- At left or right turn lanes located on sharp horizontal curves where drivers are likely to unintentionally drift into the turn lane (Figure 10a).
- At roundabouts across the entry lanes (Figure 10b).
- As lane line extensions for multiple turn lanes at an intersection (Figure 10c).
- As extensions of shoulder edge lines at freeway exit ramps (Figure 10e).

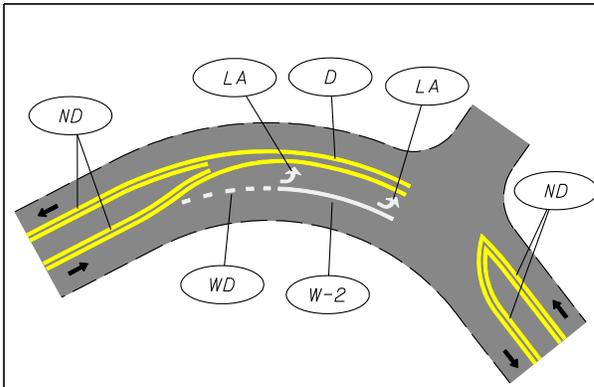


Figure 10a Typical Turn Lane Located on Sharp Horizontal Curve

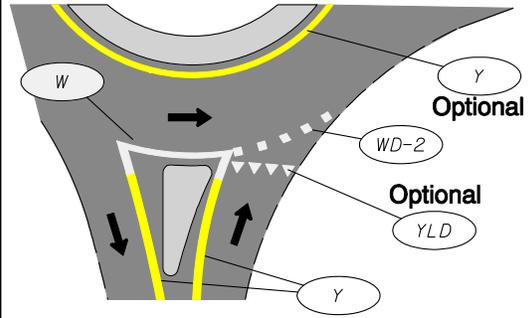


Figure 10b Typical Roundabout Entry Lane

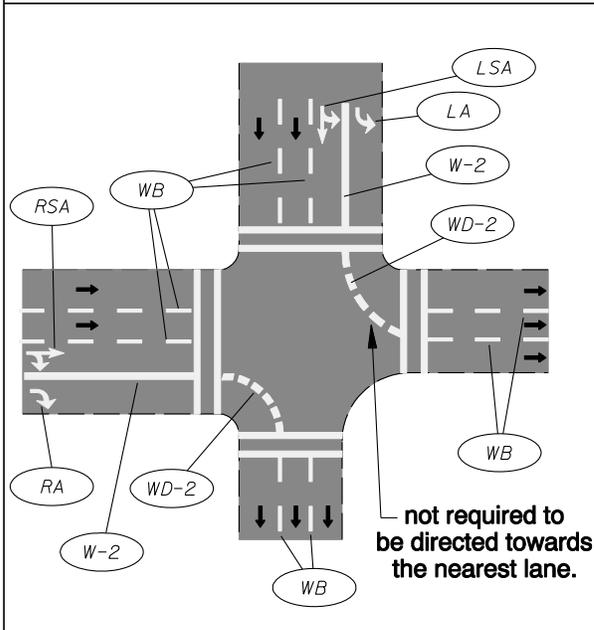


Figure 10c Typical Pavement Markings With Optional Double Turn Lanes

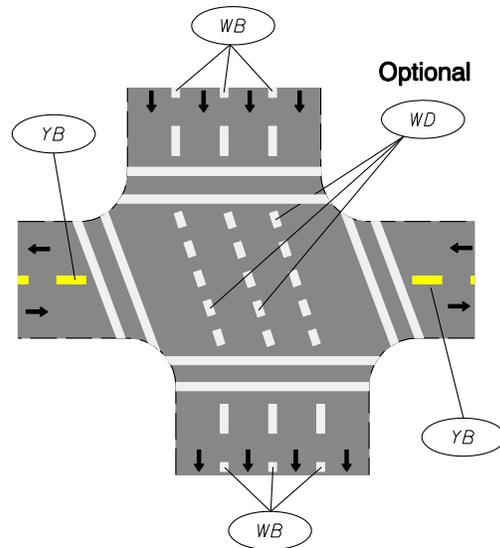


Figure 10d Typical Pavement Markings With Offset Lanes

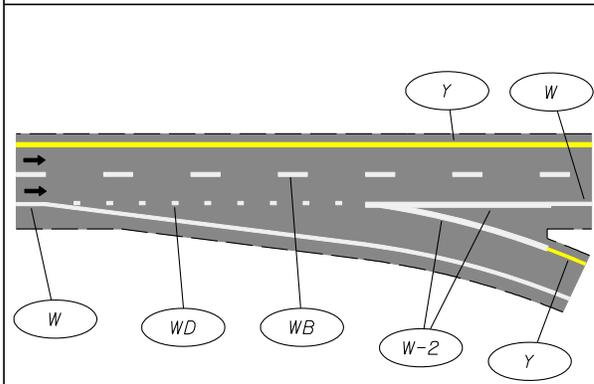


Figure 10e Typical Extension of Edge Line (Freeway Section)

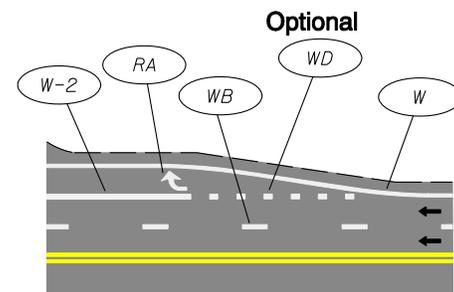


Figure 10f Typical Channelized Right Turn Lane Without Bike Lane

Dotted lines may be used:

- At offset or skewed intersections (Figure 10d).
- Prior to full width development at right turn lanes (Figure 10f).
- As extensions of edge lines at wide, complex intersections or at intersections located on horizontal curves.

When used, dotted lines shall:

- Be the same width and color of the line being extended. There are a few exceptions. A normal white dotted line (WD) may be used to extend a wide white line (W-2) through an intersection. Dotted lines used in left turn lane “gap” sections (Figure 10a) and across left-hand freeway exits shall be a normal white dotted line (WD).

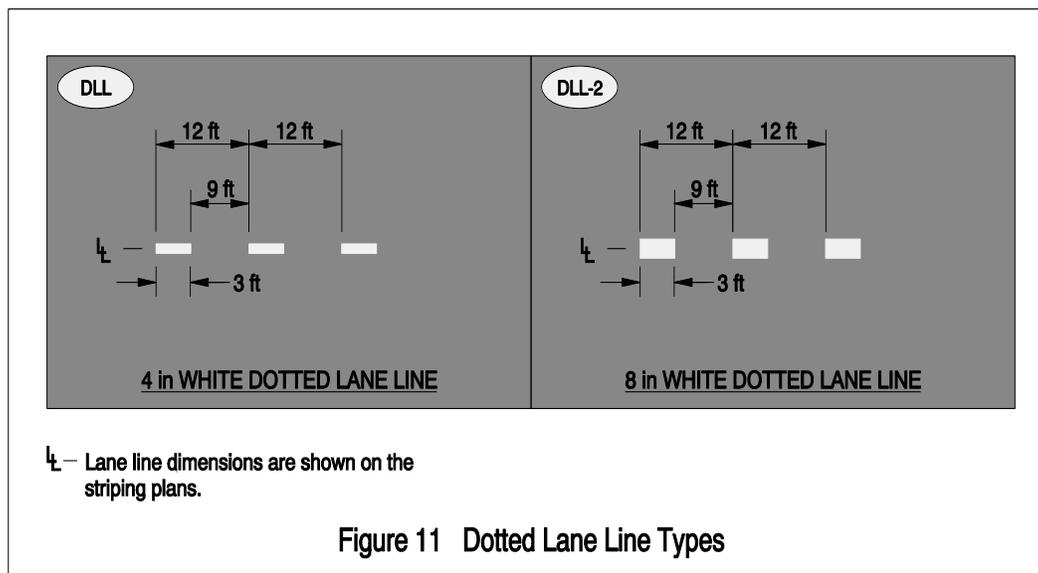
When used, dotted lines may:

- Follow the desired path through the intersection. When engineering judgment deems it necessary, the dotted line is not required to direct turning traffic into the nearest lane (Figure 10c). This is typically based on origin-destination patterns, traffic volumes, and/or design vehicle turning radii.

Dotted lines are used as lane lines to provide warning of a downstream change in the lane function, such as, a drop lane and interchange exit and entrance ramps.

Types (Figure 11):

- **DLL:** Normal width white dotted lane line is used for interchange entrance ramp acceleration lanes, exit ramp deceleration lanes, and at-grade right-turn acceleration lanes.
- **DLL-2:** Wide white dotted lane line is used when a through lane becomes a mandatory exit or turn lane. Also known as lane drop line.



Dotted lane lines shall be used:

- When a through lane becomes a mandatory exit or turn lane (Figures 12a & 12b).
- For freeway entrance ramps with parallel acceleration lane (Figure 12c) and for at-grade right turn acceleration lanes.
- For an auxiliary lane 2 miles or less in length between an entrance ramp and an exit ramp.
- For an auxiliary lane 1 mile or less in length between two adjacent intersections.

When used, wide dotted lane lines (DLL-2) shall:

- Be followed by a solid wide white line (W-2) and at least two lane use arrows in advance of the intersection (Figures 12a).
- Be followed by a solid wide white line (W-2) and begin at least ½ mile in advance of the theoretical gore point for freeway applications (Figure 12b).

When used, wide dotted lane lines (DLL-2) should:

- Begin approximately ½ mile in advance of the wide solid white line (W-2) for urban locations, where possible. Where space may be limited, engineering judgment should be used to determine the best starting point of the lane drop line. Intersections and/or appropriate advance guide signing may help determine a logical starting point.

When used, wide dotted lane lines (DLL-2) may:

- Start prior to other intersections, especially in urban locations where intersections are closely spaced. A wide dotted lane line that is striped up to an intersection does not indicate that the lane drops at that intersection (Figure 12a).

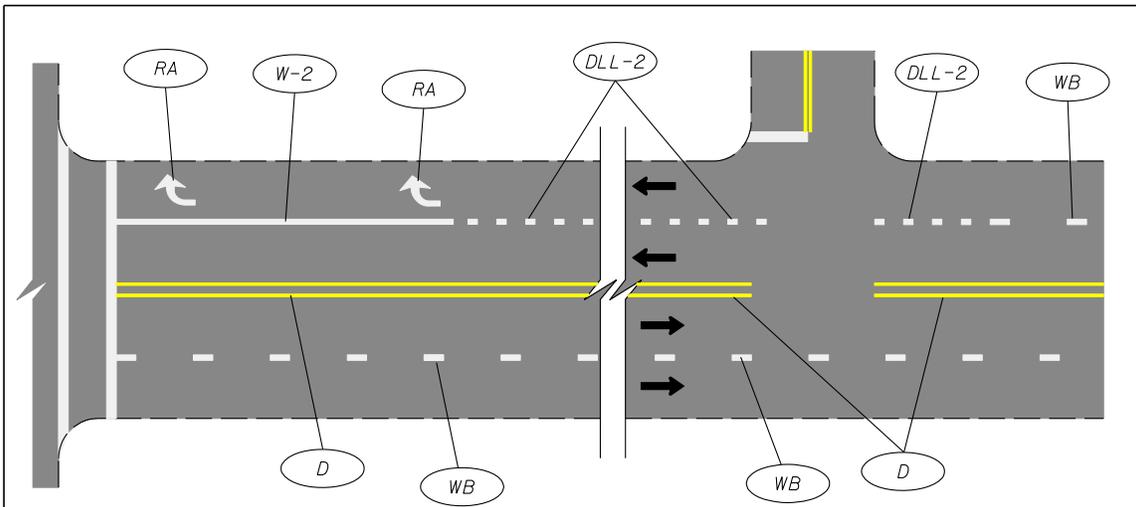


Figure 12a Pavement Markings for Right Turn Drop Lane (Urban Location)

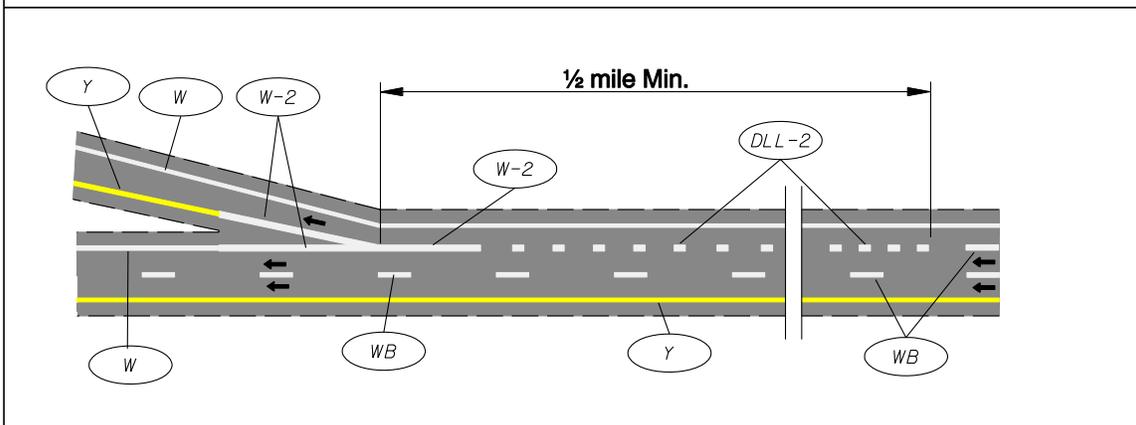


Figure 12b Pavement Markings for Standard Lane Drop (Freeway Section)

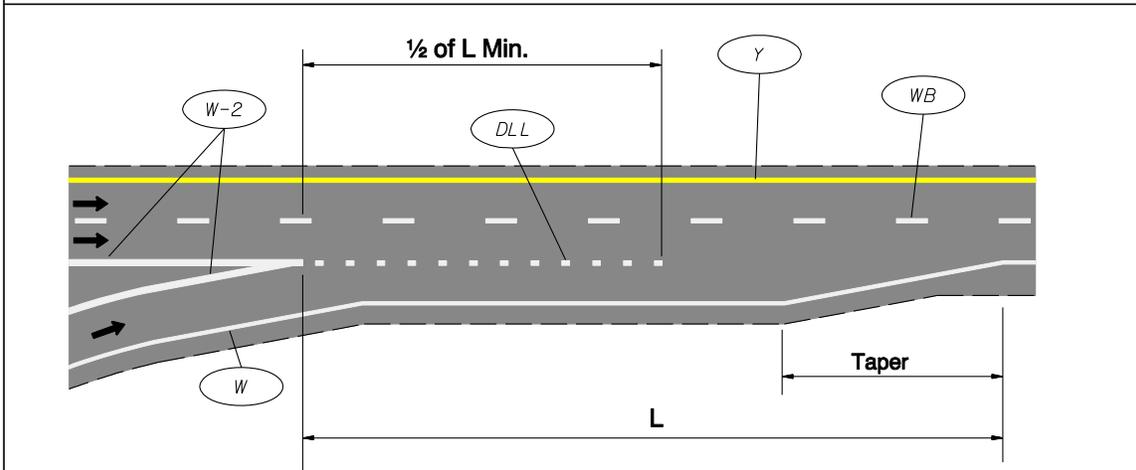


Figure 12c Typical Freeway Entrance Ramp (With Parallel Acceleration Lane)

Lane reductions and additions are used in a variety of different applications, such as for climbing lanes, passing lanes, and to adequately handle traffic volumes. Typical layout for lane reduction transition is shown in Figure 13. This layout may not be appropriate for ramp meter locations with a two-lane approach. Engineering judgment should be used for these locations.

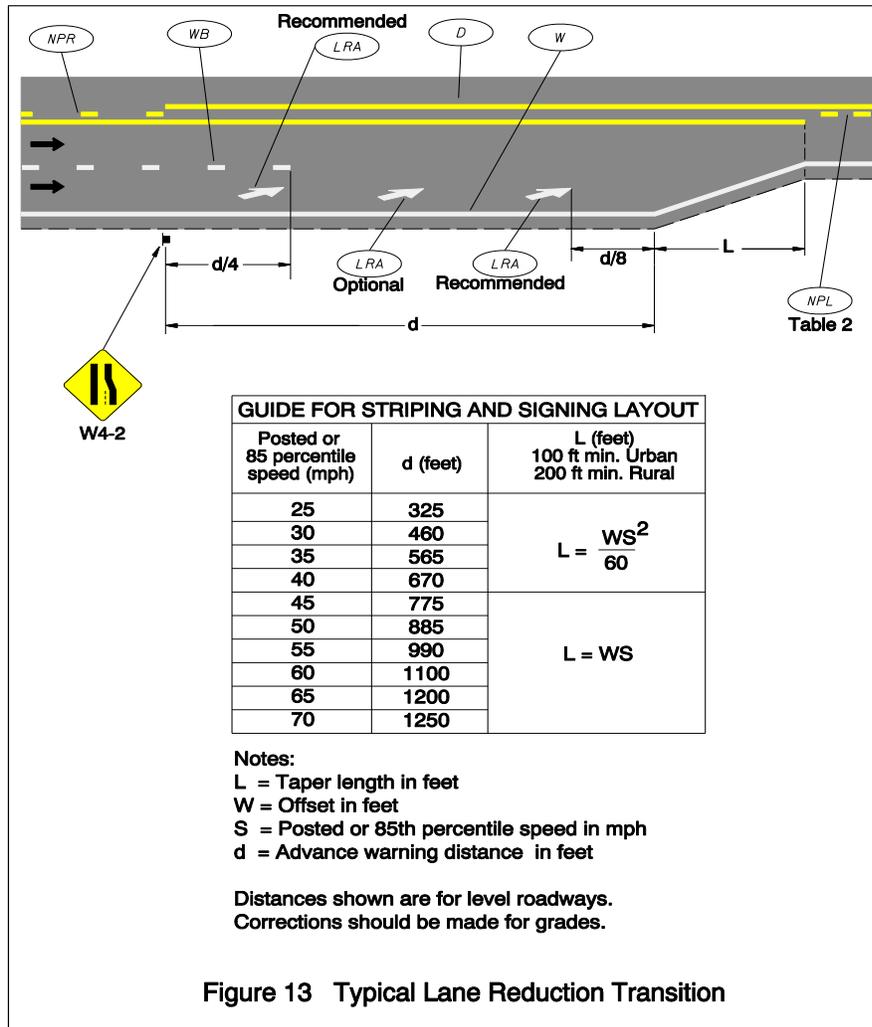


Figure 13 Typical Lane Reduction Transition

Lane reduction transition layout shall include:

- A minimum length of no-passing zone markings following the taper for oncoming traffic according to Table 2.
- Lane Ends sign (W4-2) placed at a distance “d” from the beginning of the taper. If not feasible, a different “d” value may be used based on engineering judgment.

Table 2: No-Passing Zone Marking Distance

Posted or 85 Percentile Speed (mph)	25	30	35	40	45	50	55	60	65	70
Minimum No-Passing Distance Needed (ft)	450	500	550	600	700	800	900	1000	1100	1200

Lane reduction transition layout should include:

- Two lane reduction arrows for a posted speed limit of 45 mph or more (Figure 13). An additional arrow may be installed in between the two arrows.

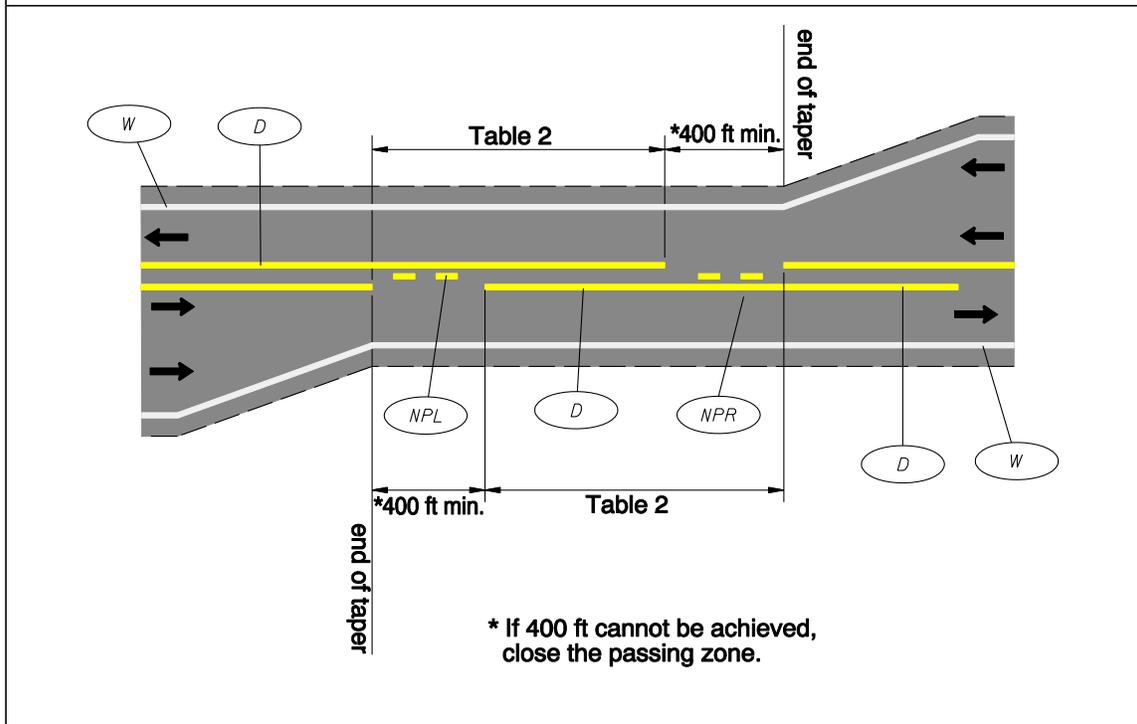
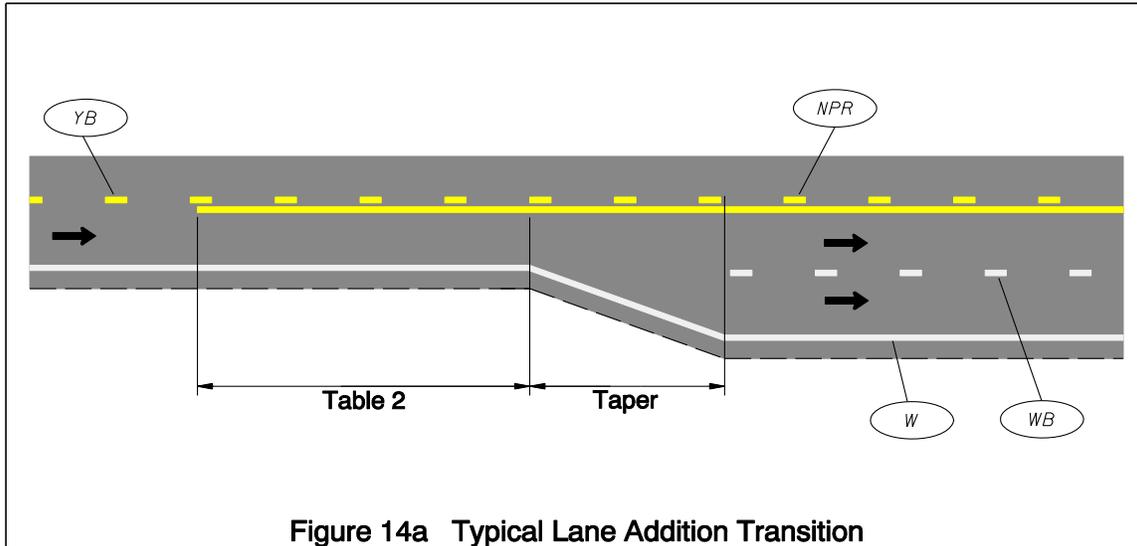
Typical layouts for lane addition transitions and transition between two lane reductions are shown in Figures 14a and 14b, respectively.

Lane addition transition layout shall include (Figure 14a):

- Delineation of the lane lines with a white broken line (WB) as soon as full lane width is developed.
- A minimum length of no-passing zone markings preceding the start of the taper according to Table 2.

Transition between two lane reductions layout shall include (Figure 14b):

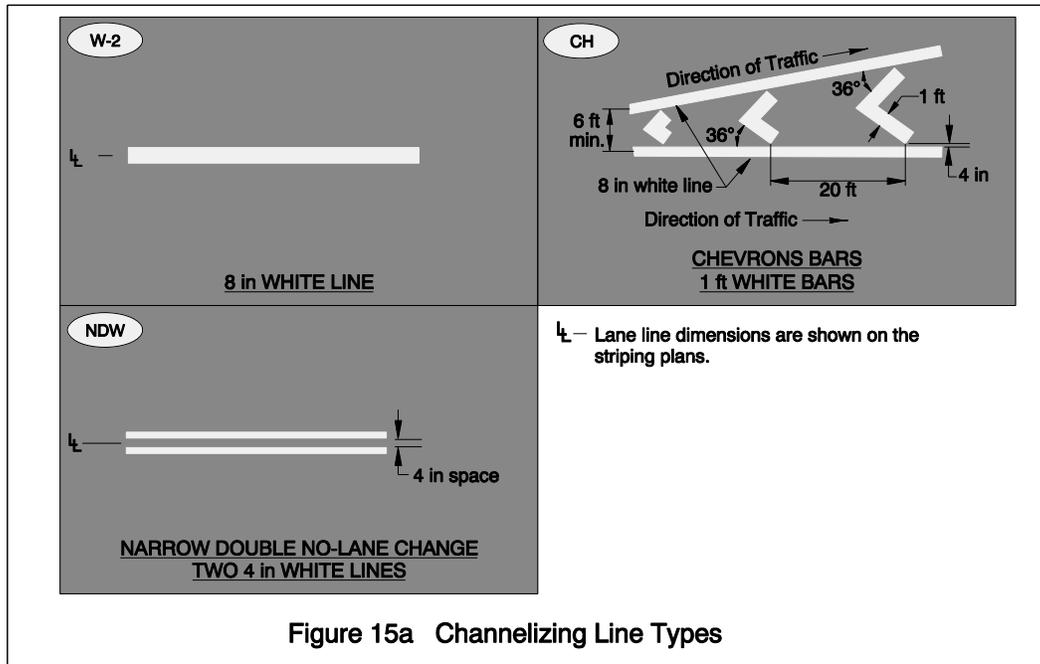
- A minimum length of no-passing zone markings following the end of the taper in the oncoming direction according to Table 2.



Channelizing lines are used to discourage or prohibit sideways movements of traffic proceeding in the same general direction. Traversable channelizing islands are formed by channelizing lines and help direct the motorists through an intersection or around obstructions.

Types (Figure 15a):

- **W-2:** A wide white line shall be used when crossing of the line is discouraged and to form channelizing islands.
- **NDW:** A narrow double white line shall be used when crossing of the line is prohibited.
- **CH:** Chevron bars may be used within the neutral area. The points of the chevron bars shall be toward approaching traffic.



Typical channelizing line applications:

- Approaches to obstructions (Figure 15b).
- Gores at freeway entrance and exit ramps (Figure 15c).
- Separation of turn lanes from through traffic lanes (Figure 15d).
- Any other location designed to discourage or prohibit crossing of the line when traffic proceeds in the same general direction on both sides of the line (Figure 15e).

Traversable channelizing islands may:

- Include white chevron bars (CH) within the neutral area or island if extra delineation is needed for special emphasis or to discourage motorists from entering the neutral area.

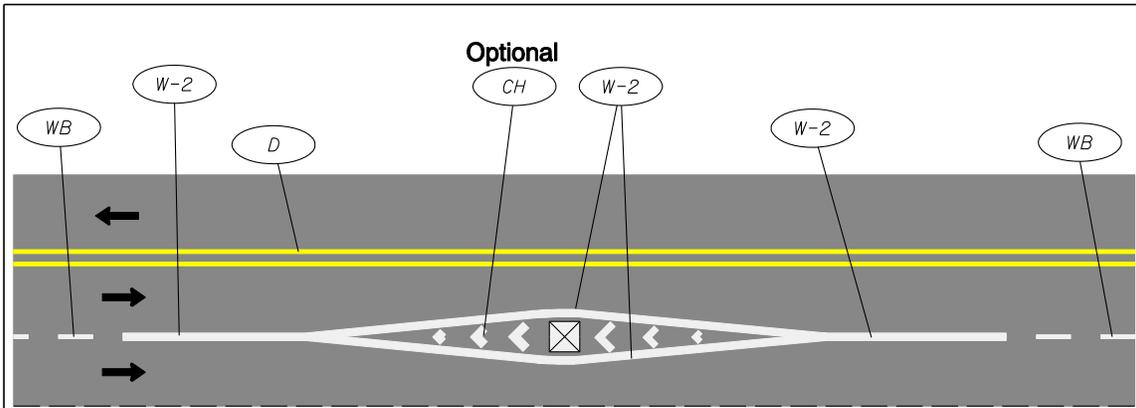


Figure 15b Channelizing Lines for Obstruction in the Roadway (Traffic Passing Both Sides of Obstruction)

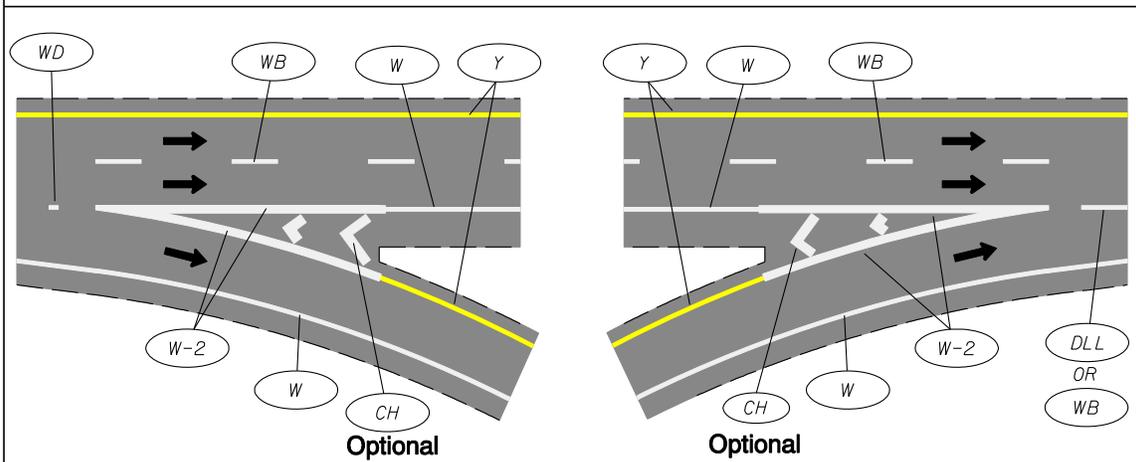


Figure 15c Channelizing Lines for Freeway Exit & Entrance Ramps

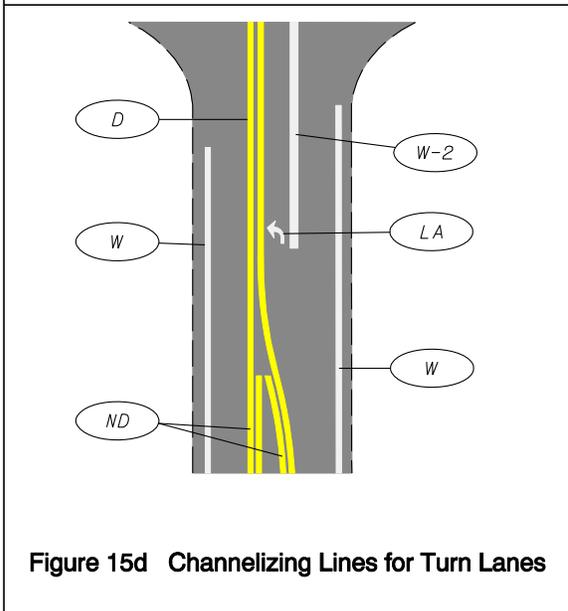


Figure 15d Channelizing Lines for Turn Lanes

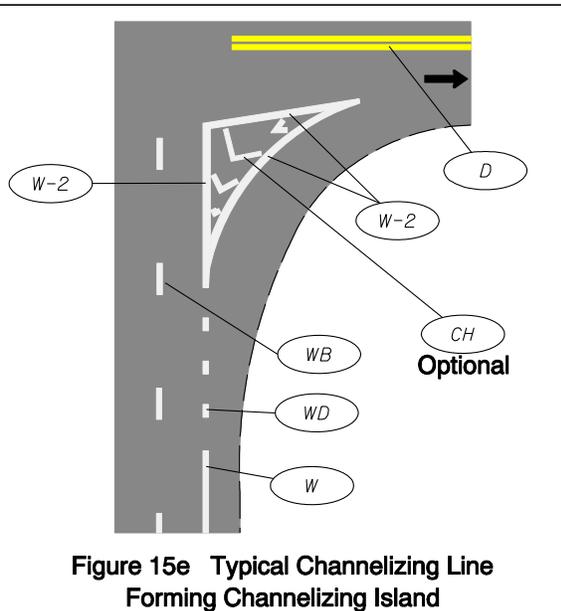


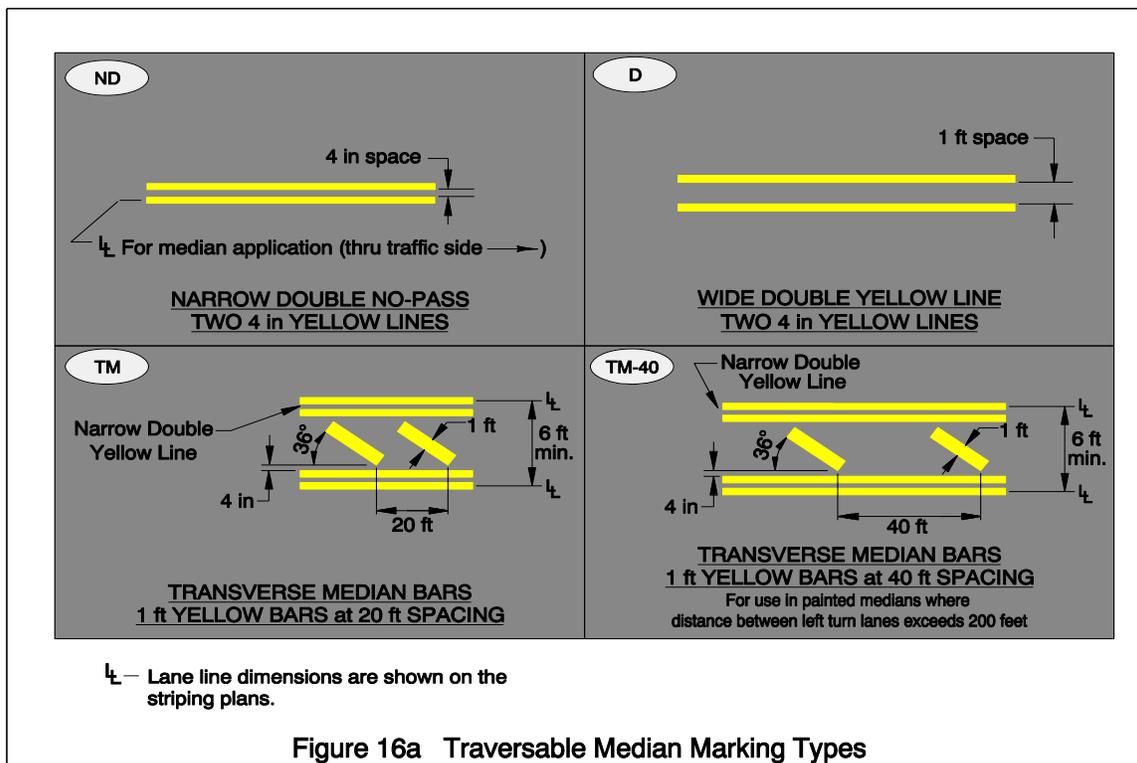
Figure 15e Typical Channelizing Line Forming Channelizing Island

B-9 Traversable Medians

Traversable medians provide separation between opposing flows of traffic and are intended to prohibit vehicles from crossing the median except at driveways, alleys, and intersections or using it as a two-way left turn lane. Traversable medians are delineated only by pavement markings and do not physically prevent vehicles from crossing or entering the medians.

