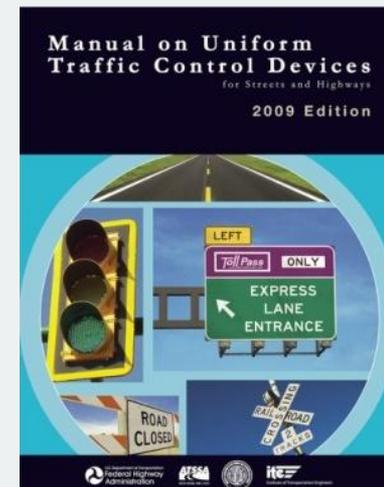


Part 3 MARKINGS TRAINING

April 12, 2011

- Federal MUTCD published in Dec. 2009
- DE MUTCD committee began meeting in Jan. 2010 to establish DE-specific guidance



- DE MUTCD submitted to Delaware Register and is currently available for public comment through April 30, 2011

<http://regulations.delaware.gov/register/april2011/proposed/index.shtml#TopOfPage>

- All presentation materials are DRAFT

- Paragraphs are numbered
- *Guidance is italicized*
- No more metric
- Definitions relocated to Part 1
- **Standards remain bold**
- Options and Support remain unformatted
- Delaware Revisions in blue with line in margin and “(DE Revision)” at beginning of paragraph

Guidance:

08A (DE Revision) *Black contrast markings should be used with white edge along all concrete roadways (see Figures 3A-1A and 3A-1B).*

08B (DE Revision) *Except as provided in Paragraph 8D, the black contrast 3A-1A should be used along all interstates, freeways, and expressways with*

08C (DE Revision) *The black contrast marking patterns shown in Figure 3A conventional roadways with concrete pavement.*

Option:

08D (DE Revision) *The black contrast marking patterns shown in Figure 3A freeways, and expressways with concrete pavement based on engineering ju*

Support:

09 *When used in combination with other colors, black is not considered a enhancing system for the markings.*

**Section 3A.06 Functions, Widths, and Patterns of Longitudinal P
Standard:**

01 **The general functions of longitudinal lines shall be:**

- A. A double line indicates maximum or special restrictions,**
- B. A solid line discourages or prohibits crossing (depending on the**
- C. A broken line indicates a permissive condition, and**
- D. A dotted line provides guidance or warning of a downstream ch**

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

01 (DE Revision) When used in this Manual, the text headings of Standard, Guidance, Option, and Support shall be defined as follows:

- A. Standard**—a statement of required, mandatory, or specifically prohibitive practice regarding a traffic control device. All Standard statements are labeled, and the text appears in bold type. The verb “shall” is typically used. The verbs “should” and “may” are not used in Standard statements. Standard statements are sometimes modified by Options.
- B. Guidance**—a statement of recommended, but not mandatory, practice in typical situations, with deviations allowed if engineering judgment or engineering study indicates the deviation to be appropriate. All Guidance statements are labeled, and the text appears in unbold type. The verb “should” is typically used. The verbs “shall” and “may” are not used in Guidance statements. Guidance statements are sometimes modified by Options.
- C. Option**—a statement of practice that is a permissive condition and carries no requirement or recommendation. Option statements sometime contain allowable modifications to a Standard or Guidance statement. All Option statements are labeled, and the text appears in unbold type. The verb “may” is typically used. The verbs “shall” and “should” are not used in Option statements.
- D. Support**—an informational statement that does not convey any degree of mandate, recommendation, authorization, prohibition, or enforceable condition. Support statements are labeled, and the text appears in unbold type. The verbs “shall,” “should,” and “may” are not used in Support statements.

- **Standards are requirements that SHALL be followed unless there is an Option**
- **DE Standard: Reverted to 2003 MUTCD language allowing engineering judgment**
- *Guidance is recommended and SHOULD be followed*
- Options MAY be followed and are sometimes modifications to Standards and Guidance

Section 3A.01 – Markings on highways and on
private roads open to public travel

- **3A: General**
- **3B: Pavement and Curb Markings**
- **3C: Roundabout Markings**
- 3D: Markings for Preferential Lanes
- 3E: Markings for Toll Plazas
- 3F: Delineators
- 3G: Colored Pavements
- 3H: Channelizing Devices used for Emphasis of Pavement Marking Patterns
- 3I: Islands
- 3J: Rumble Strip Markings

Guidance:

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

Standard:

03 **Markings that must be visible at night shall be retroreflective unless ambient illumination assures that the markings are adequately visible. All markings on Interstate highways shall be retroreflective.**

04 **Markings that are no longer applicable for roadway conditions or restrictions and that might cause confusion for the road user shall be removed or obliterated to be unidentifiable as a marking as soon as practical.**

Option:

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

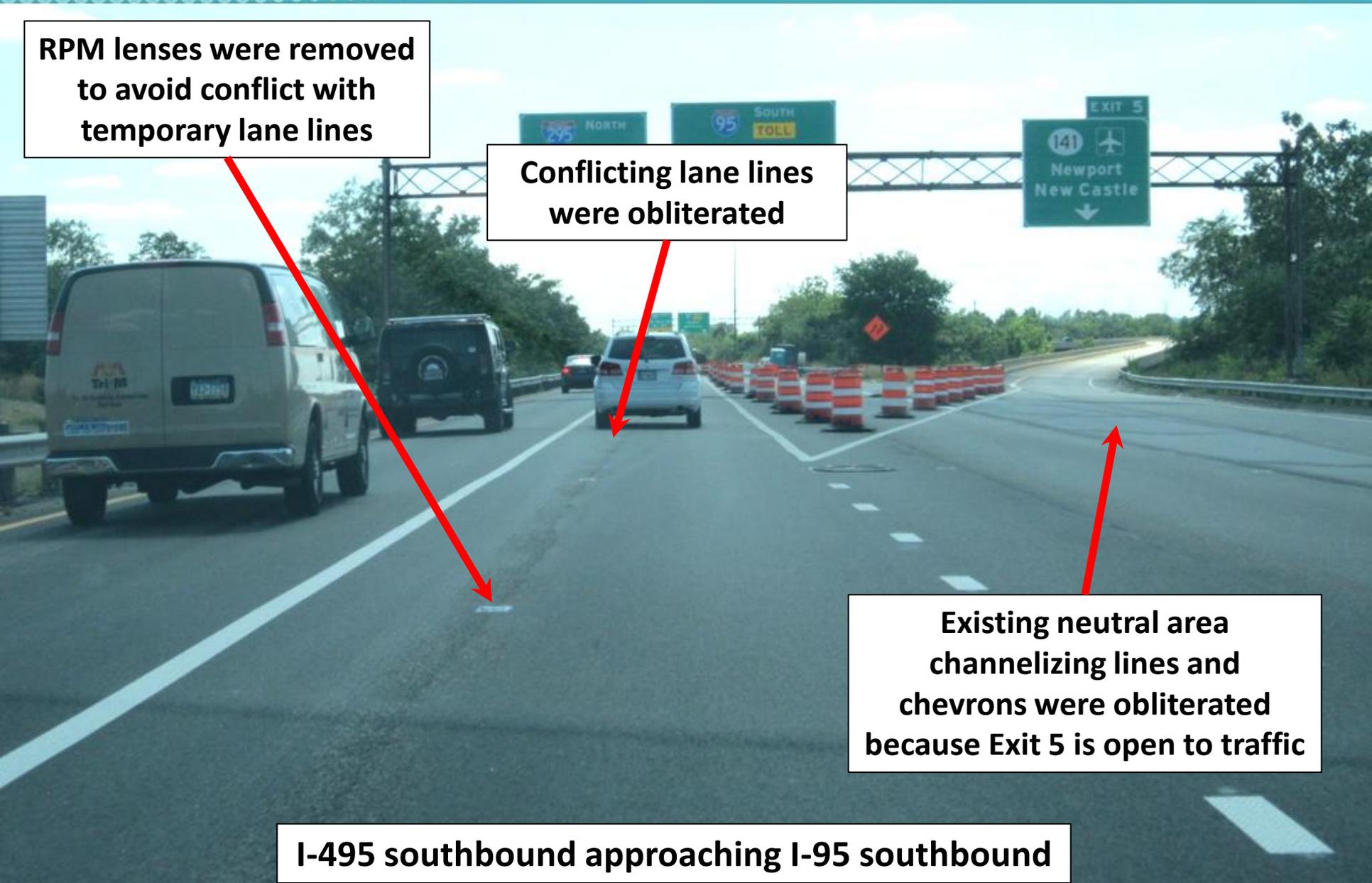
- *Markings should be installed prior to opening a road*
- **Shall be retroreflective**
- **Conflicting markings shall be removed or obliterated**
- “Blackout” tape used to cover conflicting markings only if tape is approximately same color as pavement

RPM lenses were removed to avoid conflict with temporary lane lines

Conflicting lane lines were obliterated

Existing neutral area channelizing lines and chevrons were obliterated because Exit 5 is open to traffic

I-495 southbound approaching I-95 southbound



“Blackout” tape shall not be used on concrete because it does not match the pavement color



SR 141 northbound at Exits 6A and 6B

Support:

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

01A (DE Revision) DelDOT's [Striping Item Usage Guidelines](#) provides guidance regarding pavement marking materials for various applications along state-maintained roadways.

- DE Support: DelDOT Striping Item Usage Guidelines provides guidance on materials

Striping Item Usage Guidelines

Item Number	Description	Unit of Measure	Pavement Surface		Typical Use
			Hot-Mix	Concrete	
748525	Temporary Markings, Tape, 4"	LF	X	X	Temporary pavement markings on final hot-mix surface, when temporary markings are not placed in final striping configuration.
748526	Temporary Markings, Tape, 6"	LF	X	X	
748527	Temporary Markings, Tape, Words/Symbols	SF	X	X	
748518	Blackout Tape, 6"	LF	X		Used to cover markings as part of a Maintenance of Traffic phase.
748528	Blackout Tape, 6"	LF	X		Used to cover 6" markings as part of a Maintenance of Traffic phase.
748506	Permanent Pavement Striping, Epoxy Resin Paint, White/Yellow, 4"	LF	X		Edge lines, center lines, and broken (10'/30') and dotted (2'/6') patterns (except turning tracks) on conventional roads.
748507	Permanent Pavement Striping, Epoxy Resin Paint, White/Yellow, 6"	LF	X	X	Edge lines, center lines, and broken (10'/30') patterns on interstates, freeways, and expressways; channelizing lines (gore areas) and dotted (2'/6') patterns on on-ramps and off-ramps on conventional roads.
748508	Permanent Pavement Striping, Epoxy Resin Paint, White/Yellow, 6"	LF	X		Edge lines on conventional roads. (Ex: wide edge lines)
748509	Permanent Pavement Striping, Epoxy Resin Paint, White/Yellow, 12"	LF	X	X	Channelizing lines (gore areas) and broken (3'/9') patterns on on-ramps and off-ramps on interstates, freeways, and expressways.
748535	Permanent Pavement Striping, Epoxy Resin Paint, Black, 4"	LF		X	Leading broken (10'/30') and dotted (2'/6') patterns for 4" white on conventional roads.
748536	Permanent Pavement Striping, Epoxy Resin Paint, Black, 6"	LF		X	Leading dotted (2'/6') patterns for 6" white on on-ramps and off-ramps on conventional roads.
748537	Permanent Pavement Striping, Epoxy Resin Paint, Black, 8"	LF			Used under 4" white on conventional roads; not preferred for new applications.
748538	Permanent Pavement Striping, Epoxy Resin Paint, Black, 10"	LF			Used under 6" white on interstates, freeways, and expressways and at on-ramps and off-ramps on conventional roads; not preferred for new applications.
748539	Permanent Pavement Striping, Epoxy Resin Paint, Black, 12"	LF		X	Leading dotted (3'/9') patterns for 12" white at on-ramps and off-ramps on interstates, freeways, and expressways.
748540	Permanent Pavement Striping, Epoxy Resin Paint, Black, 16"	LF		X	Used under 12" white on interstates, freeways, and expressways; not preferred for new applications.
748547	Retroreflective Preformed Patterned Contrast Markings, 9"	LF		X	Broken (10'/30') patterns on interstates, freeways, and expressways. (Note: This item includes both the white and black markings)
748556	Retroreflective Preformed Patterned Contrast Markings, 16"	LF		X	Channelizing lines (gore areas) and dotted (3'/9') patterns for on-ramps and off-ramps on interstates, freeways, and expressways; not a common application. (Note: This item includes both the white and black markings)
748557	Permanent Pavement Striping, Epoxy Resin Paint, Black, 3"	LF		X	Used side-by-side with 4" and 6" edge lines on conventional roads and interstates, freeways, and expressways, respectively; black contrast is on the left side closest to traffic.

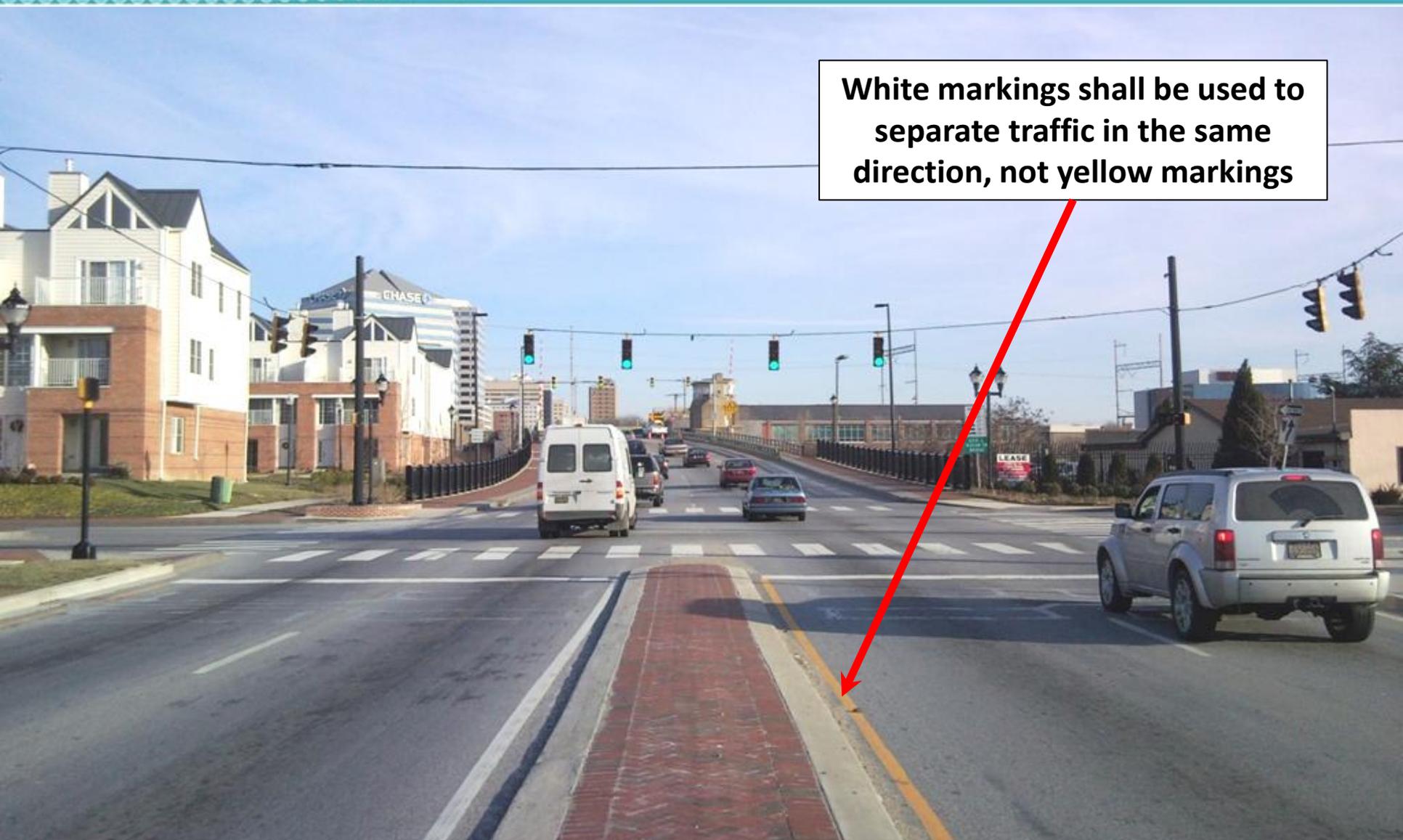
TO BE REVISED PER 2011 DE MUTCD

Standard:

- 01 **Markings shall be yellow, white, red, blue, or purple. The colors for markings shall conform to the standard highway colors. Black in conjunction with one of the colors mentioned in the first sentence of this paragraph shall be a usable color.**
- 02 **When used, white markings for longitudinal lines shall delineate:**
 - A. **The separation of traffic flows in the same direction, or**
 - B. **The right-hand edge of the roadway.**
- 03 **When used, yellow markings for longitudinal lines shall delineate:**
 - A. **The separation of traffic traveling in opposite directions,**
 - B. **The left-hand edge of the roadways of divided highways and one-way streets or ramps, or**
 - C. **The separation of two-way left-turn lanes and reversible lanes from other lanes.**

- **Yellow, white, red, blue, and purple markings only**
- **White separates traffic in same direction and delineates right edge of road**
- **Yellow separates traffic in opposite directions and delineates left edge of divided and one-way roads**

White markings shall be used to separate traffic in the same direction, not yellow markings



US 13 Bus. (Walnut St) at A St, Wilmington

08 Black may be used in combination with the colors mentioned in the first sentence of Paragraph 1 where a light-colored pavement does not provide sufficient contrast with the markings.