Types (Figures 16a):

- **ND:** Used to delineate medians 4 ft or greater in width (Figure 16b).
- **D:** Used to delineate medians less than 4 ft wide (Figure 16b).
- **TM:** Typical transverse median bar spacing.
- **TM-40:** Transverse median bars with increased spacing that may be used where the distance between left turn lanes exceeds 200 ft.



Traversable medians shall:

- Have their yellow lines joined using a curve, where the median width is 6 ft or more and the median ends at an intersection (Figure 16c). This is commonly referred to as a “bull nose”. Typically, a bull nose that is 100 ft in length produces an aesthetically pleasing curve that misses the wheel path of vehicles turning left from the side street.
- Have a minimum length of no-passing zone markings preceding the start of the taper according to Table 2 in Section B-7 (Figure 16d).

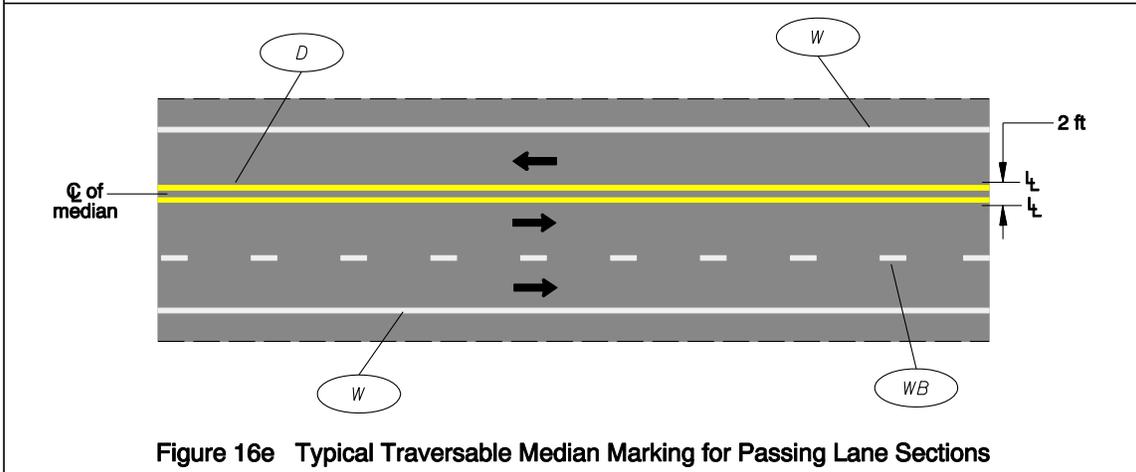
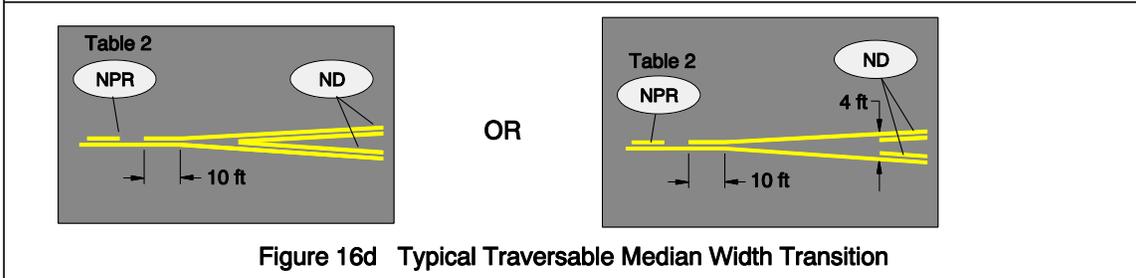
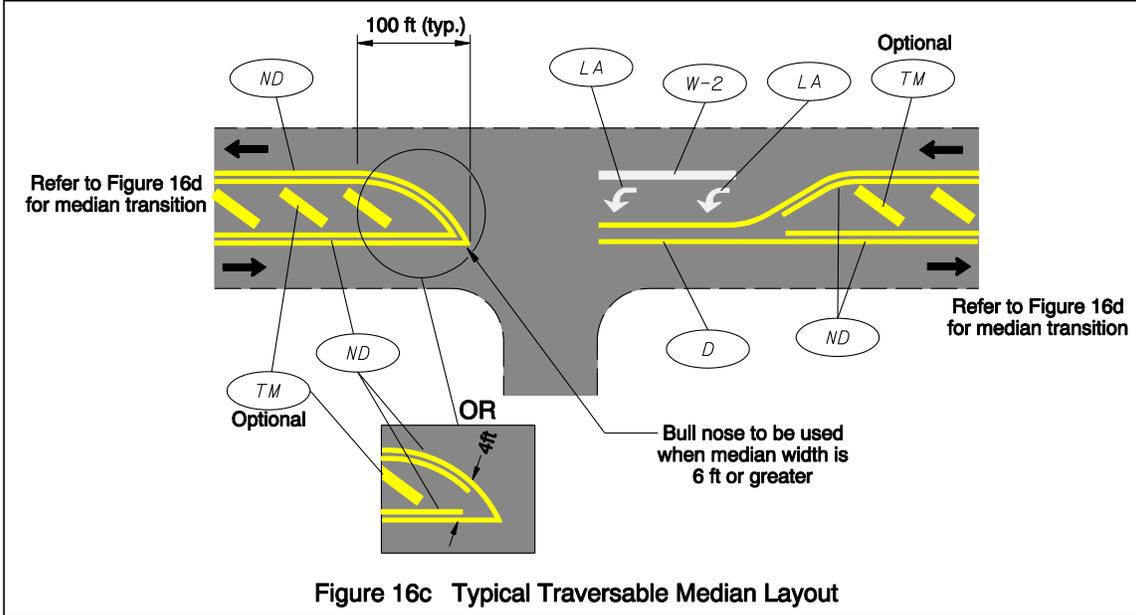
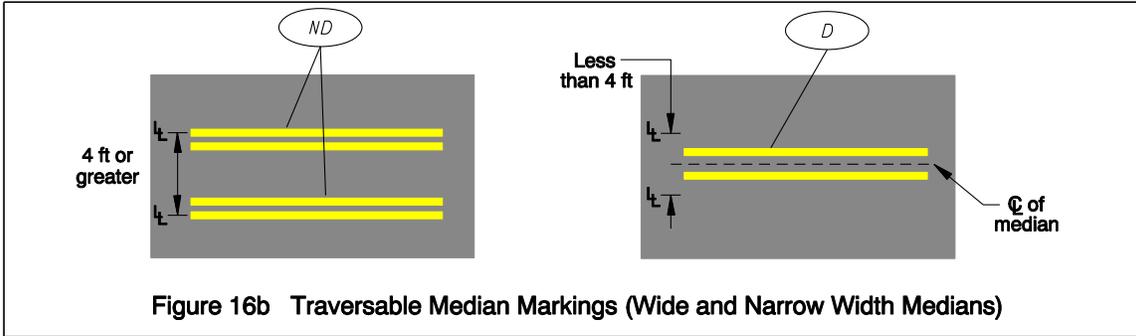
Traversable medians should:

- Be delineated with narrow double yellow lines (ND) when the median width is 4 ft or greater (Figures 16b & 16c).
- Be delineated with a wide double yellow line (D) when the median width is less than 4 ft, such as, for passing lane sections (Figure 16e).

Traversable medians may:

- Be supplemented with yellow transverse median bars if medians are 6 ft or greater in width and when engineering judgment determines it necessary. Use caution when using transverse median bars since it is illegal to cross a traversable median with yellow transverse median bars. Typically the median bars are placed at 20 ft intervals. When the distance between left turn lanes exceeds 200 ft, the spacing may

be increased to 40 ft.



B-10 Non-Traversable Medians and Channelizing Islands

Non-traversable medians (such as raised medians and traffic separators) and channelizing islands physically prevent vehicles from crossing or entering the median or channelizing island by means of a raised curb or concrete barrier.

Non-traversable medians shall:

- Have no passing-zone markings according to Section B-20 (Approach to a Fixed Object) preceding the start of the non-traversable median.

Non-traversable medians and channelizing islands should:

- Have a normal solid line of the appropriate color installed along side the physical barrier where possible. Due to striping equipment limitations, a line typically cannot be placed closer than 1.5 ft from the face of the physical barrier. Some equipment may allow a closer placement or require a farther placement from the face of curb or barrier. Always check with the Region Striping Manager to confirm the equipment limitations when designing striping within 3 ft of physical barriers to ensure that the striping can be maintained after installation.
- Have retroreflective solid yellow markings and/or other treatments (such as raised pavement markers or tubular markers) placed on the nose of raised medians for delineation (Figure 17a).
- Have retroreflective solid white markings and/or other treatments (such as raised pavement markers or tubular markers) placed on the nose of channelizing islands for delineation (Figure 17b).

Non-traversable medians and channelizing islands may:

- Have yellow colored pavement for median islands separating traffic flows in opposite directions.
- Have white colored pavement for channelizing islands where traffic passes on both sides in the same general direction.

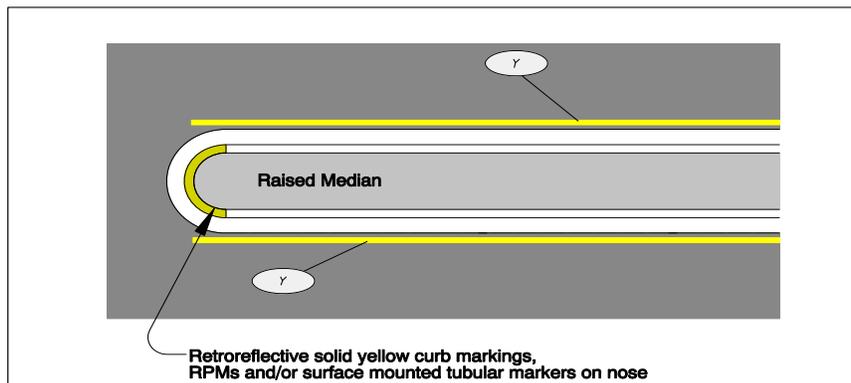


Figure 17a Non-Traversable Median Markings

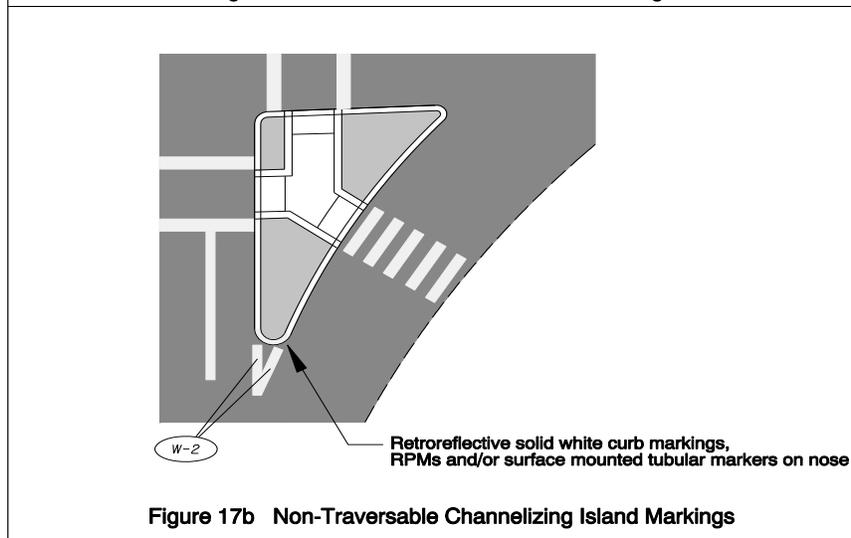


Figure 17b Non-Traversable Channelizing Island Markings

B-11 Right Turn Lanes

A right turn lane may be designed as a developed right-turn lane, a slip lane (refer to Section B-12), or a drop lane where a thru lane becomes a mandatory right turn lane.

Right turn lanes shall include:

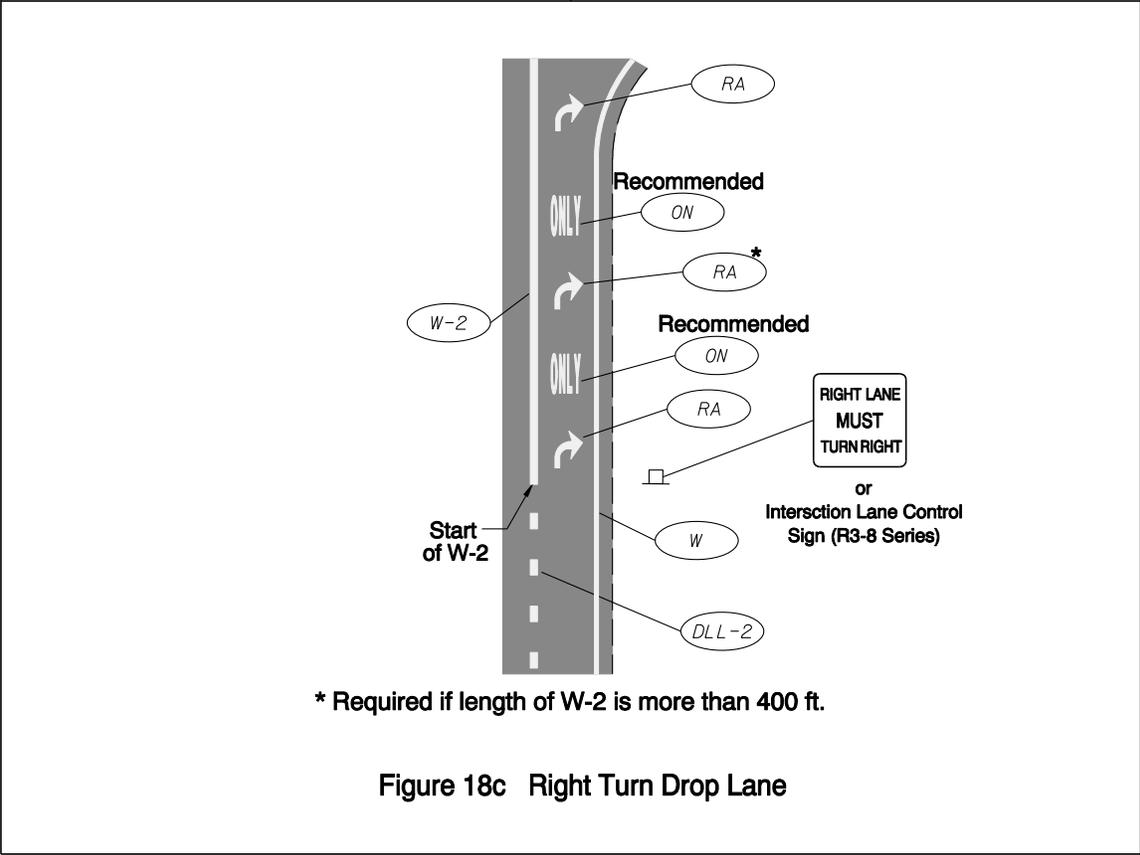
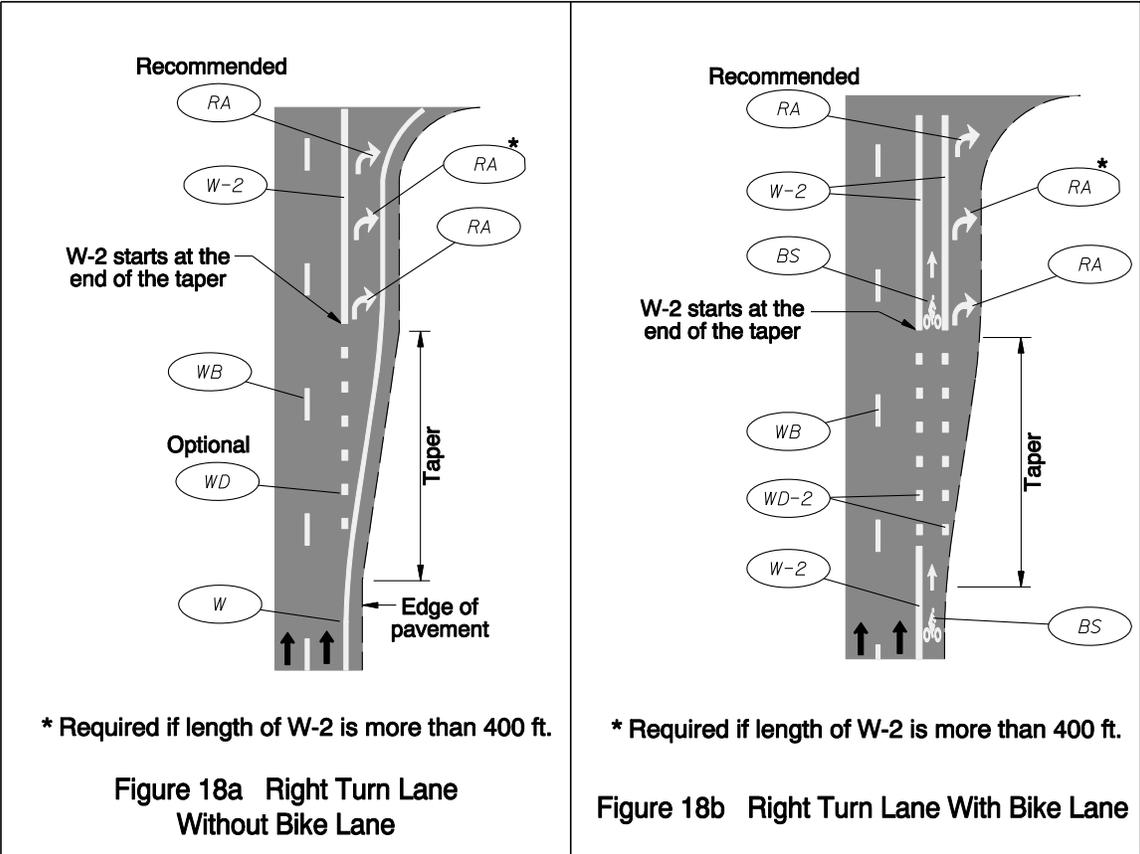
- A wide white line (W-2) for a developed right turn lane, where full lane width is developed prior to the intersection (Figures 18a and 18b). A lane use arrow shall be used at the start of the wide white line (W-2). An additional arrow shall be included at the mid-point of the full width lane when the wide white line (W-2) is longer than 400 ft (Figures 18a thru 18c).
- A wide white dotted line (W-2) and at least two lane use arrows where a thru lane becomes a mandatory right turn lane at an intersection, one at the beginning of the wide white line (W-2) and one at the intersection (Figure 18c). An additional arrow shall be used in between the two required arrows if the length of the wide white line (W-2) is 400 ft or more.
- Wide white dotted lines (WD-2) in the taper section, if the right-turn lane is next to a bike lane, to indicate the area where turning vehicles may be crossing a bike lane (Figure 18b).

Right turn lanes should include:

- A lane use arrow at the intersection for developed right-turn lanes.
- Adequate storage length depending on design speed, traffic volume, and traffic control type. An engineering study should be done to determine the appropriate storage length for signalized intersections. A minimum 50 ft length of wide white line (W-2) should be used for unsignalized intersections.
- A white dotted line (WD) in the taper section for right turn lanes located on horizontal curves and where a bike lane is not present.
- "ONLY" word markings where a thru lane becomes a mandatory right turn lane (Figure 18c).

Right turn lanes may include:

- A white dotted line (WD) in the taper section prior to full lane width development if a bike lane is not present (Figure 18a).



APPROVAL REQUIRED! An engineering study & State Traffic Engineer approval is required for:

- Right turn slip lanes at signalized intersection.
- Yield controlled right turn slip lanes from minor street (stop controlled) onto major street (free flow).
- Stop or yield controlled right turn slip lanes from major street (free flow) onto minor street (stop controlled).

Right turn slip lane is typical in rural areas with large radii. If right turn slip lanes are used at unsignalized intersections in urban areas, special consideration should be given to the pedestrian crossing path. Figure 19a shows typical markings for a right turn slip lane with a developed right turn lane.

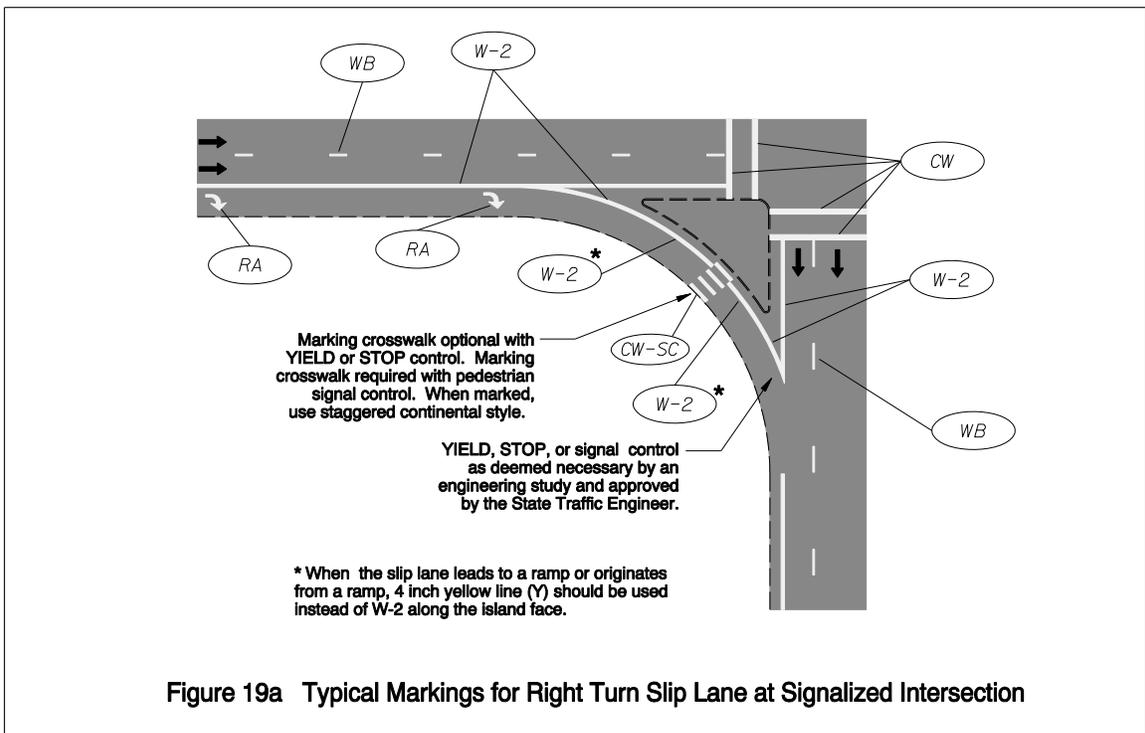
- Yield, Stop, or signal control is required for right turn slip lane at signalized intersections, as deemed necessary by an engineering study (Figure 19b).
- Stop control is the standard for right turn slip lane from minor street (stop controlled) onto major street (free flow) (Figure 19c). Yield control may be provided if deemed appropriate by an engineering study.
- Uncontrolled is the standard for right turn slip lane from major street (free flow) to minor street (stop controlled) (Figure 19d). Yield control is recommended if the “X” distance shown in Figure 19d exceeds 100 ft or an engineering study indicates a need. Stop control may be provided if deemed appropriate by an engineering study.

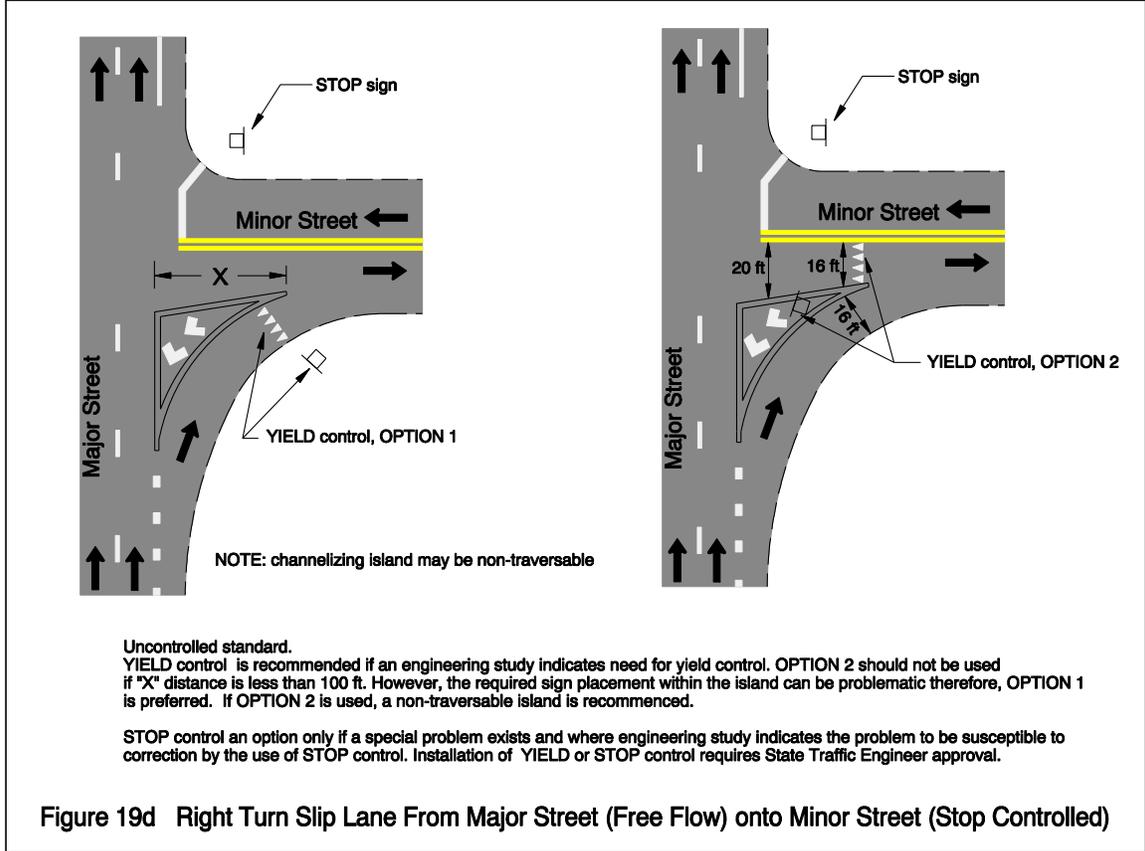
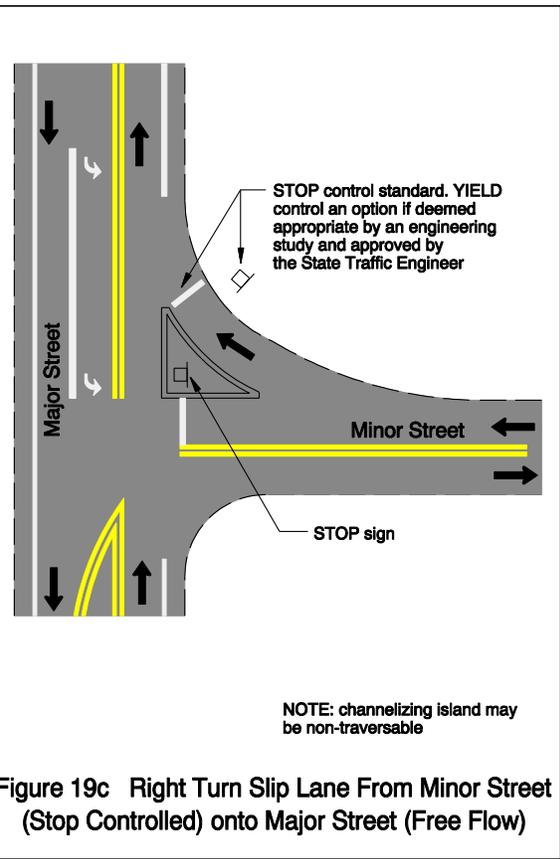
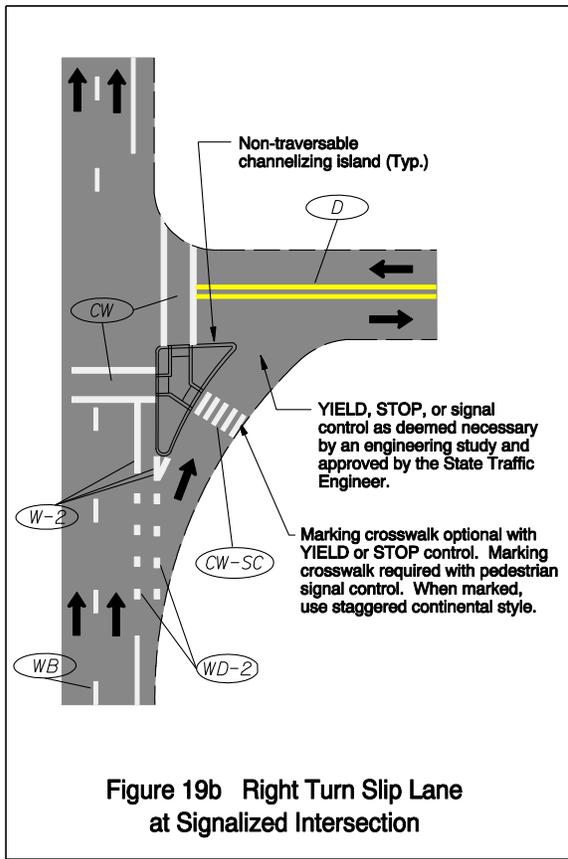
Right turn slip lane should:

- Include stop bars with STOP signs at stop controlled slip lanes.

Right turn slip lane may:

- Include yield lines at yield controlled slip lanes.
- Include chevron bars (CH) in the neutral area of a traversable channelizing island (Figure 19d).

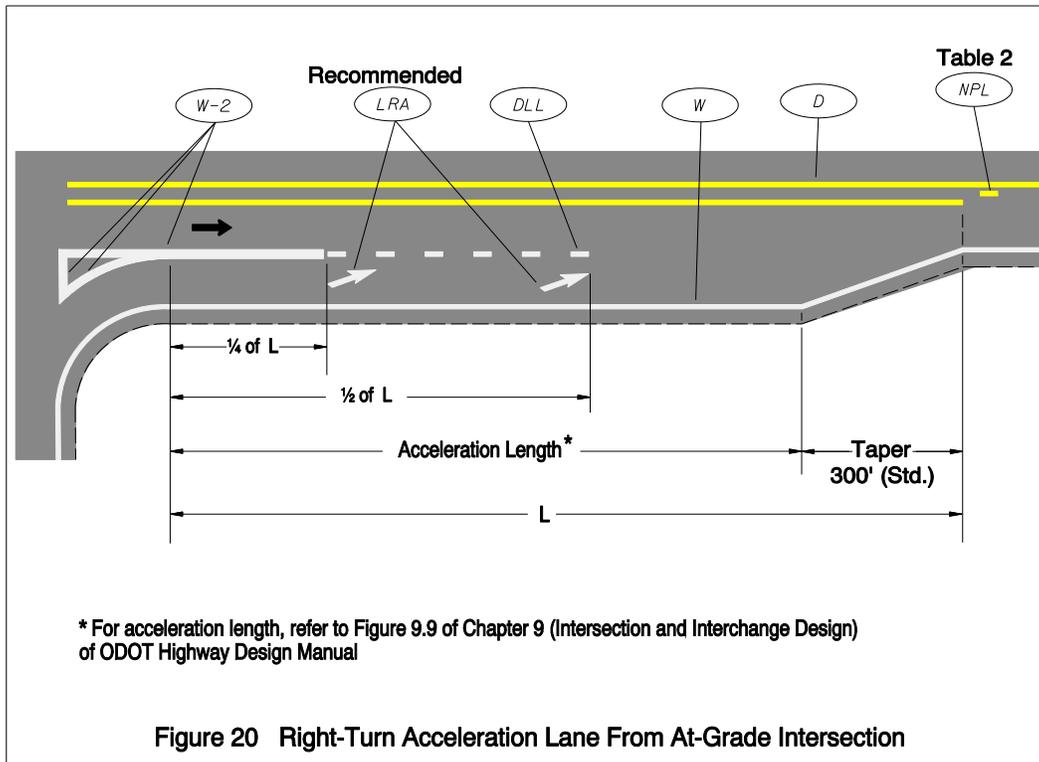




APPROVAL REQUIRED! An engineering study & the joint approval of the State Traffic Engineer and the State Roadway Engineer are required for:

- Right turn acceleration lane from at grade intersection.

A Typical layout of an at-grade right turn acceleration lane is shown in Figure 20. Refer to Section 6.38.3.3 of the ODOT Traffic Manual and Chapter 9 of the ODOT Highway Design Manual for design criteria of at-grade right turn acceleration lane. Special consideration should be given to the bike users and pedestrians.



At-grade right turn acceleration lane shall include:

- White dotted lane line (DLL) from the end of the wide white line (W-2) to a distance equal to one-half the distance between the beginning of the acceleration lane and the end of the taper.
- Double no-passing marking (D) from the intersection to the end of the taper.
- One-direction no-passing marking (NPL) for two-lane undivided highway starting at the end of the taper and continue to a distance equal to the distance shown in Table 2 in Section B-7.