Guidance:

08A (DE Revision) *Black contrast markings should be used with white edge lines, broken lines, and dotted lines along all concrete roadways (see Figures 3A-1A and 3A-1B).*

08B (DE Revision) *Except as provided in Paragraph 8D, the black contrast marking patterns shown in Figure 3A-1A should be used along all interstates, freeways, and expressways with concrete pavement.*

08C (DE Revision) *The black contrast marking patterns shown in Figure 3A-1B should be used along all conventional roadways with concrete pavement.*

Option:

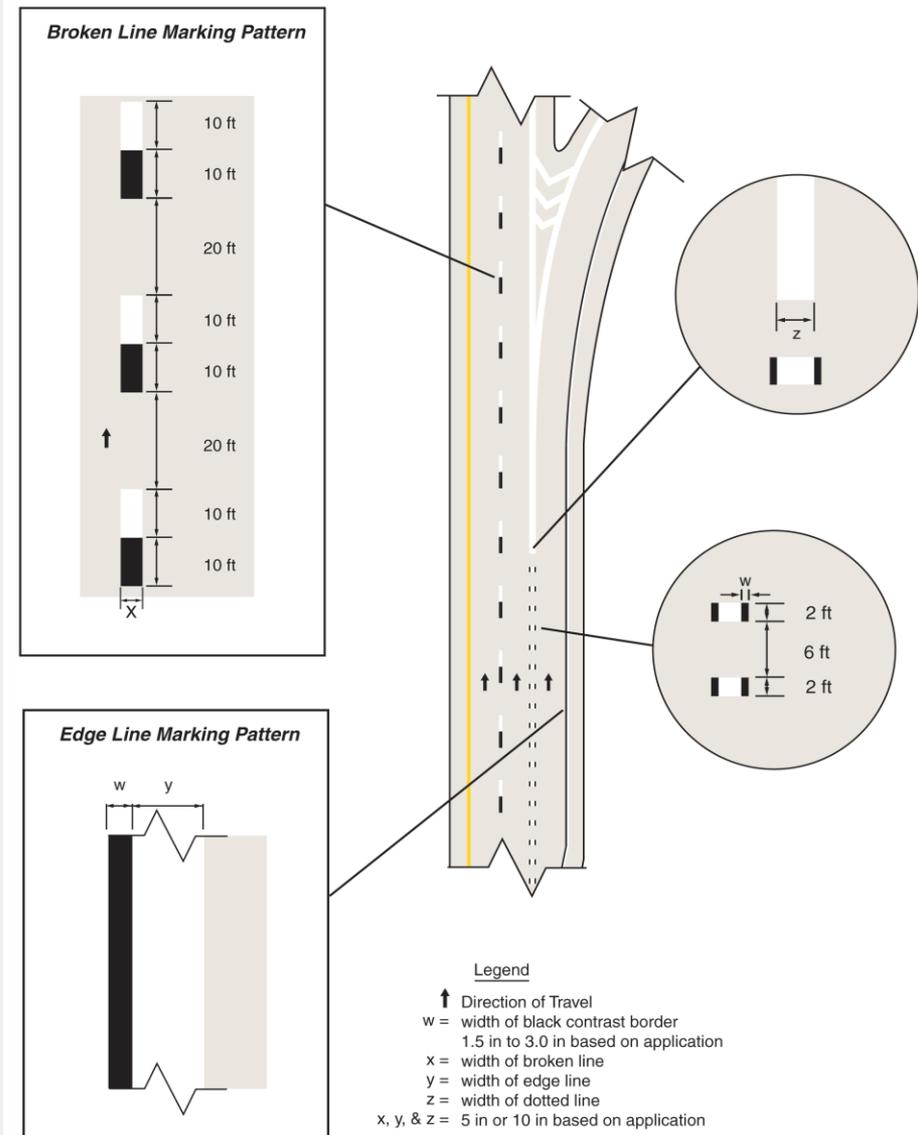
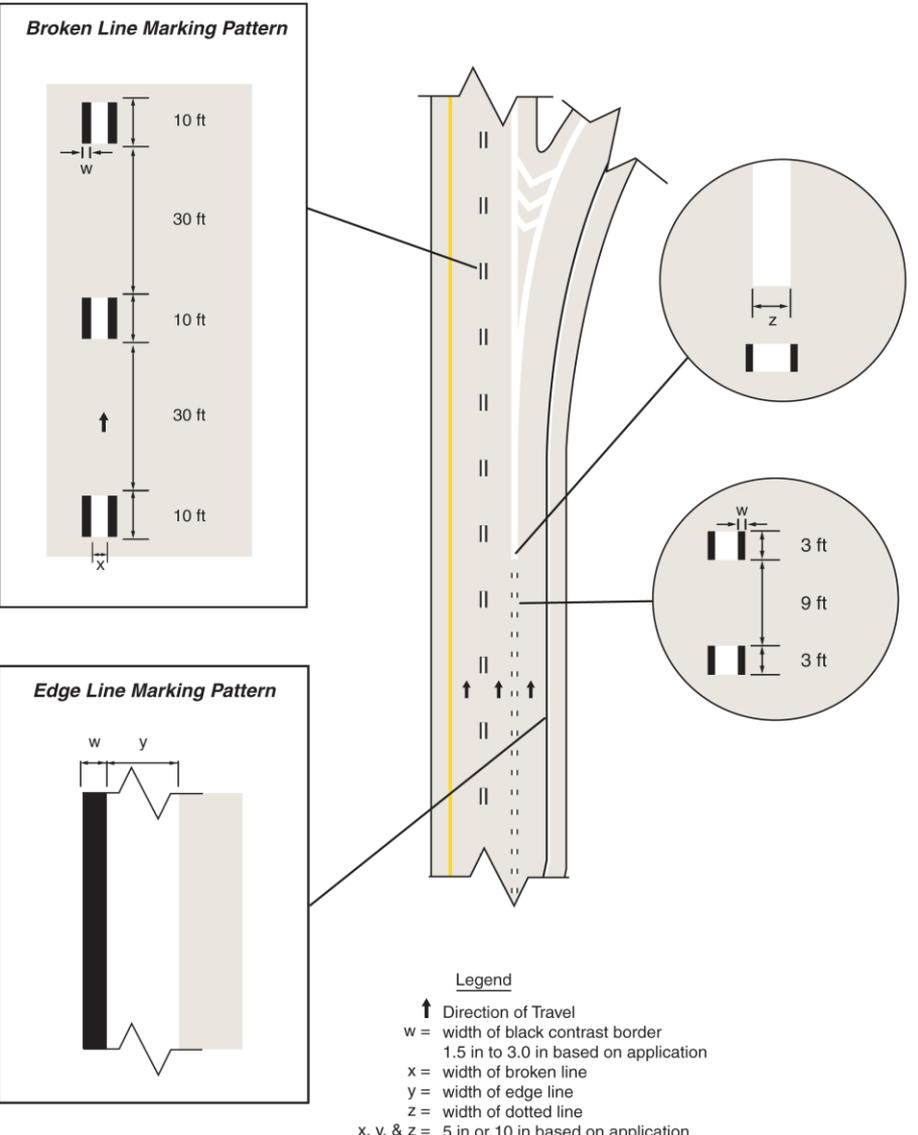
08D (DE Revision) *The black contrast marking patterns shown in Figure 3A-1B may be used along interstates, freeways, and expressways with concrete pavement based on engineering judgment.*

- *DE Guidance:*
 - *Black contrast markings with white edge lines, broken lines, and dotted lines along all concrete roads*
 - *Figure 3A-1A: Interstates, freeways, and expressways*
 - *Figure 3A-1B: Conventional roads*
- *DE Option:*
 - *Figure 3A-1B may be used for interstates, freeways, and expressways based on engineering judgment*

Section 3A.05 Colors

**Figure 3A-1A. Black Contrast Marking Patterns on Interstates, Freeways or Expressways
(Delaware Revision)**

**Figure 3A-1B. Black Contrast Marking Patterns on All Other Roads
(Non-Interstates, Freeways or Expressways)
(Delaware Revision)**



Lane lines on all concrete roads should include black contrast markings

White-on-black edge lines are no longer the preferred application due to maintenance concerns; follow side-by-side application in Figures 3A-1A and 3A-1B

SR 1 southbound approaching Exit 119 (N. Smyrna)

Leading black contrast broken lane lines installed along Elkton Rd to enhance the conspicuity of the markings



Elkton Rd westbound approaching Casho Mill Rd

Standard:

01 The general functions of longitudinal lines shall be:

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

- **Double lines indicate crossing and passing prohibitions**
- **Solid lines discourage or prohibit crossing**
- **Broken lines delineate lane assignments and passing zones**
- **Dotted lines (“skips”) inform motorists of changes in lane conditions**

- 02 The widths and patterns of longitudinal lines shall be as follows:
- A. Normal line—4 to 6 inches wide.
 - B. Wide line—at least twice the width of a normal line.
 - C. Double line—two parallel lines separated by a discernible space.
 - D. Broken line—normal line segments separated by gaps.
 - E. Dotted line—noticeably shorter line segments separated by shorter gaps than used for a broken line. The width of a dotted line extension shall be at least the same as the width of the line it extends.

Guidance:

- 02A (DE Revision) Double lines should consist of two parallel lines separated by a width of 6 inches.
- 02B (DE Revision) A normal line along all state-maintained roadways should be 5 inches wide.
- 02C (DE Revision) A wide line along all state-maintained roadways should be 10 inches wide.
- 03A (DE Revision) See Section 6F.78 for provisions regarding the application of temporary pavement markings.

- **Wide line – at least twice normal width**
- *DE Guidance:*
 - Double lines have 6" separation
 - 5" normal lines along all state-maintained roads
 - 10" wide lines along all state-maintained roads
- DE Support: Refer to Part 6 for temporary markings

Guidance:

04 *Broken lines should consist of 10-foot line segments and 30-foot gaps, or dimensions in a similar ratio of line segments to gaps as appropriate for traffic speeds and need for delineation.*

Support:

05 *Patterns for dotted lines depend on the application (see Sections 3B.04 and 3B.08.)*

Guidance:

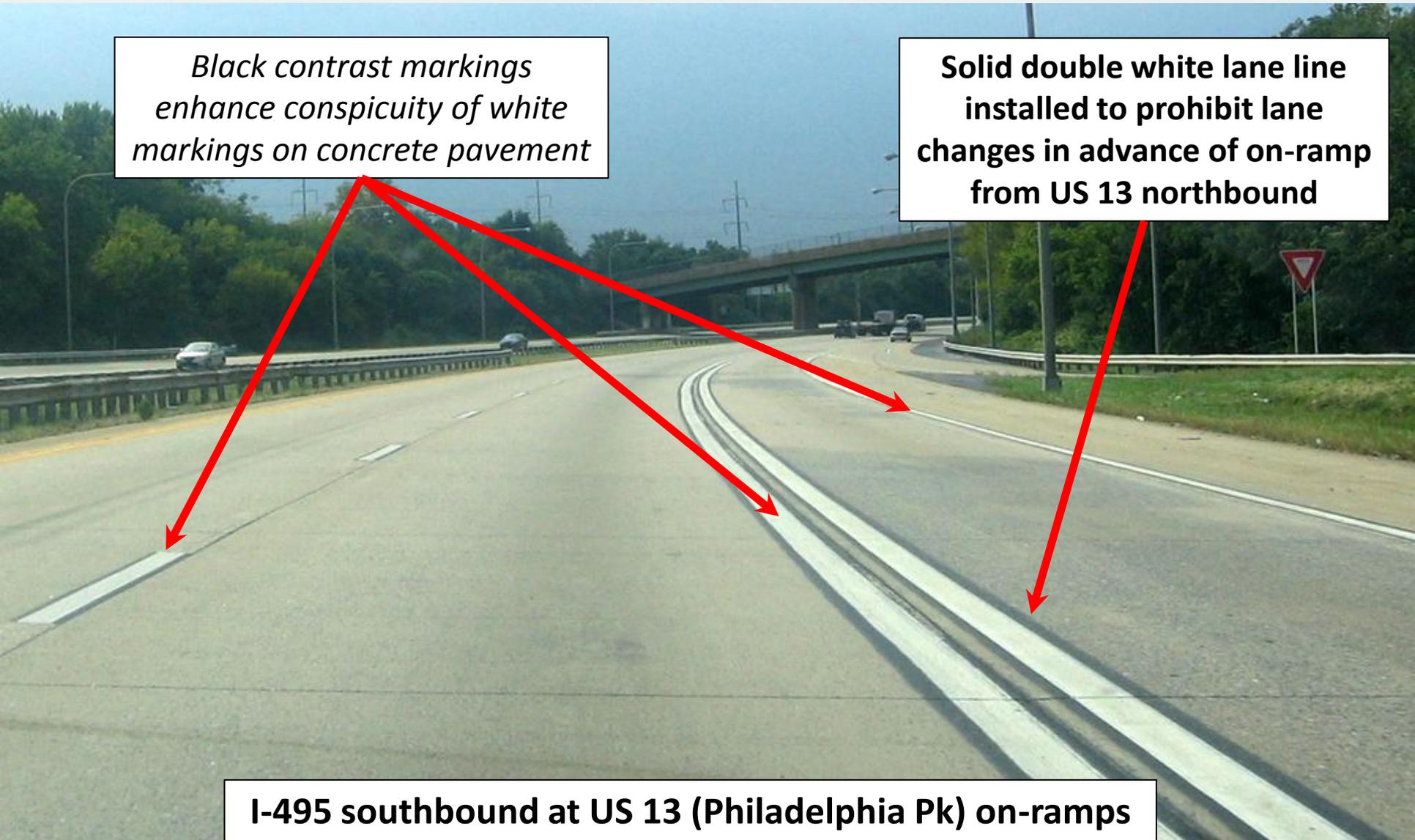
06 *(DE Revision) A dotted line for line extensions along interstates, freeways, and expressways should consist of 3-foot line segments and 9-foot gaps. A dotted line for line extensions along all other roadways should consist of 2-foot line segments and 6-foot gaps, except at roundabouts. Line extensions used at roundabouts should consist of 2-foot line segments and 2-foot gaps.*

- *Broken lines consist of 10' lines with 30' gaps*
- *DE Guidance:*
 - *3' lines with 9' gaps for dotted lines on interstates, freeways, and expressways*
 - *2' lines with 6' gaps for dotted lines on conventional roads*
 - *2' lines with 2' gaps for line extensions at roundabouts*

Black contrast markings enhance conspicuity of white markings on concrete pavement

Solid double white lane line installed to prohibit lane changes in advance of on-ramp from US 13 northbound

I-495 southbound at US 13 (Philadelphia Pk) on-ramps



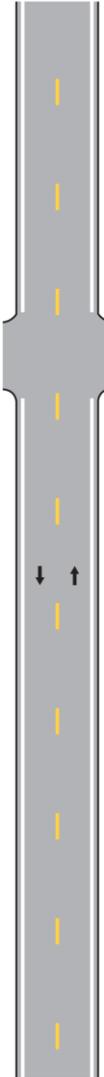
Standard:

- 04 The center line markings on two-lane, two-way roadways shall be one of the following as shown in Figure 3B-1:
- A. Two-direction passing zone markings consisting of a normal broken yellow line where crossing the center line markings for passing with care is permitted for traffic traveling in either direction;
 - B. One-direction no-passing zone markings consisting of a double yellow line, one of which is a normal broken yellow line and the other is a normal solid yellow line, where crossing the center line markings for passing with care is permitted for the traffic traveling adjacent to the broken line, but is prohibited for traffic traveling adjacent to the solid line; or
 - C. Two-direction no-passing zone markings consisting of two normal solid yellow lines where crossing the center line markings for passing is prohibited for traffic traveling in either direction.
- 05 A single solid yellow line shall not be used as a center line marking on a two-way roadway.
- 06 The center line markings on undivided two-way roadways with four or more lanes for moving motor vehicle traffic always available shall be the two-direction no-passing zone markings consisting of a solid double yellow line as shown in Figure 3B-2.

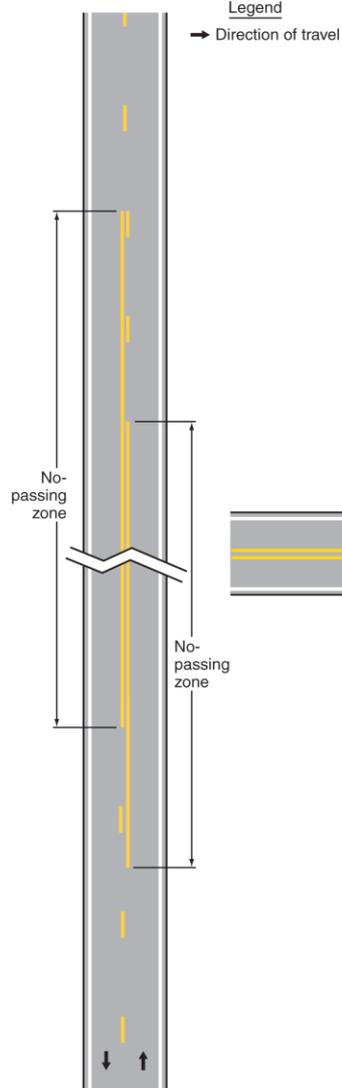
- **Two-lane, two-way roads follow Figure 3B-1**
- **Single solid yellow center lines prohibited on two-way roads**
- **Multi-lane roads follow Figure 3B-2**

Figure 3B-1. Examples of Two-Lane, Two-Way Marking Applications (Delaware Revision)

A - Typical two-lane, two-way marking with passing permitted in both directions



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



C - Typical two-lane, two-way marking approaching an intersection

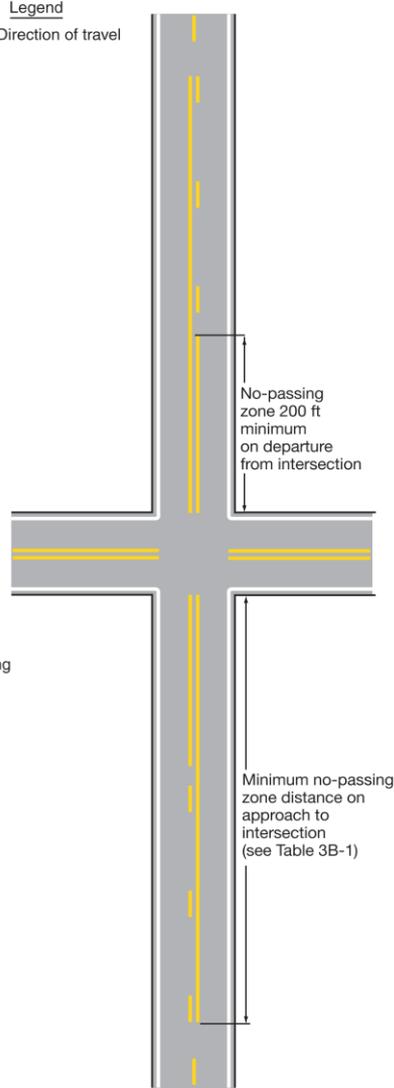
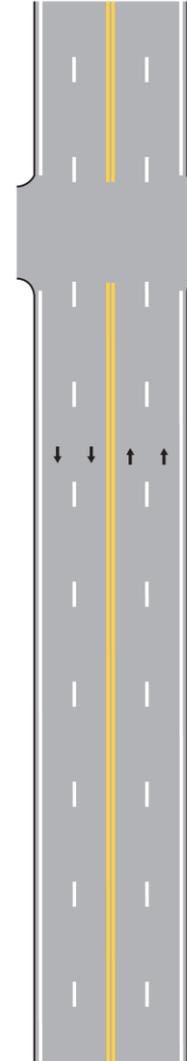
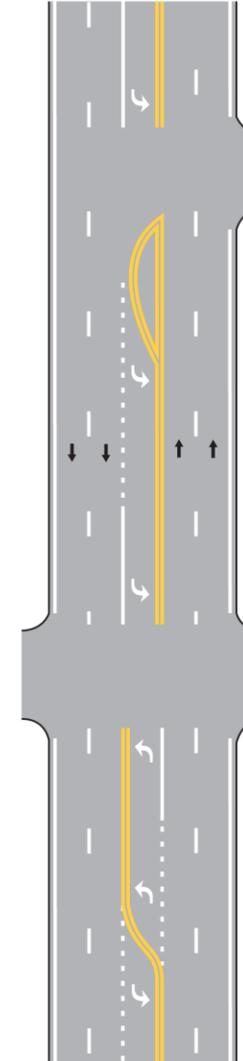


Figure 3B-2. Examples of Four-or-More Lane, Two-Way Marking Applications (Delaware Revision)

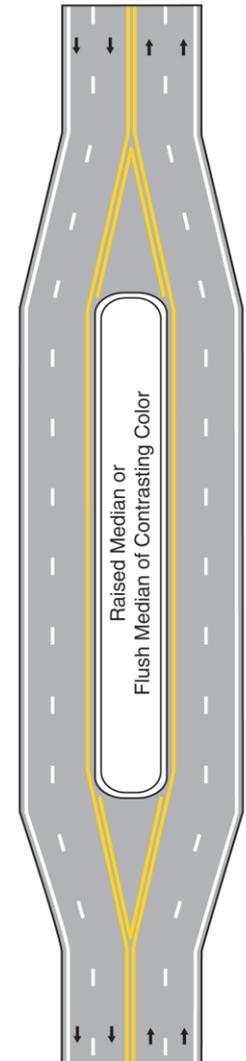
A - Typical multi-lane, two-way marking



B - Typical multi-lane, two-way marking with single lane left turn channelization



C - Typical multi-lane, two-way marking with raised median or flush median of contrasting color



Legend

→ Direction of travel

Raised Median or
Flush Median of Contrasting Color

Standard:

09 (DE Revision) Center line markings shall be placed on all paved roadways that have a traveled way of 19 feet or more in width and an ADT of 500 vehicles per day or greater. Center line markings shall also be placed on all paved two-way streets or highways that have three or more lanes for moving motor vehicle traffic.