At-grade right turn acceleration lane should include:

- Two lane reduction arrows (LRA), one at the start of the white dotted lane line (DLL) and one at the end of the white dotted lane line (DLL).

At-grade right turn acceleration lane may include:

- An additional lane reduction arrow (LRA) between the two required lane reduction arrows if the distance between the arrows is 400 ft or more.

Figure 21 illustrates the typical layouts for a left turn lane for two-lane undivided roads. Refer to the ODOT Highway Design Manual (HDM) for other configurations.

Left turn lanes shall include:

- A wide white line (W-2) according to the Table on Figure 21.
- Reversing curves (Figure 21: Option 1) for multiple left turns, left turns located on vertical crest curves or horizontal curves, and end-to-end left turns.
- A minimum length of no-passing zone markings (according to Table 2 in Section B-7) preceding the start of the taper for two-lane undivided road.
- A lane use arrow at the start of the wide white line (W-2). An additional arrow shall be included at the mid-point of the full width lane when the wide white line (W-2) is longer than 400 ft.
- At least two lane use arrows where a thru lane becomes a mandatory left turn lane at an intersection, one at the beginning of the wide white line (W-2) and one at the intersection.

Left turn lanes should include:

- A lane use arrow at the intersection.
- Adequate storage lengths. An engineering analysis should be done to determine the appropriate storage length. Longer storage lengths should be provided for locations with higher speeds, higher volumes, or traffic signals.
- A white dotted line (WD) in the gap between the reversing curves and wide white line (W-2) when the left turn lane is located on a sharp horizontal curve where drivers are likely to unintentionally drift into the turn lane.

Left turn lanes may include:

- The “break” layout (Figure 21: Option 2) instead of a reversing curve when approved by Region Traffic. The “break” layout allows for an easier re-trace.
- Transverse median bars (TM) in the neutral area. Use caution when using transverse median bars since it is illegal to cross a traversable median with yellow transverse median bars.

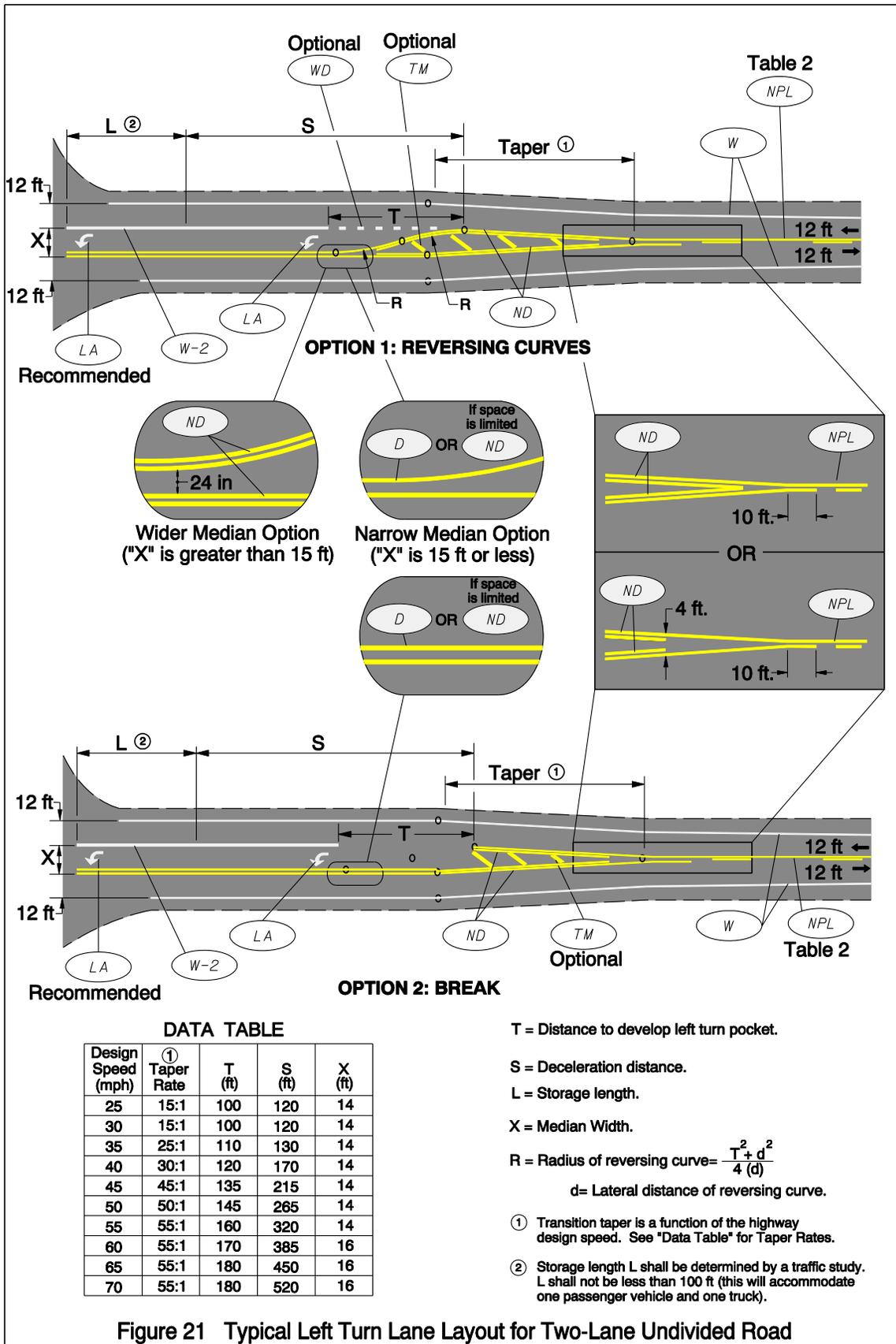
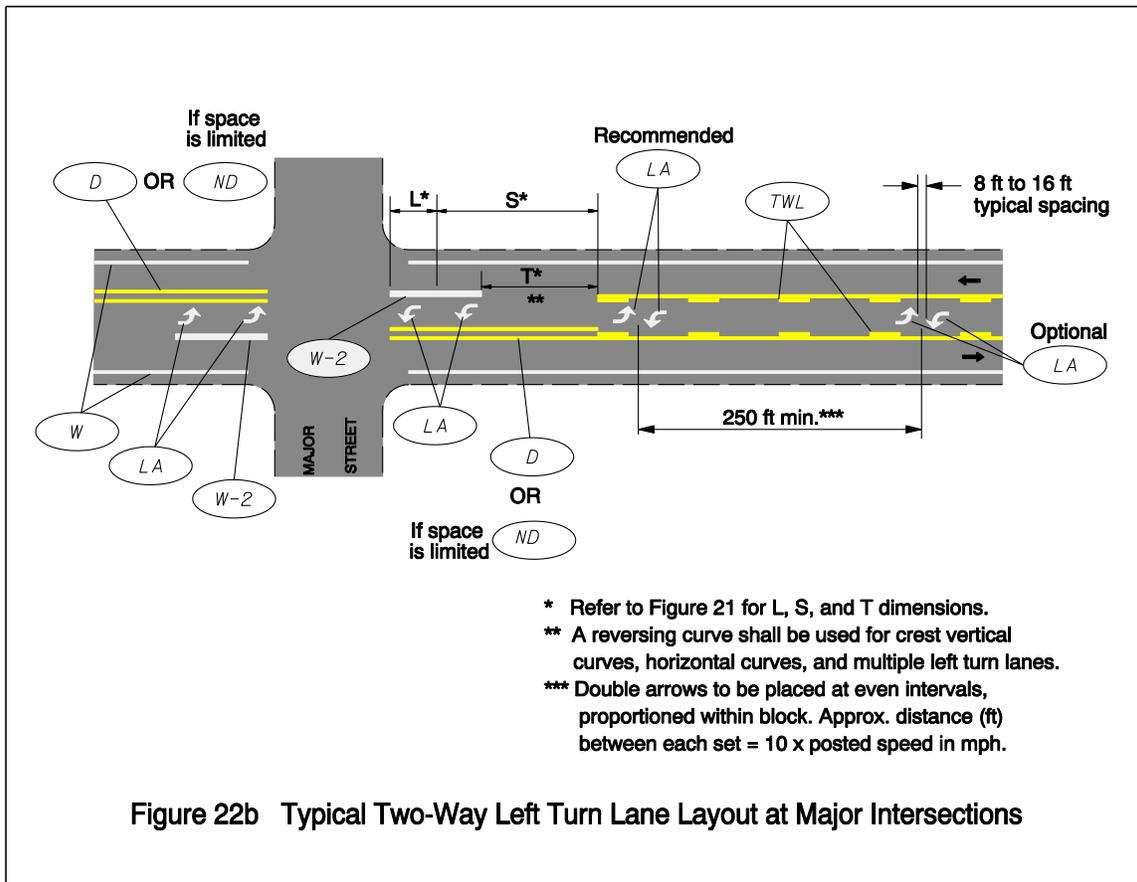
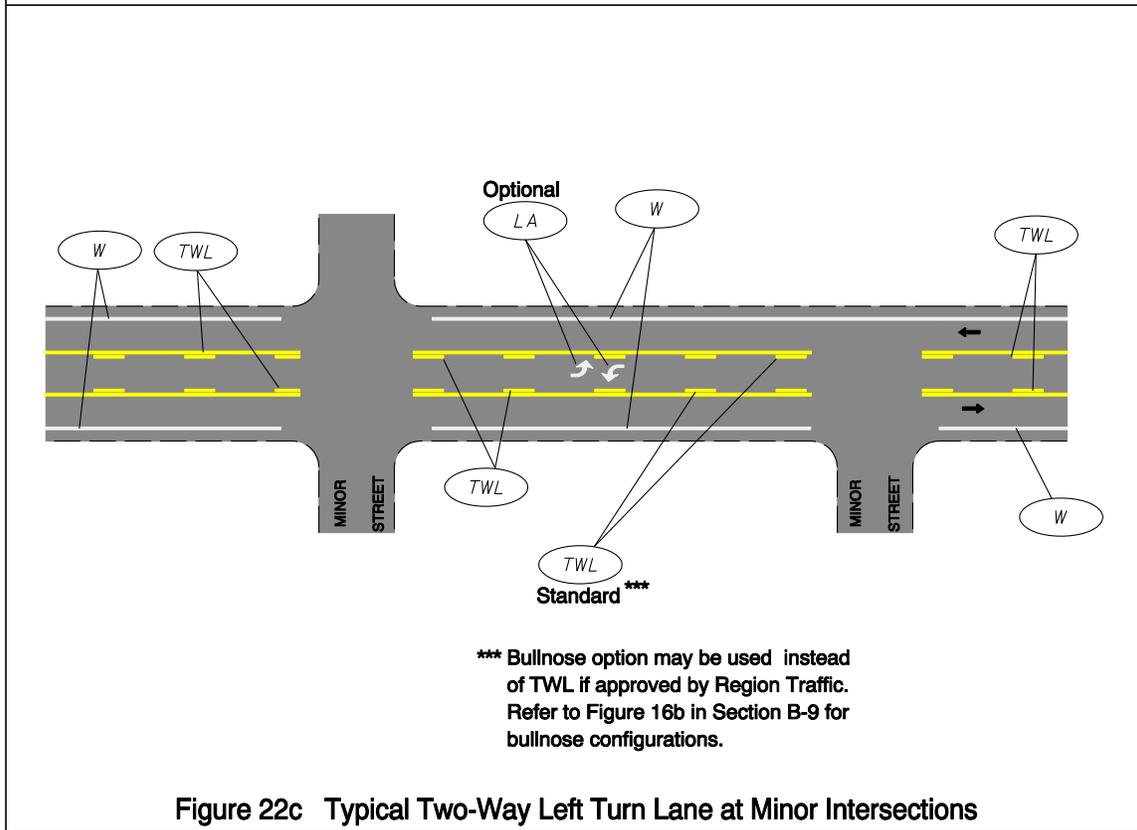


Figure 21 Typical Left Turn Lane Layout for Two-Lane Undivided Road



- * Refer to Figure 21 for L, S, and T dimensions.
- ** A reversing curve shall be used for crest vertical curves, horizontal curves, and multiple left turn lanes.
- *** Double arrows to be placed at even intervals, proportioned within block. Approx. distance (ft) between each set = 10 x posted speed in mph.



*** Bullnose option may be used instead of TWL if approved by Region Traffic. Refer to Figure 16b in Section B-9 for bullnose configurations.

Roundabouts are circular roadways at intersecting highways with yield control at the entering lanes. Figure 23 shows a typical layout of a single lane roundabout.

Roundabouts markings shall:

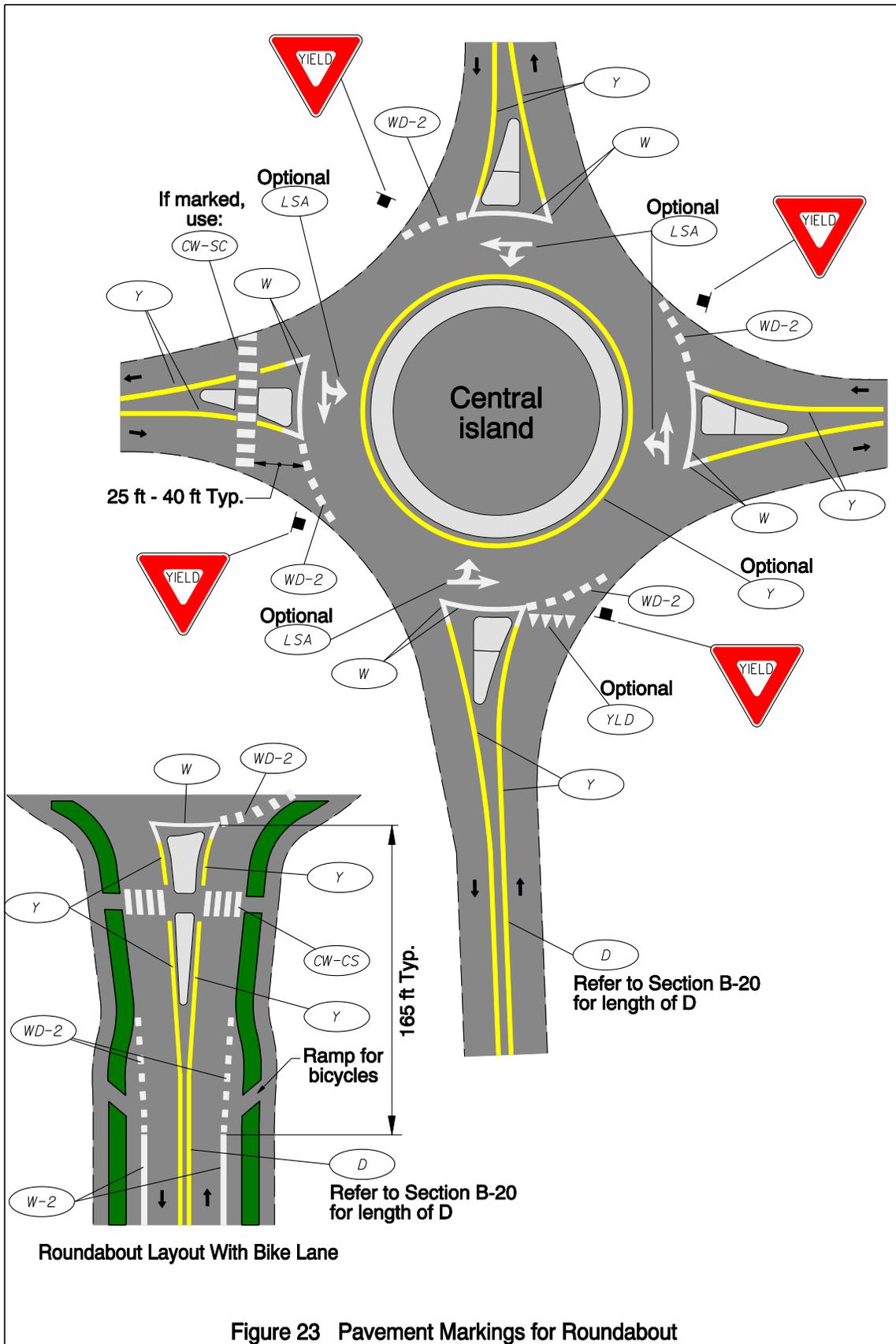
- Include no-passing zone markings prior to the splitter island according to Section B-20 (Approach to a Fixed Obstruction).
- **NOT** include markings for bicycle lanes within the circulatory roadway of roundabout. Bike lanes should stop 165 ft before the yield line, or if no yield line is present, 165 ft before the edge of the circulatory roadway.

Roundabout markings should include:

- Continental style crosswalk markings at urban roundabouts. Crosswalks should be located 25 to 40 ft from the wide white dotted line (WD-2) (or yield line if one is present) to allow for approximately one car length of storage.
- Lane lines within the circulatory roadway of multi-lane roundabouts. If used, these lines shall NOT be continuous concentric lines.
- A white edge line (W) on the outer (right) edge of the circular roadways along the splitter islands. No line is marked across the exiting lanes.
- A wide white dotted line (WD-2) extending across the entering lanes.
- Lane use arrows within the circulatory roadway for multi-lane roundabouts.

Roundabout markings may include:

- A yellow edge line (Y) around the inner (left) edge of the circular roadway.
- A white yield line (YLD) across entering lanes if engineering judgment determines a need.
- Continental style crosswalk markings at rural roundabouts when engineering judgment determines a need. Crosswalks should be located 25 to 40 ft from the white dotted line (or yield line if one is present) to allow for approximately one car length of storage.
- Lane-use arrows on any approach and within the circulatory roadway.



**APPROVAL
REQUIRED!**

An engineering study & Region Traffic Engineer approval is required for:

- Any modification to the striping as shown in Figures 24a and 24b, including but not limited to extending the 8-inch white channelizing lines beyond the painted gore point.

Types of entrance ramps on freeways:

- Added lane (Figure 24a).
- Parallel acceleration lane (Figure 24b). This is the standard design used in Oregon.
- Tapered acceleration lane. A tapered acceleration lane is characterized by a tangent entrance ramp entering the freeway without an acceleration lane section (note that both Figures 24a and 24b have a curved entrance ramp with a developed acceleration lane parallel to the highway). ODOT currently does not design this type of entrance ramp, however, there may be existing entrance ramps with this type of design. In these cases, contact the Region Traffic Engineer for guidance.

Entrance ramps shall include:

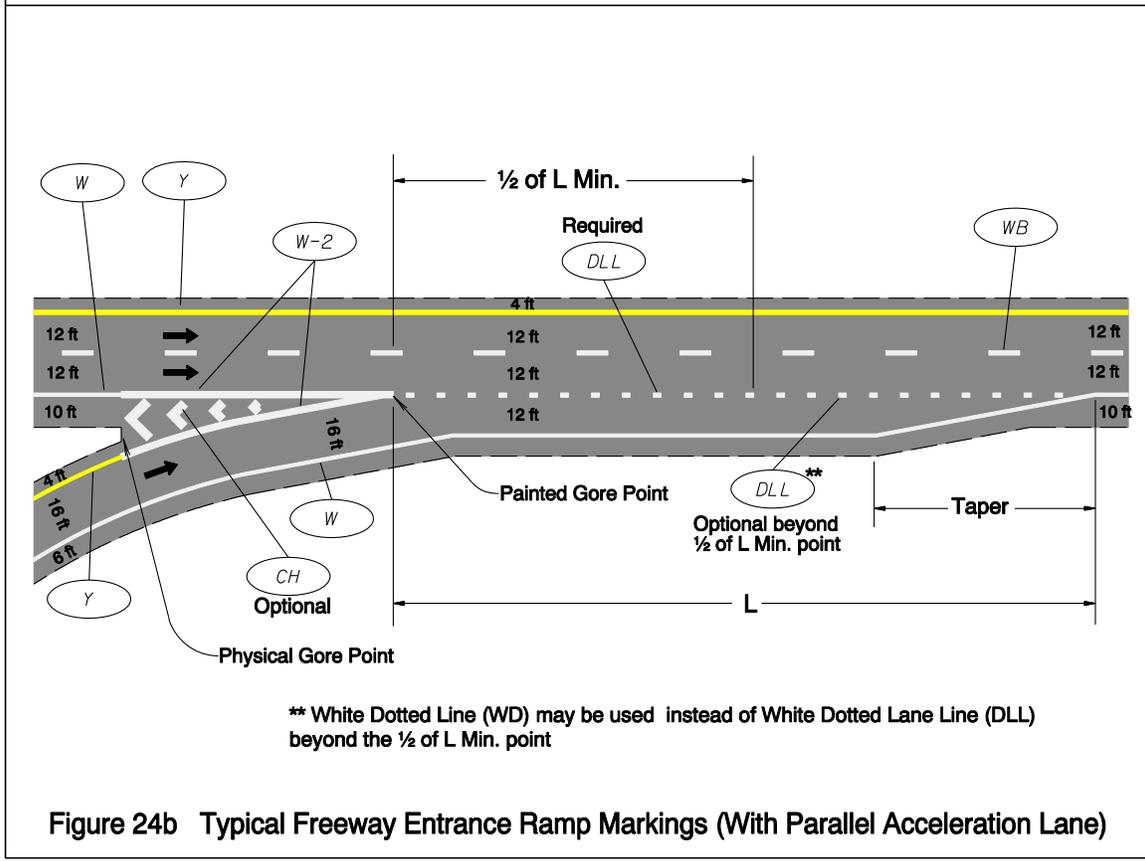
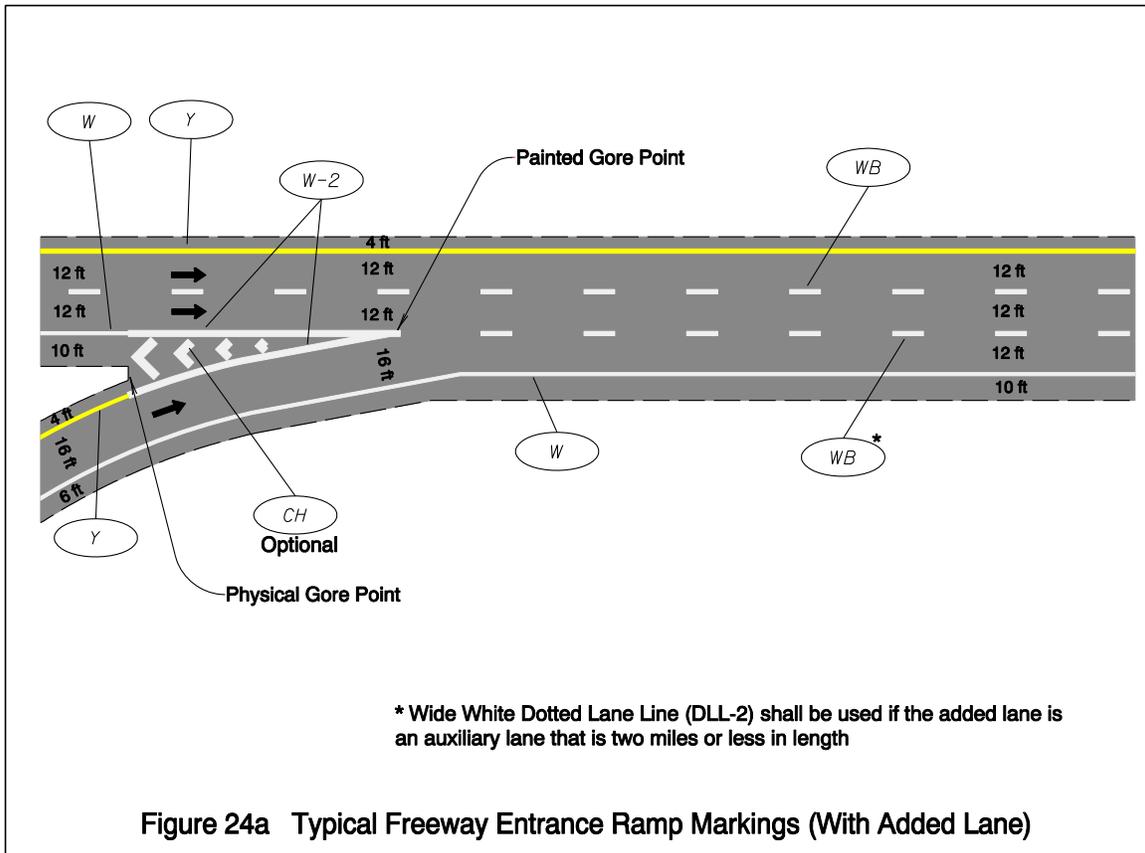
- Wide white channelizing lines (W-2) from the physical gore point to the painted gore point.
- White broken line (WB) from the painted gore point for the added lane option (Figure 24a) unless this lane becomes an auxiliary lane between the entrance ramp and the following exit ramp, which is 2 miles or less in length. For this case, wide white dotted lane line (DLL-2) shall be used.
- White dotted lane line (DLL) for the parallel acceleration lane, from the painted gore point to a point at least one-half the distance from the painted gore point to the end of the taper (Figure 24b).

Entrance ramps should include:

- The gore point established by measurements of dimensions shown in Figures 24a and 24b. Layout of ramp striping should originate with gore point.

Entrance ramps may include:

- White dotted lane line (DLL) for parallel acceleration lane from the end of the required white dotted lane line (DLL) to the end of the taper (Figure 14b). White dotted line (WD) may be used instead of white dotted lane line (DLL) beyond the required white dotted lane line (DLL).
- Chevron bars (CH) within the neutral area to further discourage motorists from using this area.



Types of exit ramps on freeways:

- Exit lanes with tapered deceleration lanes (Figure 25a). This is the standard design used in Oregon.
- Exit lanes with a lane drop (Figure 25b shows a single lane drop exit and 25c shows a two lane exit with a lane drop).
- Exit lanes with parallel deceleration lanes. This type is typically not used in Oregon. A parallel deceleration lane is characterized by a lane developed shortly before the gore point. In these cases, contact the Region Traffic Engineer for guidance.

Exit ramps shall include:

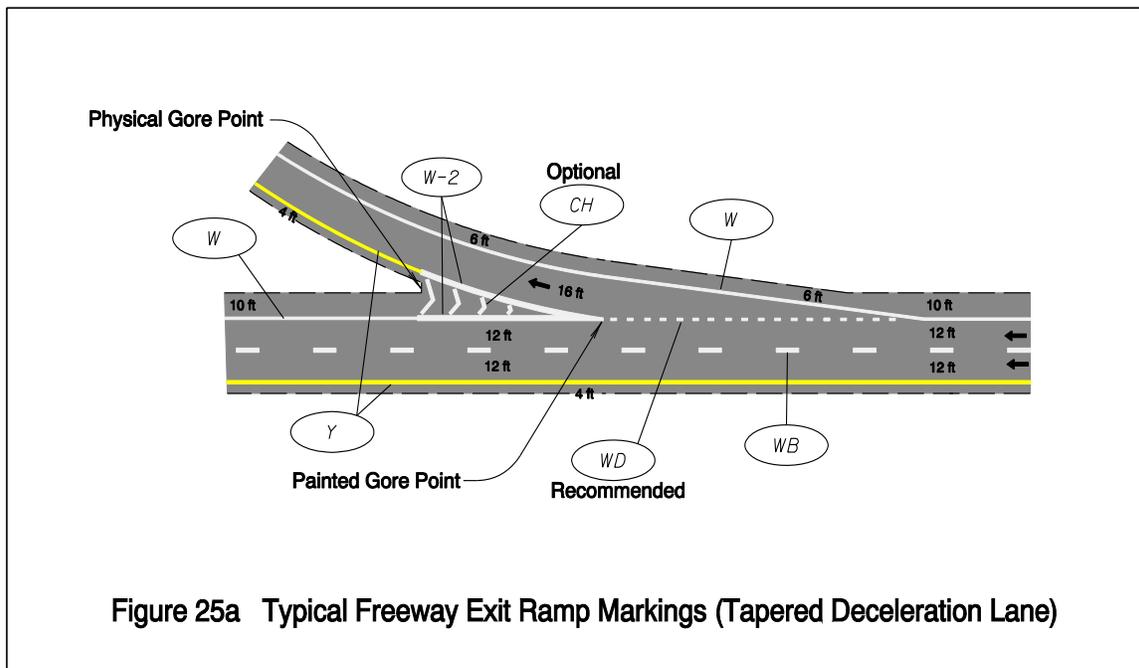
- Wide white lines (W-2) from the painted gore point to the physical gore point. For exits with drop lane(s), the wide white line (W-2) shall start 100 ft to 300 ft prior to the painted gore point.
- Wide dotted lane lines (DLL-2) for exit ramps with drop lane(s). Wide dotted lane line (DLL-2) shall start at least ½-mile in advance of the painted gore point and shall continue to the wide white line (W-2). This distance may not be available for some urban and cloverleaf interchanges. For these situations, wide dotted lane line (DLL-2) should be extended as long as possible.

Exit ramps should include:

- A white dotted line (WD) for tapered deceleration lane (Figure 25a), from the upstream end of the taper to the painted gore point.

Exit ramps may include:

- Chevron bars within the neutral area to further discourage motorists from using this area.



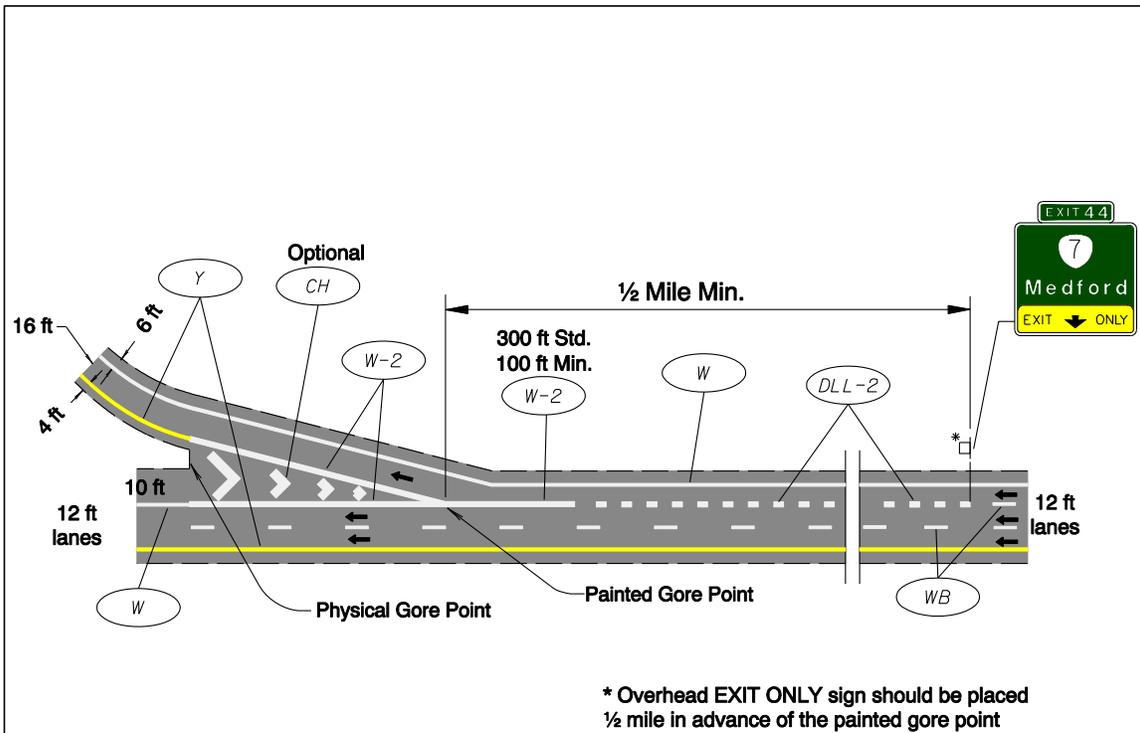


Figure 25b Typical Freeway Exit Ramp Markings (Single Lane Drop)

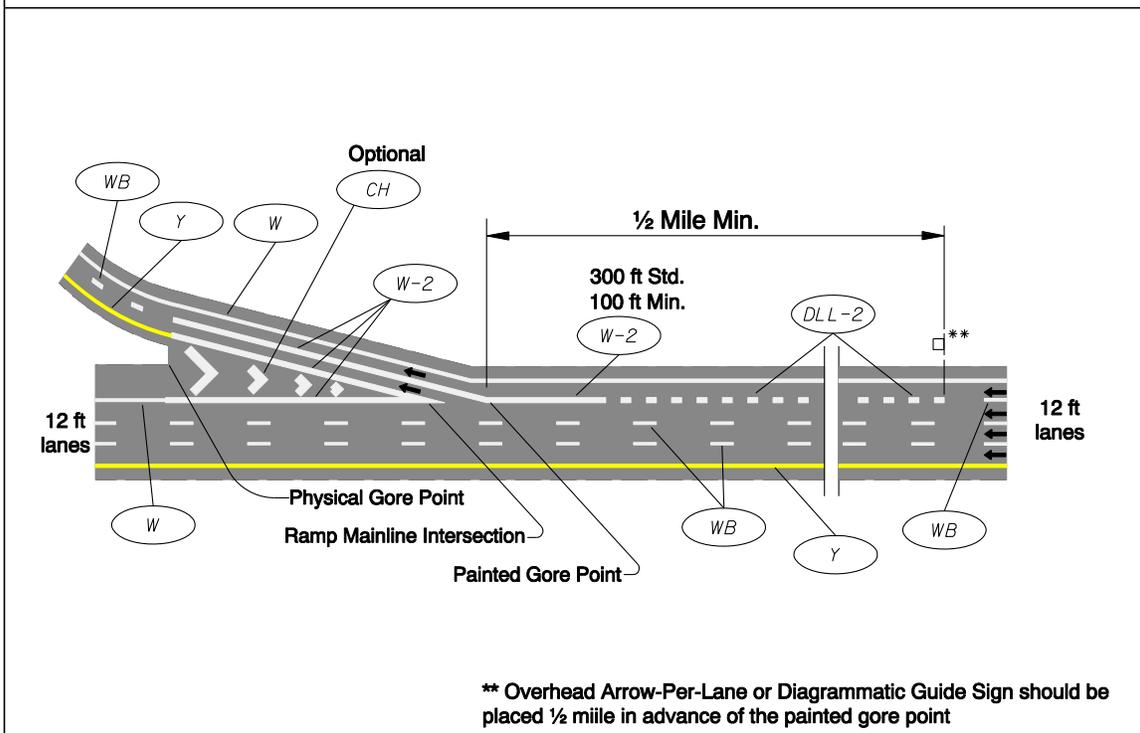


Figure 25c Typical Freeway Exit Ramp Markings (Two-Lane Exit With Single Lane Drop)

**APPROVAL
REQUIRED!**

An engineering study & State Traffic Engineer approval is required for:

- Red raised pavement markers used for wrong way treatments.