Guidance:

10 (DE Revision) Center line markings should be placed on surface-treated roadways that have a traveled way of 19 feet or more in width and an ADT of 1,000 vehicles per day or greater.

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

11A (DE Revision) Center line markings should not be placed on subdivision roadways unless engineering judgment indicates such a need.

Option:

12 (DE Revision) Center line markings may be placed on paved roadways that are 19 feet or more in width and have an ADT less than 500 vehicles per day where engineering judgment indicates such a need.

12A (DE Revision) Center line markings may be placed on surface-treated roadways that are 19 feet or more in width and have an ADT less than 1,000 vehicles per day where engineering judgment indicates such a need.

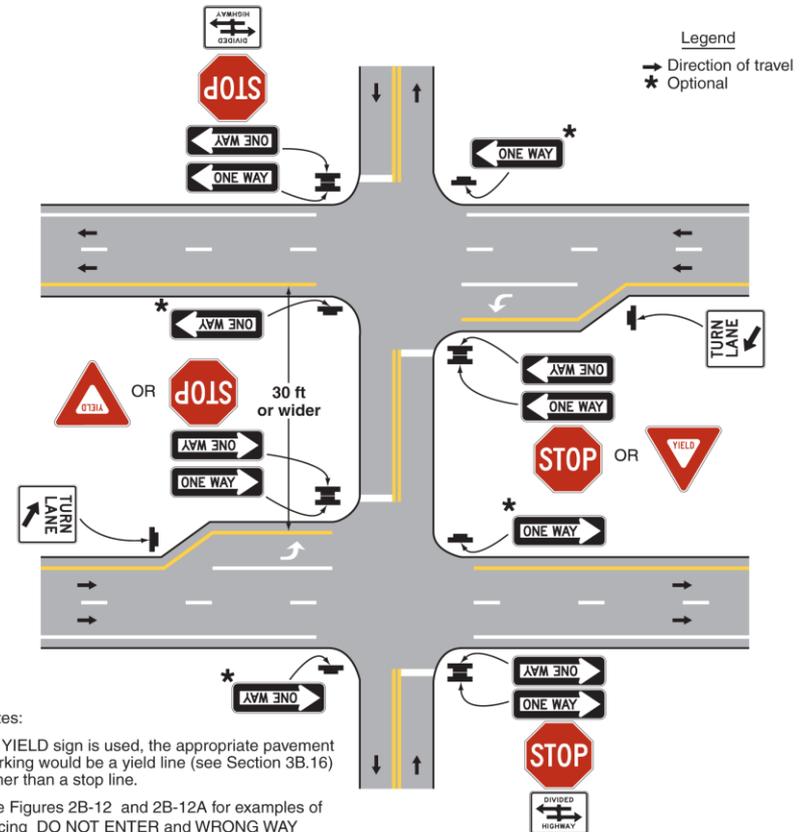
- **DE Standard: Paved roads with traveled way $\geq 19'$ and ADT ≥ 500**
- *DE Guidance:*
 - Surface-treated roads with traveled way $\geq 19'$ and ADT $\geq 1,000$
 - Engineering judgment where traveled way $< 19'$
 - Should not be placed on subdivisions streets unless engineering judgment indicates a need
- **DE Option:**
 - Paved roads with traveled way $\geq 19'$ and ADT < 500 based on engineering judgment
 - Surface-treated roads with traveled way $\geq 19'$ and ADT $< 1,000$ based on engineering judgment

11B (DE Revision) Center line markings should be installed within median crossovers along divided highways where the median width is greater than or equal to 50 feet (see Figure 2B-15).

12B (DE Revision) Center line markings may be installed within median crossovers along divided highways where the median width is greater than or equal to 30 feet and less than 50 feet where engineering judgment indicates such a need (see Figure 2B-15).

- *DE Guidance: Installed within median crossovers where median width $\geq 50'$*
- DE Option: Installed within median crossovers where median width $\geq 30'$ and $< 50'$ based on engineering judgment

Figure 2B-15. ONE WAY, TURN LANE, and Divided Highway Crossing Signing for Median Openings along Divided Highways with Median Widths of 30 Feet or Wider (Delaware Revision)



Double yellow center line should be placed in the median if the median width is greater than or equal to 50 ft. Engineering judgement should be used to determine whether a double yellow center line should be placed in the median if the median width is greater than or equal to 30 ft and less than 50 ft.

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

Guidance:

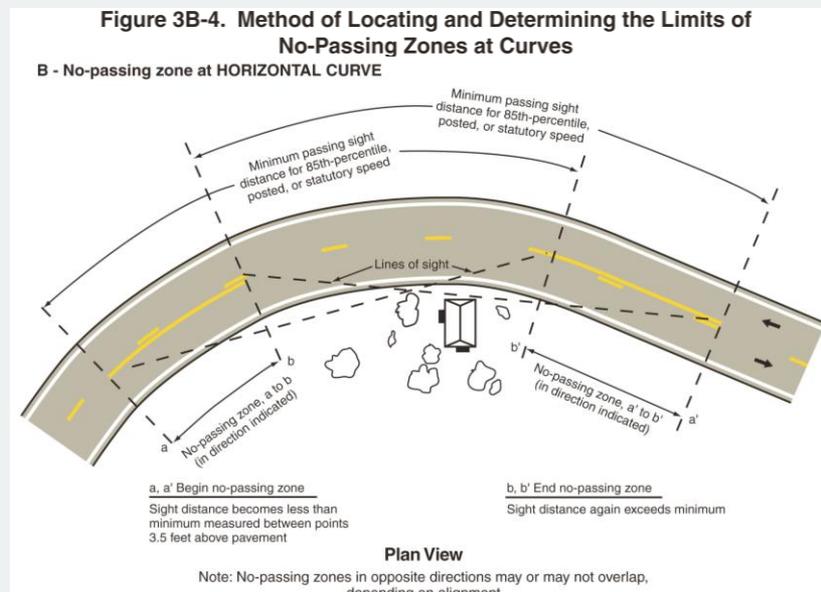
07 Where the distance between successive no-passing zones is less than 400 feet, no-passing markings should connect the zones.

Standard:

08 Where center line markings are used, no-passing zone markings shall be used on approaches to grade crossings in compliance with Section 8B.27.

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

- Used where passing sight distance < Table 3B-1
- Assumed eye and object heights 3.5' above road
- Continuous no-passing zone if distance between two successive zones < 400'
- Required on approaches to rail crossings



Guidance:

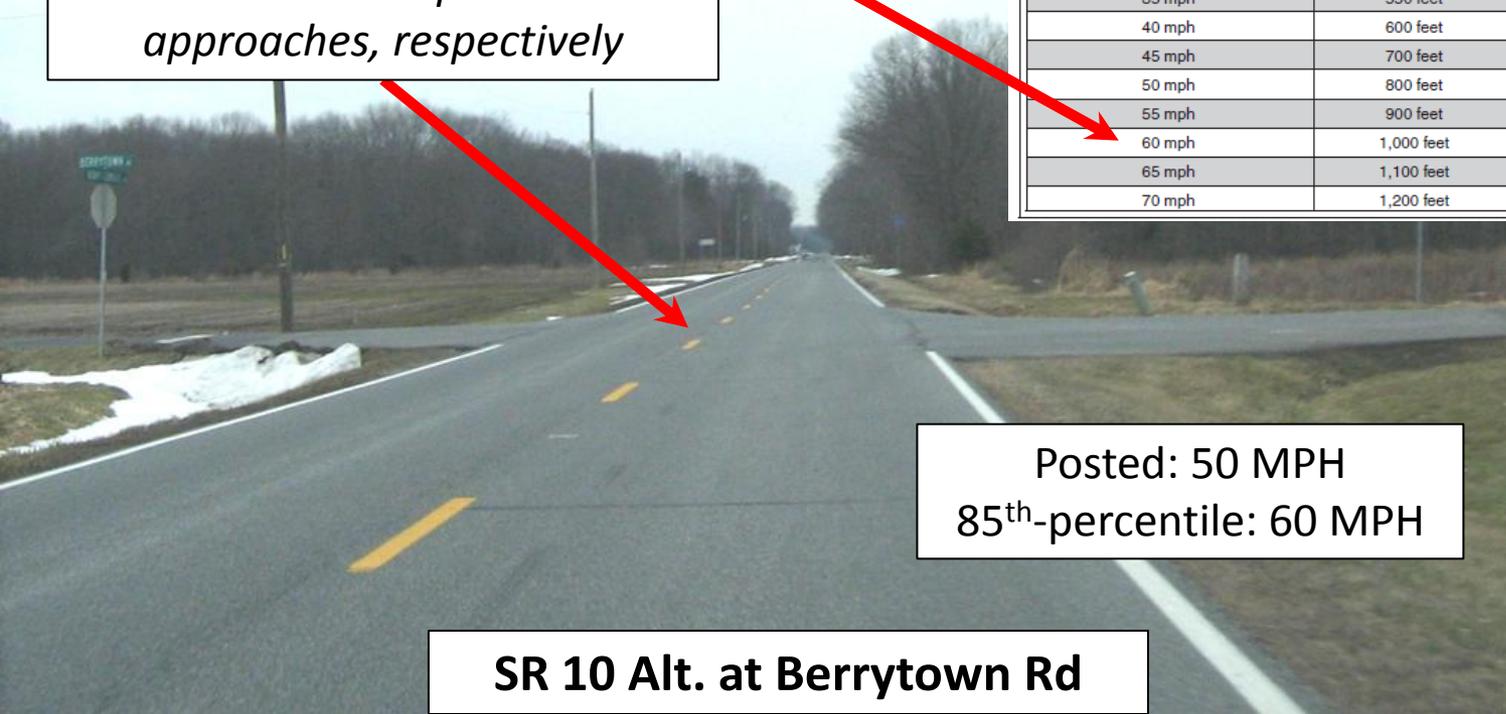
04A (DE Revision) Where center line markings are used, no-passing zone markings on all approaches to an intersection should be based on the distances shown in Table 3B-1. Where center line markings are used, no-passing zone markings should extend a minimum of 200 feet on all departure legs of an intersection (see Figure 3B-1).

- DE Guidance: No-passing zone \geq Table 3B-1 on approach to intersection and $\geq 200'$ on departure

200' (min.) and 1,000' (min.) no-passing zones should be installed on the departures and approaches, respectively

Table 3B-1. Minimum Passing Sight Distances for No-Passing Zone Markings

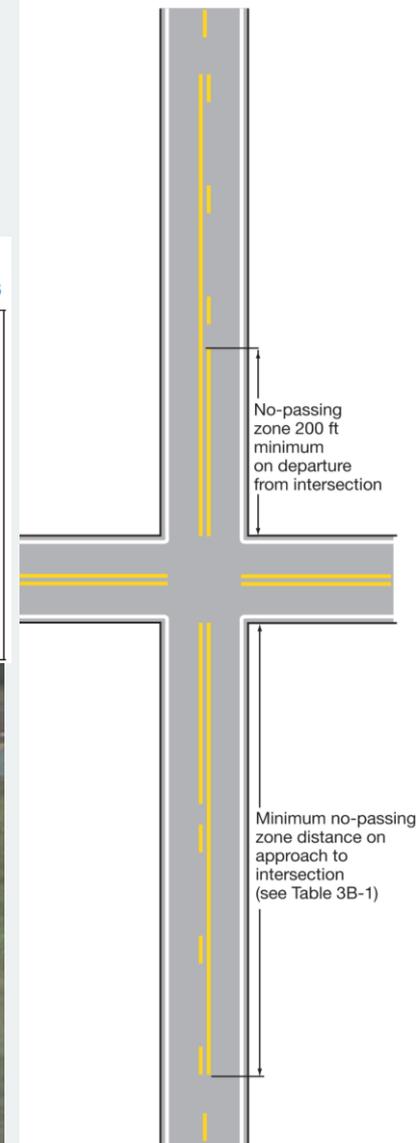
85th-Percentile or Posted or Statutory Speed Limit	Minimum Passing Sight Distance
25 mph	450 feet
30 mph	500 feet
35 mph	550 feet
40 mph	600 feet
45 mph	700 feet
50 mph	800 feet
55 mph	900 feet
60 mph	1,000 feet
65 mph	1,100 feet
70 mph	1,200 feet



Posted: 50 MPH
85th-percentile: 60 MPH

SR 10 Alt. at Berrytown Rd

C - Typical two-lane, two-way marking approaching an intersection



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

Guidance:

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

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

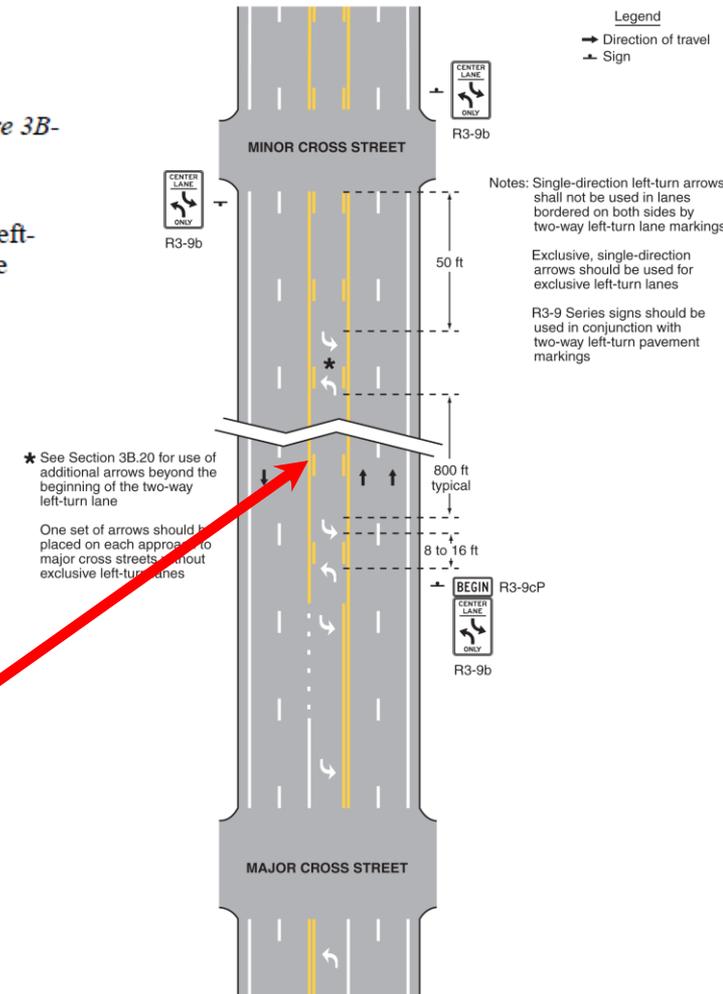
Guidance:

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

Option: **(from Section 3B.20)**

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

Figure 3B-7. Example of Two-Way Left-Turn Lane Marking Applications
(Delaware Revision)



- **Broken (10' lines; 30' gaps) and solid yellow lines for two-way left-turn lanes**
- *Two-way left-turn arrows and Two-Way Left Turn Only signs (R3-9 Series) supplement longitudinal markings*
- *DE Guidance: 800' arrow spacing between cross streets*

Middleford Rd west of US 13

Two-way left-turn arrows should be spaced at 800' intervals between cross streets



R3-9b

17 two-way left-turn arrows within 1,600' segment



R3-9b sign should be adjacent to two-way left-turn lane pavement markings

SR 300 west of US 13

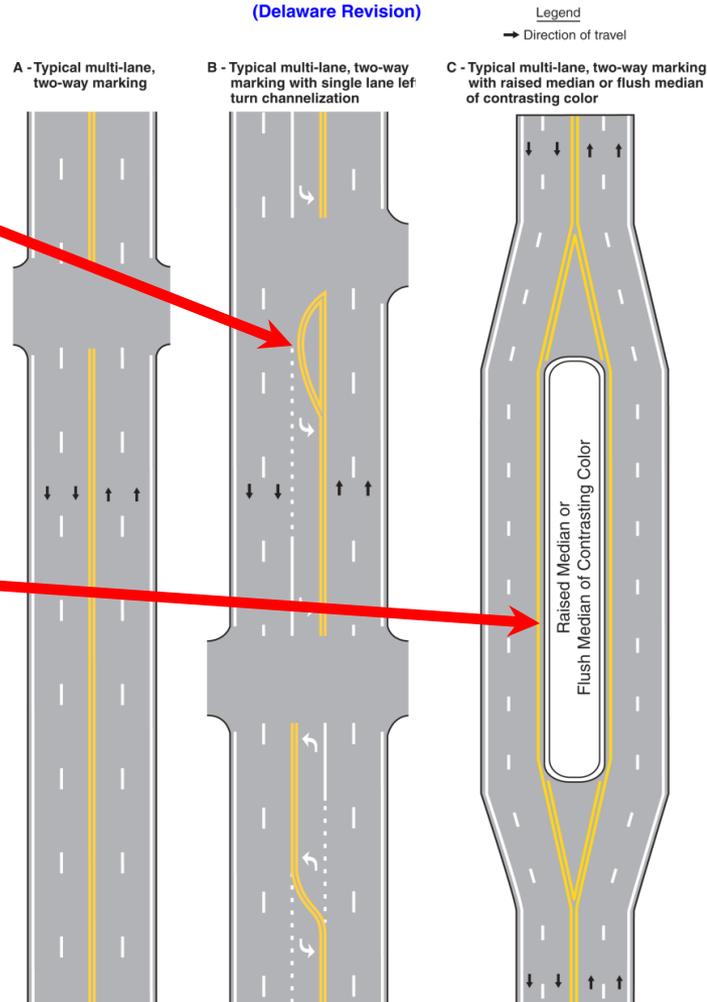


Standard:
 06 If a continuous flush median island formed by pavement markings separating travel in opposite directions is used, two sets of solid double yellow lines shall be used to form the island as shown in Figures 3B-2 and 3B-5. Other markings in the median island area shall also be yellow, except crosswalk markings which shall be white (see Section 3B.18).