An engineering study & Region Traffic Engineer approval is required for:

- Other wrong way treatments, such as white wrong way arrows.

Ramp terminals shall:

- Include lane use arrows in each lane at the beginning of the wide white line (W-2) when there is more than one lane approaching the intersection on the ramp terminal (Figures 26a and 26b).
- Include lane use arrows at the intersection when there is more than one lane approaching the intersection on the ramp terminal to help prevent wrong-way movements.
- Be marked with edge lines and double yellow centerline (D) on the two-way portion for ramps which carry two-way traffic over some of their length (such as folded diamond interchange configurations). One way portions shall be marked with standard edge lines only.

Ramp terminals should:

- Include a lane split as soon as the pavement width is sufficient for two lanes with adequate shoulders in order to develop additional lanes on a ramp. If this point exceeds storage requirements, a white broken line (WB) shall be provided. The broken line should lead into the lane that will minimize the number of possible lane changes at the terminal end or into the lane containing the heaviest movement (for three or more lanes) (Figure 26a).

On approaches to fixed obstructions in the roadway, such as bridge or sign supports, curbed islands, raised barrier, etc., the striping shown in Figures 27a thru 27c should be used.

Approaches to a fixed obstruction shall:

- NOT have lane widths reduced for the obstruction unless approved by the State Roadway Engineer.

If traffic is required to pass to the right of obstruction (Figures 27a and 27b):

- Narrow double no-passing (ND) markings shall be used in the taper areas as determined by the appropriate taper formula.
- Two direction no-passing markings (D or ND) shall be used from the end of the taper to a distance at least twice the length of the taper.
- Transverse median bars (TM) may be used in the neutral area between the narrow double lines if engineering judgment deems it necessary.

If traffic may pass to either left or right of obstruction (Figure 27c):

- Two wide white (W-2) channelizing lines shall be used, diverging from the lane line, one to each side of the obstruction.
- Wide white (W-2) channelizing line on either side shall be extended for a minimum distance of L. Narrow double white (NDW) lines may be used instead of wide white lines if engineering judgment deems it necessary to restrict passing in this area.
- White chevrons bars (CH) may be used in the neutral area between the wide white lines if engineering judgment deems it necessary.

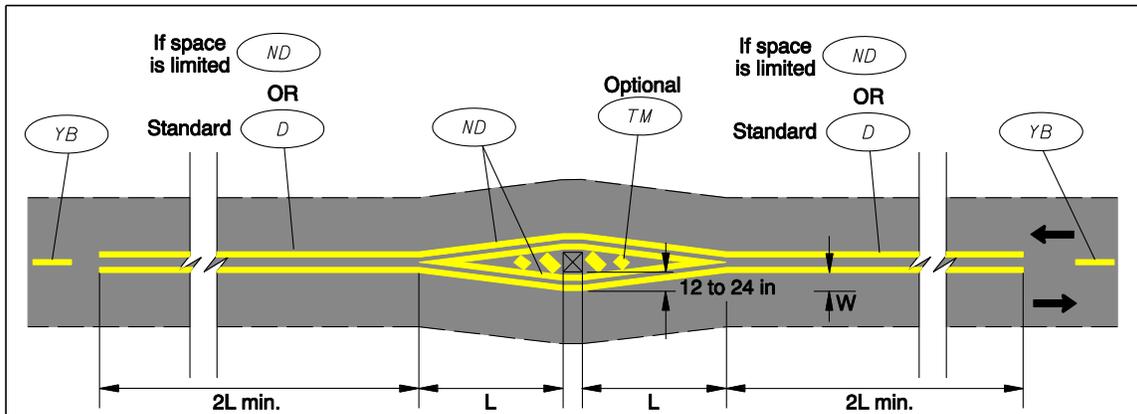


Figure 27a Center of Two-Lane Road

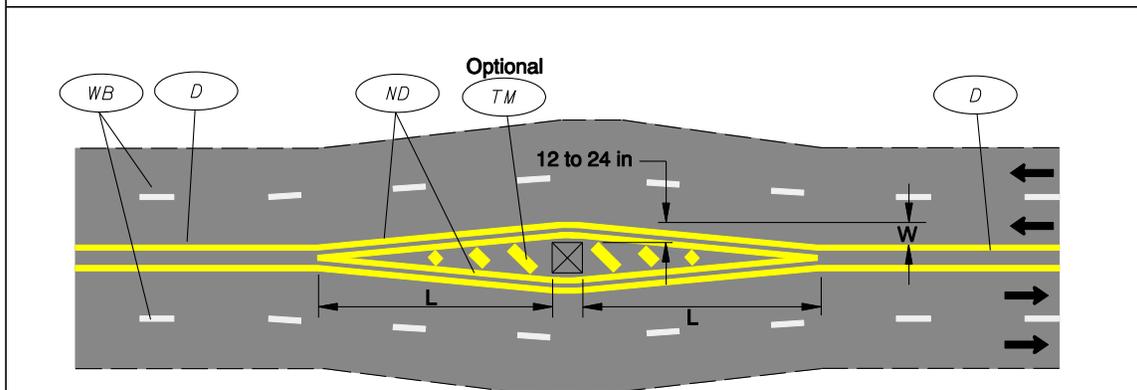
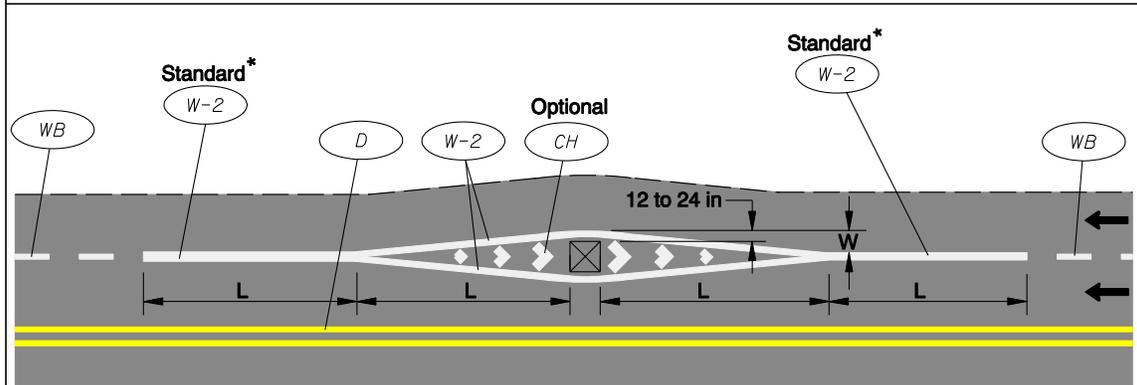


Figure 27b Center of Four-Lane Road



* Narrow double white (NDW) may be used if engineering judgment deems it necessary to restrict passing in this area

Figure 27c Traffic Passing Both Sides of Obstruction

For speeds 40 mph or less: $L(\text{ft}) = \frac{WS^2}{60}$

S = 85th percentile speed or posted speed in miles per hour

For speeds 45 mph or greater: $L(\text{ft}) = WS$

W = Offset distance in feet

L = 100 ft min. in urban areas
L = 200 ft min. in rural areas

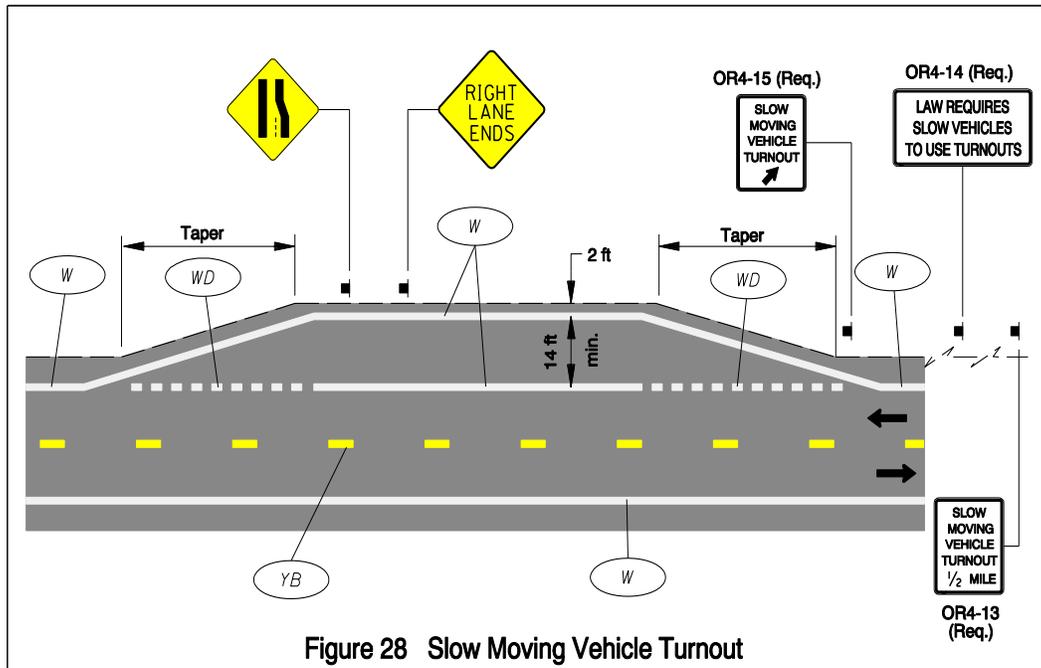
Length "L" should be extended as required by sight distance conditions

B-21 Slow Moving Vehicle and Bus Turnouts

Slow moving vehicle turnouts:

Slow moving vehicle turnouts are no longer installed in Oregon. However, there may be existing turnouts or special circumstances where new ones are installed when approved by the State Roadway Engineer.

- The striping layout for slow moving vehicles shown in Figure 28 may only be installed if the required signing for a slow moving vehicle turnout is installed. If no signing is installed, the edge line shall continue across the widened pavement area.



Bus turnouts:

Where bus turnouts are installed and designed to accommodate one bus at a time, they should be striped according to Figure 29a (if a bike lane is not present) or 29b (if a bike lane is present).

Where bus turnouts are installed and designed to accommodate more than one bus at a time, they should be striped according to Figure 29c (if a bike lane is not present) or 29d (if a bike lane is present).

The striping shown across the bus turnout in Figures 29a and 29c may be omitted if edge lines are not present (for example, in an urban area with curb and sidewalk).

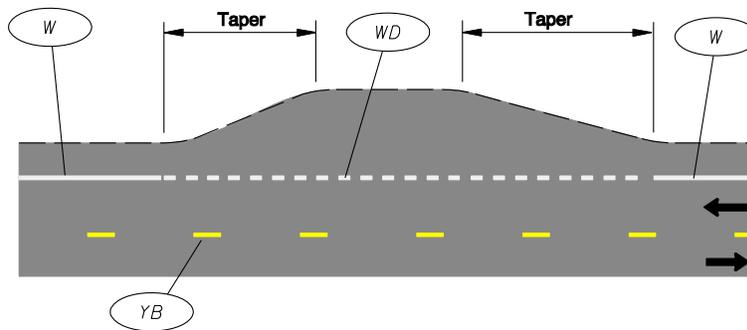


Figure 29a Typical Bus Turnout Layout (Without Bike Lane)

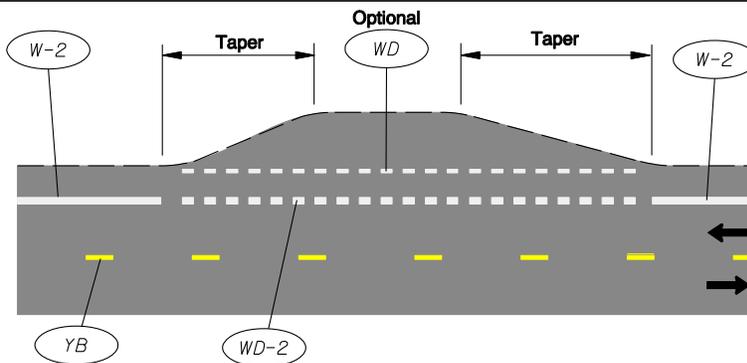


Figure 29b Typical Bus Turnout Layout (With Bike Lane)

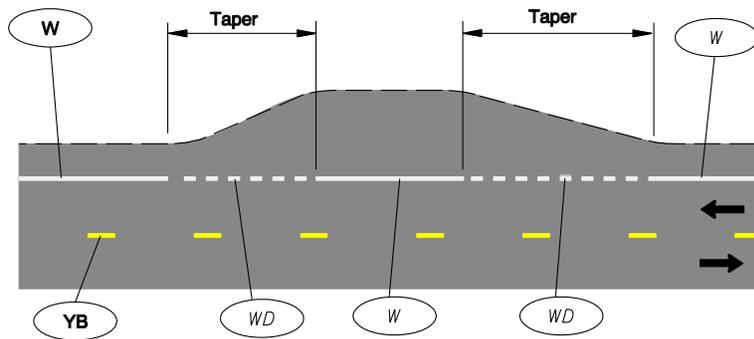


Figure 29c Optional Bus Turnout Layout (Without Bike Lane)

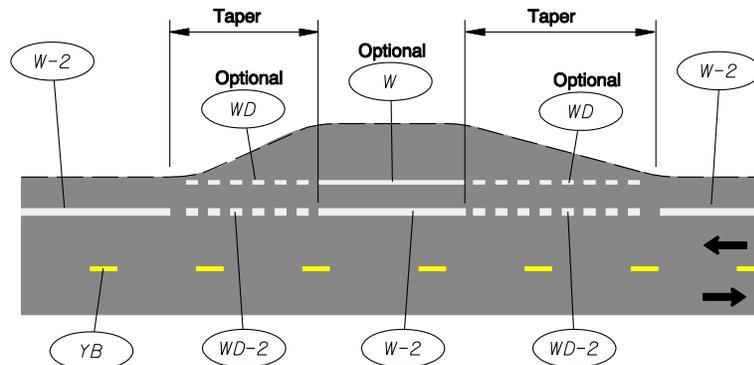


Figure 29d Optional Bus Turnout Layout (With Bike Lane)

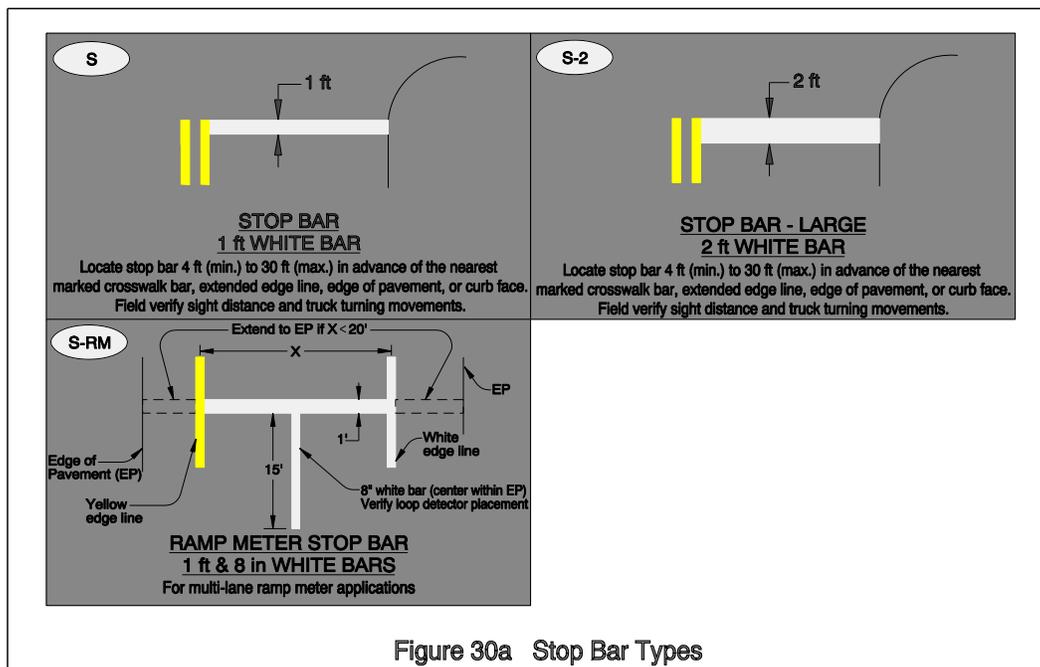
**APPROVAL
REQUIRED!**

An engineering study & Region Traffic Engineer approval is required for:

- Use of stop bar where there is a marked crosswalk and if it is desirable to provide a separate point for vehicles to stop, such as for good sight distance or to allow adequate turning radii.

Types (Figure 30a):

- **S:** Standard stop bar used for most applications.
- **S-2:** For added emphasis at high speed approaches or locations with crash history, stop bars may be 24 inch wide.
- **S-RM:** For entrance ramps where two lanes of traffic are entering by a ramp meter. The white line extending 15 ft perpendicular to stop bar shall be used to indicate the lane separation.



Stop bars shall be used:

- At approaches of signalized intersections where there are no marked crosswalks. If a marked crosswalk is in place, the nearside bar will function as a stop bar.

Stop bars should be used:

- At approaches with STOP signs.
- In advance of marked crosswalk bars at mid-block and uncontrolled approaches on multi-lane highways.
- In advance of continental crosswalks at approaches of signalized intersections to indicate drivers where to stop.

If used, stop bars shall:

- Be placed as near as possible to the traveled way of the intersected highway but should not be closer than 4 ft or farther than 30 ft to the traveled way or nearest crosswalk bar. In curbed sections, the stop bars should normally be placed on a line extended from the back edge of the sidewalk.
- Be placed a minimum of 40 ft in advance of the signal indications.
- Extend across the traveled way of the vehicles to be stopped.

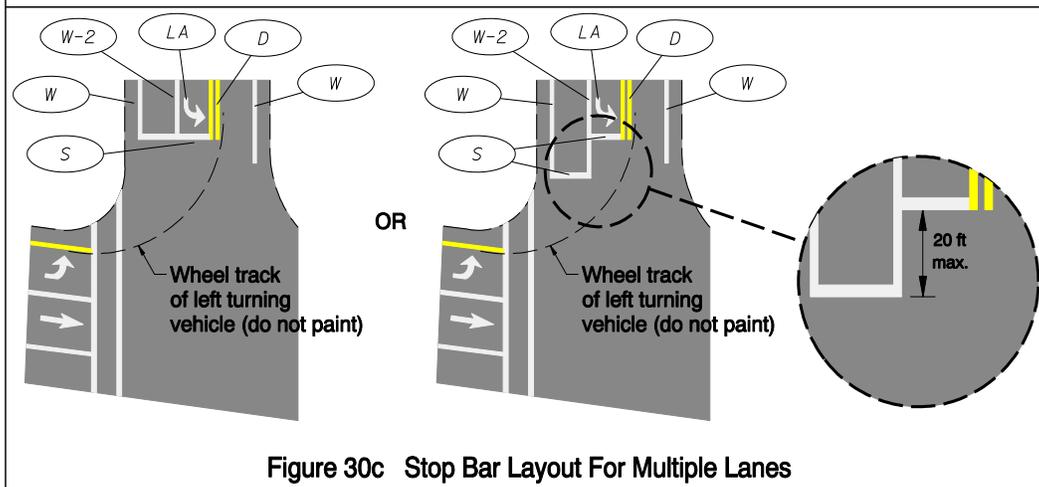
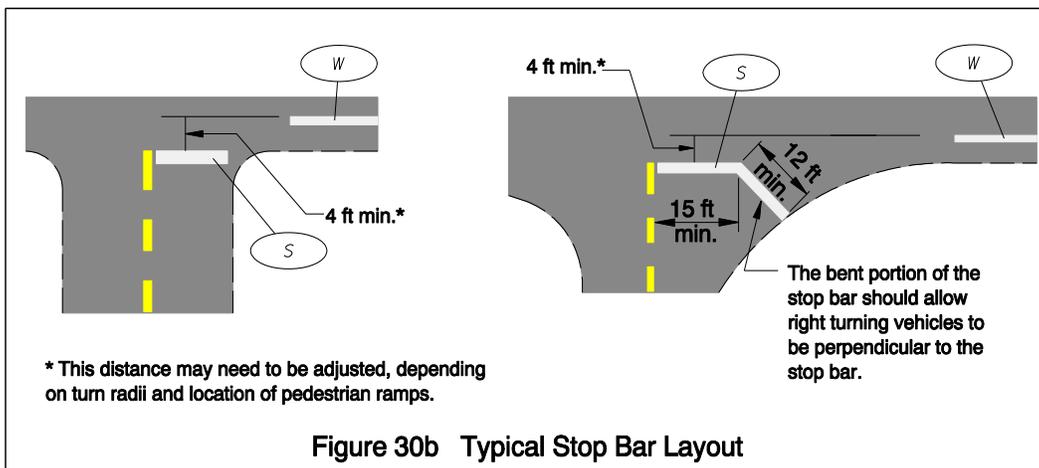
- Be placed at the STOP HERE ON RED signing for ramp meter locations and extend from edge line to edge line when necessary as shown in Figure 30a.

If used, stop bars should:

- Be placed 30 ft from the nearest marked crosswalk bar at mid-block and uncontrolled approaches on multi-lane highways. If placement at 30 ft is not feasible, they may be placed within 20 to 50 ft from the nearest crosswalk bar (Section B-24, Figure 32d).
- Be placed such that vehicles at the stop bar will not be in the path of the design vehicle left turning radius.

If used, stop bars may:

- Be staggered longitudinally on a lane-by-lane basis (Figure 30c) in order to improve the driver's view of pedestrians, to provide better sight distance for turning vehicles, and to increase the turning radius for left-turning vehicles. A maximum of two separate stop bar locations per approach and a maximum offset distance of 20 ft should be used to avoid motorist confusion and increase compliance at the stop bar locations.



Types (Figure 31a):

- **BYLD:** Yield line used for bikepath.
- **YLD:** Yield line used for vehicular traffic.

Yield lines shall:

- NOT be used in front of the marked pedestrian crosswalks.

Yield lines may be used:

- At locations where a YIELD sign is present to indicate the point at which a driver should yield (Figure 31b).
- At roundabouts if an engineering investigation determines a need. See Section B-16 Roundabouts for additional details.

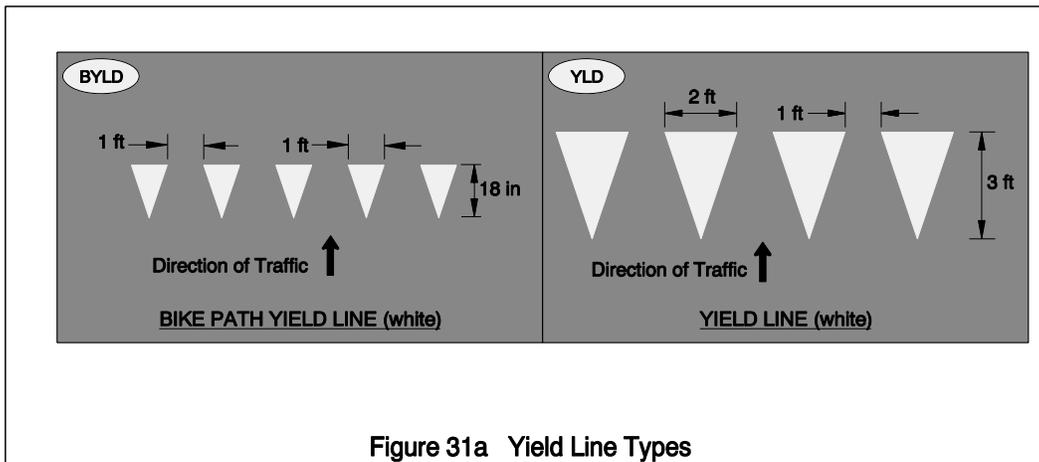


Figure 31a Yield Line Types

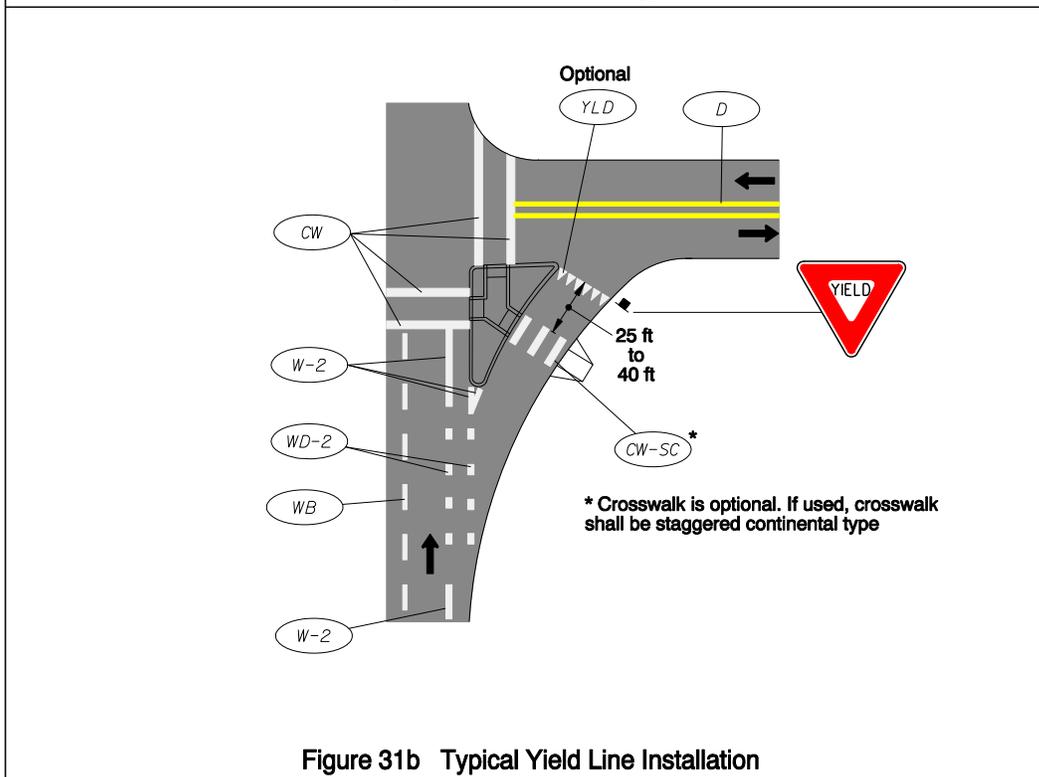


Figure 31b Typical Yield Line Installation

**APPROVAL
REQUIRED!**

An engineering study & Region Traffic Engineer approval is required for:

- Continental crosswalk markings (except at roundabouts, and non-signal controlled channelized right turn lanes).

An engineering study & State Traffic Engineer approval is required for:

- Mid-block crosswalks.
- New school crosswalks.
- Crosswalk closures at signalized intersections.
- Crosswalk markings installed at uncontrolled approaches (except at roundabouts and non-signal controlled channelized right turn lanes).
- Local agencies wishing to mark and maintain crosswalks on state highways within their jurisdiction.
- Textured or colored crosswalk treatments installed within the standard crosswalk markings.

Crosswalks shall be marked at:

- Signalized intersections (all crossings with pedestrian WALK/DON'T WALK indications). Individual crossings may be closed at signalized intersections with State Traffic Engineer approval. Barrier and signs are required to prohibit the crossing.
- Established school crossings (see Section B-27).

Crosswalks should be marked at:

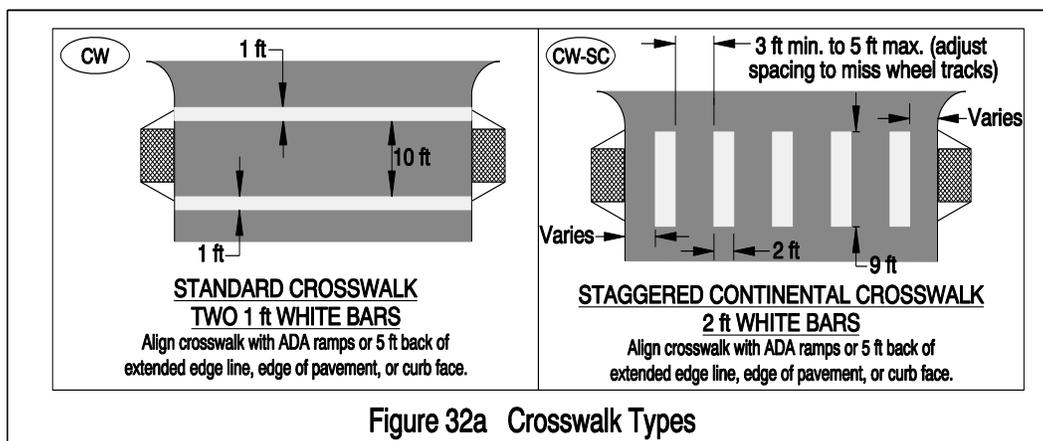
- Urban roundabouts (see Section B-16).

Crosswalks may be marked at:

- Road approaches where there are stop signs.
- Unsignalized channelized right turn lanes (Figure 32c).
- Rural roundabouts (see Section B-16).
- At other locations as approved by the State Traffic Engineer (such as mid-block).

Types (Figure 32a):

- **CW:** This is the standard crosswalk marking used for most applications.
- **CW-SC:** Continental crosswalk markings shall be the standard marking at roundabouts, and non-signal controlled channelized right turn lanes. They may also be used at other established crossings when an engineering study indicates special emphasis or higher visibility is required (such as at school crossings and mid-block crossings). If the continental crosswalk is skewed, the bars shall run parallel to the flow of traffic to attempt to miss wheel tracks.



Where marked, crosswalks shall:

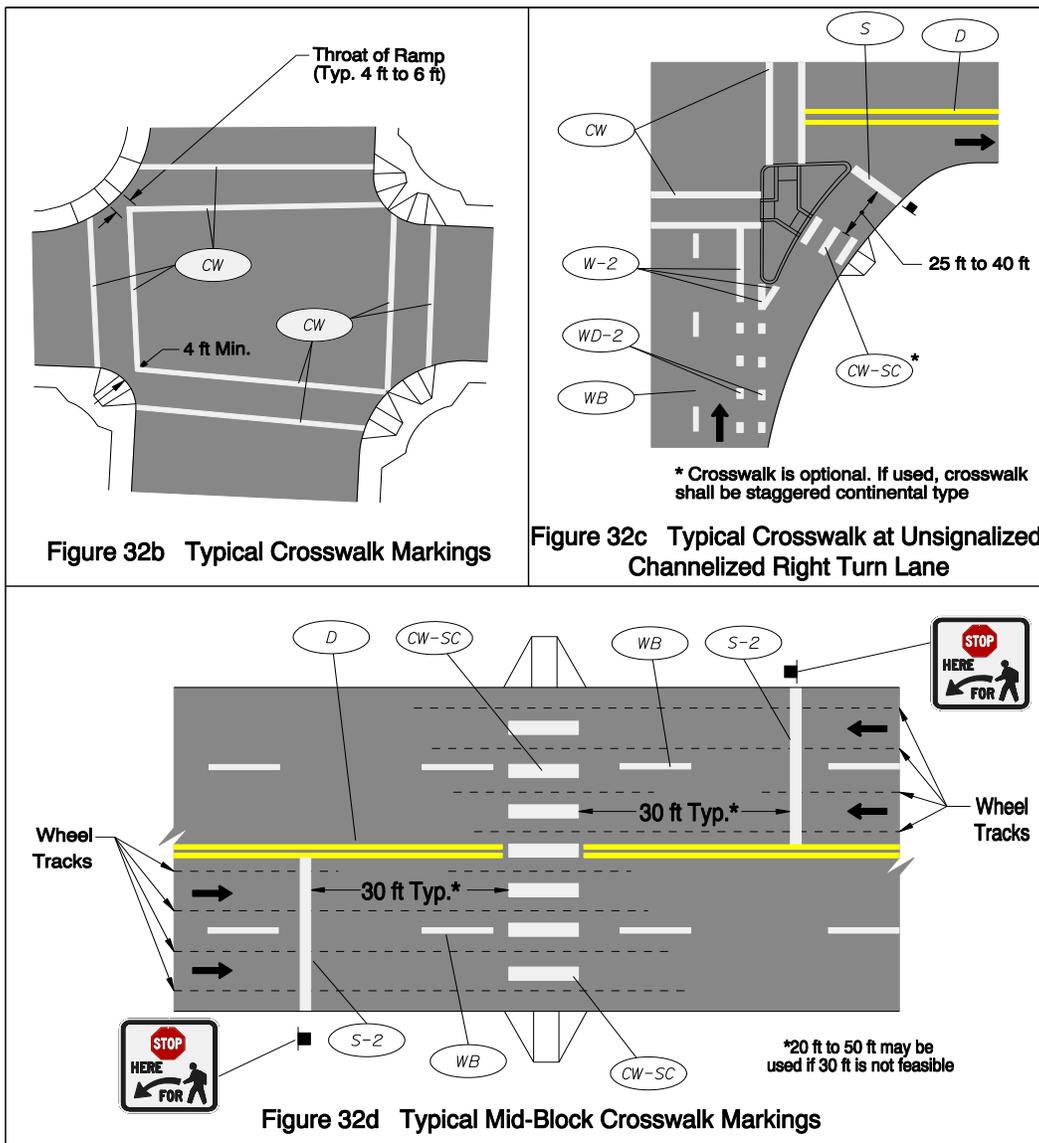
- Have ADA compliant ramps/transitions at each end of the crosswalk.
- Have the throat of the ADA ramp (the portion of the ramp that is flush with the pavement surface, typically 4 to 6 ft in width) entirely inside the crosswalk markings (Figure 32b). Throats exceeding 10 ft will require a greater crosswalk width.

Where marked, crosswalks should:

- Be located 25 to 40 ft from the yield line, stop bar, or island gore point at non-signal controlled channelized right turn lanes to allow for one car length of storage (Figure 32c).
- Include advance stop bars typically located 30 ft from the nearside crosswalk bar at mid-block (Figure 32d) and uncontrolled locations on multi-lane highways. If it is not feasible to install the advance stop bars at the typical 30 ft, they may be installed within 20 to 50 ft from the nearside crosswalk.

Where marked, crosswalks may:

- Use a narrower width crosswalk to a minimum of 6 ft (measured from inside to inside of bars) where there is a separate stop bar.
- Include advance stop bars located 30 ft from the nearside crosswalk bar at mid-block and uncontrolled locations on two-lane two-way highways where engineering judgment determines a need. If it is not feasible to install the advance stop bars at 30 ft, they may be installed within 20 to 50 ft from the nearside crosswalk.



Placement of turn arrows is important. Improperly placed arrows may mislead motorists.

Types (Figure 33a: Use the following non-elongated arrow types in Regions 2 through 5):

- **LA:** Left turn arrow
- **RA:** Right turn arrow
- **LSA:** Left turn straight arrow
- **RSA:** Right turn straight arrow
- **SA:** Straight arrow

Types (Figure 33b: Use the following elongated arrow types in Region 1):

- **E-LA:** Elongated left turn arrow
- **E-RA:** Elongated right turn arrow
- **E-LSA:** Elongated left turn straight arrow
- **E-RSA:** Elongated right turn straight arrow
- **ESA:** Elongated straight arrow

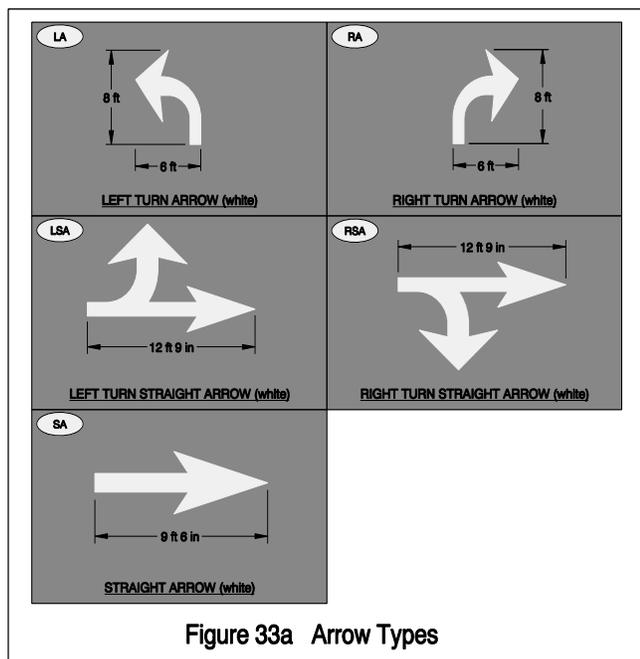


Figure 33a Arrow Types

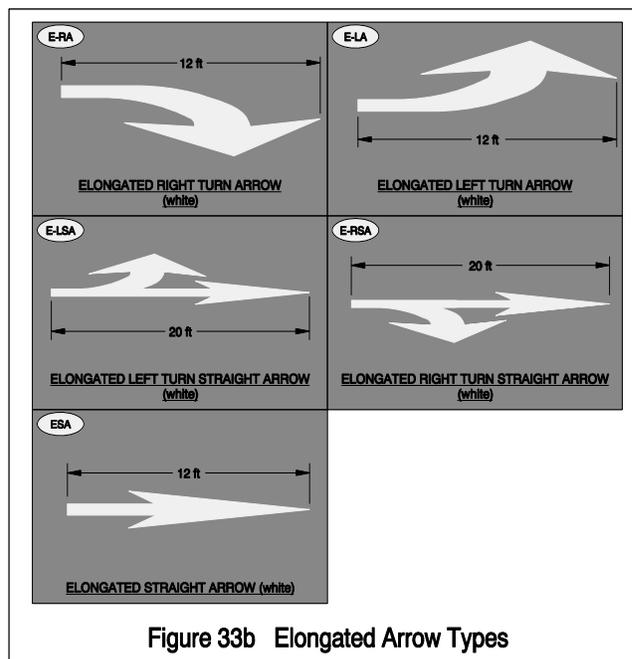


Figure 33b Elongated Arrow Types

Lane use arrows shall be used:

- Where a through lane becomes a mandatory turn lane (Figure 34a). A minimum of two arrows shall be used.
- At the approach to a developed turn lane (at the beginning of the wide white channelizing line) (Figures 34b and 34c).
- At the mid-point of the turn lane if the length of the turn lane is 400 ft or more (Figure 34c).
- When there is more than one lane approaching the intersection on the ramp terminal. They shall be used in each lane at the beginning of the wide white channelizing line (W-2) and near the intersection (See Figures 26a and 26b on page 42).

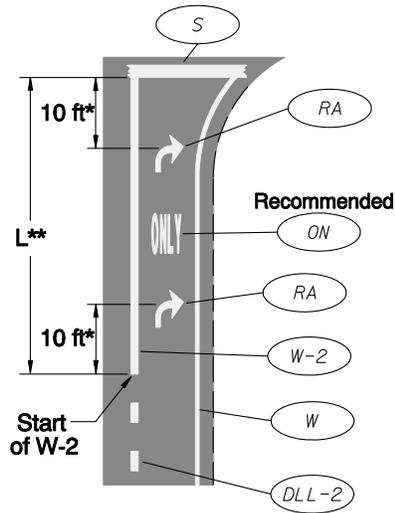
Lane use arrows should be used:

- At the intersection for developed turn lanes.
- For individual lanes or entire approaches to intersections that have unexpected or non-standard lane use.

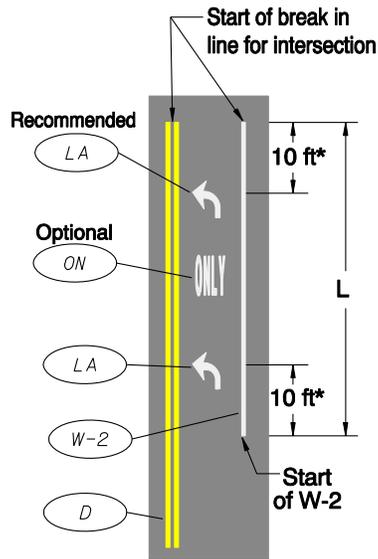
When used, Lane use arrows should:

- Be marked beyond an alley entrance, toward the intersection to avoid motorist confusion.
- Be repeated in advance of mandatory turn lanes or in long storage lengths, as necessary to prevent

entrapment and to help motorists select the appropriate lane before reaching the end of the line of waiting vehicles.

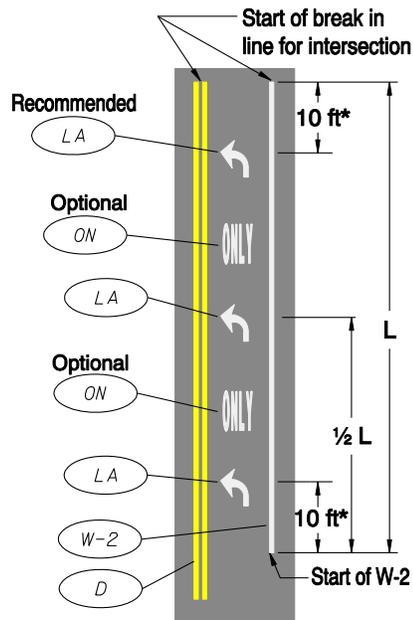


* 15 ft when installing elongated arrows.
 ** When L is greater than 400 ft, install 3rd lane use arrow at $\frac{1}{2}L$ as shown in Figure 34c.



* 15 ft when installing elongated arrows.

Figure 34a Lane Use Arrow Placement (Drop Lane) Figure 34b Lane Use Arrow Placement ($L \leq 400$ ft)



* 15 ft when installing elongated arrows.

Figure 34c Lane Use Arrow Placement ($L > 400$ ft)

**APPROVAL
REQUIRED!**

An engineering study & Region Traffic Engineer approval is required for:

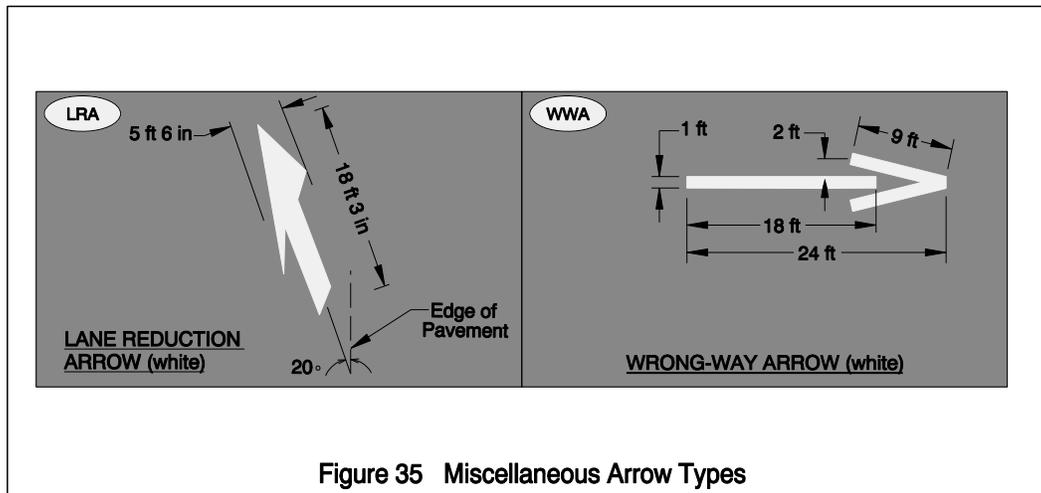
- Use of wrong way arrows

Types: (Figure 35):

- **LRA:** Lane reduction arrow.
- **WWA:** Wrong way arrow. Used only in specialized locations, where an engineering investigation shows a need.

Lane reduction arrows should be used:

- Where a lane-reduction transition occurs on a roadway with a posted speed of 45 mph or higher (See Figure 13 on Page 18).
- At at-grade right turn acceleration lanes (see Figure 20 on Page 29).



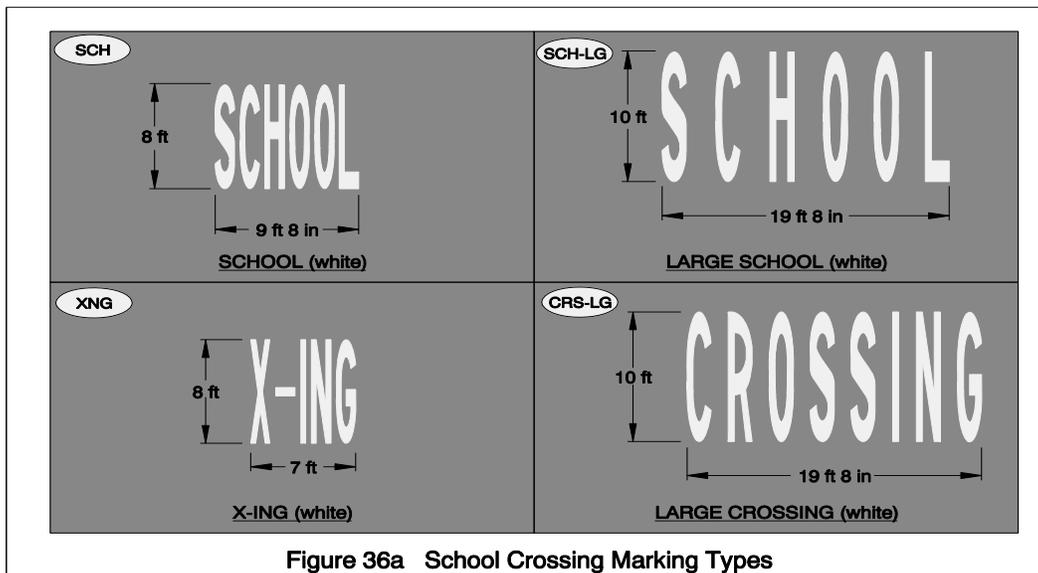
	<p>An engineering study & State Traffic Engineer approval is required for:</p> <ul style="list-style-type: none"> • New school zones
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School markings may:

- Be installed if advance school warning assembly signing is installed (sign S1-1 with supplemental W16-9p plaque).

Types (Figure 36a):

- **SCH:** Small SCHOOL legend used for placement across the width of one lane. This is the standard layout.
- **SCH-LG:** Large SCHOOL legend may be used for placement across the width of two lanes.
- **CRS-LG:** Large CROSSING legend used in conjunction with the large SCHOOL legend.
- **XNG:** Small X-ING legend used in conjunction with the small SCHOOL legend.



When used, school markings shall include:

- Small SCHOOL legend in combination with X-ING placed on each lane in advance of a marked school crossing (Figures 36b).
- SCHOOL used alone where there is no marked school crossing (Figure 36d).

When used, school markings may include:

- Large SCHOOL legend (with CROSSING as appropriate) placed across the width of two lanes (Figure 36c) on multi-lane roadways instead of the standard layout shown in Figure 36b with Region Traffic approval.

When used:

- The word SCHOOL should be placed adjacent to the advance school warning assembly signing (Figure 36b-36d).
- The word X-ING or CROSSING should be placed appropriately based on posted speed and road characteristics, a minimum of four times the letter height to maximum 10 times the letter height (Figures 36b and 36c).

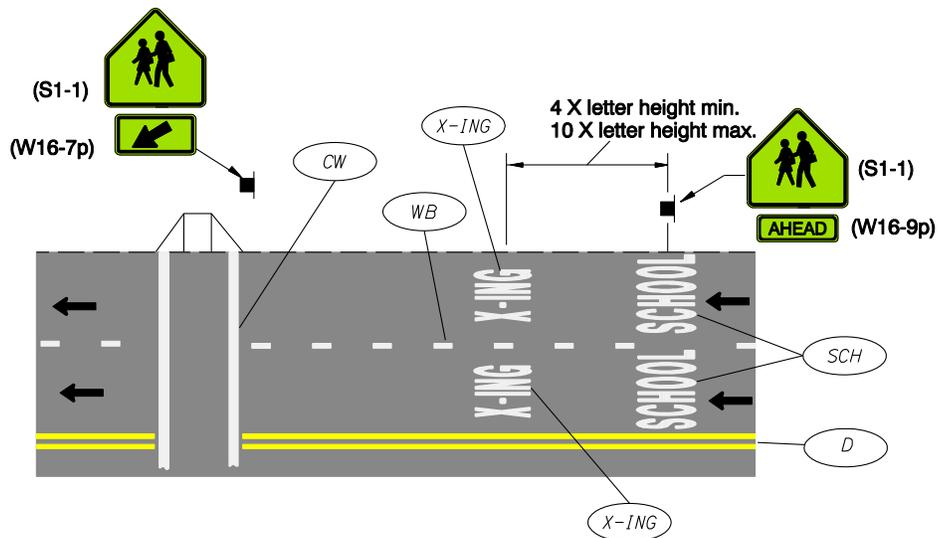


Figure 36b Typical School Marking Layout With Crossing

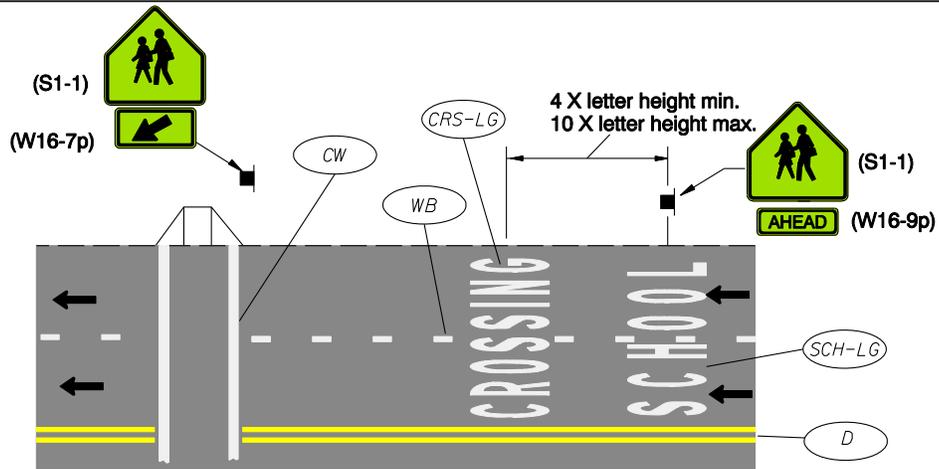


Figure 36c Optional Two-Lane School Marking Layout With Crossing

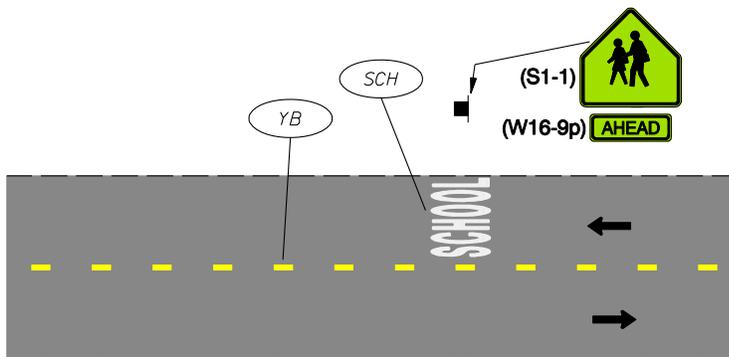


Figure 36d Typical One-Lane School Marking Layout Without Crossing

APPROVAL
REQUIRED!

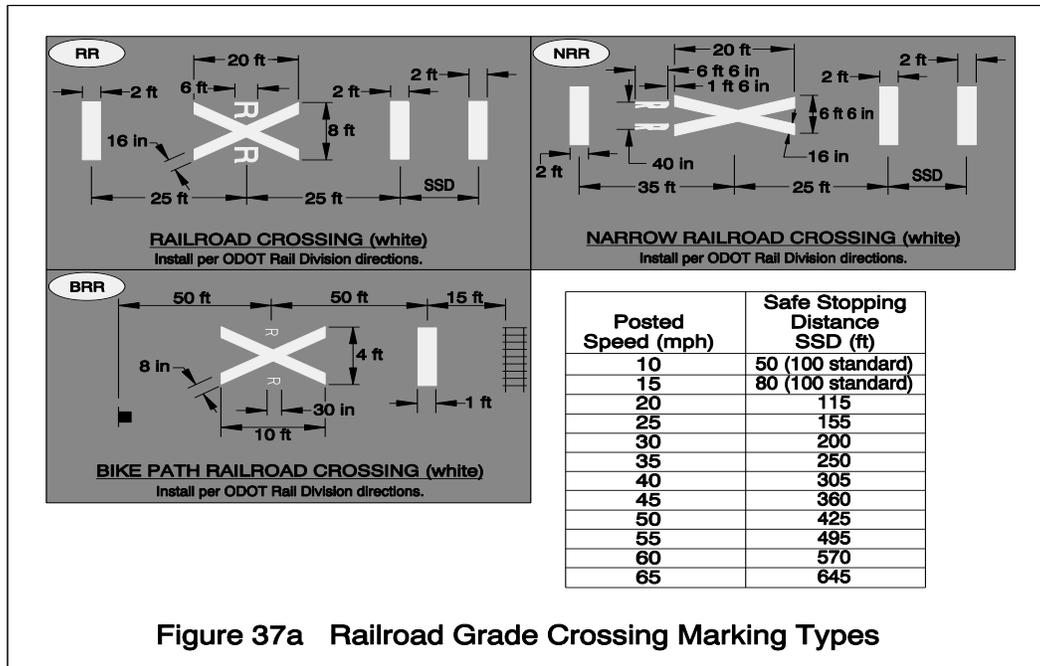
An engineering study & Rail Division approval (in consultation with Region Traffic) is required for:

- Removal or alternate placement of pavement markings for approaches to railroad crossings

Unless otherwise authorized by the crossing order, pavement markings for approaches to railroad crossings shall be installed at all crossings and conform to the requirements established under the crossing order (see OAR chapter 741-110 for details). Figure 37 illustrates the typical layouts for railroad crossing markings.

Types (Figure 37a):

- RR:** Complete standard railroad crossing legends for vehicular traffic, includes required transverse and stop bars.
- NRR:** Complete railroad crossing legend for vehicular traffic, includes required stop bars, which may be used instead of the standard RR marking for narrow lanes .
- BRR:** Complete railroad crossing legends for bicycle lanes, includes required stop bar.



Railroad crossing markings shall:

- Include no-passing zone markings on two-lane roadways where centerline is used for traffic approaching the rail crossing.
- Include two ft wide transverse bars, extended across all approach lanes for multi-lane highways (Figure 37b).
- Include RXR symbol markings in each approach lane on all paved approaches to grade crossings (including bicycle lanes).
- Include a stop bar (S-2) at least 12 ft from the nearest rail or one foot in advance of location where gate arm crosses the roadway. The stop bar should be perpendicular to roadway or parallel to gate, if present (Figures 37b & 37c).

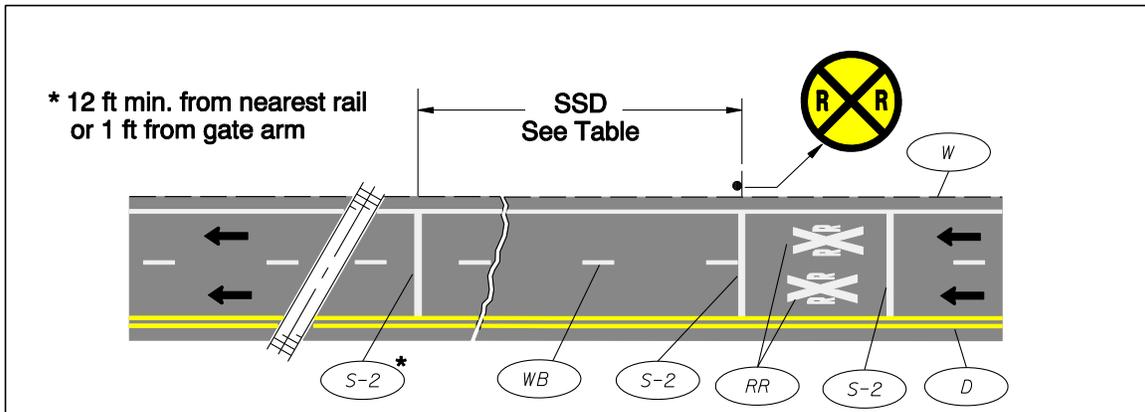


Figure 37b Multi-Lane Railroad Crossing Markings

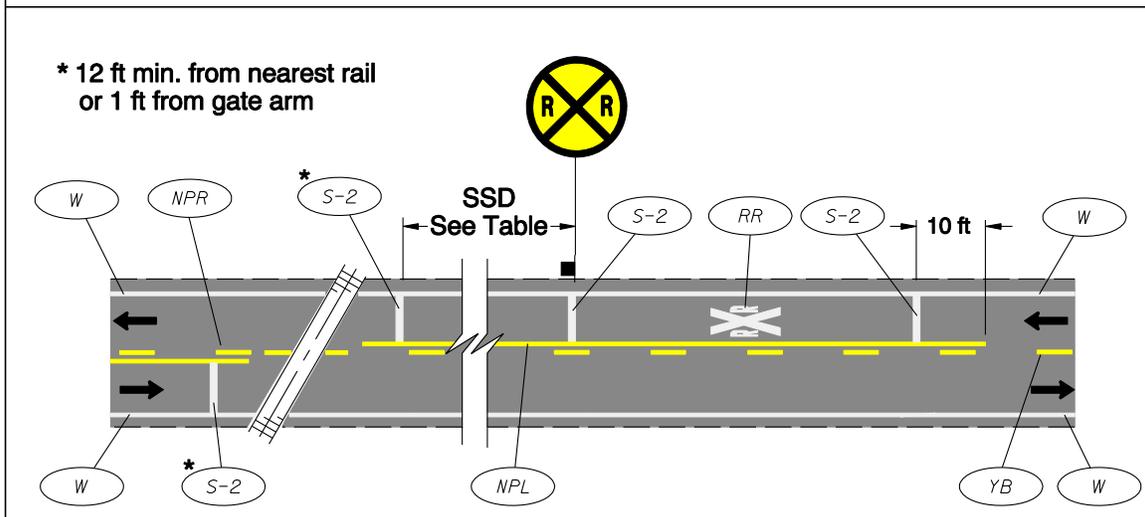


Figure 37c Typical Railroad Grade Crossing Markings

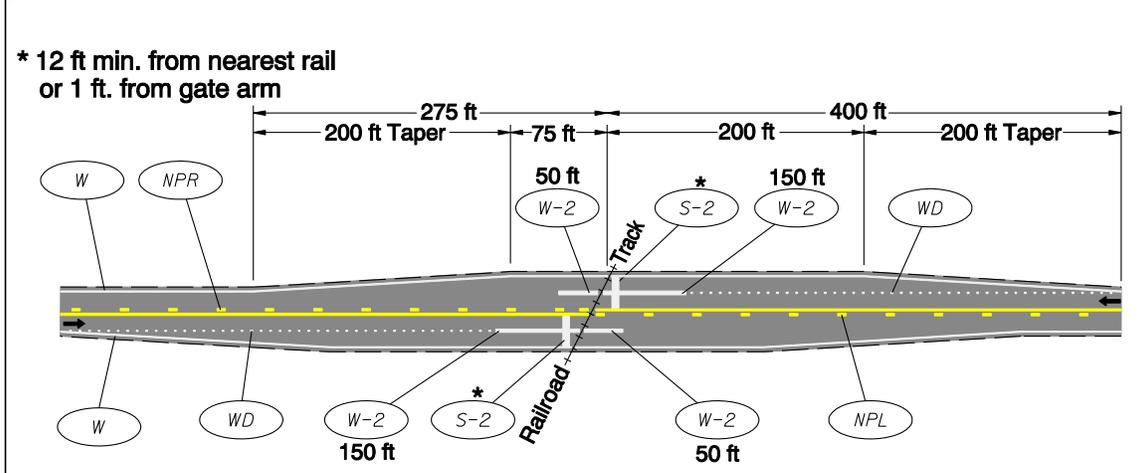


Figure 37d Railroad Grade Crossing Markings With Truck & Bus Stop Bars

Preferential lanes may be designated to identify a wide variety of special uses. This could include, but is not limited to, high-occupancy vehicle (HOV) lanes, bicycle lanes, bus-only lanes, and taxi-only lanes.

Types (Figure 38):

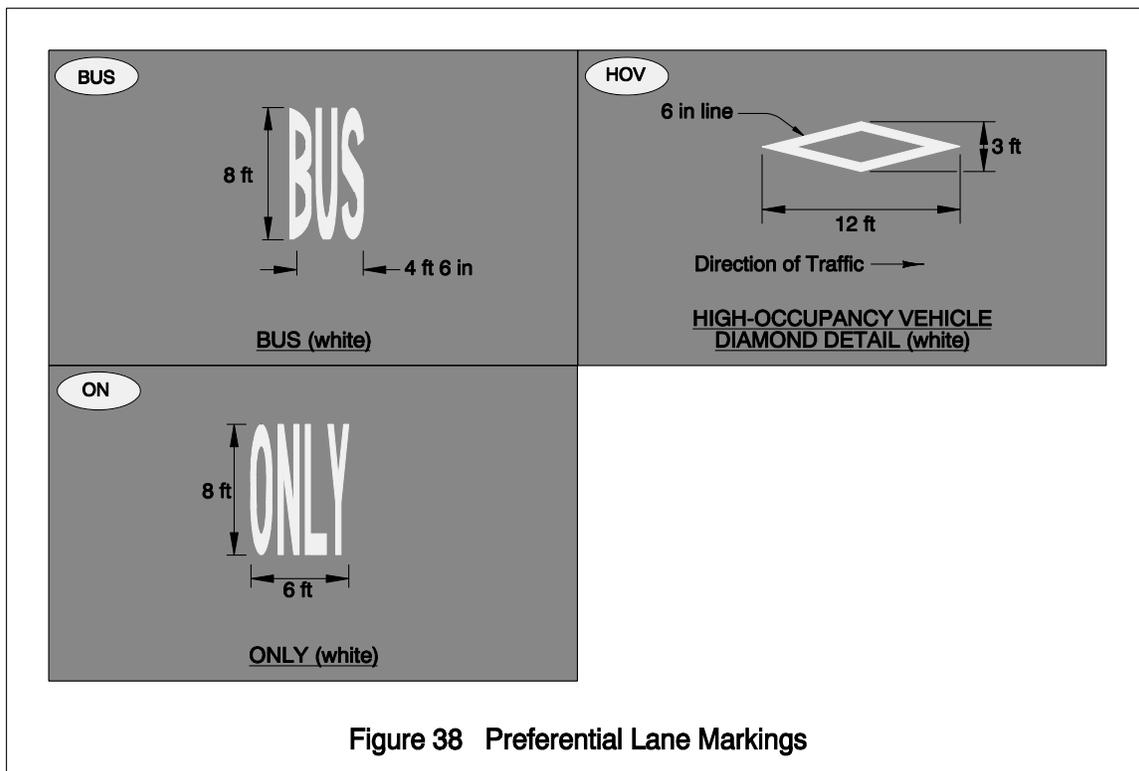
- **BUS:** BUS legend to be used with ONLY legend.
- **HOV:** Diamond HOV legend.
- **ON:** ONLY legend to be used in conjunction with the BUS legend.

When a lane is assigned full or part time to a particular class or classes of vehicles:

- Preferential lane markings shall be used.
- Signs or signals shall be used with preferential lane word or symbol markings.
- All preferential lane word and symbol markings shall be positioned laterally in the center of the preferred-use lane.

Where a preferential lane use is established, the preferential lane marking shall be:

- **HOV lane:** The preferential lane use marking for high-occupancy vehicle lanes shall consist of white lines formed in a diamond shape.
- **Bicycle lane:** The preferential lane use marking for a bicycle lane shall consist of a bicycle symbol. See section B-30 for details.
- **Bus only lane:** The preferential lane use marking for a bus only lane shall consist of the word marking BUS ONLY.



Definitions:

A **bike lane** is a portion of a roadway that has been designated by pavement markings and signs for the preferential or exclusive use of bicyclists.

- Bike lanes shall not be provided on the circular roadway of a roundabout.
- A through bike lane shall not be positioned to the right of a right-turn lane or to the left of a left-turn lane unless conflicting movements are controlled by a traffic control signal.

A **shared-use path** is a path physically separated from motor vehicle traffic by an open space or barrier and either within a highway right-of-way or within an independent right-of-way, used by bicyclists, pedestrians, joggers, skaters, and other non-motorized travelers.

A **bikeway** is created when a road has the appropriate design treatment for bicyclists, based on motor vehicle traffic volumes and speeds: Shared roadway, shoulder bikeway, bike lane or bicycle boulevard.

Types (Figure 39a):

- **BS:** Standard bike lane stencil with straight arrow.
- **BSL:** Bike lane stencil with left turn arrow. Used in specialized locations (Figure 39b).
- **BSR:** Bike lane stencil with right turn arrow. Used in specialized locations.

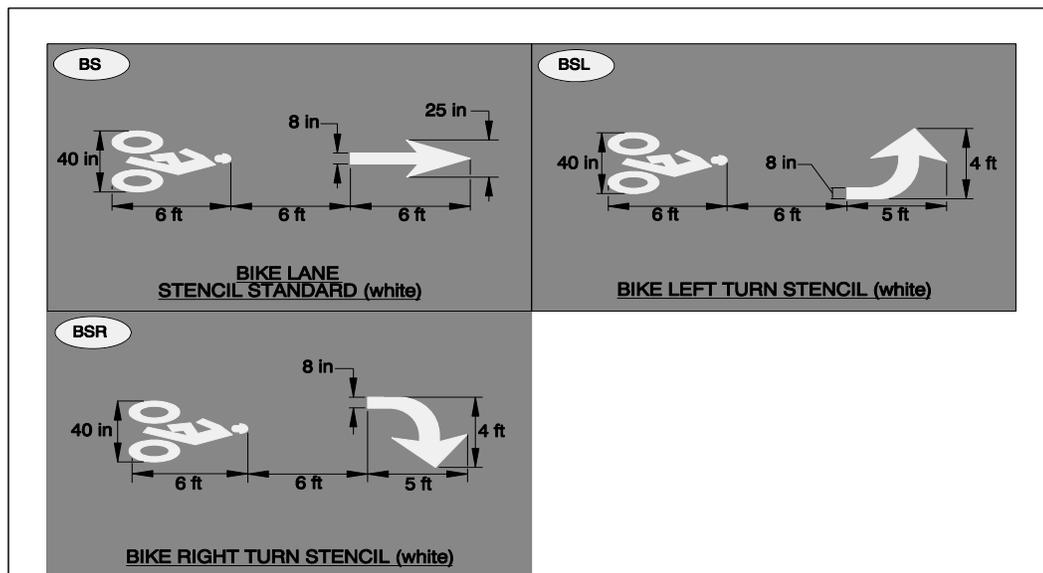


Figure 39a Bike Lane Marking Types

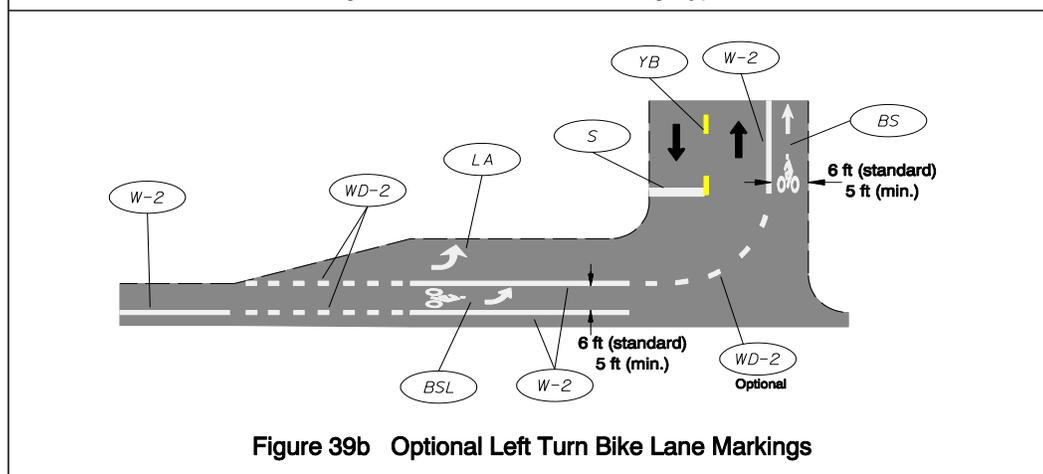


Figure 39b Optional Left Turn Bike Lane Markings

Markings of Designated Bike Lanes:

Figures 40a-40c show typical bike lane marking layouts. Standard width of a bike lane is 6 ft. Minimum width of a bike lane with open shoulders is 4 ft. Minimum width of a bike lane against curb, guardrail or parked cars is 5 ft.