Guidance:
 06A (DE Revision) A normal solid yellow edge line should be used adjacent to a raised median or flush median of contrasting color (see Figure 3B-2).

- **Two sets of solid double yellow center lines shall form flush medians of the same color**
- *DE Guidance: Solid single yellow edge lines surround raised or flush medians of contrasting color*

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



Milltown Rd at Grendon Dr



CORRECT

Two sets of solid double yellow center lines shall form flush medians of the same color regardless of the use of optional crosshatch markings



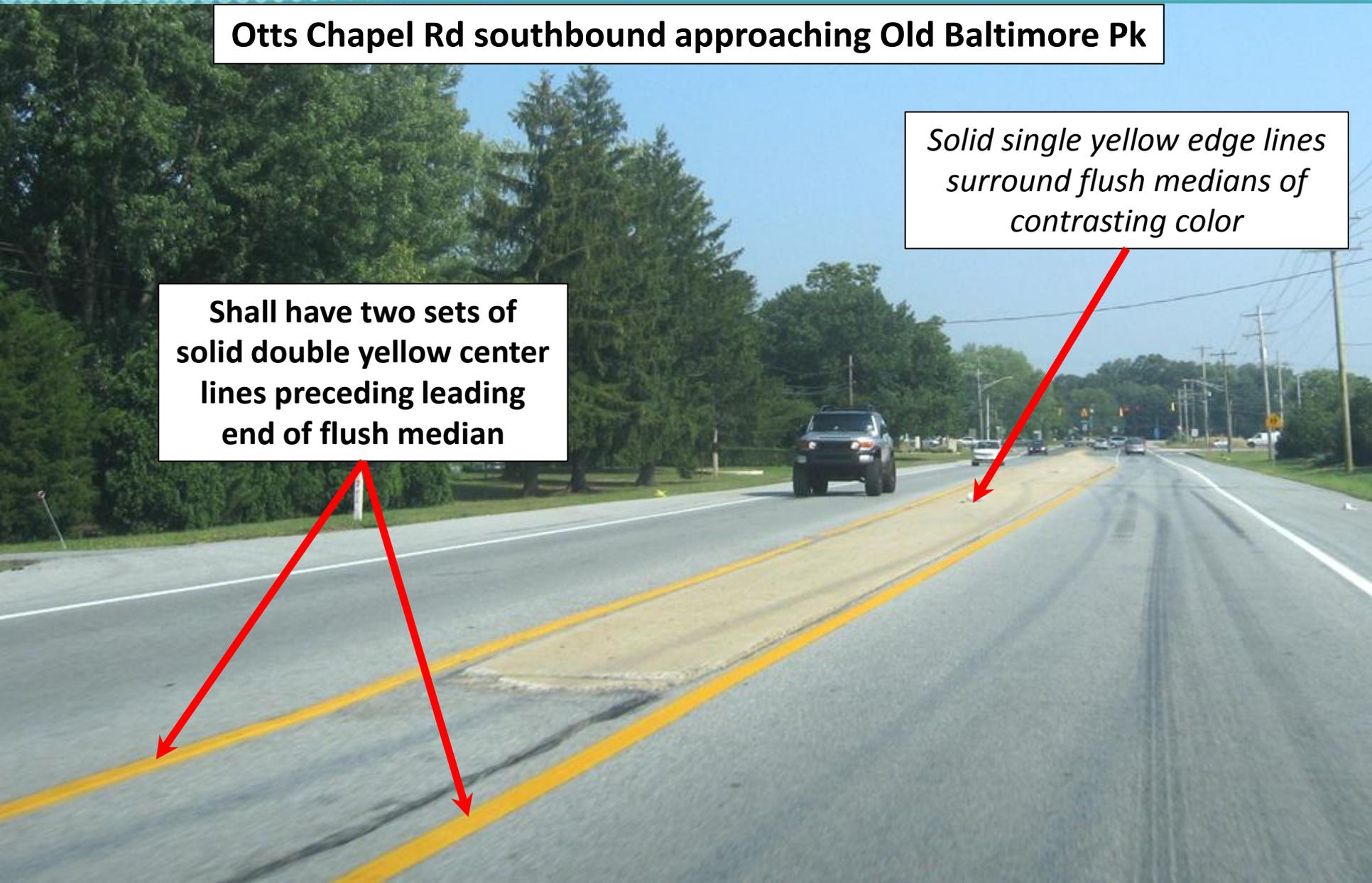
SR 72 south of Old Baltimore Pk

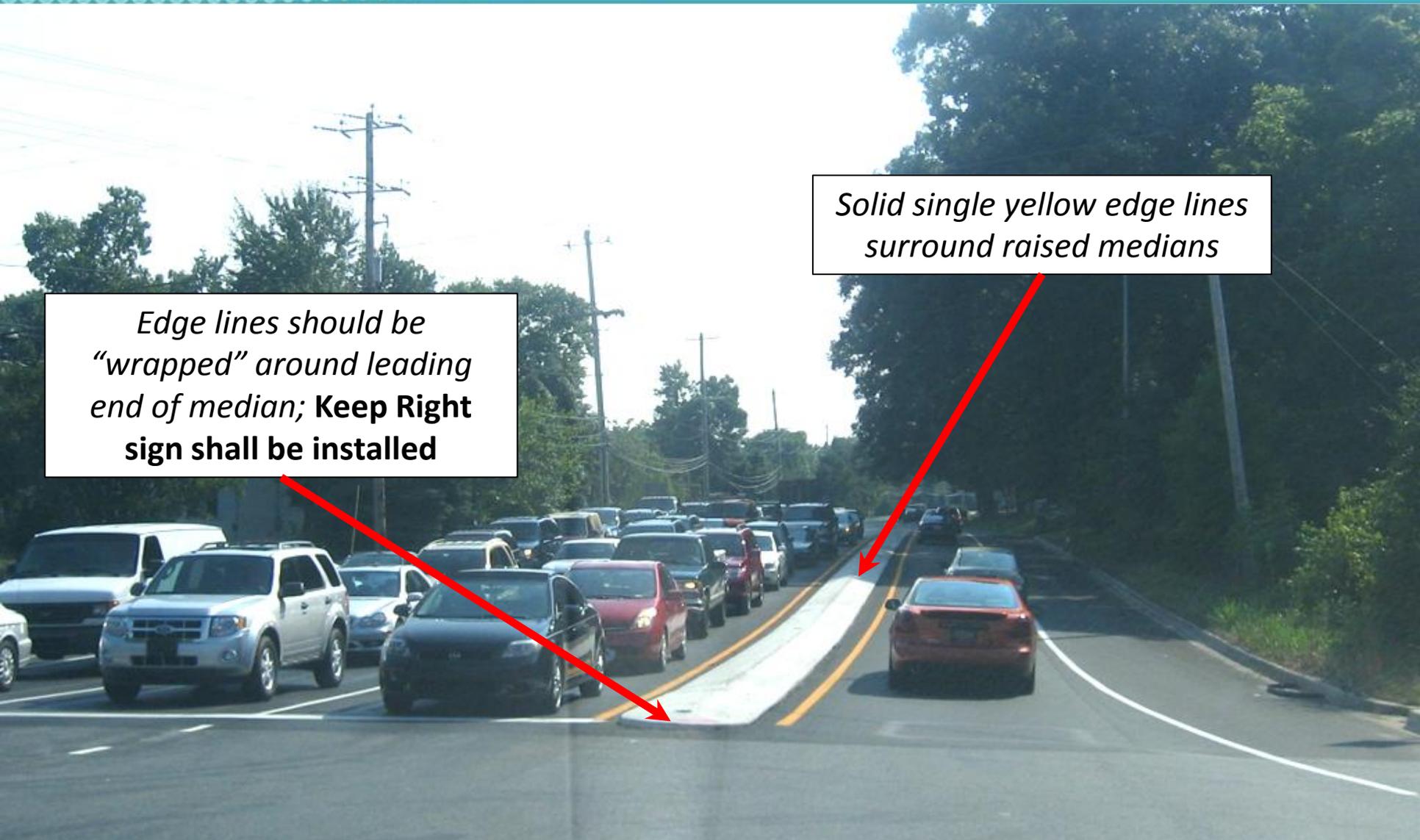
INCORRECT

Otts Chapel Rd southbound approaching Old Baltimore Pk

*Solid single yellow edge lines
surround flush medians of
contrasting color*

**Shall have two sets of
solid double yellow center
lines preceding leading
end of flush median**





*Edge lines should be “wrapped” around leading end of median; **Keep Right** sign shall be installed*

Solid single yellow edge lines surround raised medians

Old Baltimore Pk at SR 896, west leg of intersection

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

Guidance:

03 Lane line markings should be used on all roadways that are intended to operate with two or more adjacent traffic lanes in the same direction of travel, except as otherwise required for reversible lanes. Lane line markings should also be used at congested locations where the roadway will accommodate more traffic lanes with lane line markings than without the markings.

17 (DE Revision) Along interstates, freeways, and expressways, the dotted white lane lines that are used for lane drop markings and that are used as a lane line separating through lanes from auxiliary lanes should consist of line segments that are 3 feet in length separated by 9-foot gaps. Along all other roadways, the dotted white lane lines that are used for lane drop markings and that are used as a lane line separating through lanes from auxiliary lanes should consist of line segments that are 2 feet in length separated by 6-foot gaps.

- **Shall be used on interstates and freeways**
- Should be used on all roads to separate traffic in same direction
- DE Guidance:
 - 3' lines with 9' gaps for dotted lane lines on interstates, freeways, and expressways
 - 2' lines with 6' gaps for dotted lane lines on conventional roads



Solid and broken (10' lines; 30' gaps) lane lines separating double left-turn lanes

Solid and dotted (2' lines; 6' gaps) lane lines separating left-turn and through/right-turn traffic

Old Baltimore Pk eastbound at SR 896

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

Guidance:

08 (DE Revision) For exit ramps with a parallel deceleration lane, a *wide dotted white line extension* should be installed in the taper area upstream from the full-width deceleration lane as shown in Drawings A and C of Figures 3B-8 and 3B-8A.

09 (DE Revision) For an exit ramp with a tapered deceleration lane, a *wide dotted white line extension* should be installed from the theoretical gore through the taper area such that it meets the edge line at the upstream end of the taper as shown in Drawing B of Figures 3B-8 and 3B-8A.

- **Figure 3B-8, Drawings A and C for parallel deceleration lanes along interstates, freeways, expressways.**

- Figure 3B-8, Drawing B for tapered deceleration lane

- *DE Guidance:*

- 10" wide dotted lane lines for exit ramp deceleration lanes
- Extend through taper

Figure 3B-8A. Examples of Dotted Line and Channelizing Line Applications for Exit Ramp Markings along All Other Roads (Non-Interstates, Freeways and Expressways) (Sheet 1 of 2) (Delaware Revision)

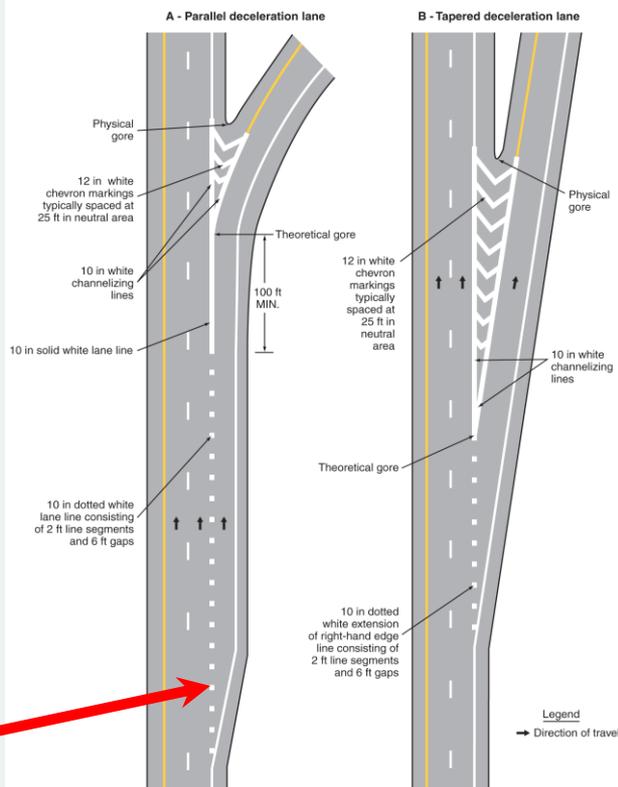
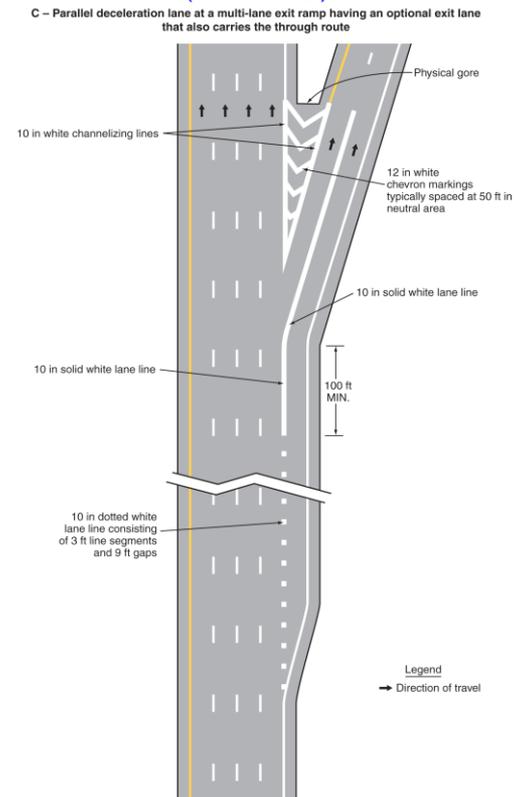


Figure 3B-8. Examples of Dotted Line and Channelizing Line Applications for Exit Ramp Markings along Interstates, Freeways and Expressways (Sheet 2 of 2) (Delaware Revision)



Standard:

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

Guidance:

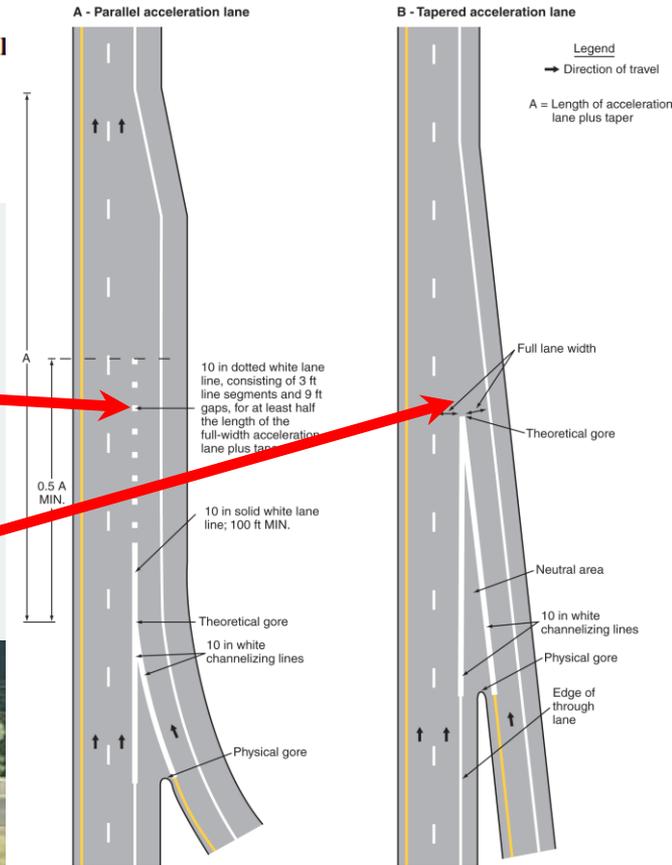
10A (DE Revision) Dotted white lane line markings described in Paragraph 10 should be 10 inches wide along all state-maintained roadways.

- Figure 3B-9, Drawing A for parallel acceleration lanes**

- DE Guidance: 10" wide dotted lane line extending to 0.5A (min.)