Bike lane markings shall:

- Include longitudinal pavement markings to delineate bike lanes. A wide longitudinal white line (W-2 or WD-2) shall be used to separate motor vehicle lanes from bicycle lanes traveling in the same direction. Double yellow lines (D or ND) shall be used to separate motor vehicle lanes from bicycle lanes traveling in the opposite direction.
- Include bicycle stencils or Bike Lane signs placed after intersections to inform entering motorists of the restricted nature of the lane (Figure 40b).
- Include wide white dotted lines (WD-2) to mark an area where vehicles may be crossing a bike lane, such as in the taper section prior to a left or right turn lane (Figures 39b & 40a).

Bike lane markings should:

- Stop at least 100 ft before the beginning of wide white line (W-2) when a through lane becomes a mandatory right-turn lane (Figure 40c). Through bike lane markings should resume to the left of the right-turn lane.
- Stop 165 ft before the yield line, or if no yield line is present, 165 ft before the edge of the circulatory roadway of a roundabout.
- Include additional stencils or signs on long sections of roadways with no intersections. For appropriate spacing (in ft), multiply the posted speed (in mph) by 40.

Bike lane markings may:

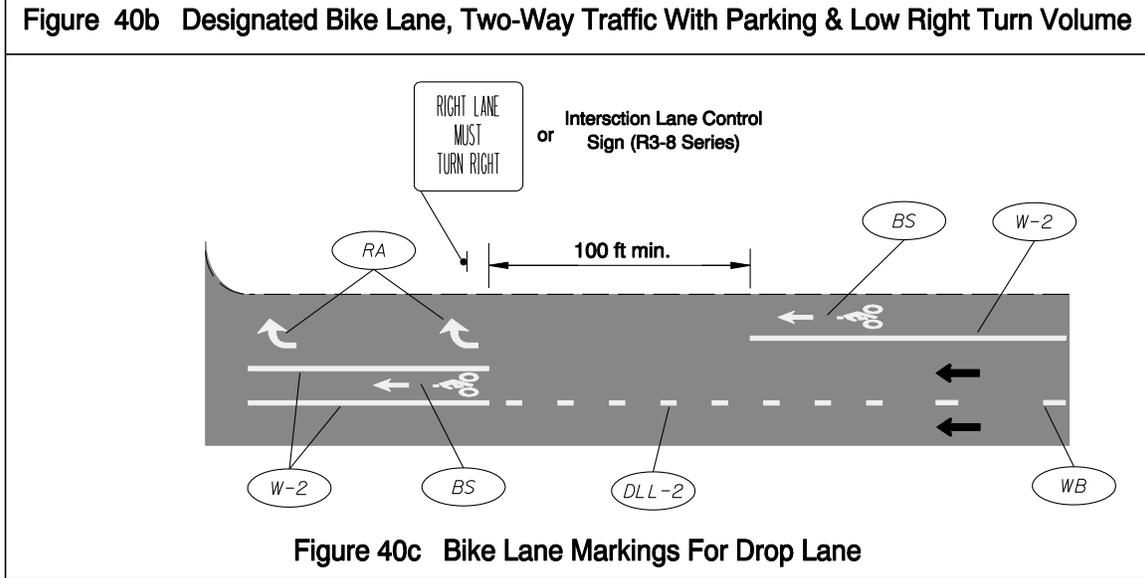
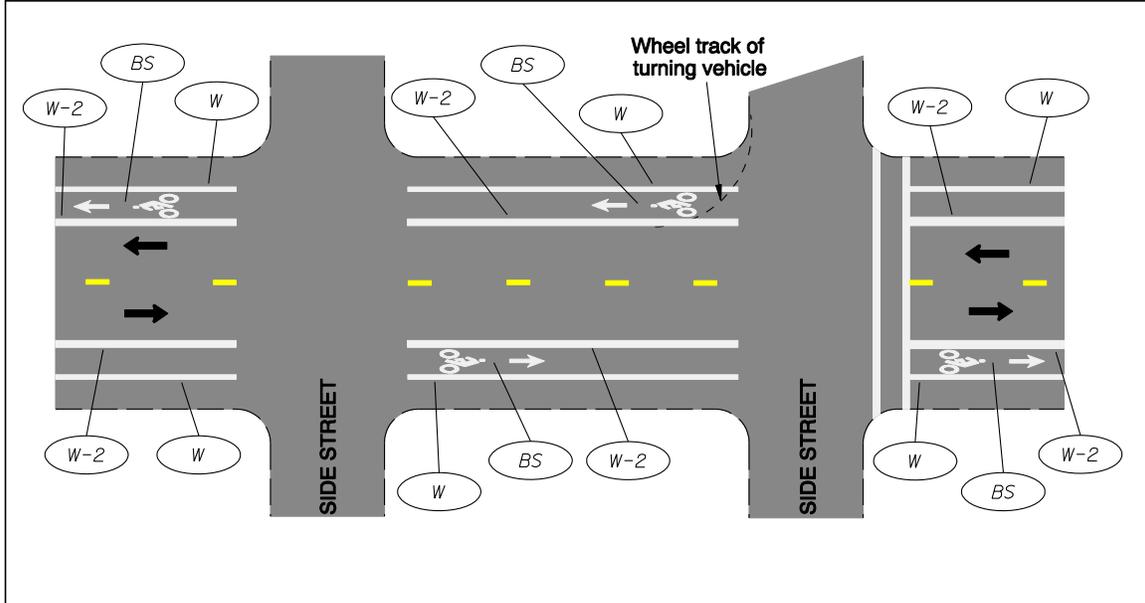
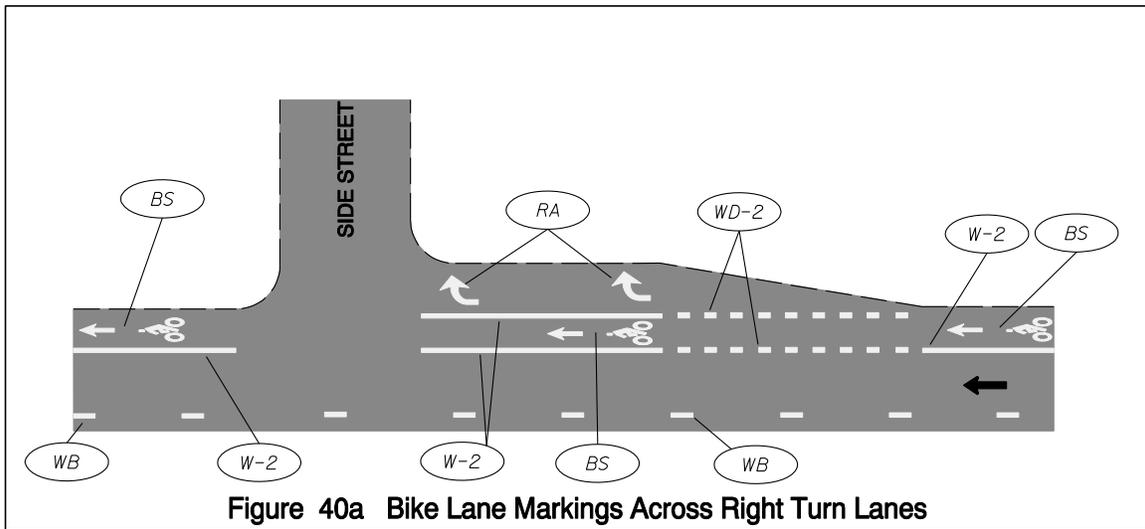
- Include wide white dotted line (W-2) at the intersection for left turn bike lane to guide the left turning bikes (Figure 39b).
- Exclude bicycle stencils or signs immediately after intersections when blocks are short or the intersecting street is minor.

Shared-use path markings:

Generally, centerline is not required on shared-use paths. However, a normal solid yellow centerline stripe should be used through curves and where sight distance is restricted.

On paths with high use, a broken yellow line (3 ft segments with 9 ft gaps) may be used to separate travel into two directions.

Where necessary to stop the bicycle traffic, a stop bar may be placed in conjunction with a standard bikeway stop sign (OBR1-1 or R1-1). The stop bar shall be a white 12-inch bar.



B-31 Cattle Guard Markings

Figure 41 shows the typical pattern for marking cattle guards.

Types:

- **CG:** Cattle guard markings

Cattle guard markings shall:

- Extend completely across the roadway from shoulder to shoulder. This may require additional paving.
- Barrier shall be painted white.

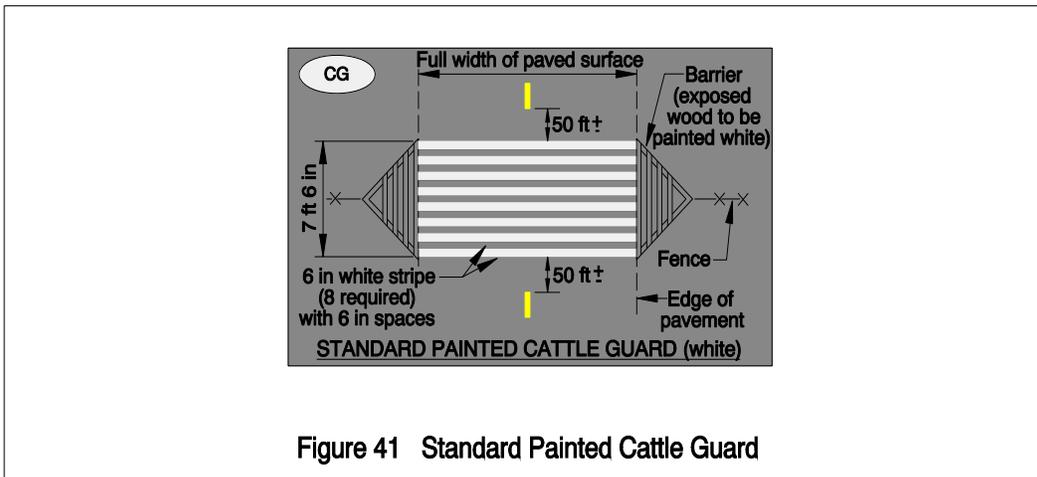


Figure 41 Standard Painted Cattle Guard

Types (Figure 42a):

- **HC:** Detail used for head-in van-accessible parking stall. Blue colored background for the symbol and blue curb may be used.
- **P:** On-street parking tick marks.

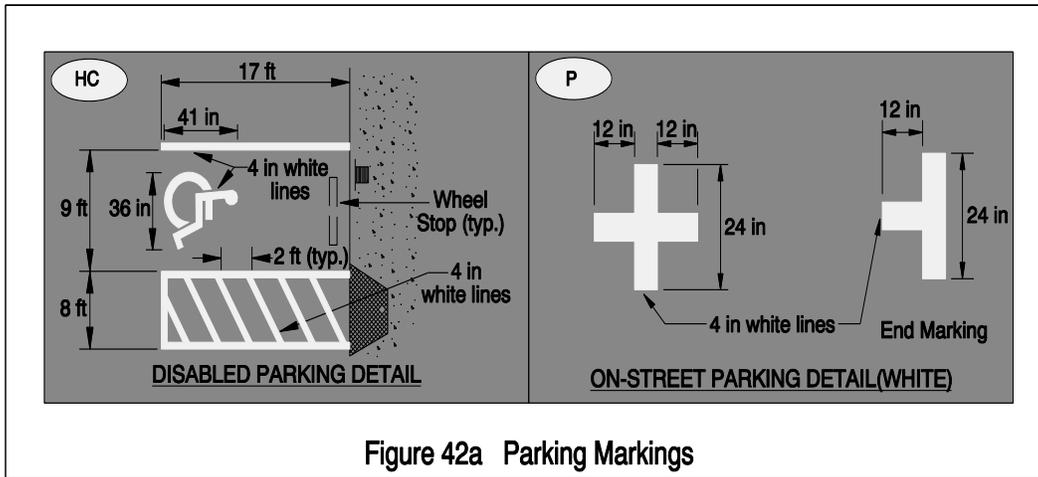


Figure 42a Parking Markings

On-street parking is normally installed on highways in traditional downtown areas and commercial business districts. Parallel parking should be used as shown in Figure 42b. Diagonal on-street parking is discouraged and requires a design exception from the Roadway Engineering Manager.

Curb markings typically are not installed. However, curbs may be colored to supplement standard signs for parking regulation if requested by the local jurisdiction. Curb markings should be installed and maintained by the local jurisdiction.

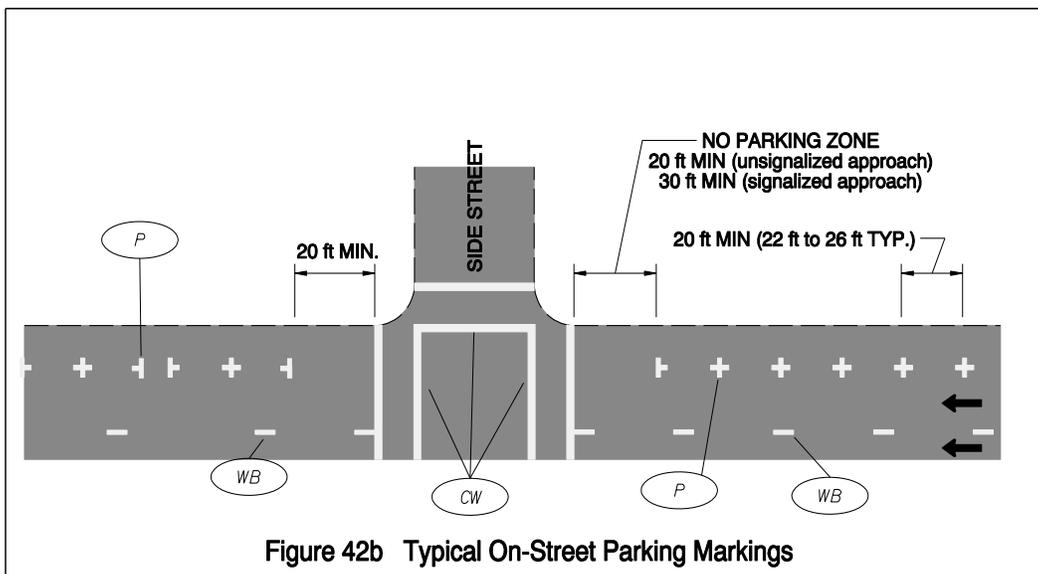


Figure 42b Typical On-Street Parking Markings

Off-street parking is typically installed in rest areas and view points. Designing a safe and efficient parking layout off of the highway involves many factors. For detailed information on parking layout, consult the following resources: Roadway Engineering Unit, AASHTO Guide for Park-and-Ride Facilities, and AASHTO Guide for Development of Rest Areas on Major Arterials and Freeways.

In general, standard width is nine ft with a range of 7.5 ft (for compact cars) to 9.5 ft (for standard cars). Standard length is 17 ft with a range of 15 ft (for compact cars) to 20 ft (for standard cars).

Width for an interstate design vehicle (WB-67) should be between 13 ft and 15 ft. Length for a WB-67 should be at least 80 ft.

Disabled parking spaces are required for all affected buildings subject to the state building code as per ORS 447.233. Refer to Oregon Transportation Commission Standards for Accessible Parking Places for more detailed information on disabled parking standards.

- A standard accessible parking space is at least nine ft wide with an adjacent access aisle that is at least six ft wide. Standard sign R7-8 (Disabled Person Parking Sign) shall be installed.
- A “van accessible” space is at least nine ft wide with an adjacent access aisle that is at least eight ft wide. Standard signs R7-8 (Disabled Person Parking Sign) and R7-8 (VAN ACCESSIBLE sign) shall be installed. When a space is reserved for wheelchair users, an OR7-8C sign (WHEELCHAIR USER ONLY sign) shall be installed in addition to those required for a “van accessible” space.

Section C: Raised Pavement Marker (RPM) Standards

C-1 Raised Pavement Marker (RPM) General

(MUTCD 3B.11-3B.14)

A raised pavement marker (RPM) is a device, at least 0.4 inches high, installed on a road surface or in a groove. RPMs provide better visibility over painted or durable lines during wet-weather conditions, especially at night. They also provide a tactile and auditory warning when vehicles cross over them.

Raised pavement markers should be used:

- In accordance with the Region RPM plan. Contact the Region Traffic Engineer for guidance.

When used, raised pavement markers can function as:

- A substitute for certain types of traffic line markings. However, RPM's used as substitution for pavement markings should not be used in the state highways.
- A supplement for traffic line markings.
- Vehicle positioning guides.
- A location marker for fire hydrants.
- Advance warning for freeway median crossovers.

C-2 RPMs Used for Substitution

On very rare occasions, RPMs may be used for substitution of pavement lines if a more audible and tactile characteristic is desired. However, profiled durable markings provide a similar effect at a lower installation cost and should be considered.

Types used for substitution (Figure 43):

- **WB/RB-FE:** Reflectors and buttons at 2 ft 6 in centers used for substituting white broken lines (WB) on freeways and expressways.
- **WB/RB-R:** Reflectors and buttons at 3 ft 4 in centers used for substituting white broken lines (WB) on rural highways.
- **WB/RB-U:** Reflectors and buttons at 2 ft 6 in centers used for substituting white broken lines (WB) on urban highways.
- **YB/RB-R:** Reflectors and buttons at 3 ft 4 in centers used for substituting yellow broken lines (YB) on rural highways.
- **YB/RB-U:** Reflectors and buttons at 2 ft 6 in centers used for substituting yellow broken lines (YB) on urban highways.
- **DLL/RB-3:** Reflectors and buttons at 3 ft centers used for substituting wide dotted lane line markings (DLL).
- **W-2/RB-5:** Reflectors and buttons at 5 ft centers used for substituting wide white lines (W-2).
- **TM/B:** Buttons used for substituting transverse median markers (TM).

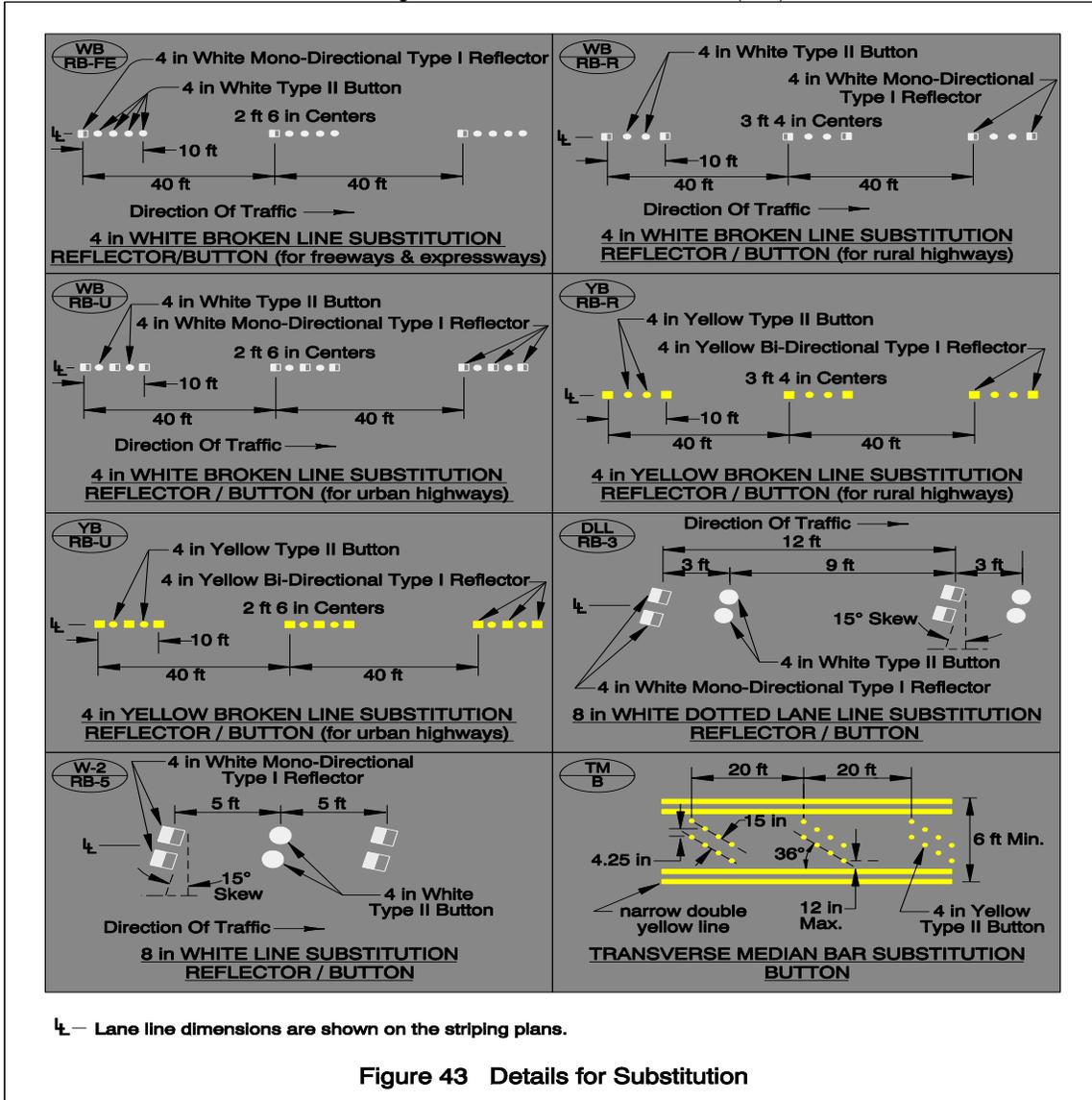


Figure 43 Details for Substitution

C-3 RPMs Used for Supplementation

Types used for supplementation (Figure 44):

- **YB/R-40:** Reflectors at 40 ft centers used for supplementing yellow broken lines (YB).
- **YB/R-80:** Reflectors at 80 ft centers may be used for supplementing yellow broken lines (YB) on tangent sections.
- **WB/R-40:** Reflectors at 40 ft centers used for supplementing white broken lines (WB).
- **DLL/R-12:** Reflectors at 12 ft centers used for supplementing 4" white dotted lane lines (DLL).
- **DLL-2/2R-12:** A pair of reflectors at 12 ft centers used for supplementing 8" white dotted lane lines (DLL-2).
- **DLL-2/2R-24:** A pair of reflectors at 24 ft centers used for supplementing 8" white dotted lane lines (DLL-2).
- **W-2/2R-20L:** Reflectors at 20 ft centers used for supplementing 8" white channelizing lines (W-2).
- **W-2/2R-20R:** Reflectors at 20 ft centers used for supplementing 8" white channelizing lines (W-2).

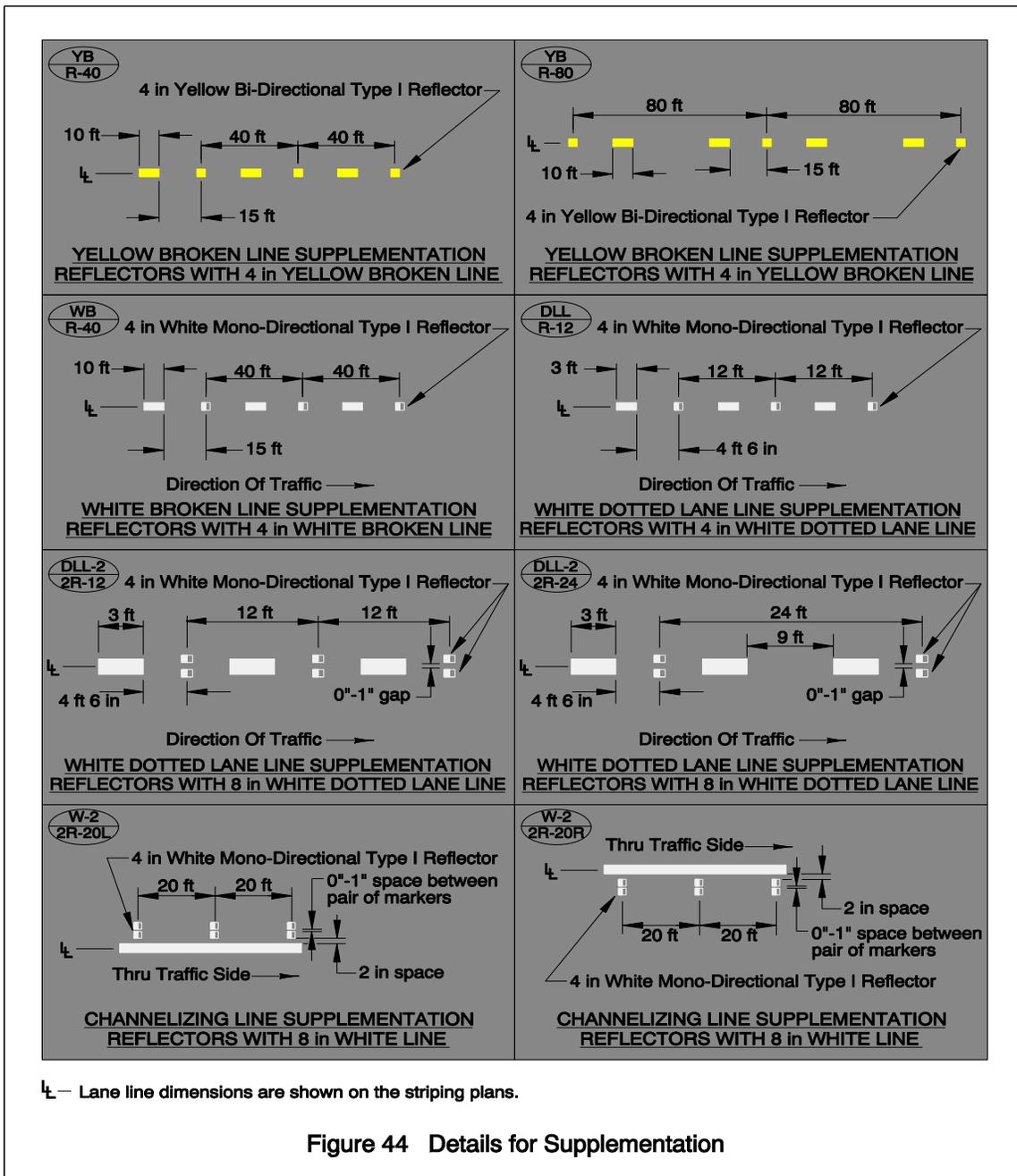
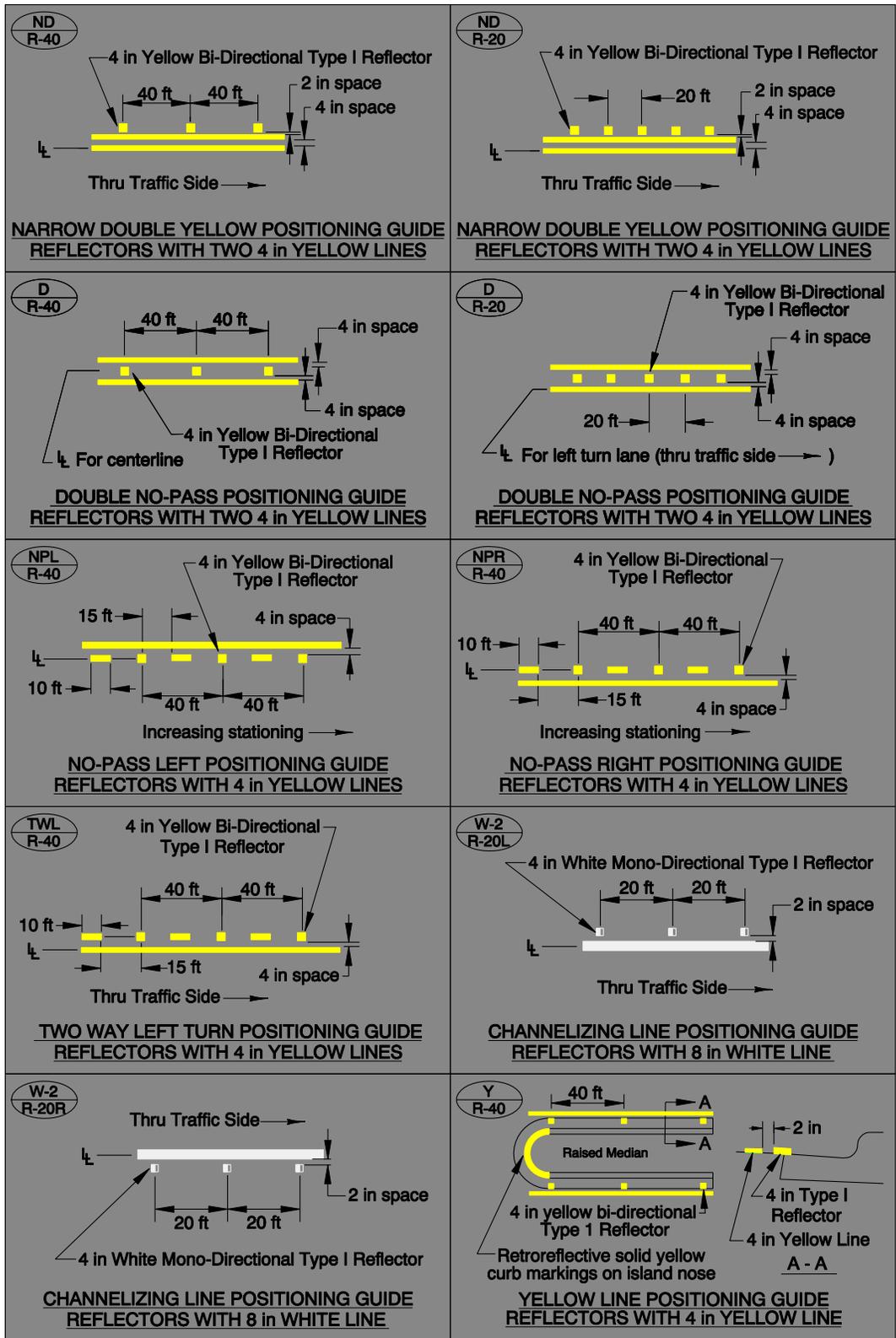


Figure 44 Details for Supplementation

Types used for positioning guides (Figure 45):

- **ND/R-40:** Reflectors at 40 ft centers used as positioning guides for narrow yellow double lines (ND). NOT used as positioning guides for narrow double yellow lines at left turn lanes.
- **ND/R-20:** Reflectors at 20 ft centers used as positioning guides for narrow double yellow lines (ND) at left turn lanes.
- **D/R-40:** Reflectors at 40 ft centers used as positioning guides for double no-passing lines (D). NOT used as positioning guides for wide double yellow lines at left turn lanes.
- **D/R-20:** Reflectors at 20 ft centers used as positioning guides for wide double yellow lines (D) at left turn lanes.
- **NPL/R-40:** Reflectors at 40 ft centers used as positioning guides for no-passing left lines (NPL).
- **NPR/R-40:** Reflectors at 40 ft centers used as positioning guides for no-passing right lines (NPR).
- **TWL/R-40:** Reflectors at 40 ft centers used as positioning guides for two-way left turn lines (TWL).
- **W-2/R-20L:** Reflectors at 20 ft centers used as positioning guides for white channelizing lines (W-2) used for left turn lanes.
- **W-2/R-20R:** Reflectors at 20 ft centers used as positioning guides for white channelizing lines (W-2) used for right turn lanes.
- **Y/R-40:** Reflectors at 40 ft centers used as positioning guides for yellow lines used next to a raised median.



ℒ — Lane line dimensions are shown on the striping plans.

Figure 45 Typical Details For Positioning Guides

C-5 Typical Layouts and Guidance for RPMs

Typical left turn lane layouts using RPMs are shown in figures 46a and 46b. Figure 46c shows a typical layout of RPM placement at island noses.

If used, RPMs shall:

- Have the color, which under both day and night conditions conform to the color of the marking for which they serve as a positioning guide, or for which they supplement or substitute.
- Not include non-reflective markers as a substitute for other types of pavement markings unless accompanied by reflective markers.

If used, RPMs should:

- **NOT** be used within bikeways. At locations where a bicycle lane crosses a line supplemented with raised pavement markers, the spacing should be wide enough to allow safe passage.
- Be installed such that directional configurations of reflective and non-reflective surfaces minimize visibility of information to road users that does not apply to them.

If used, RPMs may:

- Be recessed in snow zone areas where roads are frequently plowed.