- DE Guidance: Omit dotted lane line for tapered acceleration lanes per Figure 3B-9, Drawing B

Figure 3B-9. Examples of Dotted Line and Channelizing Line Applications for Entrance Ramp Markings along Interstates, Freeways and Expressways (Delaware Revision)



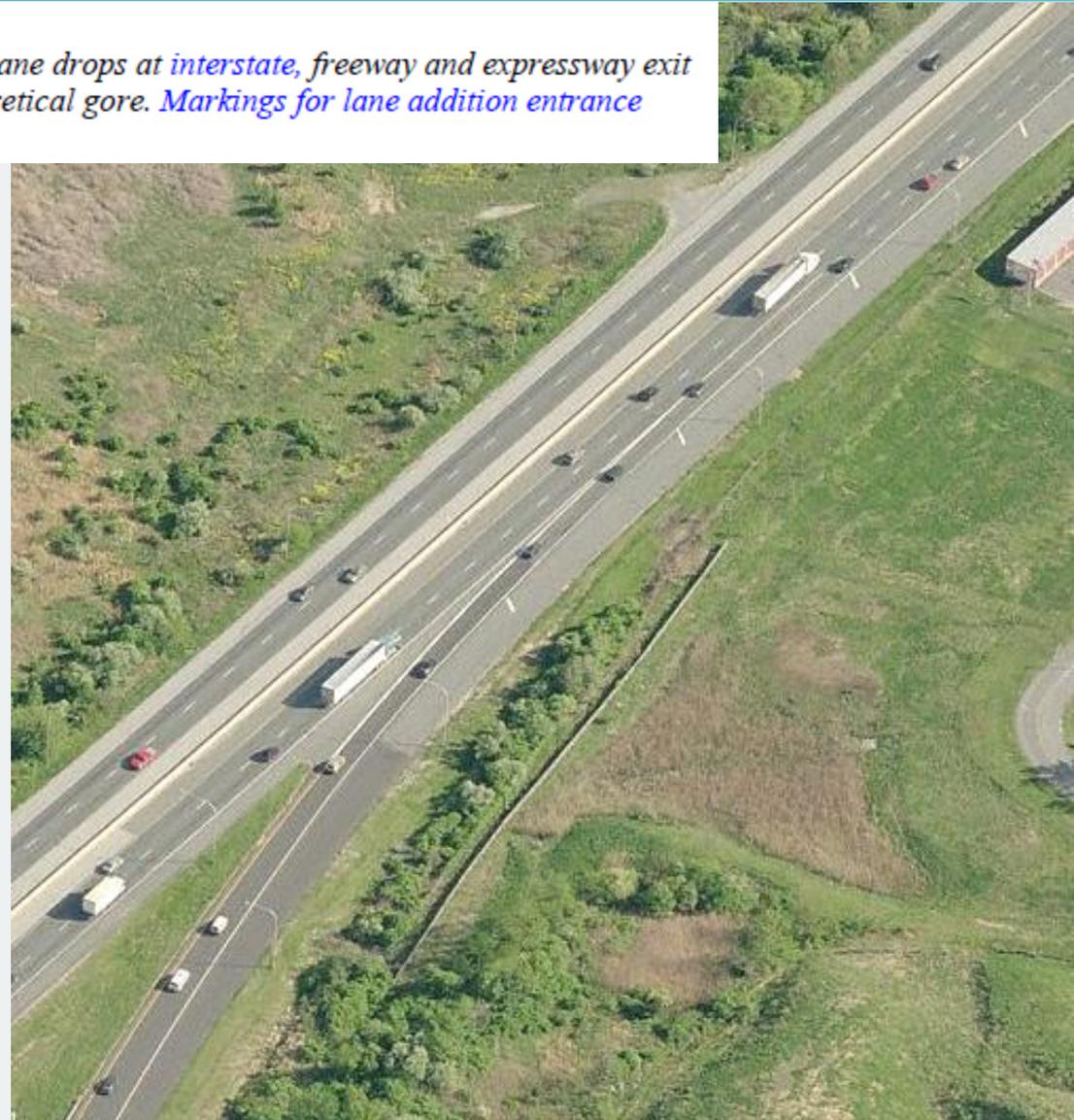
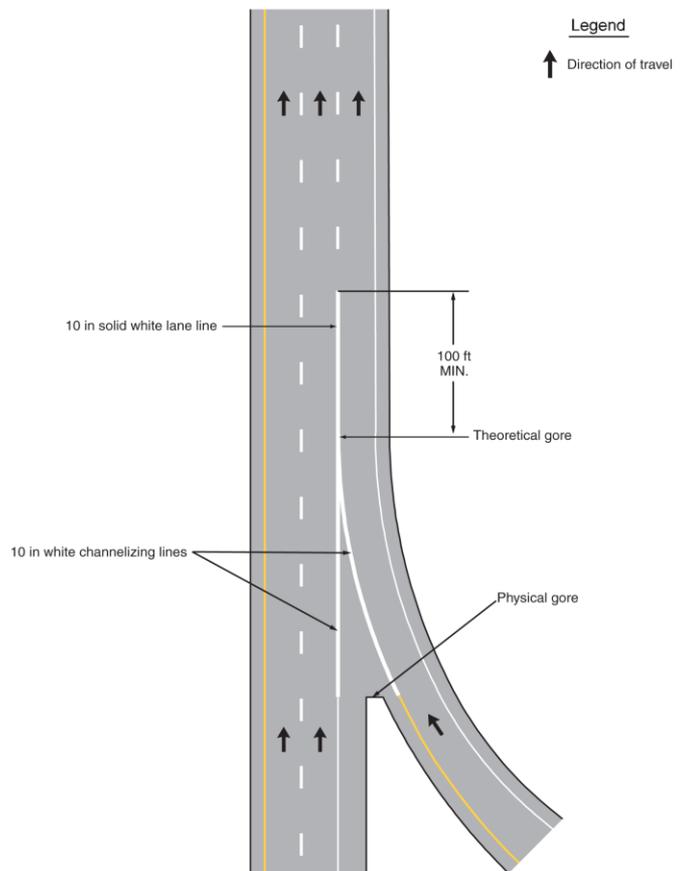
US 113 northbound on-ramp to SR 1 northbound

Guidance:

14 (DE Revision) Lane drop markings used in advance of lane drops at interstate, freeway and expressway exit ramps should begin at least 1/2 mile in advance of the theoretical gore. Markings for lane addition entrance ramps should be installed as shown in Figure 3B-9B.

- DE Guidance: Figure 3B-9B for lane additions

Figure 3B-9B. Example of Channelizing Line Application for Added Lane Entrance Ramp (Delaware Revision)



SR 1 southbound at US 13, Tybouts Corner

Standard:

13 **(DE Revision)** A wide dotted white lane line shall be used:

- A. As a lane drop marking in advance of lane drops at exit ramps to distinguish a lane drop from a normal exit ramp (see Drawings A, B, and C of Figures 3B-10 and 3B-10A),
- B. In advance of route splits with dedicated lanes (see Drawing D of Figures 3B-10 and 3B-10A),
- C. To separate a through lane that continues beyond an interchange from an adjacent auxiliary lane between an entrance ramp and an exit ramp (see Drawing E of Figures 3B-10 and 3B-10A),

Guidance:

14 **(DE Revision)** Lane drop markings used in advance of lane drops at *interstate, freeway and expressway exit ramps should begin at least 1/2 mile in advance of the theoretical gore. Markings for lane addition entrance ramps should be installed as shown in Figure 3B-9B.*

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

- **Wide (10") dotted (3' lines; 9' gaps) lane lines at interstate, freeway, and expressway lane drops, splits, and combination on/off-ramps**
- *Begin 1/2 mile in advance of theoretical gore (min.)*
- *DE Guidance: Begin at first EXIT ONLY lane drop/assignment sign (max.)*



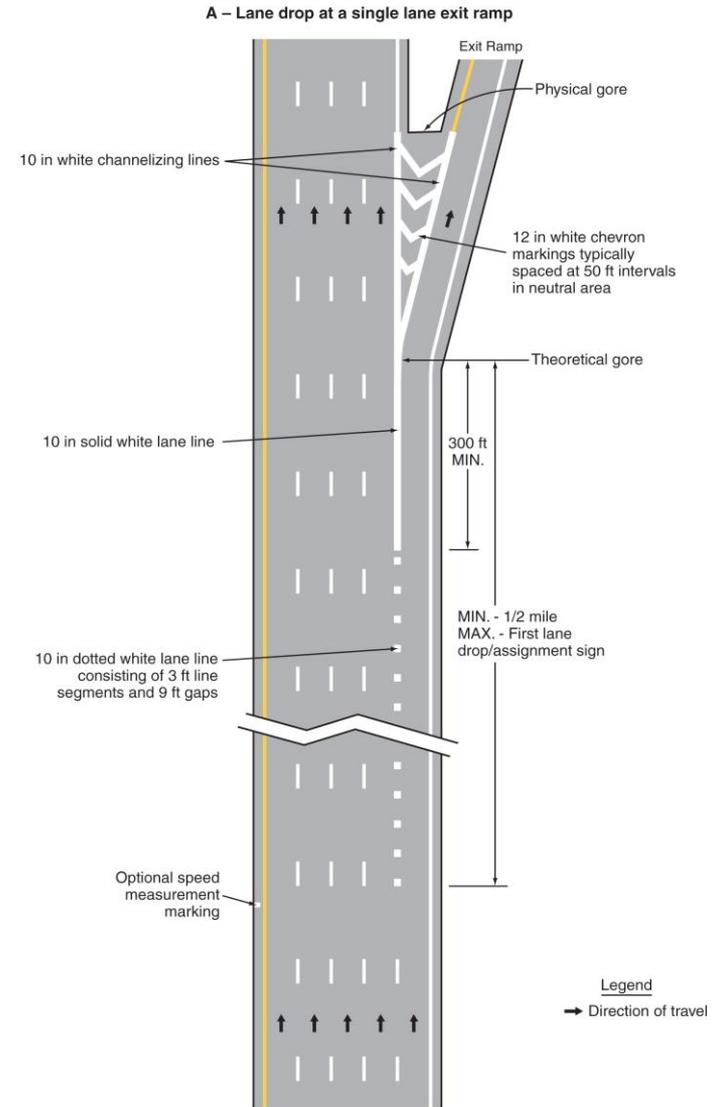
I-95 southbound approaching SR 1



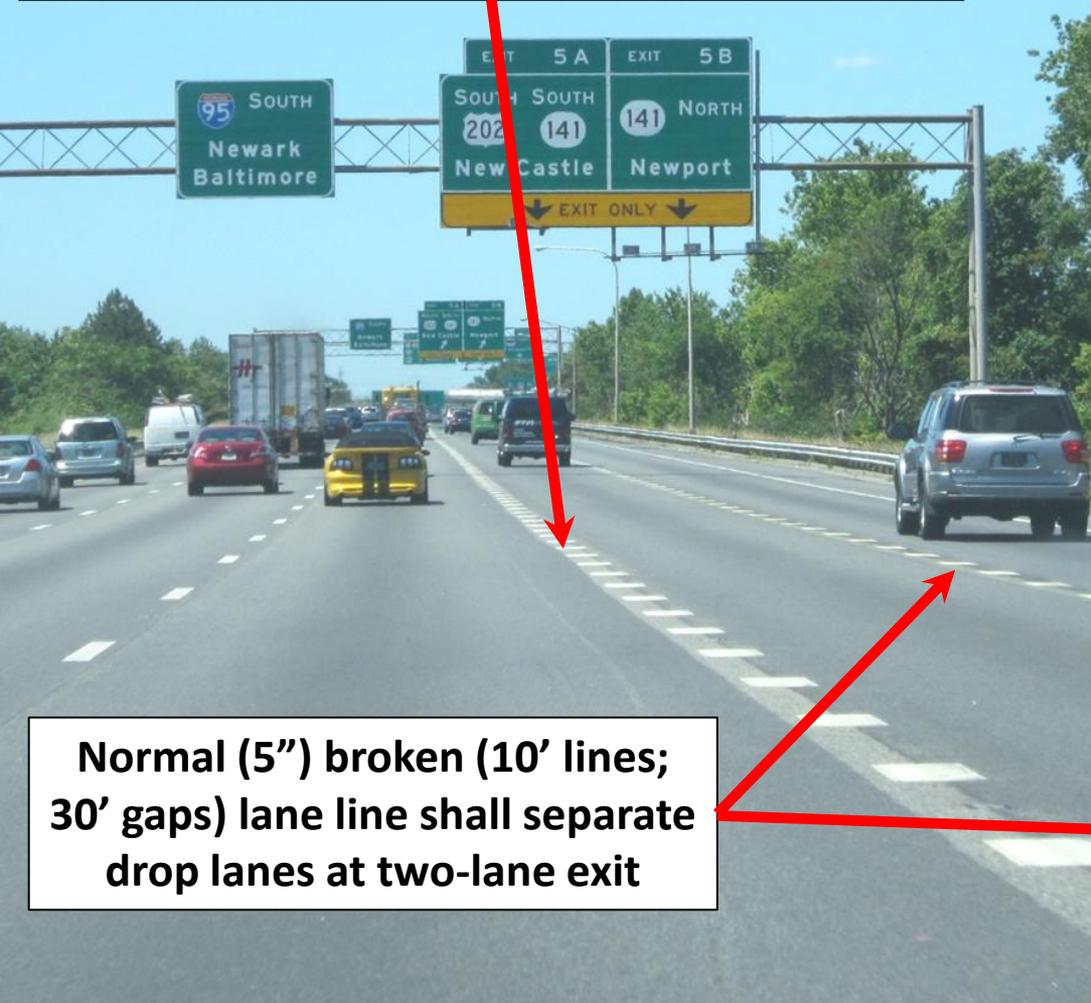
Broken (10' lines; 30' gaps) lane lines shall not be used for lane drops at exit ramps

I-95 southbound approaching Exit 6

Figure 3B-10. Examples of Applications of Interstate, Freeway and Expressway Lane-Drop Markings (Sheet 1 of 5) (Delaware Revision)



Wide (10") dotted (3' lines; 9' gaps) lane line separates drop lanes from through lanes



Normal (5") broken (10' lines; 30' gaps) lane line shall separate drop lanes at two-lane exit

I-95 southbound approaching Exits 5A and 5B

**Figure 3B-10. Examples of Applications of Interstate, Freeway and Expressway Lane-Drop Markings (Sheet 3 of 5)
(Delaware Revision)**

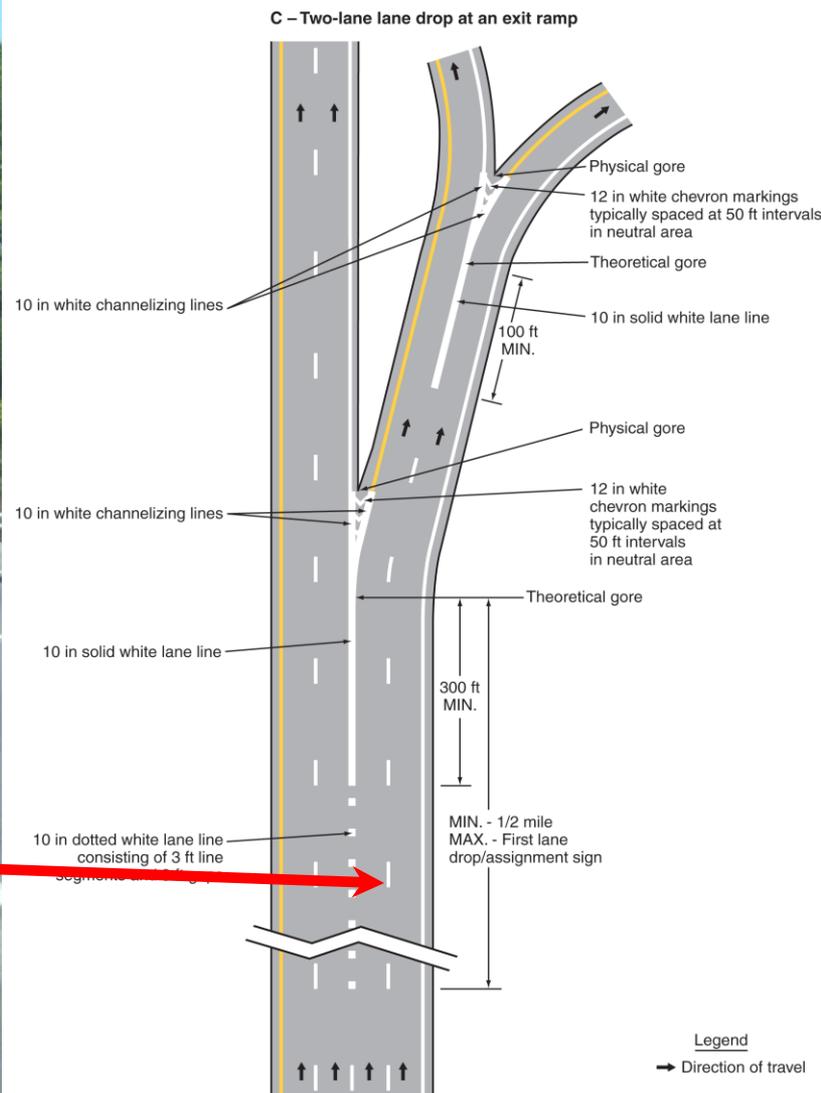


Figure 3B-10. Examples of Applications of Interstate, Freeway and Expressway Lane-Drop Markings (Sheet 2 of 5)
(Delaware Revision)

B – Lane drop at a multi-lane exit ramp having an optional exit lane that also carries the through route

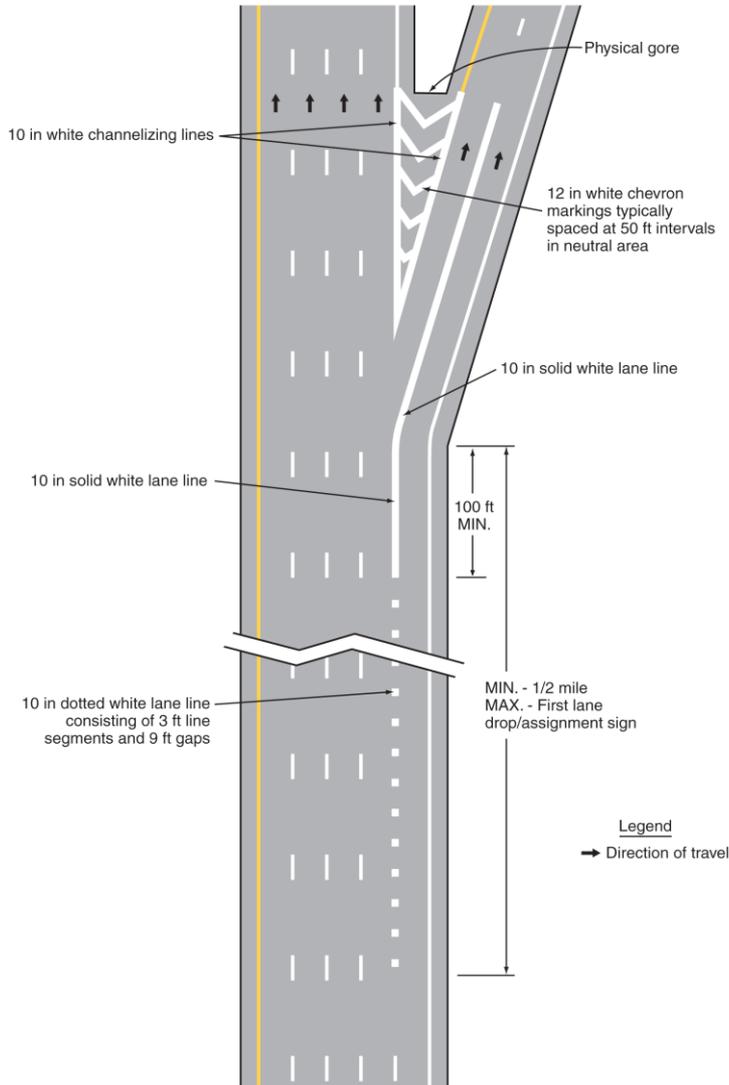
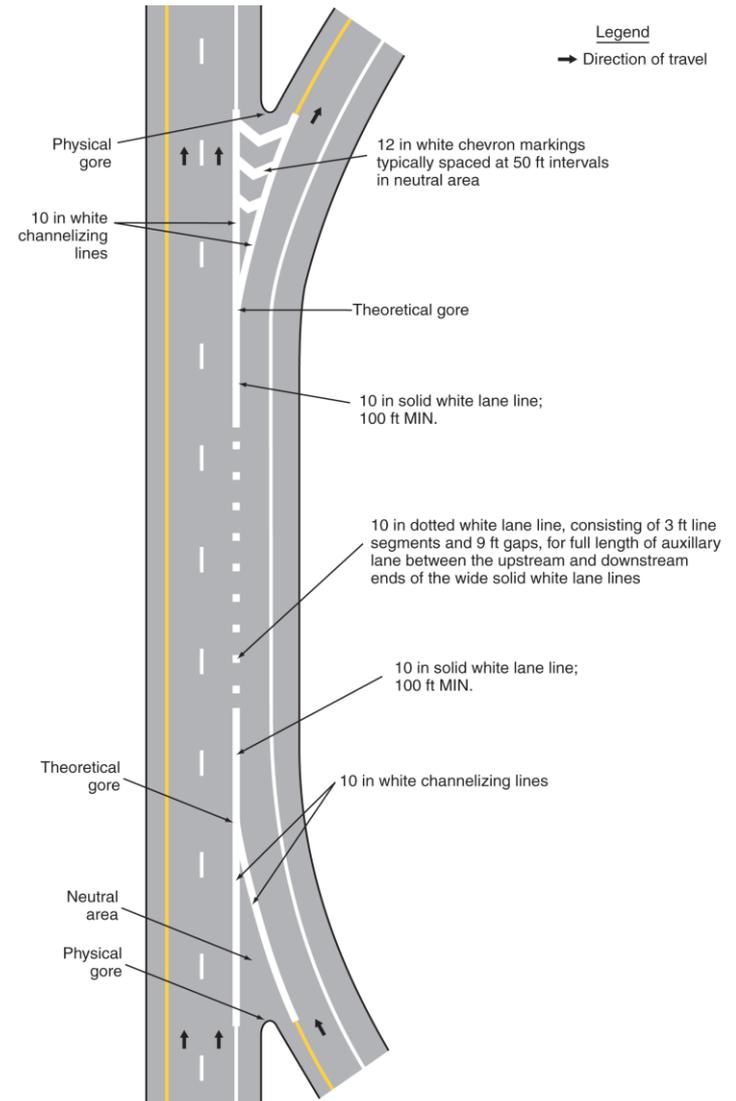


Figure 3B-10. Examples of Applications of Interstate, Freeway and Expressway Lane-Drop Markings (Sheet 5 of 5)
(Delaware Revision)

E – Auxiliary lane, such as at a cloverleaf interchange



Standard:

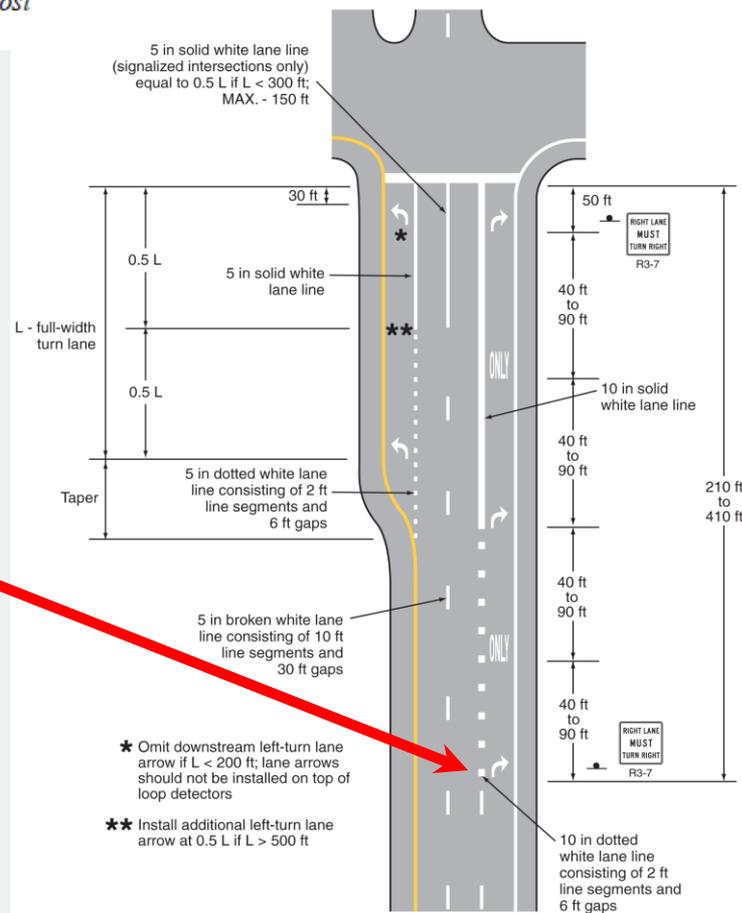
13 (DE Revision) A wide dotted white lane line shall be used:

- D. As a lane drop marking in advance of lane drops at intersections to distinguish a lane drop from an intersection through lane (see Drawings A and B of Figure 3B-11), and
- E. To separate a through lane that continues beyond an intersection from an adjacent auxiliary lane between two intersections (see Drawing C of Figure 3B-11).

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

Figure 3B-11. Examples of Applications of Conventional Road Auxiliary Lane and Lane-Drop Markings (Sheet 1 of 5)
(Delaware Revision)

A – Right-turn lane drop at an intersection
(Posted or 85th-percentile speed < 35 MPH)



- **Wide (10") dotted (2' lines; 6' gaps) lane lines used at lane drops at intersections on conventional roads**

- *DE Guidance: Begin at first regulatory lane drop sign (R3-7)*

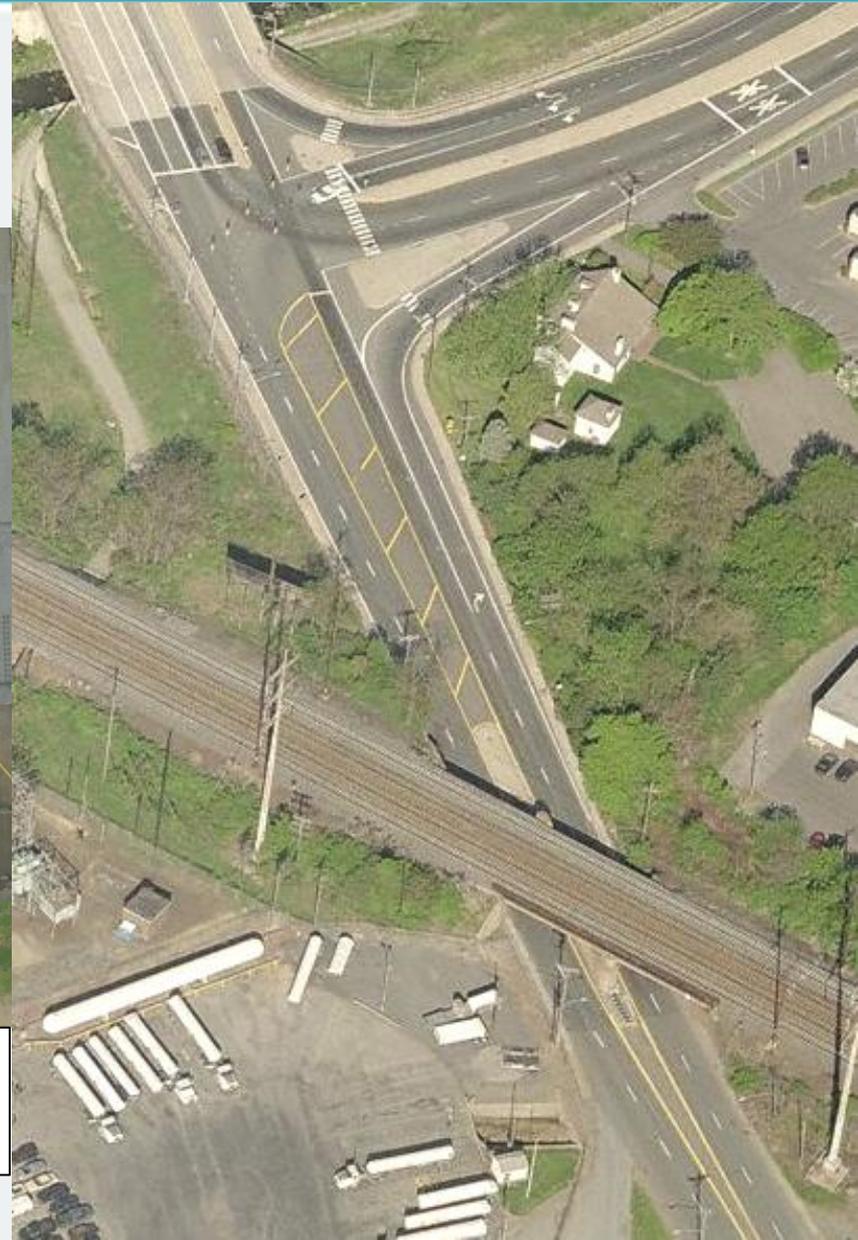


Wide (10") dotted (2' lines; 6' gaps) lane lines, not broken lane lines, shall delineate drop lanes at intersections

Right-turn arrow and R3-7 sign installed; *should also include ONLY marking*

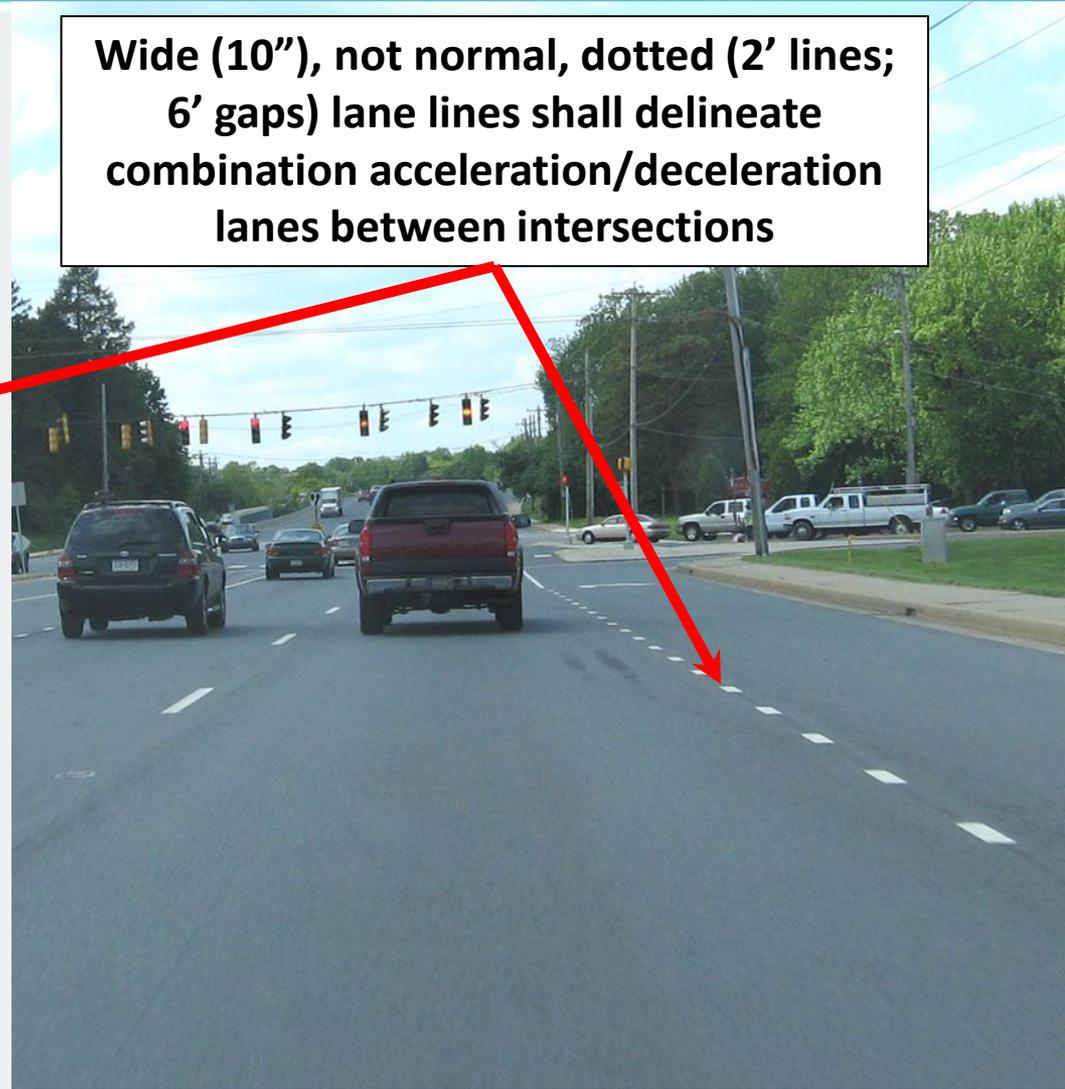


US 13 (Philadelphia Pk) southbound approaching SR 92





Wide (10"), not normal, dotted (2' lines; 6' gaps) lane lines shall delineate combination acceleration/deceleration lanes between intersections



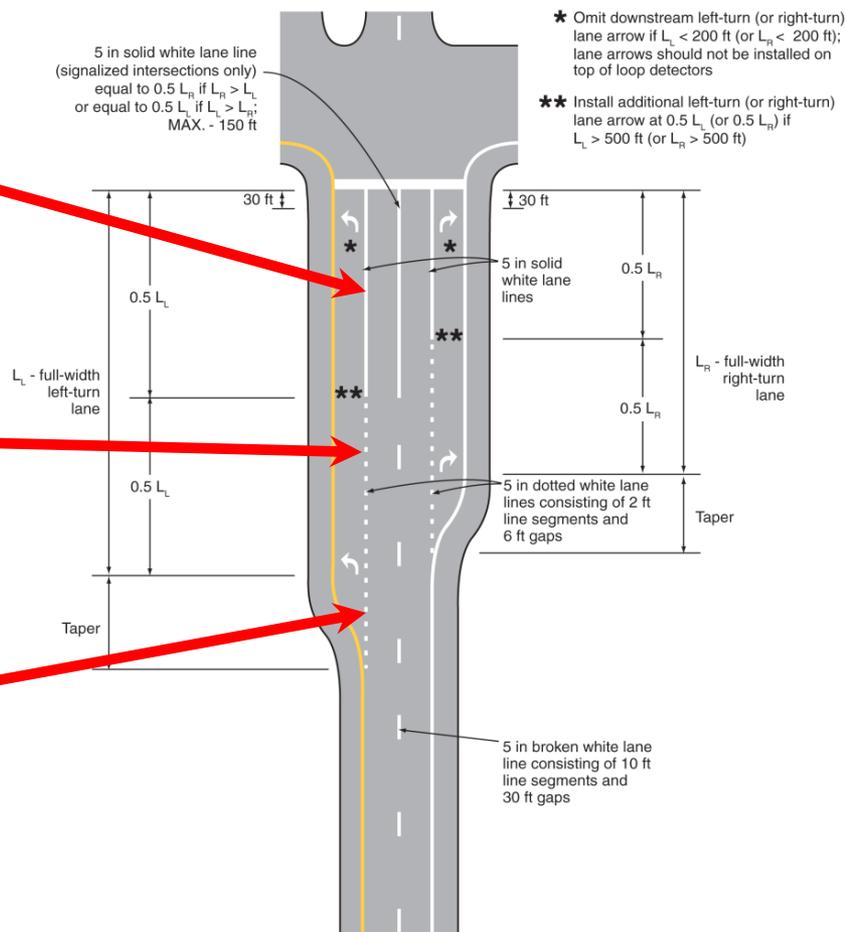
SR 92 westbound between I-95 southbound off-ramp and Peachtree Rd / Society Dr (east)

Guidance:

25 (DE Revision) On approaches to intersections, a solid white lane line marking should be used to separate a through lane from an added mandatory turn lane. The length of the solid white lane line should be one-half the length of the full-width mandatory turn lane (see Figure 3B-11).

Figure 3B-11. Examples of Applications of Conventional Road Auxiliary Lane and Lane-Drop Markings
(Sheet 4 of 5)
(Delaware Revision)

D – Exclusive turn lanes at an intersection



DE Guidance:

- Downstream solid lane line, equal to $0.5L$, separates turn and through lanes
- Upstream dotted lane line, equal to $0.5L$, separates turn and through lanes
- Upstream dotted lane line extends through taper

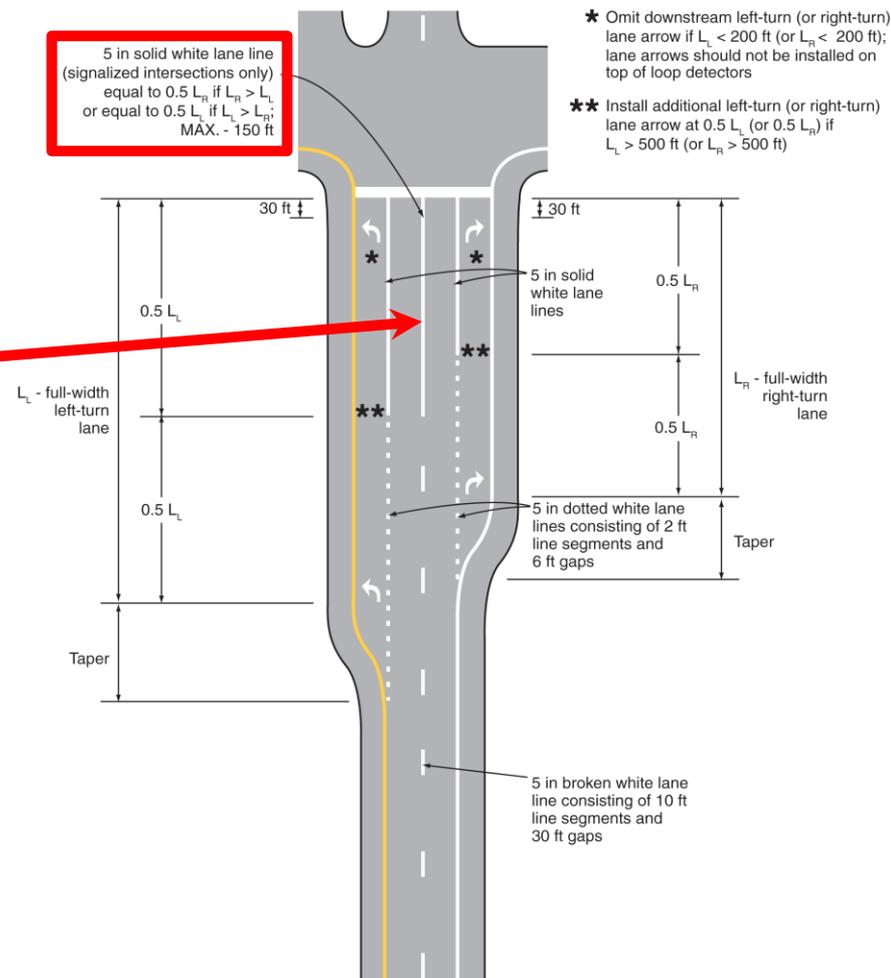
26 (DE Revision) On approaches to *signalized* intersections, solid white lane line markings *should be used to separate adjacent through lanes or adjacent mandatory turn lanes from each other. The length of the solid white lane line markings should be as depicted in Figure 3B-11.*

Figure 3B-11. Examples of Applications of Conventional Road Auxiliary Lane and Lane-Drop Markings

(Sheet 4 of 5)

(Delaware Revision)

D – Exclusive turn lanes at an intersection



DE Guidance:

– Unsignalized approach – broken lane line(s) continues through intersection

– Signalized approach – solid white lane line(s) separates adjacent through lanes; length equal to:

- $0.5L_L$ if $L_R < L_L < 300'$
- $0.5L_R$ if $L_L < L_R < 300'$
- 150' (max.)