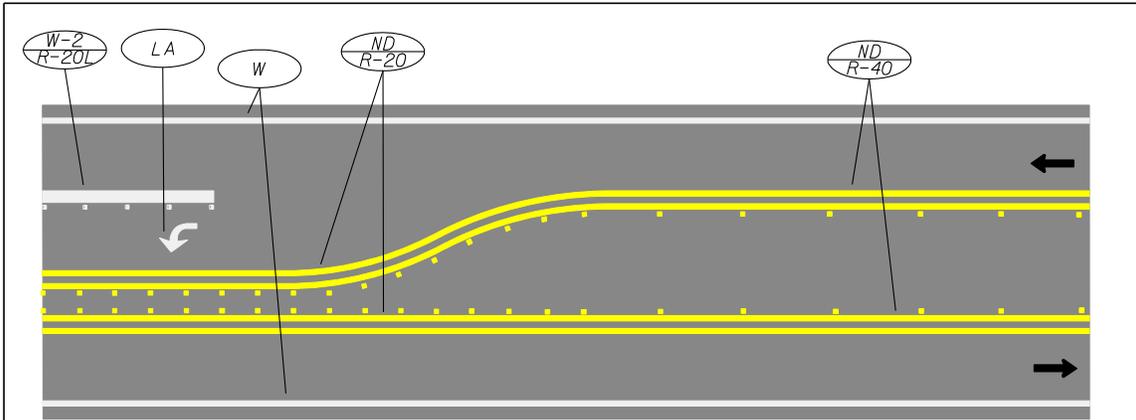


Figure 46a Typical Wide Median Left Turn Lane Layout Using RPMs

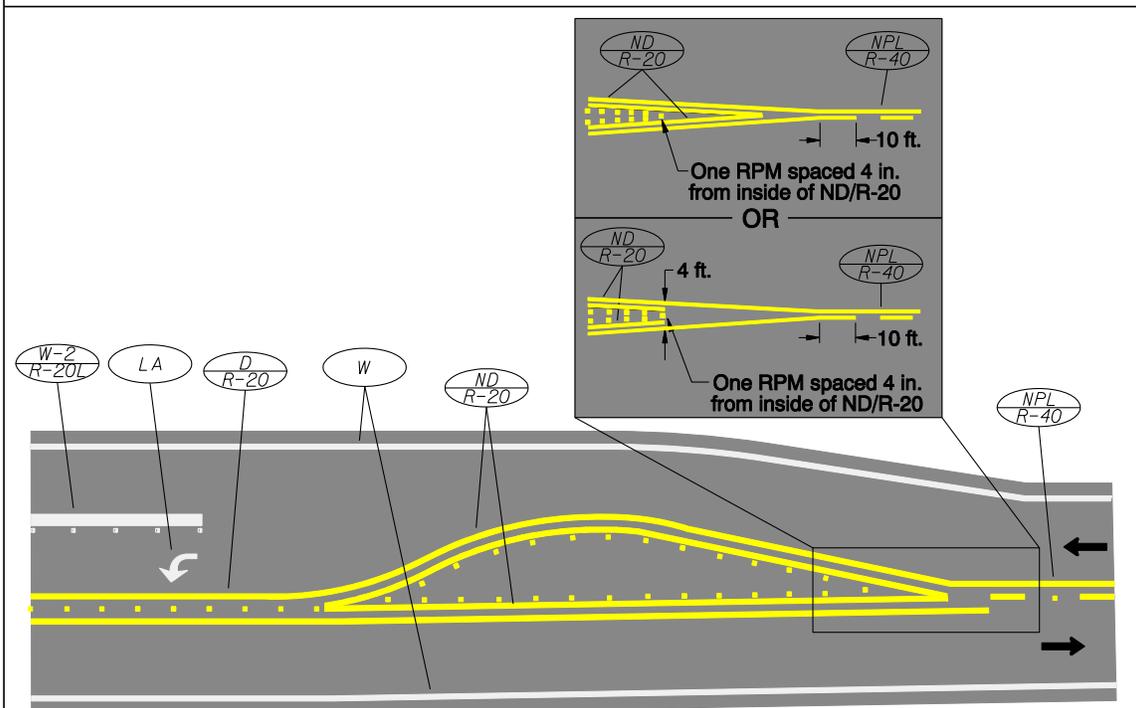


Figure 46b Typical Narrow Median Left Turn lane Layout Using RPMs

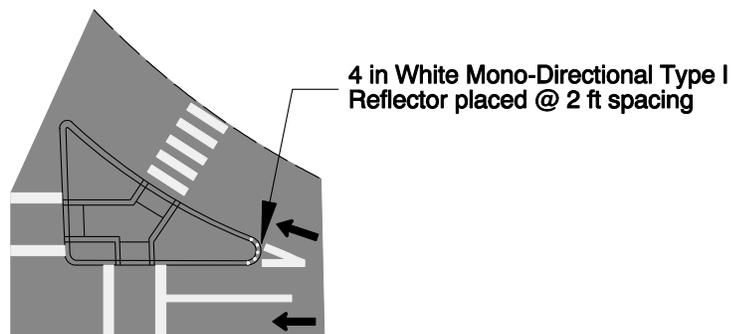


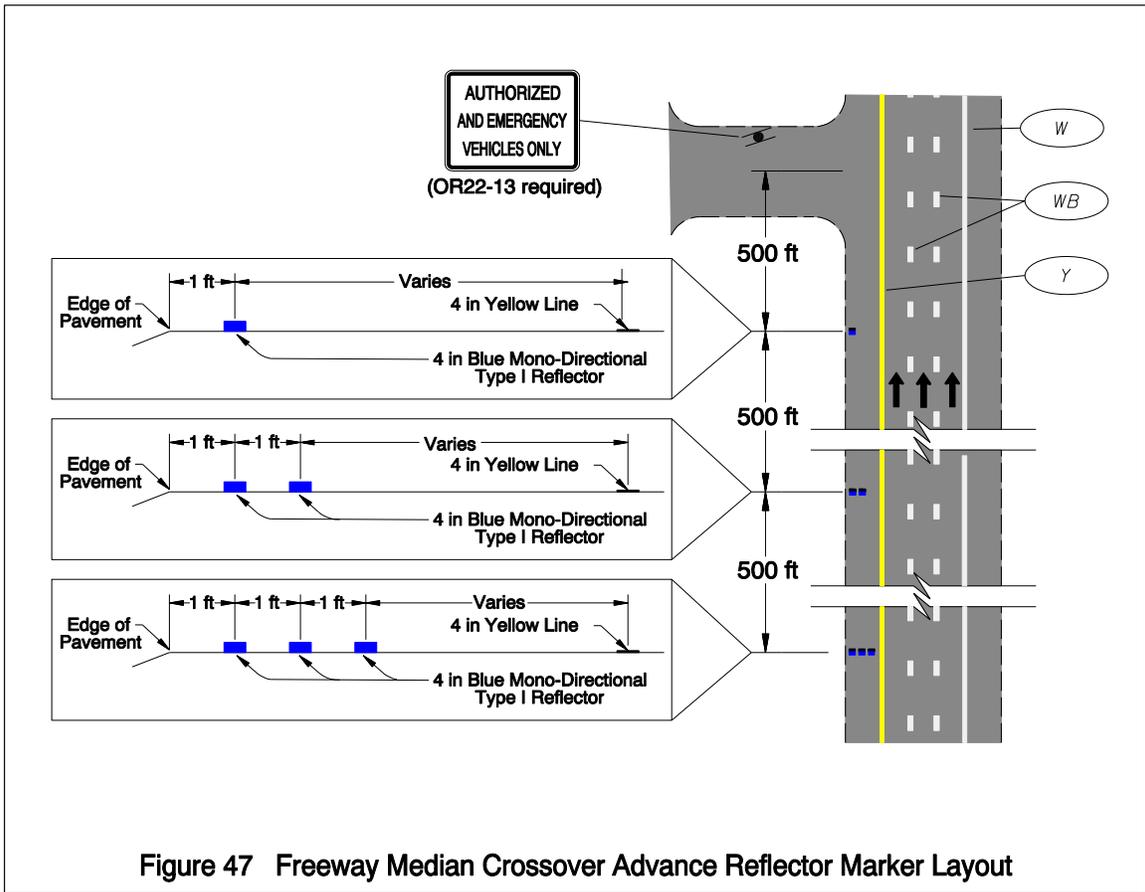
Figure 46c Typical RPM Placement at Island Nose

APPROVAL REQUIRED! An engineering study & State Traffic Engineer approval is required for:

- Freeway median crossover

To delineate a freeway median crossover in adverse weather conditions, RPMs should be used and placed as shown in Figure 47.

If the median crossover is located in an area that is frequently snowplowed, delineator posts with yellow targets may be used instead of RPMs. Refer to Standard Drawings TM570 thru 575 for layout and installation details of delineator posts.

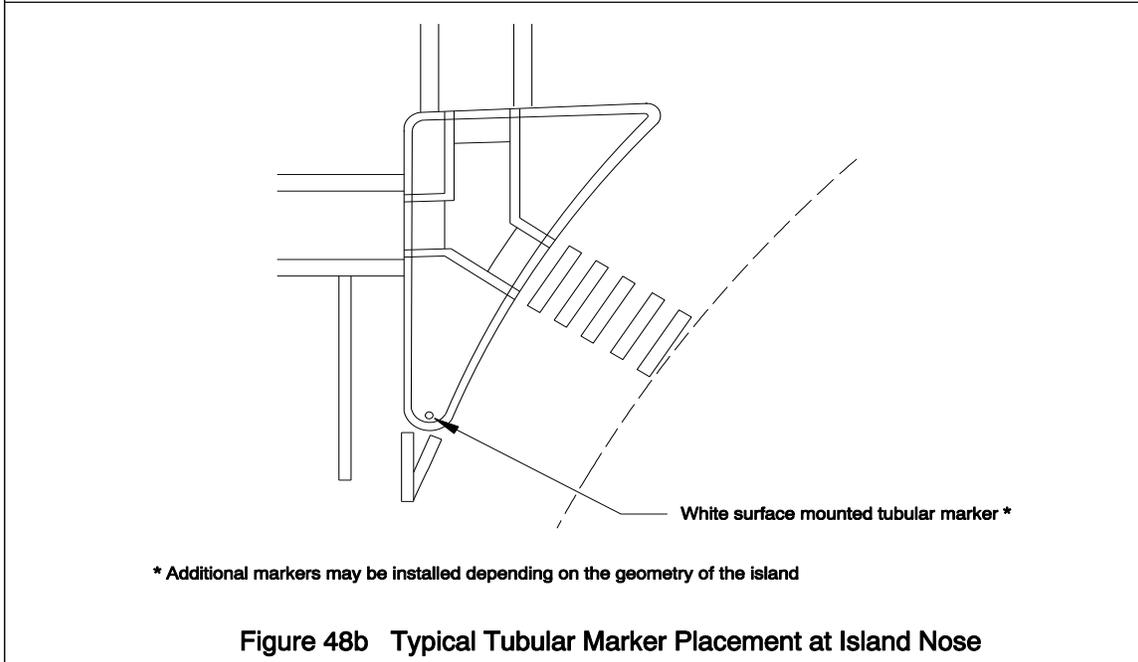
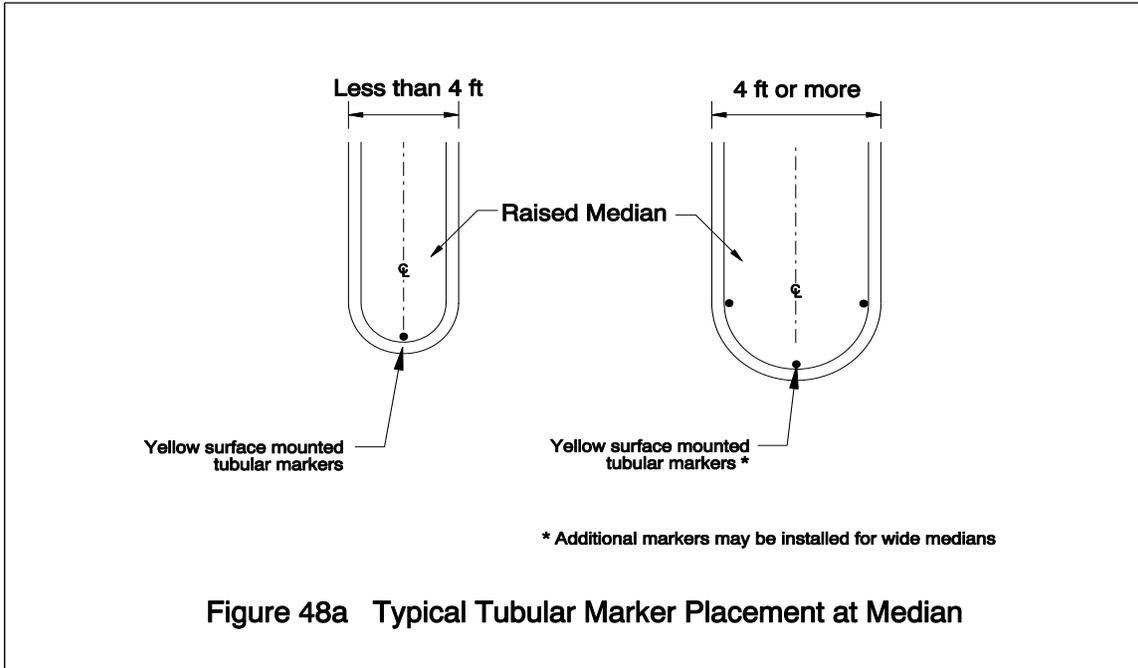


Section D: Surface Mounted Tubular Markers

Surface mounted tubular markers may be used at traffic islands, along a center line to preclude turns, or along lane lines to preclude lane changing, as determined by engineering judgment. Figures 48a and 48b show typical layout for tubular marker placement for raised medians and island nose, respectively.

If used, tubular markers shall:

- Have the same color as the pavement marking that they supplement, or for which they are substituted.
- Have two flexible reflective bands at least three inches wide. The color of the reflective band shall match the color of the tube.



Appendix A: Delegated Authority

For additional delegated authority information, see Section 5 of the ODOT Traffic Manual, 2009 Edition. All delegated authority requests for State Traffic Engineer approval should roughly follow the same process for approval:

1. Consultation with Region Traffic Unit; and
2. A request sent through the Region Traffic Manager/Engineer with supporting documentation.

The following items **require approval by the State Traffic Engineer** for use on state highways (the bold items have striping-related elements):

- **Colored pavements**
- **Crosswalk closure**
- **Dual right or left turn lanes**
- **Freeway median crossovers**
- **Marked crosswalks**
- **Multi-way stop applications**
- One-way operation for trucks and buses
- **Parking prohibitions or restrictions**
- PREPARE TO STOP WHEN LIGHTS FLASH sign applications
- Right turn permitted without stopping
- **Roundabouts**
- **Rumble strips – transverse**
- **School crossings**
- Speed zones – permanent, emergency, construction, temporary, and school areas
- STOP sign applications on state highways
- Through highways at intersections of the state highway
- Traffic signals – approval process, portable, modifications, temporary, or removal
- Transit exceptions to turn lanes
- Truck routes and truck prohibitions
- **Turn lanes- multiple turn lanes, right turn lanes, shared (or combined) bike and right-turn lane**
- **Turn prohibitions**
- UNMUFFLED ENGINE BRAKING PROHIBITED signs
- YIELD sign applications on state highways

The following items **may be authorized by the Region Traffic Manager/Engineer** for use on state highways (the bold items have striping related elements):

- **Advance stop lines (at marked crosswalks)**
- **Bicycle lanes**
- **Continental style crosswalks**
- Intersection control beacons
- **Left and right turn lanes at unsignalized intersections**
- **No-passing zones**
- **Ramp meters**
- Roadway illumination
- **Rumble strips – shoulder and centerline**
- Safe speed on curves
- Speed limit sign beacon
- Stop beacon
- STOP sign applications on cross streets that are not state highways
- Traffic signals – certain modifications
- **Turn lanes- left turn lanes, right turn lanes**
- Vehicle speed feedback sign
- Warning beacon
- **Wrong way treatments**
- YIELD sign applications on cross streets that are not state highway

Appendix B: ODOT Contacts

Traffic-Roadway Section:

Zahidul Siddique, PE (Traffic Devices Engineer) 503-986-3610
Heidi Shoblom, PE (Sign Engineer) 503-986-3603

Office of Maintenance:

Joel Fry (Field Operations Specialist) 503-986-4485

Construction Office:

Dean Chess (Qualified Products Coordinator) 503-986-3059

Region 1:

Dennis Mitchell, PE (Traffic Engineer) 503-731-8218
David Smith (Striping Manager) 503-666-9391

Region 2:

Dorothy Upton, PE (Traffic Engineer) 503-986-5761
Mark Friesen (Striping Manager) 503-373-1300

Region 3:

Ray Lapke, PE (Traffic Engineer) 541-957-3536
Randy Camp (Striping Manager) 541-957-3651

Region 4:

Joel McCarroll, PE (Traffic Engineer) 541-388-6189
Rolon Williams (Striping Manager) 541-388-6474

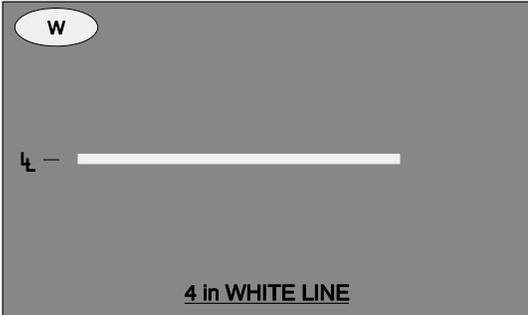
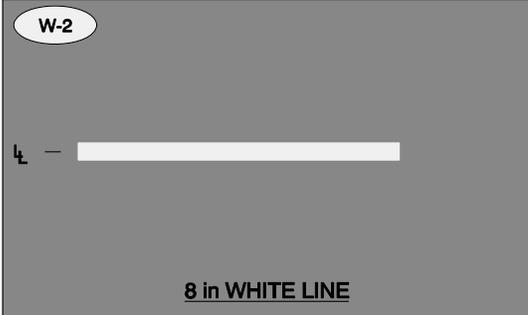
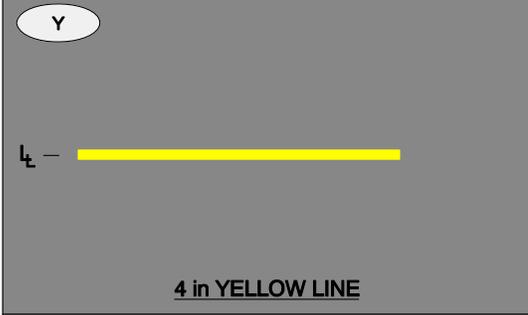
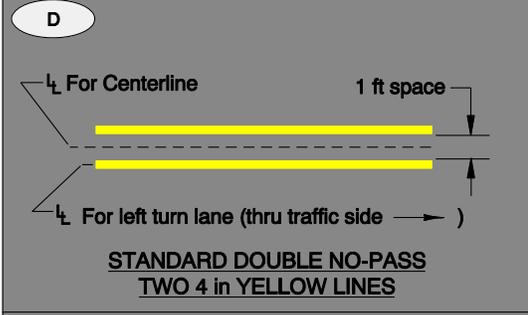
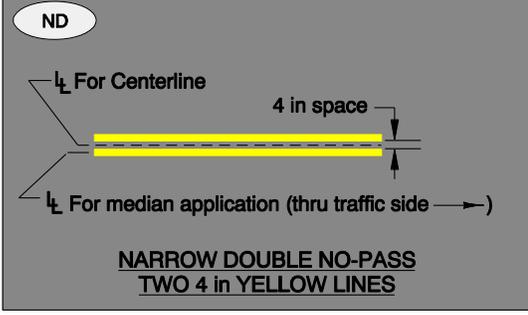
Region 5:

Jeffrey Wise, PE (Traffic Engineer) 541-963-1902
Peter Caldwell (Striping Manager) 541-963-1587

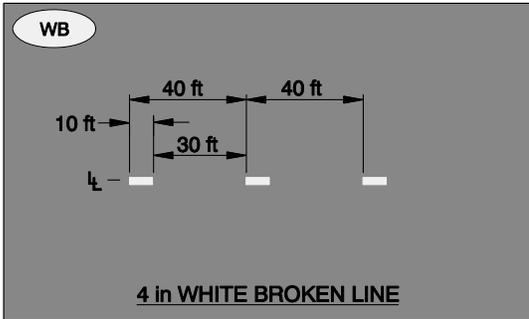
Appendix C: Online Resources

1. Manual on Uniform Traffic Control Devices (2009 edition): <http://mutcd.fhwa.dot.gov/>
2. MUTCD, Standard Highway Signs (2004 edition): http://mutcd.fhwa.dot.gov/ser-shs_millennium.htm
3. Oregon Supplement to the MUTCD: http://www.oregon.gov/ODOT/HWY/TRAFFIC-ROADWAY/MUTCD.shtml#Oregon_Supplement_to_MUTCD
4. ODOT Standard Drawings:
http://egov.oregon.gov/ODOT/HWY/ENGSERVICES/traffic_drawings.shtml#Traffic_500_Pavement_Marking
5. ODOT Standard Details:
http://egov.oregon.gov/ODOT/HWY/ENGSERVICES/details_traffic.shtml#Permanent_Traffic_Markers
6. ODOT Pavement Marking Design Guidelines:
http://www.oregon.gov/ODOT/HWY/TS/stripping.shtml#Pavement_Marking_Guidelines
7. ODOT Traffic Manual (2009 edition): http://www.oregon.gov/ODOT/HWY/TRAFFIC-ROADWAY/docs/pdf/Traffic_Manual_09.pdf
8. ODOT Highway Design Manual (2003 English):
http://egov.oregon.gov/ODOT/HWY/ENGSERVICES/hwy_manuals.shtml
9. ODOT Traffic Sign Design Manual:
http://www.oregon.gov/ODOT/HWY/TRAFFIC-ROADWAY/docs/pdf/Design_Manual.pdf
10. ODOT Traffic Sign Policy and Guidelines: http://www.oregon.gov/ODOT/HWY/TRAFFIC-ROADWAY/sign_policy.shtml
11. ODOT Specifications: <http://www.oregon.gov/ODOT/HWY/SPECS/index.shtml>
12. ODOT Average Price (contractor bids):
http://www.oregon.gov/ODOT/HWY/ESTIMATING/bid_item_prices.shtml
13. ODOT Qualified Products List (QPL):
<http://www.oregon.gov/ODOT/HWY/CONSTRUCTION/QPL/QPIndex.shtml>
14. ODOT Disabled Parking Standards:
http://www.oregon.gov/ODOT/HWY/TS/stripping.shtml#Accessible_Parking_Standards
15. Passing Sight Distance Criteria, NCHRP Report No. 605:
http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_605.pdf

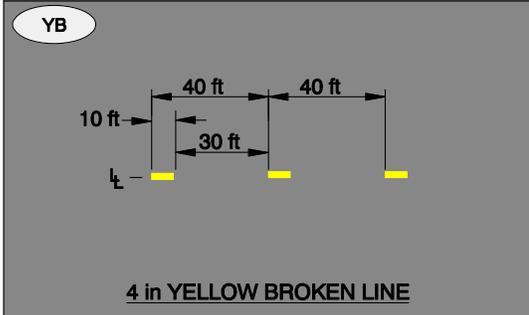
Appendix D: Bubble Note Index

<p>W</p>  <p>4 in WHITE LINE</p>	<p><i>Section B-4 Edge Lines</i></p>
<p>W-2</p>  <p>8 in WHITE LINE</p>	<p><i>Section B-3 Lane Lines</i> <i>Section B-6 Dotted Lane Lines</i> <i>Section B-8 Channelizing Lines & Traversable Channelizing Islands</i> <i>Section B-11 Right Turn Lanes</i> <i>Section B-12 Right Turn Slip Lanes</i> <i>Section B-13 At-Grade Right Turn Acceleration Lanes</i> <i>Section B-14 Left Turn Lanes</i> <i>Section B-17 Interchange Ramps: Entrance Ramps</i> <i>Section B-18 Interchange Ramps: Exit Ramps</i> <i>Section B-21 Slow Moving Vehicle & Bus Turnouts</i> <i>Section B-30 Bicycle Facility Markings</i></p>
<p>Y</p>  <p>4 in YELLOW LINE</p>	<p><i>Section B-1 Centerlines</i> <i>Section B-4 Edge Lines</i> <i>Section B-9 Traversable Medians</i> <i>Section B-10 Non-Traversable Medians and Channelizing Islands</i> <i>Section B-17 Interchange Ramps: Entrance Ramps</i> <i>Section B-18 Interchange Ramps: Exit Ramps</i> <i>Section B-19 Interchange Ramps: Ramp Terminals</i></p>
<p>D</p>  <p>STANDARD DOUBLE NO-PASS TWO 4 in YELLOW LINES</p>	<p><i>Section B-1 Centerlines</i> <i>Section B-2 No-Passing Zone Markings</i> <i>Section B-7 Lane Reduction & Addition Transitions</i> <i>Section B-14 Left Turn Lanes</i> <i>Section B-19 Interchange Ramps: Ramp Terminals</i></p>
<p>ND</p>  <p>NARROW DOUBLE NO-PASS TWO 4 in YELLOW LINES</p>	<p><i>Section B-1 Centerlines</i> <i>Section B-2 No-Passing Zone Markings</i> <i>Section B-9 Traversable Medians</i> <i>Section B-14 Left Turn Lanes</i> <i>Section B-20 Approach to a Fixed Obstruction</i></p>

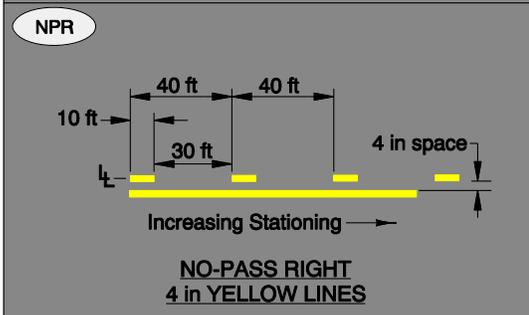
ℒ— Lane line dimensions are shown on the striping plans.



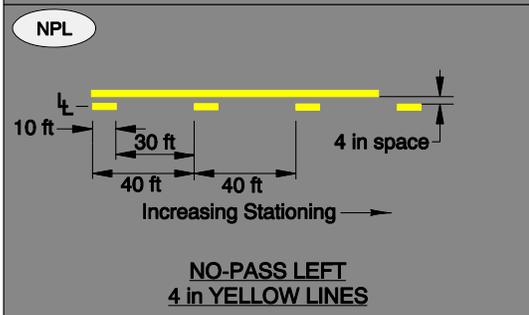
Section B-3 Lane Lines
Section B-17 Interchange Ramps: Entrance Ramps



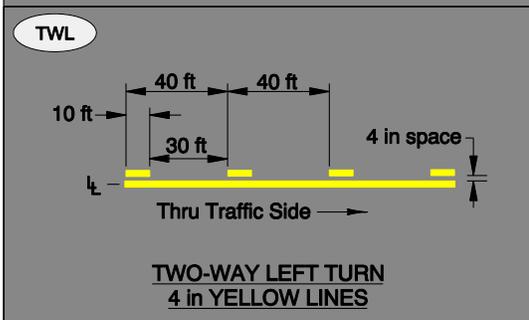
Section B-1 Centerlines



Section B-1 Centerlines
Section B-2 No-Passing Zone Markings
Section B-7 Lane Reduction & Addition Transitions
Section B-13 At-Grade Right Turn Acceleration Lanes
Section B-14 Left Turn Lanes
Section B-16 Roundabouts
Section B-20 Approach to a Fixed Obstruction
Section B-28 Railroad Crossing Markings

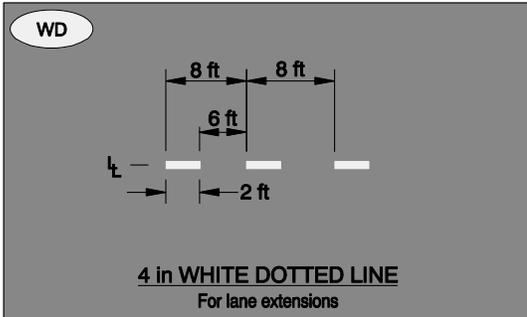


Section B-1 Centerlines
Section B-2 No-Passing Zone Markings
Section B-7 Lane Reduction & Addition Transitions
Section B-13 At-Grade Right Turn Acceleration Lanes
Section B-14 Left Turn Lanes
Section B-16 Roundabouts
Section B-20 Approach to a Fixed Obstruction
Section B-28 Railroad Crossing Markings

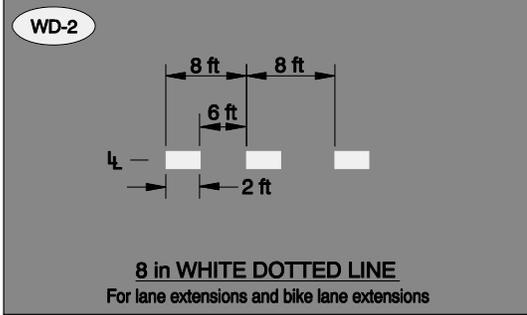


Section B-15 Two-Way Left Turn Lanes

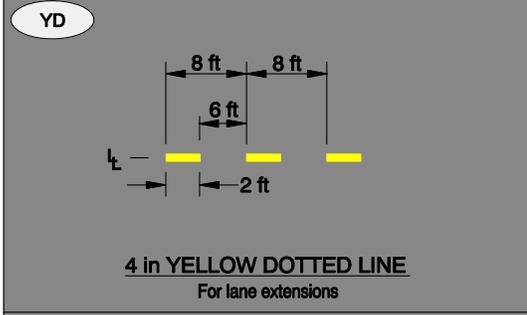
⊥— Lane line dimensions are shown on the striping plans.



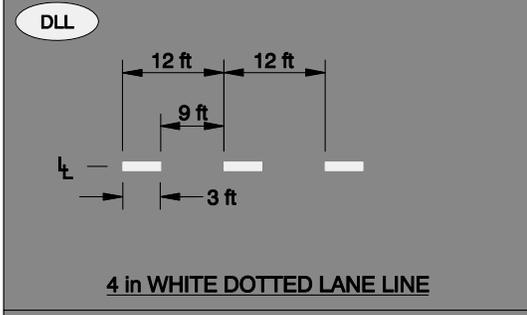
Section B-5 Dotted Lines
Section B-11 Right Turn Lanes
Section B-18 Interchange Ramps: Exit Ramps
Section B-21 Slow Moving Vehicle & Bus Turnouts



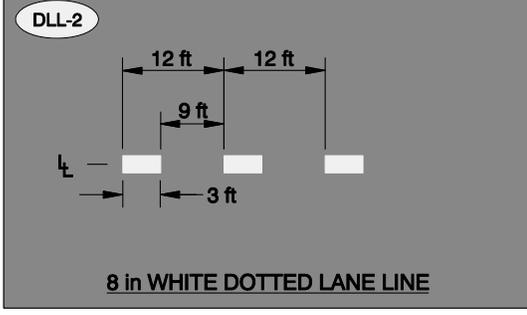
Section B-5 Dotted Lines
Section B-11 Right-Turn lanes
Section B-16 Roundabouts
Section B-21 Slow Moving Vehicle & Bus Turnouts
Section B-30 Bicycle Facility Markings



Section B-5 Dotted Lines

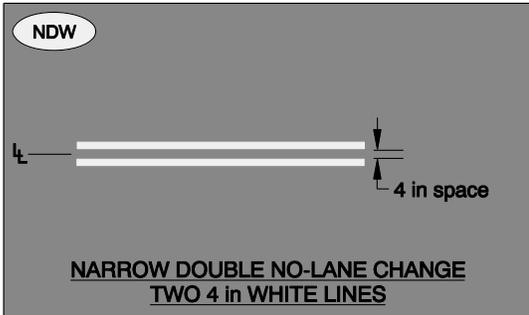


Section B-6 Dotted Lane Lines
Section B-17 Interchange Ramps: Entrance Ramps

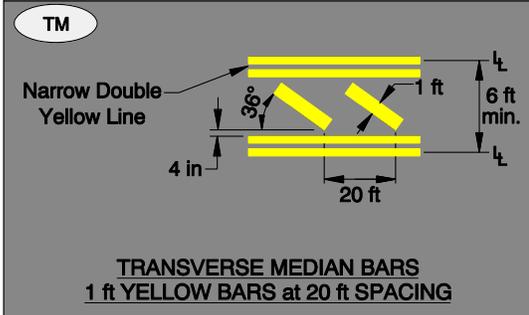


Section B-6 Dotted Lane Lines
Section B-11 Right Turn Lanes
Section B-17 Interchange Ramps: Entrance Ramps
Section B-18 Interchange Ramps: Exit Ramps

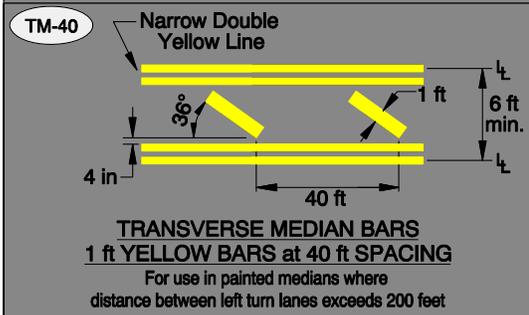
L Lane line dimensions are shown on the striping plans.



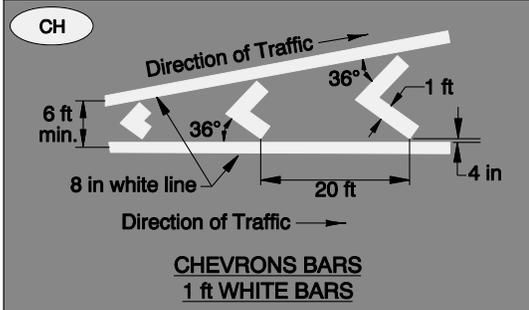
Section B-3 Lane Lines
 Section B-8 Channelizing Lines & Traversable
 Channelizing Islands
 Section B-20 Approach to a Fixed Obstruction



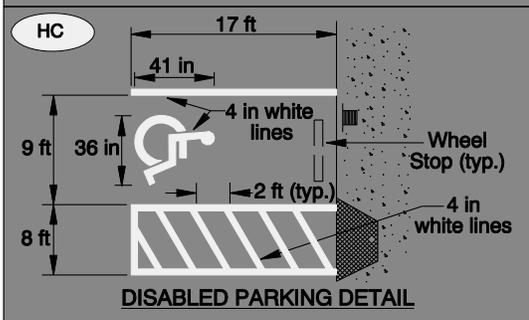
Section B-9 Traversable Median
 Section B-14 Left Turn Lanes
 Section B-20 Approach to a Fixed Obstruction



Section B-9 Traversable Medians

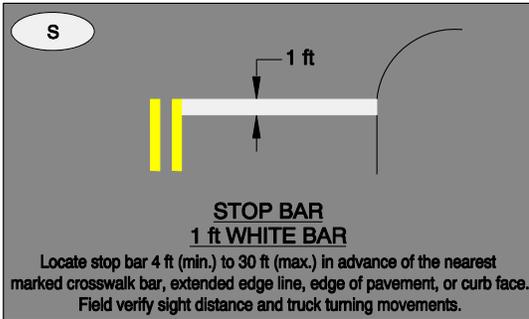


Section B-8 Channelizing Lines & Traversable
 Channelizing Islands
 Section B-17 Interchange Ramps: Entrance Ramps
 Section B-18 Interchange: Exit Ramps
 Section B-20 Approach to a Fixed Obstruction

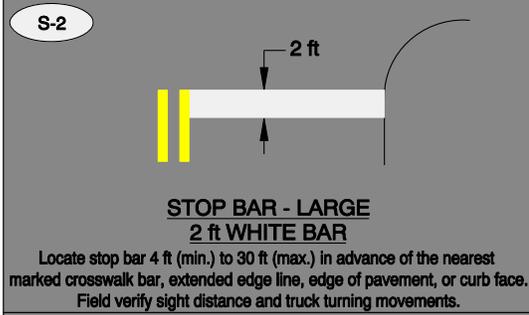


Section B-32 Parking Space Markings

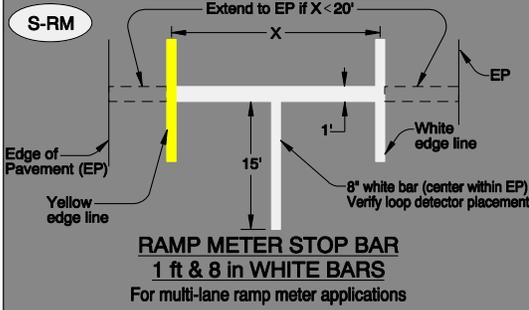
⊥ Lane line dimensions are shown on the striping plans.