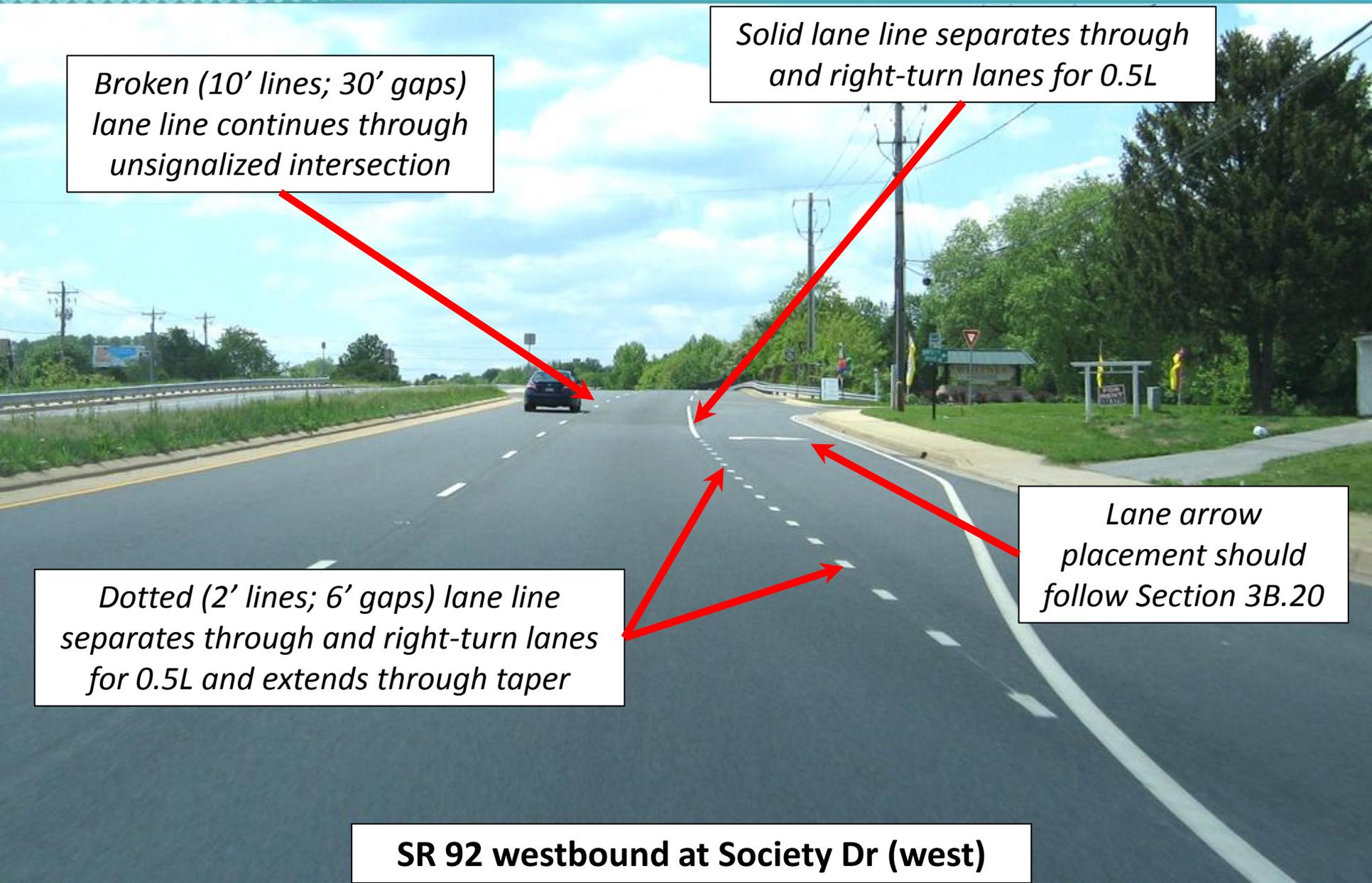
Broken (10' lines; 30' gaps) lane line continues through unsignalized intersection

Solid lane line separates through and right-turn lanes for 0.5L

Dotted (2' lines; 6' gaps) lane line separates through and right-turn lanes for 0.5L and extends through taper

Lane arrow placement should follow Section 3B.20

SR 92 westbound at Society Dr (west)



Solid, not broken, lane line should be installed to separate adjacent through lanes at signal

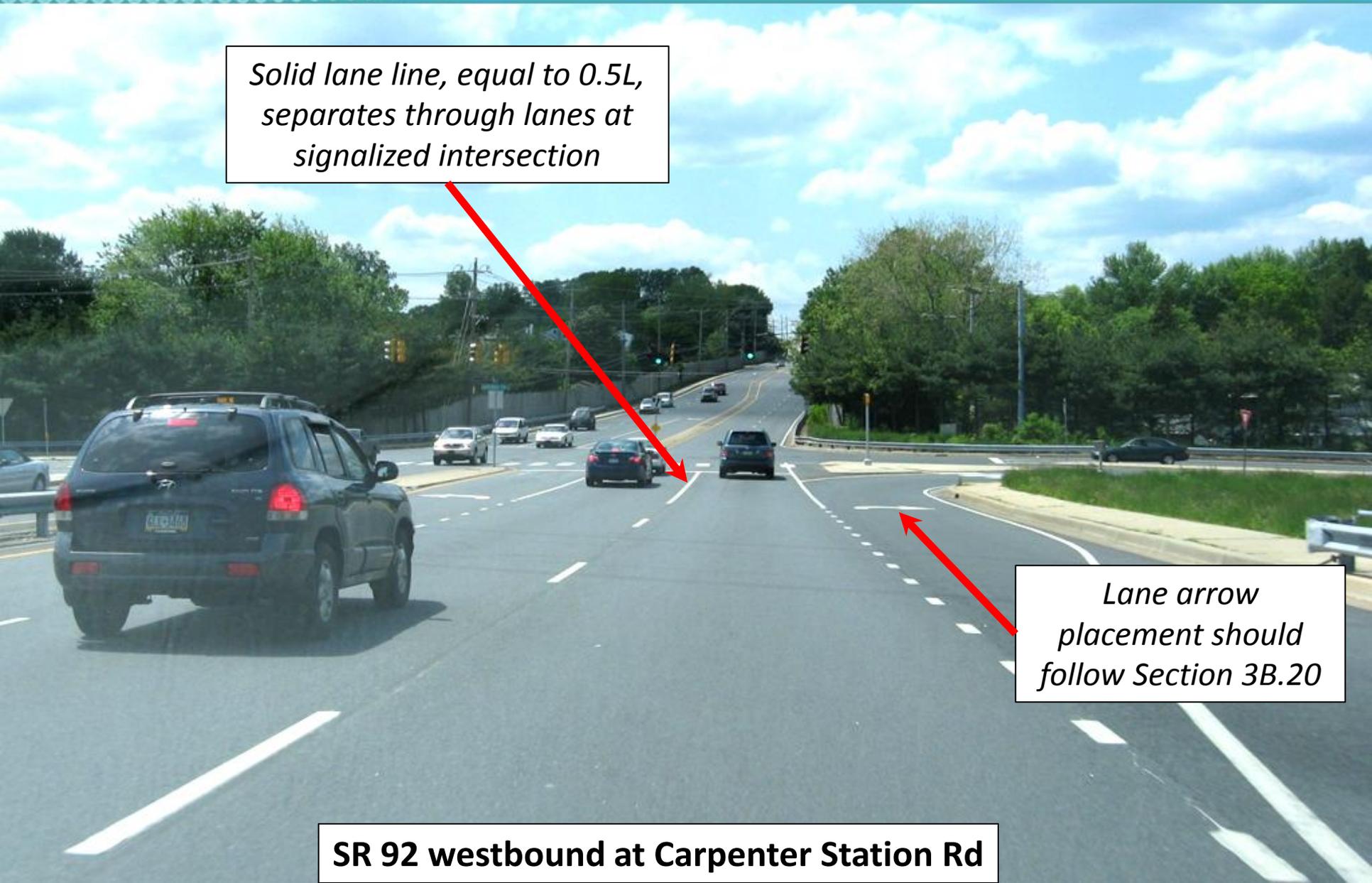


US 13 southbound at Paddock Rd / Joe Goldsborough Rd

*Solid lane line, equal to 0.5L,
separates through lanes at
signalized intersection*

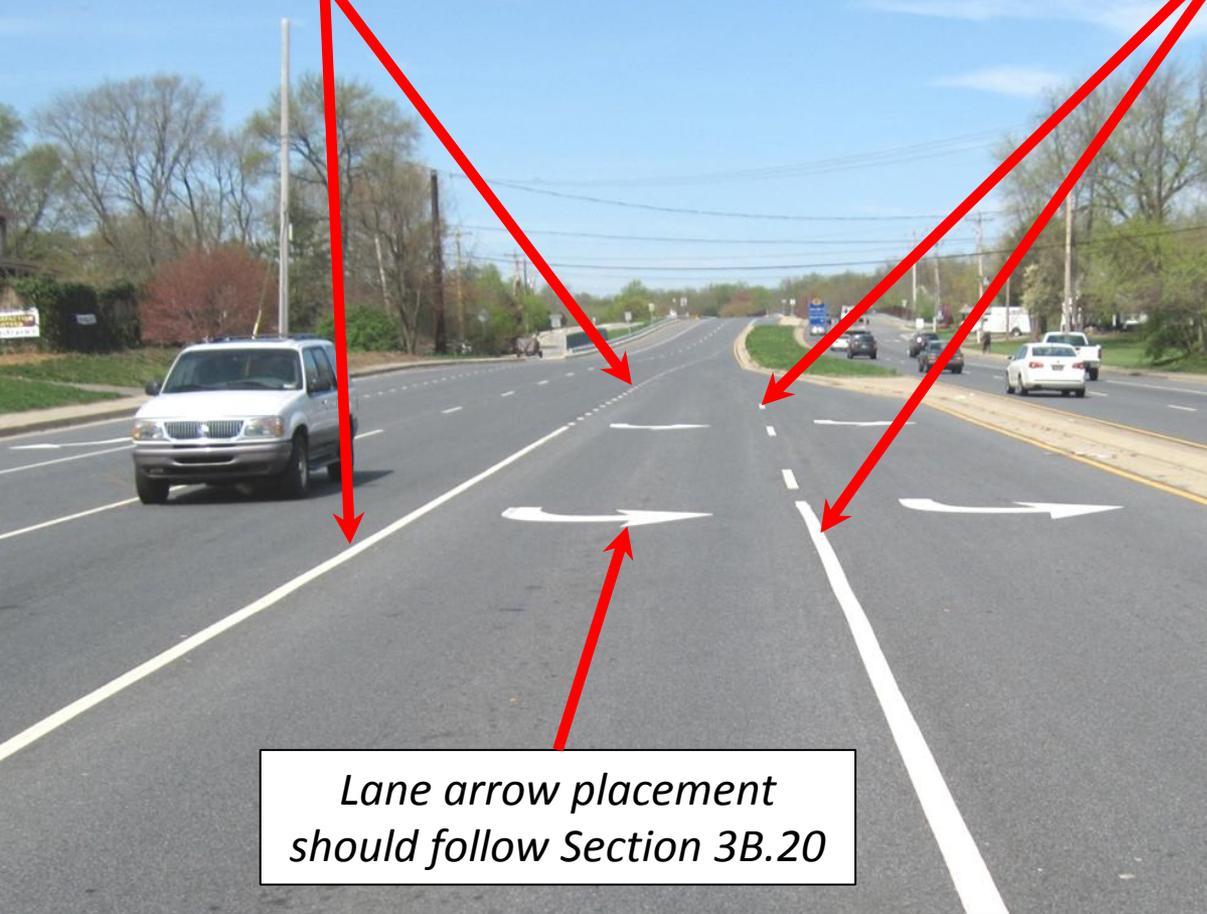
*Lane arrow
placement should
follow Section 3B.20*

SR 92 westbound at Carpenter Station Rd



Solid and dotted (2' lines; 6' gaps) lane lines separate through and left-turn lanes

Solid and broken (10' lines; 30' gaps) lane lines separate double left-turn lanes

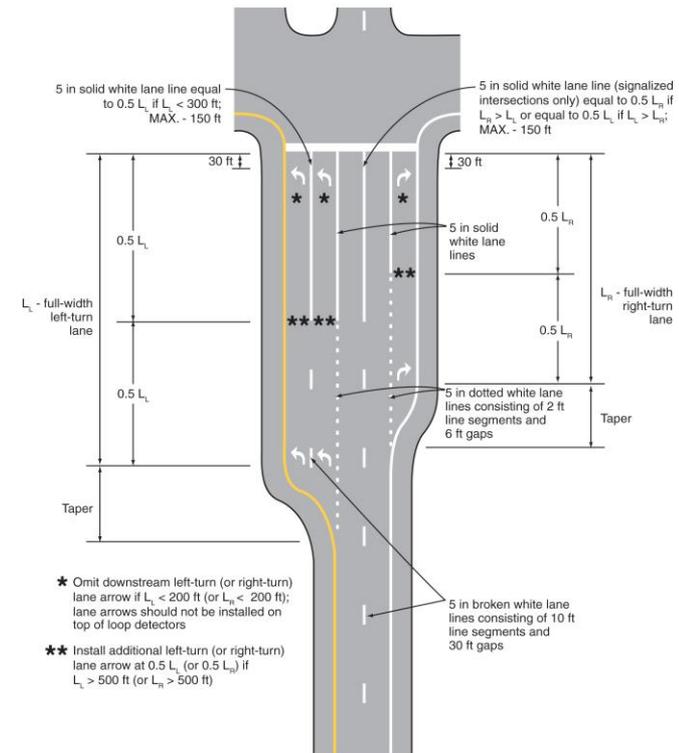


Lane arrow placement should follow Section 3B.20

Figure 3B-11. Examples of Applications of Conventional Road Auxiliary Lane and Lane-Drop Markings (Sheet 5 of 5)

(Delaware Revision)

E - Two left-turn lanes at an intersection

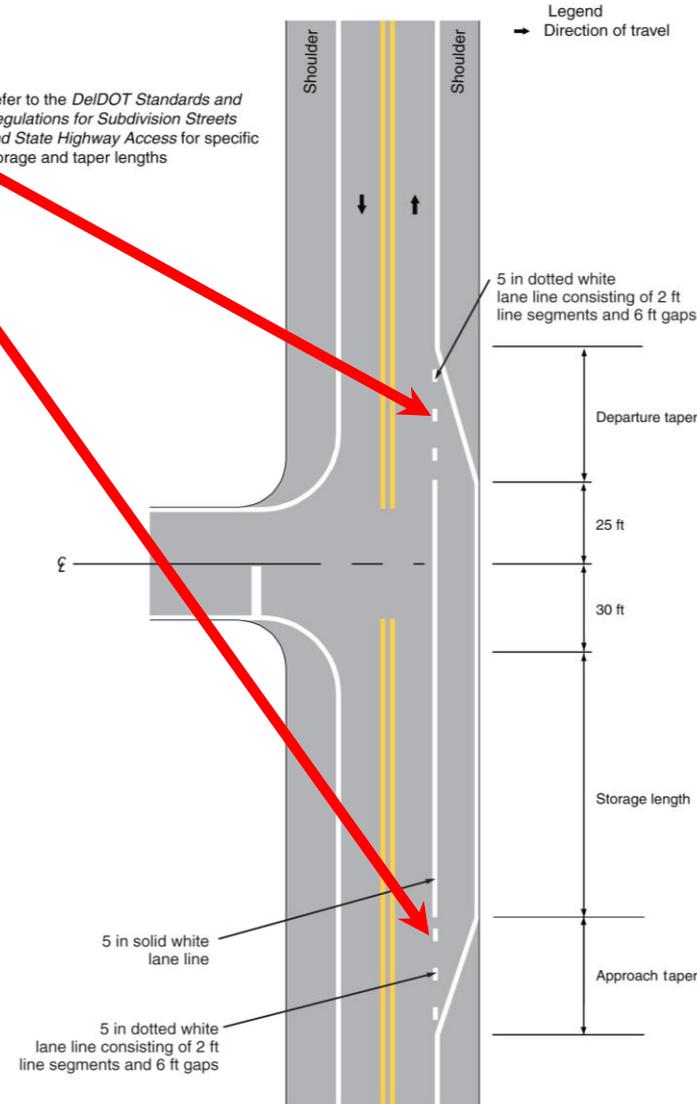


26A (DE Revision) On approaches to bypass lanes, a solid white lane line marking should be used to separate the through lane from the bypass lane as depicted in Figure 3B-11A.