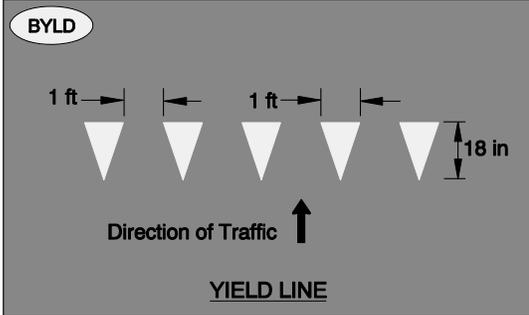
Section B-22 Stop Bars



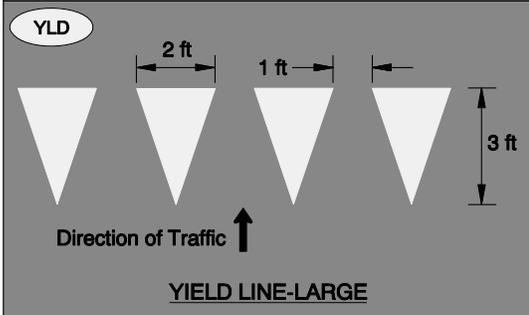
Section B-22 Stop Bars
Section B-24 Crosswalk Markings
Section B-28 Railroad Crossing Markings



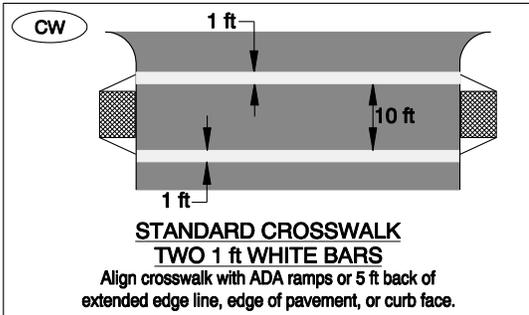
Section B-22 Stop Bars



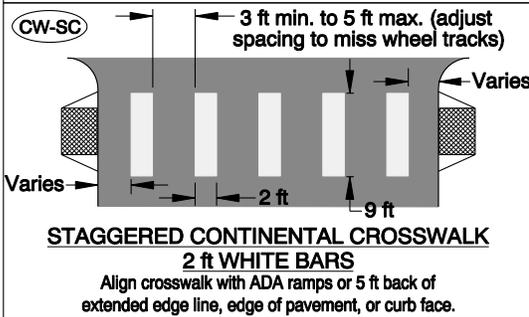
Section B-16 Roundabouts
Section B-23 Yield Lines



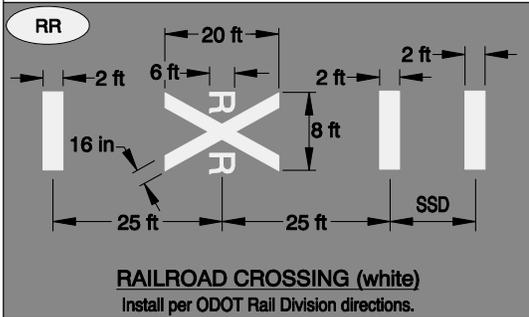
Section B-23 Yield Lines



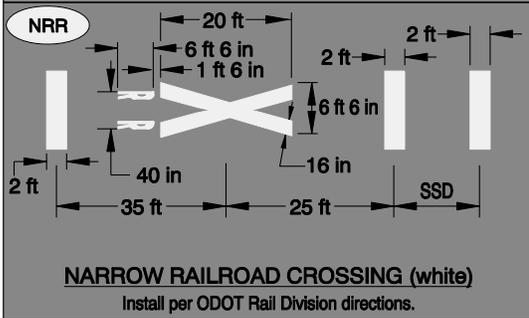
Section B-24 Crosswalk Markings



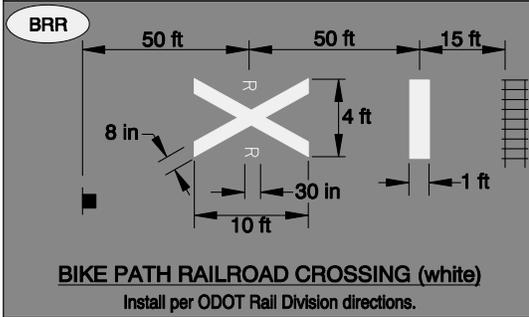
Section B-11 Right Turn Lanes
 Section B-16 Roundabouts
 Section B-24 Crosswalk Markings



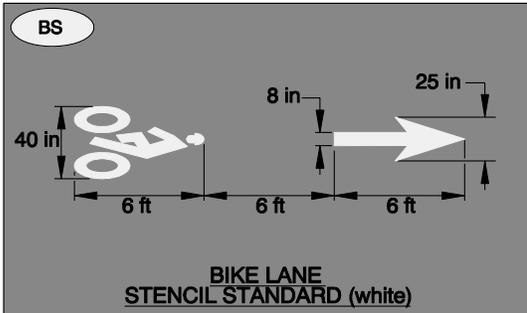
Section B-28 Railroad Crossing Markings



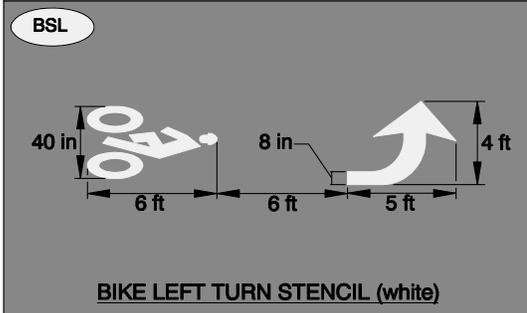
Section B-28 Railroad Crossing Markings



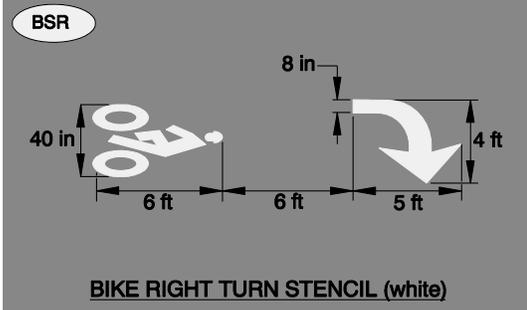
Section B-28 Railroad Crossing Markings



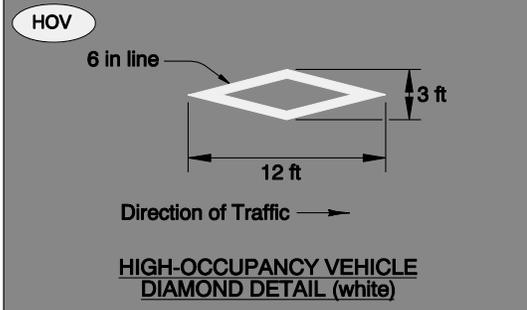
Section B-30 Bicycle Facility Markings



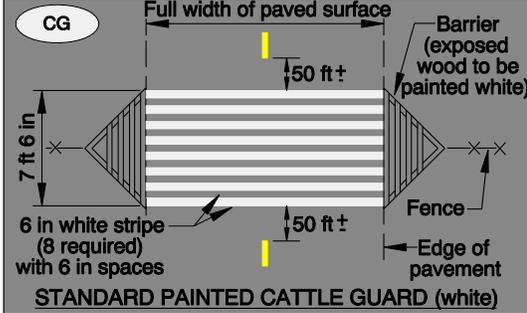
Section B-30 Bicycle Facility Markings



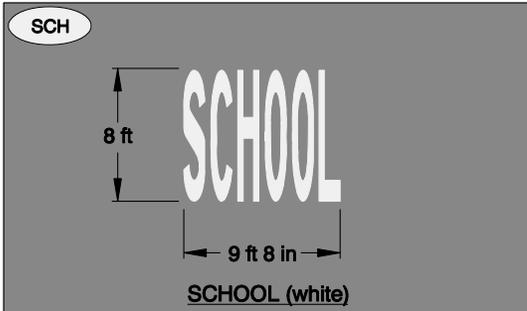
Section B-30 Bicycle Facility Markings



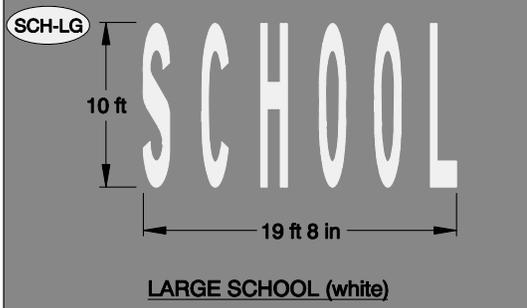
Section B-29 Preferential Lane Markings



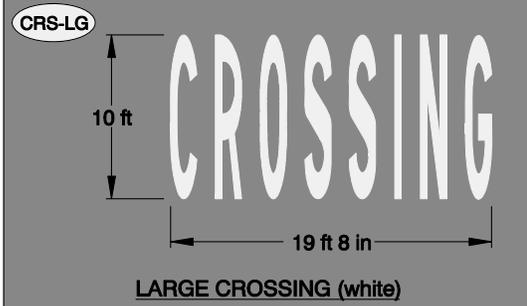
Section B-31 Cattle Guard Markings



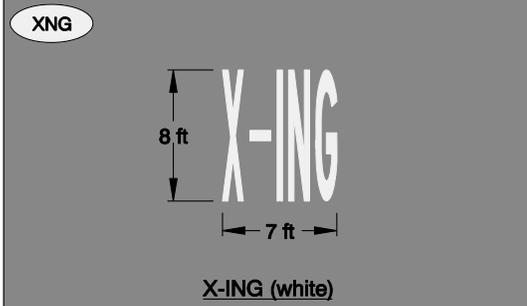
Section B-27 School Markings



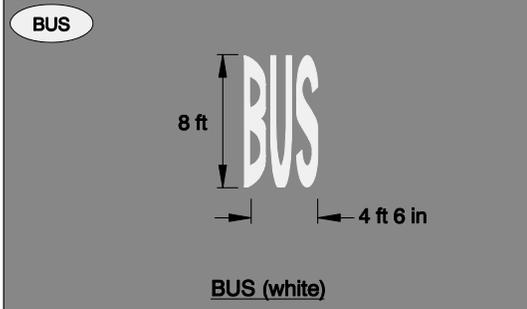
Section B-27 School Markings



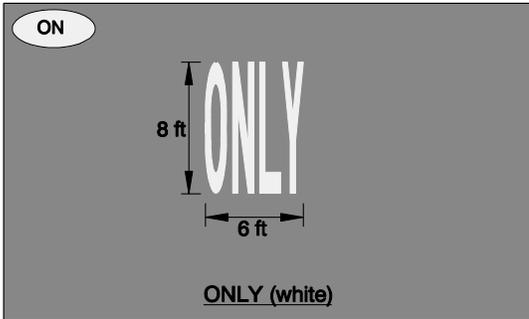
Section B-27 School Markings



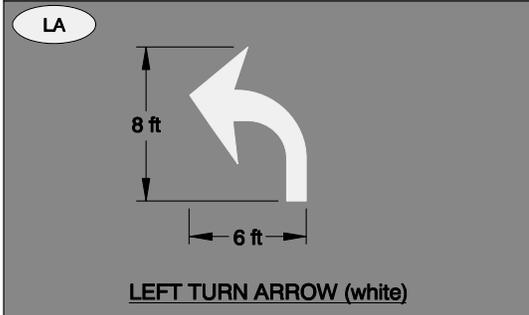
Section B-27 School Markings



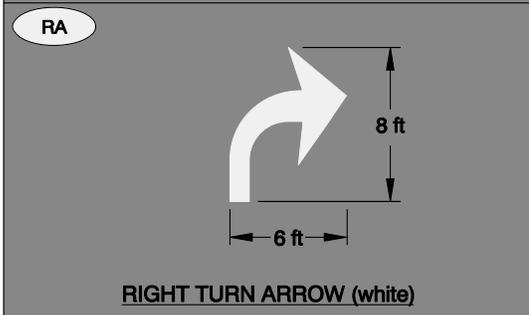
Section B-29 Preferential Lane Markings



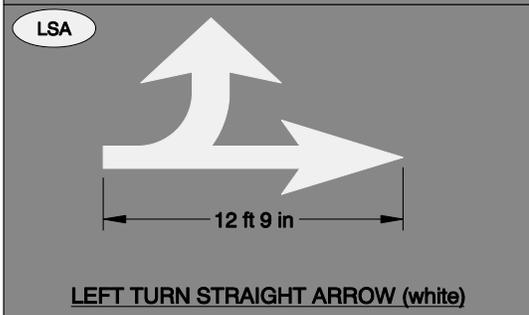
Section B-25 Lane Use Arrows
Section B-29 Preferential Lane Markings



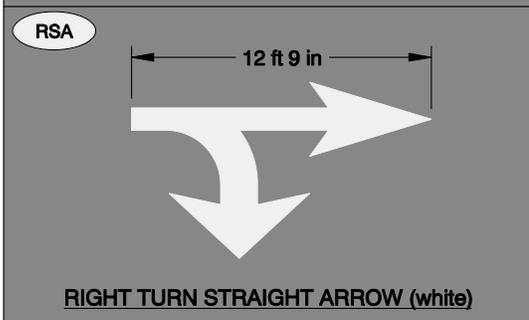
Section B-25 Lane Use Arrows



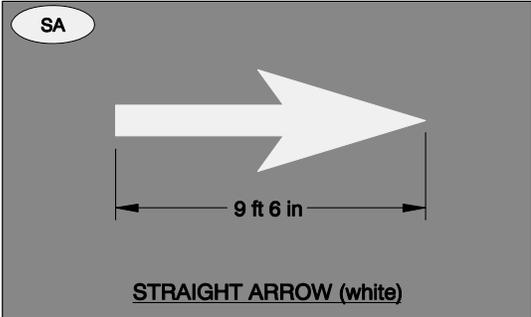
Section B-25 Lane Use Arrows



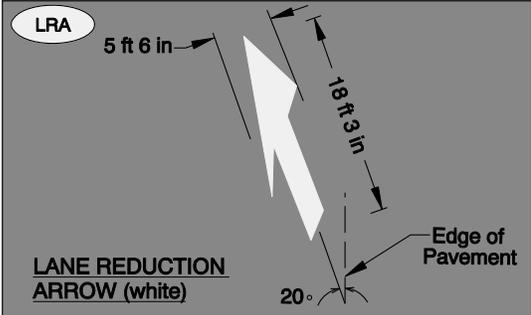
Section B-25 Lane Use Arrows



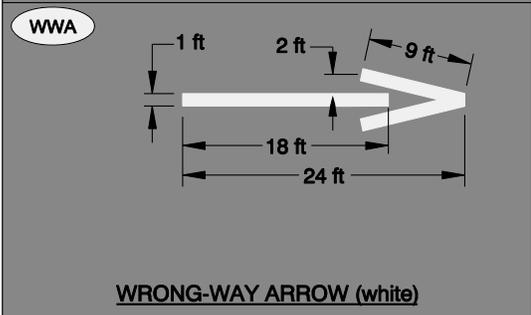
Section B-25 Lane Use Arrows



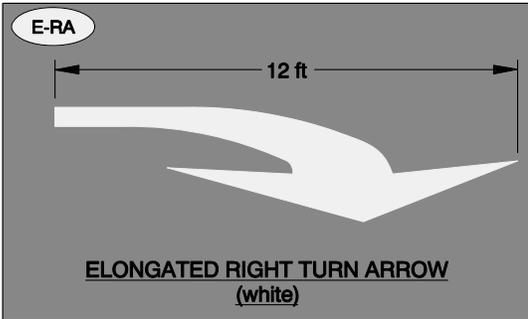
Section B-25 Lane Use Arrows



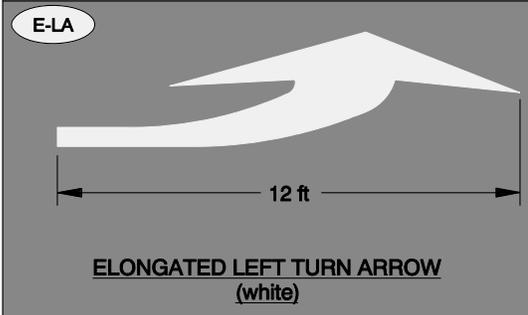
Section B-26 Miscellaneous Arrows



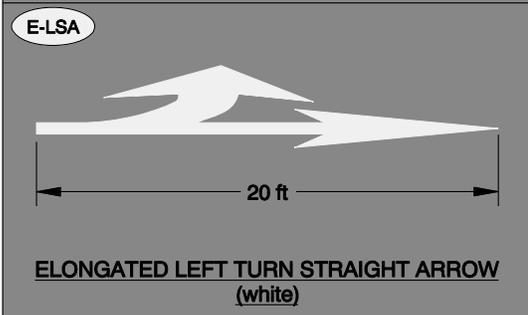
Section B-26 Miscellaneous Arrows



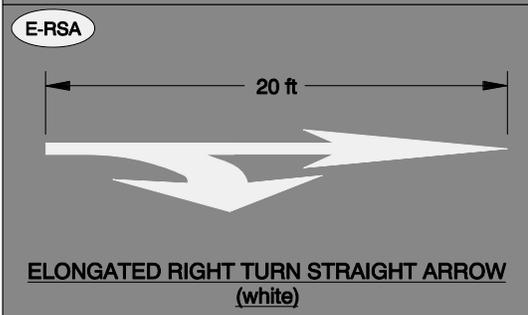
Section B-25 Lane Use Arrows



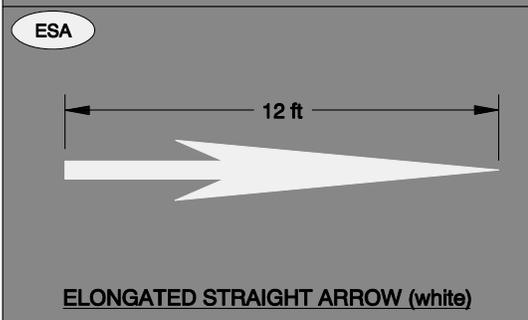
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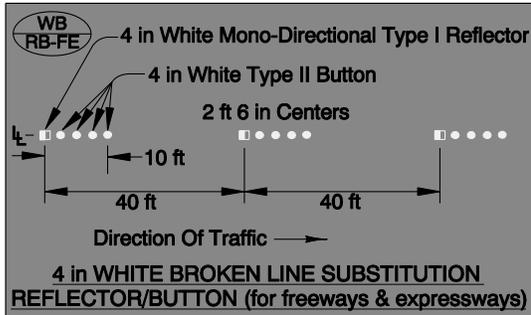
Section B-25 Lane Use Arrows



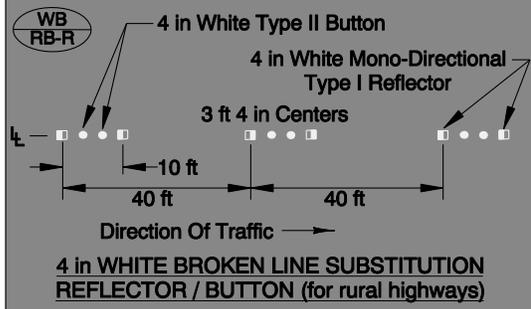
Section B-25 Lane Use Arrows



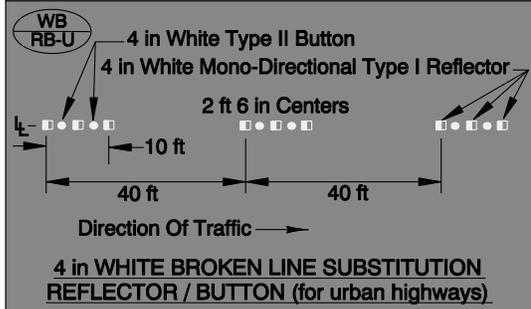
Section B-25 Lane Use Arrows



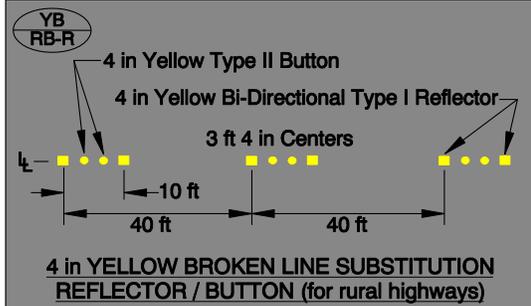
Section C-2 RPMs Used for Substitution



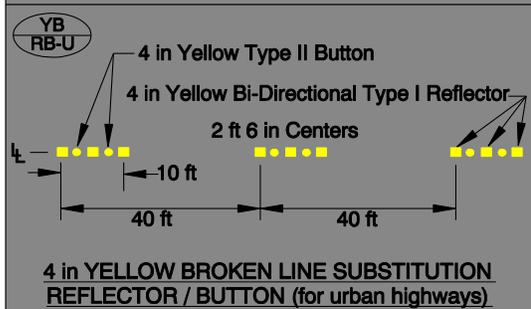
Section C-2 RPMs Used for Substitution



Section C-2 RPMs Used for Substitution

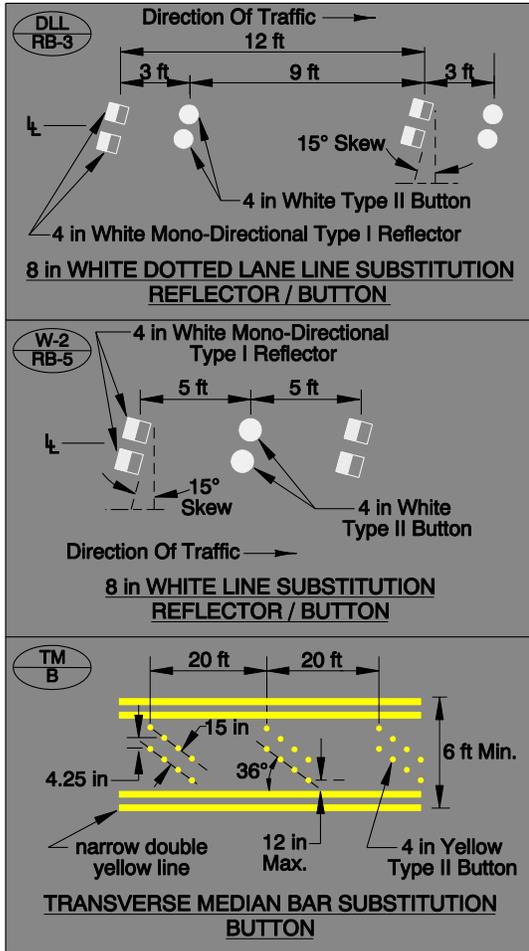


Section C-2 RPMs Used for Substitution



Section C-2 RPMs Used for Substitution

⊥ Lane line dimensions are shown on the striping plans.

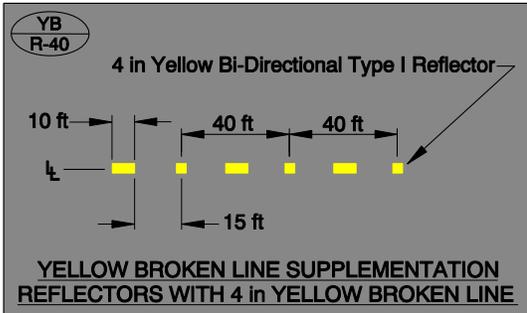


Section C-2 RPMs Used for Substitution

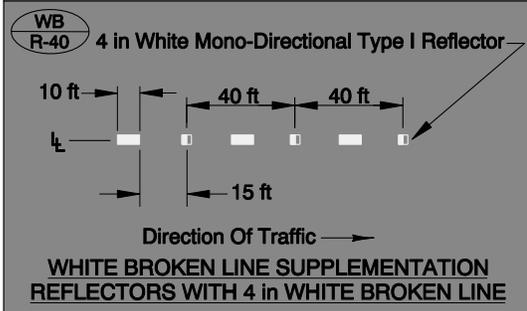
Section C-2 RPMs Used for Substitution

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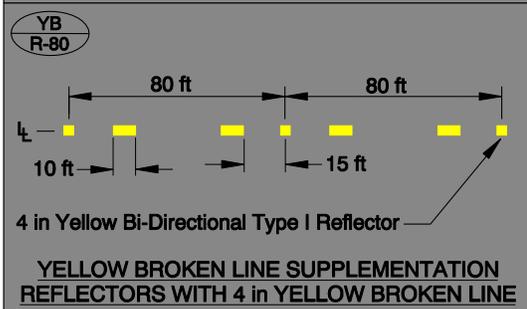
⊥ Lane line dimensions are shown on the striping plans.



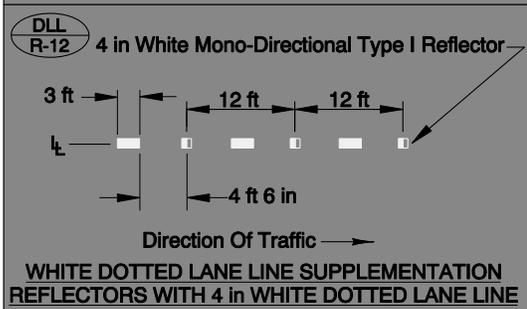
Section C-3 RPMs Used for Supplementation



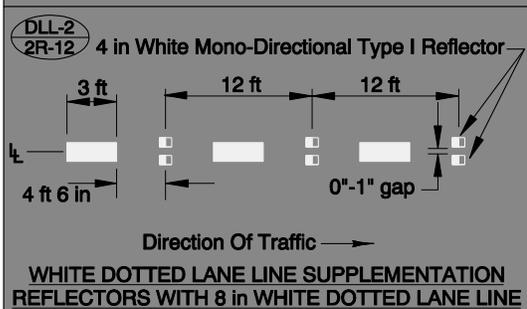
Section C-3 RPMs Used for Supplementation



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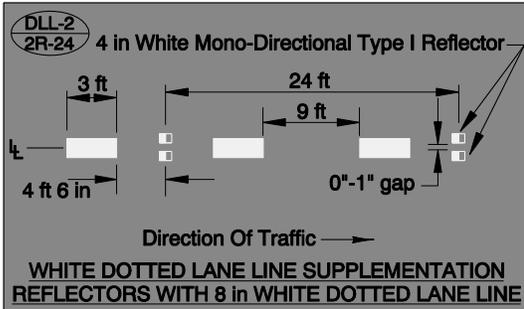


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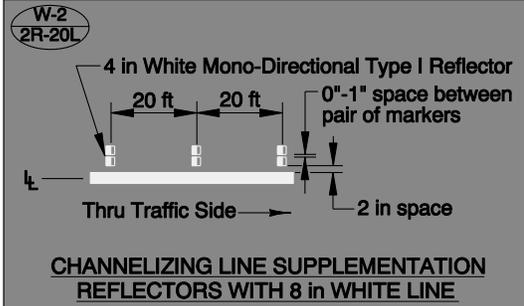


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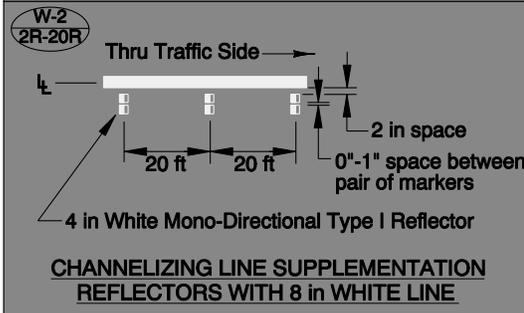
⊥ Lane line dimensions are shown on the striping plans.



Section C-3 RPMs Used for Supplementation

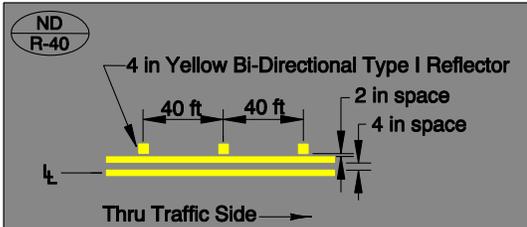


Section C-3 RPMs Used for Supplementation



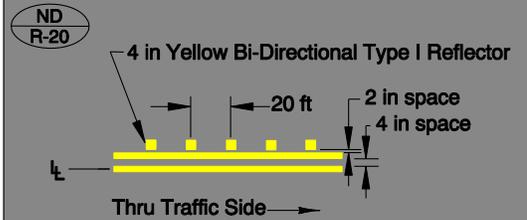
Section C-3 RPMs Used for Supplementation

⊥ — Lane line dimensions are shown on the striping plans.



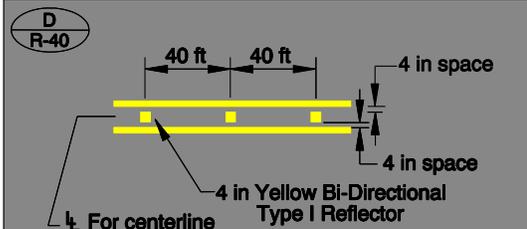
Section C-4 RPMs Used for Positioning Guides

NARROW DOUBLE YELLOW POSITIONING GUIDE REFLECTORS WITH TWO 4 in YELLOW LINES



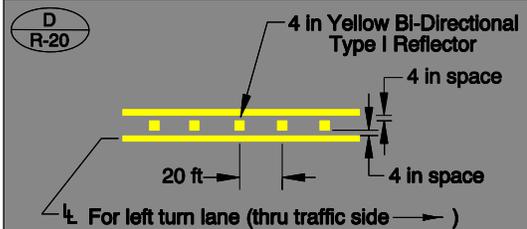
Section C-4 RPMs Used for Positioning Guides

NARROW DOUBLE YELLOW POSITIONING GUIDE REFLECTORS WITH TWO 4 in YELLOW LINES



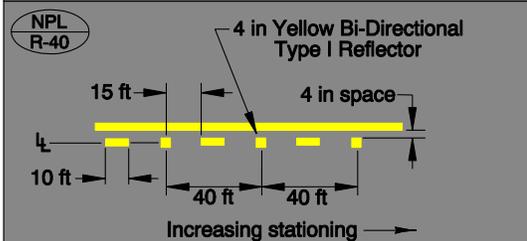
Section C-4 RPMs Used for Positioning Guides

DOUBLE NO-PASS POSITIONING GUIDE REFLECTORS WITH TWO 4 in YELLOW LINES



Section C-4 RPMs Used for Positioning Guides

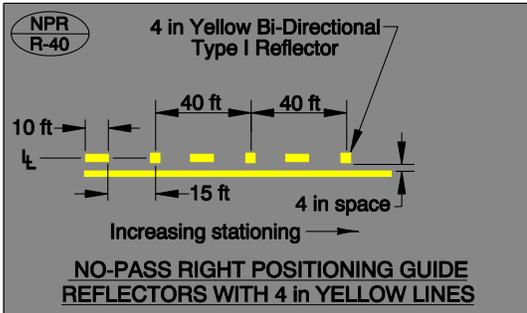
DOUBLE NO-PASS POSITIONING GUIDE REFLECTORS WITH TWO 4 in YELLOW LINES



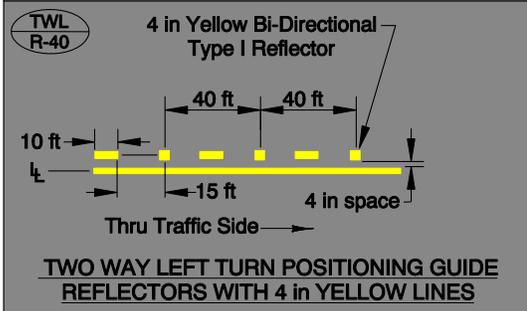
Section C-4 RPMs Used for Positioning Guides

NO-PASS LEFT POSITIONING GUIDE REFLECTORS WITH 4 in YELLOW LINES

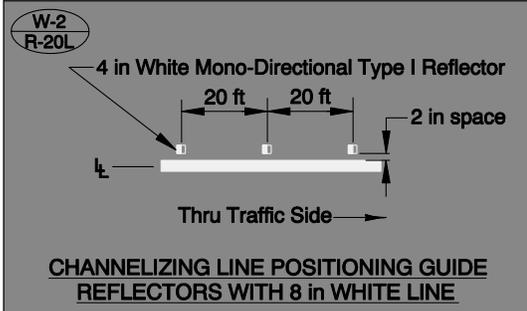
⊥ — Lane line dimensions are shown on the striping plans.



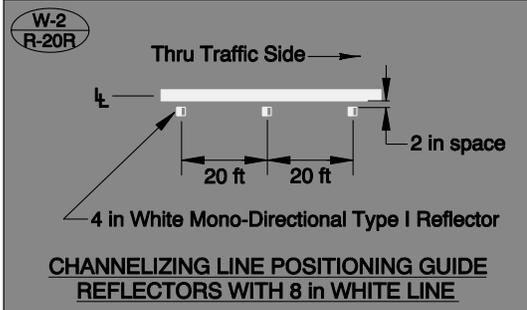
Section C-4 RPMs Used for Positioning Guides



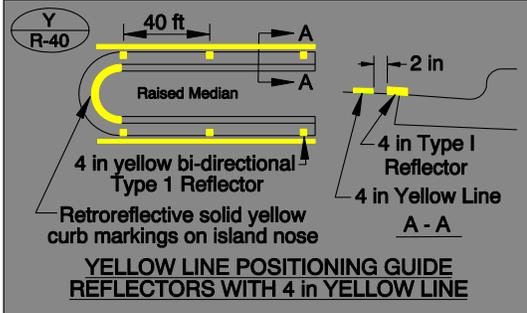
Section C-4 RPMs Used for Positioning Guides



Section C-4 RPMs Used for Positioning Guides



Section C-4 RPMs Used for Positioning Guides



Section C-4 RPMs Used for Positioning Guides

⊥ Lane line dimensions are shown on the striping plans.

Appendix E: Signing and Striping Coordination- Critical Locations

Striping design shall be coordinated with sign design for the following situations. Refer to ODOT Traffic Sign Design Manual and the 2009 edition of the MUTCD for additional information:

- Lane reduction and addition transitions (Section B-7)
- Right turn drop lane (Section B-11)
- Rural left-turn channelization (Section B-14)
- Roundabout (Section B-16)
- Interchange exit ramps with drop lane(s) (Section B-18)
- Wrong way arrows for interchange ramp terminals (Section B-19)
- Slow moving vehicle turnouts (Section B-21)
- Ramp meter locations (Section B-22)
- Mid-block crosswalks (Section B-24)
- School markings (Section B-27)
- Railroad crossing markings (Section B-28)
- Bike lane markings (Section B-30)
- Parking space markings (Section B-32)