Figure 3B-11A. Example of Auxiliary Lane Lines - Bypass Lane (Delaware Revision)

- DE Guidance: Dotted (2' lines; 6' gaps) and solid lane lines separate traffic in same direction
- DE Support: Design lengths based on Figure 5-19 in DelDOT Standards and Regulations for Subdivision Streets and State Highway Access

Note: Refer to the *DelDOT Standards and Regulations for Subdivision Streets and State Highway Access* for specific storage and taper lengths



DelDOT Standards and Regulations for Subdivision Streets and State Highway Access

Figure 5-19 Length of Bypass Lanes for Two Lane Highways

Roadway ADT	Left-Turn ADT	Storage Length (feet)	Taper Length (feet)					Assumed Speed Change on Through Lane
			Highway Posted Speed					
			25 MPH	35 MPH	40 MPH	45 MPH	50 MPH	
Less Than 2,000 Vehicles	0 - 50	-	-	-	-	-	-	-
	51 - 200	-	-	-	-	-	-	-
	Over 200	40	50	50	60	75	25	
2,000 to 4,000 Vehicles	0 - 100	-	-	-	-	-	-	-
	101 - 200	40	50	50	60	75	25	
	201 - 300	60	50	60	75	100	20	
	301 - 400	80	50	60	75	100	15	
	Over 400	Consider Separate Left-Turn Lane*						
Over 4,000 Vehicles	0 - 50	-	-	-	-	-	-	-
	51 - 100	20	50	50	60	75	20	
	101 - 200	40	50	60	75	100	15	
	201 - 400	80	50	75	100	125	10	
	Over 400	Consider Separate Left-Turn Lane*						

Notes:

* See warrants for left-turn lane

* Note: The storage length table is for unsignalized intersections only. If a signal is required, use queuing analysis to determine the storage lengths

$$\text{Storage Length} = \frac{ADT \times 0.20}{30} \times 20 \text{ ft} \times 1.5$$

- Stopping Sight Distance - Green Book Exhibit 3-1
- Minimum Taper Length = 50 ft.
- Taper Length = Stopping Sight Distance/2.0

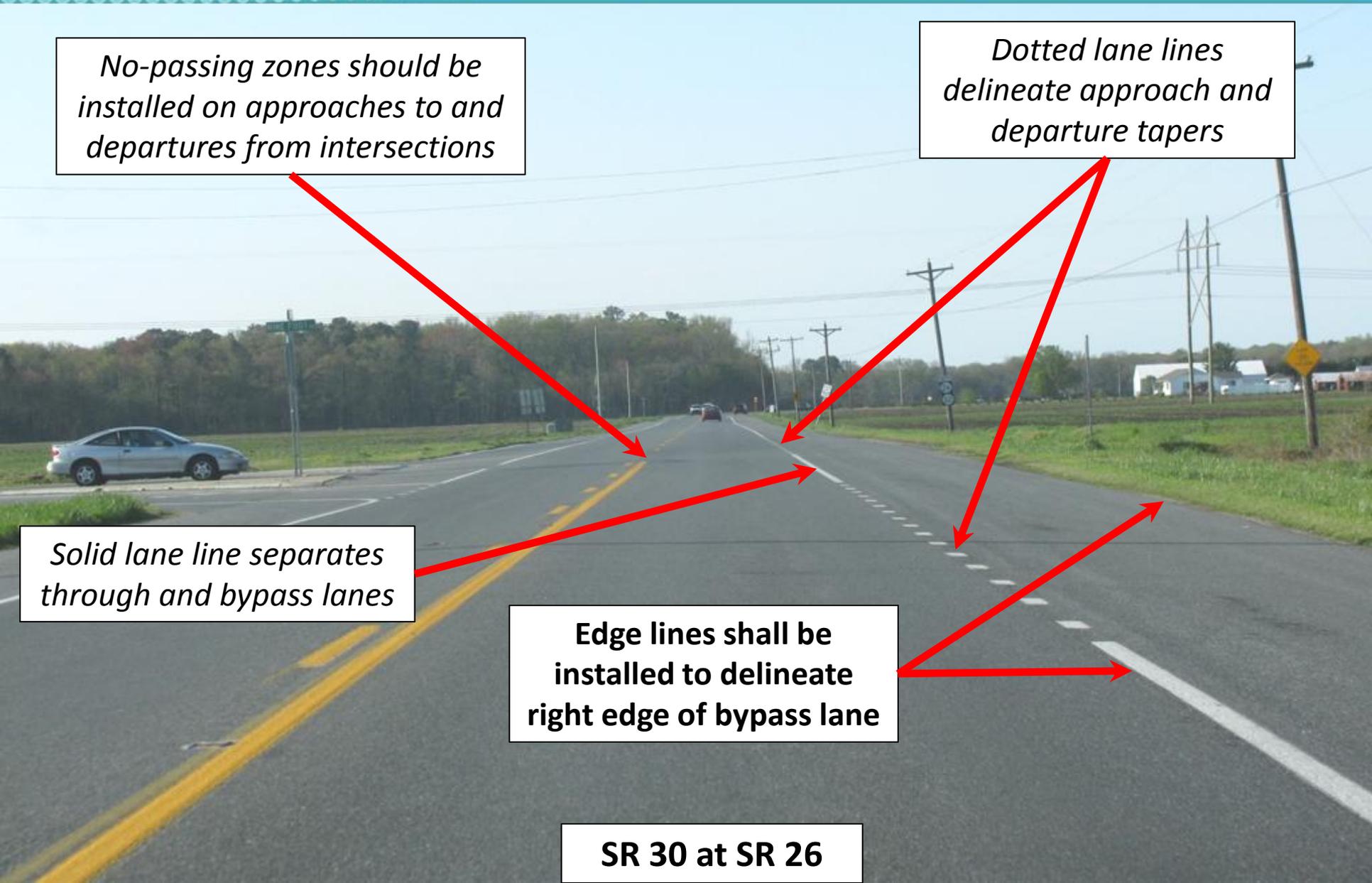
No-passing zones should be installed on approaches to and departures from intersections

Dotted lane lines delineate approach and departure tapers

Solid lane line separates through and bypass lanes

Edge lines shall be installed to delineate right edge of bypass lane

SR 30 at SR 26



Standard:

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

- **Solid double white lane line used where crossing is prohibited**



Solid double white lane line installed to prohibit lane changes in advance of on-ramp from US 13 northbound

I-495 southbound at US 13 (Philadelphia Pk) on-ramps

Standard:

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

Guidance:

01A (DE Revision) Channelizing lines along all state-maintained roadways should be 10 inches wide.

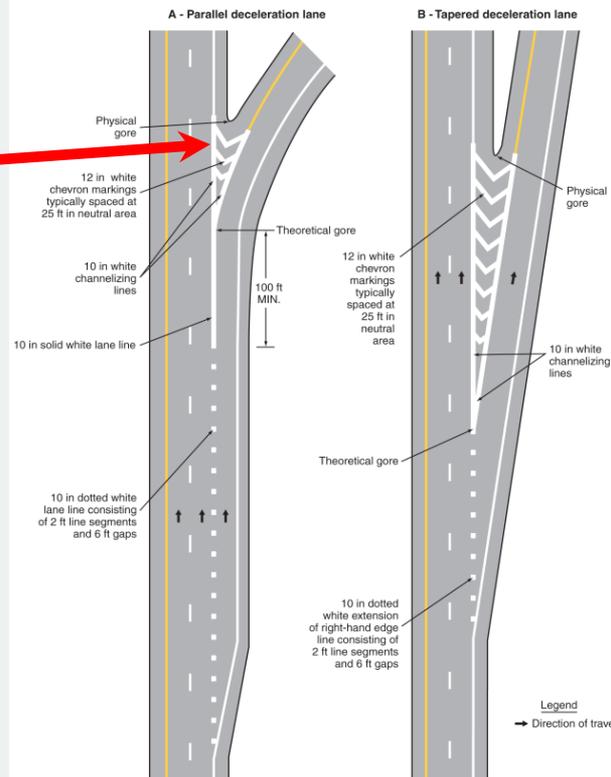
07 (DE Revision) For all exit ramps and for entrance ramps with parallel acceleration lanes, channelizing lines shall be placed on both sides of the neutral area (see Figures 3B-8 and 3B-8A, 3B-10, 3B-10A, and Drawing A of Figures 3B-9 and 3B-9A).

08 (DE Revision) For entrance ramps with tapered acceleration lanes, channelizing lines shall be placed along both sides of the neutral area to a point at least one-half of the distance to the theoretical gore.

Guidance:

09 (DE Revision) For entrance ramps with tapered acceleration lanes, the channelizing lines should extend to the theoretical gore as shown in Drawing B of Figures 3B-9 and 3B-9A.

Figure 3B-8A. Examples of Dotted Line and Channelizing Line Applications for Exit Ramp Markings along All Other Roads (Non-Interstates, Freeways and Expressways) (Sheet 1 of 2) (Delaware Revision)



- DE Guidance: 10" channelizing lines on all roadways

- Channelizing lines required at entrance and exit ramps

Standard:

- 01 If used, edge line pavement markings shall delineate the right or left edges of a roadway.
- 02 Except for dotted edge line extensions (see Section 3B.08), edge line markings shall not be continued through intersections or major driveways.
- 03 If used on the roadways of divided highways or one-way streets, or on any ramp in the direction of travel, left edge line pavement markings shall consist of a normal solid yellow line to delineate the left-hand edge of a roadway or to indicate driving or passing restrictions left of these markings.
- 04 If used, right edge line pavement markings shall consist of a normal solid white line to delineate the right-hand edge of the roadway.

Guidance:

- 05 *Edge line markings should not be broken for minor driveways.*

Support:

05A (DE Revision) DelDOT's Design Guidance Memorandum No. 1-16 defines high volume driveways as having an ADT greater than 400 vehicles per day.

- **Shall not continue through intersections or major driveways**
- **White edge lines delineate right edge of road**
- **Yellow edge lines used on left side of divided highways and one-way roads**
- *Should continue through minor driveways*
- DE Support: ADT > 400 considered "high volume" driveway



SR 1 southbound at Tybouts Corner

Option:

07 Wide solid edge line markings may be used for greater emphasis.

- Wide edge lines (at least twice normal) used where enhanced delineation is needed

Wide edge line installed to emphasize lane reduction taper, which occurs on a horizontal curve



Loewood Grove Rd approaching US 13 southbound

Standard:

01 (DE Revision) Edge line markings shall be placed on paved and surface-treated roadways with the following characteristics:

- A. Interstates,
- B. Freeways,
- C. Expressways, and
- D. Roads with a traveled way of 20 feet or more in width and an ADT of 3,000 vehicles per day or greater.

Guidance:

02 (DE Revision) Edge line markings should be placed on paved and surface-treated roadways where an engineering study indicates a need for edge line markings.

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

- **DE Standard:**

- **Interstates, freeways, and expressways**

- **All paved roads and surface-treated streets
≥ 20' wide with ADT ≥ 3,000**

- *Other roads based on engineering study or judgment*

Option:
04 Edge line markings may be placed on streets and highways with or without center line markings.

- Edge lines may be installed based on engineering study or judgment even if center lines are not installed



Standard:

01 Except as provided in Paragraph 2, pavement markings extended into or continued through an intersection or interchange area shall be the same color and at least the same width as the line markings they extend (see Figure 3B-13).

Option:

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

Guidance:

03 *(DE Revision) Where highway design or reduced visibility conditions make it desirable to provide control or to guide vehicles through an intersection or interchange, such as at offset, skewed, complex, or multi-legged intersections, on curved roadways, where multiple turn lanes are used, or where offset left turn lanes might cause driver confusion, dotted line extension markings consisting of 2-foot line segments and 6-foot gaps should be used to extend longitudinal line markings through an intersection or interchange area.*

07 *Where a double line is extended through an intersection, a single line of equal width to one of the lines of the double line should be used.*

- **Same color as the line they extend**
- *Used at complex intersections and on approaches with multiple turn lanes*
- *Double line should be extended by a single line*
- *DE Guidance: Extension should be 2' lines with 6' gaps*

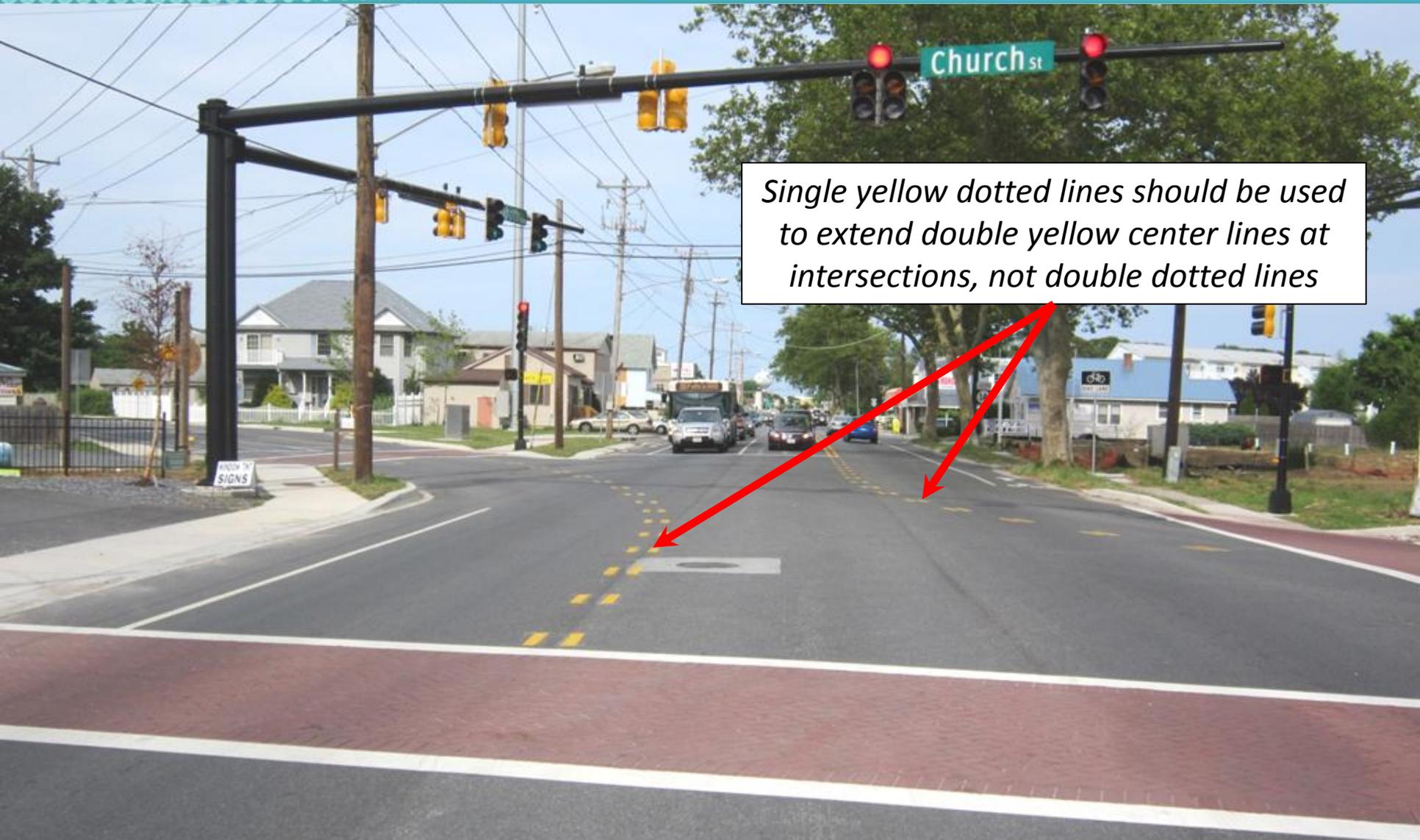


US 40 at SR 7



Edge line extension installed for westbound through motorists because of severely offset receiving lane

SR 1 southbound off-ramp at US 13 / Duck Creek Rd



Single yellow dotted lines should be used to extend double yellow center lines at intersections, not double dotted lines

SR 1A at Church St

Standard:

02 Except as provided in Paragraph 3, where pavement markings are used, lane-reduction transition markings shall be used to guide traffic through transition areas where the number of through lanes is reduced, as shown in Figure 3B-14. On two-way roadways, no-passing zone markings shall be used to prohibit passing in the direction of the convergence, and shall continue through the transition area.

Guidance:

04 For roadways having a posted or statutory speed limit of 45 mph or greater, the transition taper length for a lane-reduction transition should be computed by the formula $L = WS$. For roadways where the posted or statutory speed limit is less than 45 mph, the formula $L = WS^2/60$ should be used to compute the taper length.

Support:

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

Guidance:

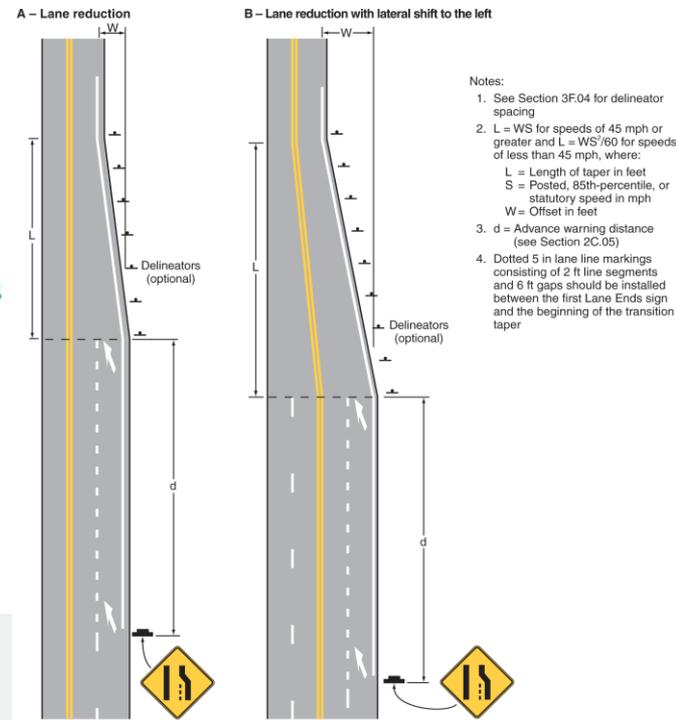
08 (DE Revision) Lane line markings should be discontinued where the transition taper begins.

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

Guidance: (from Section 3B.20)

34 (DE Revision) Where a lane-reduction transition occurs on a roadway, the lane-reduction arrow markings shown in Drawing F in Figure 3B-24 should be used as shown in Figures 3B-14, 3B-14A, 3B-14B, and 3B-14C).

Figure 3B-14. Examples of Applications of Lane-Reduction Transition Markings (Delaware Revision)



- **No-passing zone in transition area**
- **Taper length: $L = WS$ for $S \geq 45$ MPH; $L = WS^2/60$ for $S < 45$ MPH**
- **DE Guidance:**
 - Dotted lane line begins at first Lane Ends sign and terminates at beginning of taper
 - Lane reduction arrows used for all speed limits

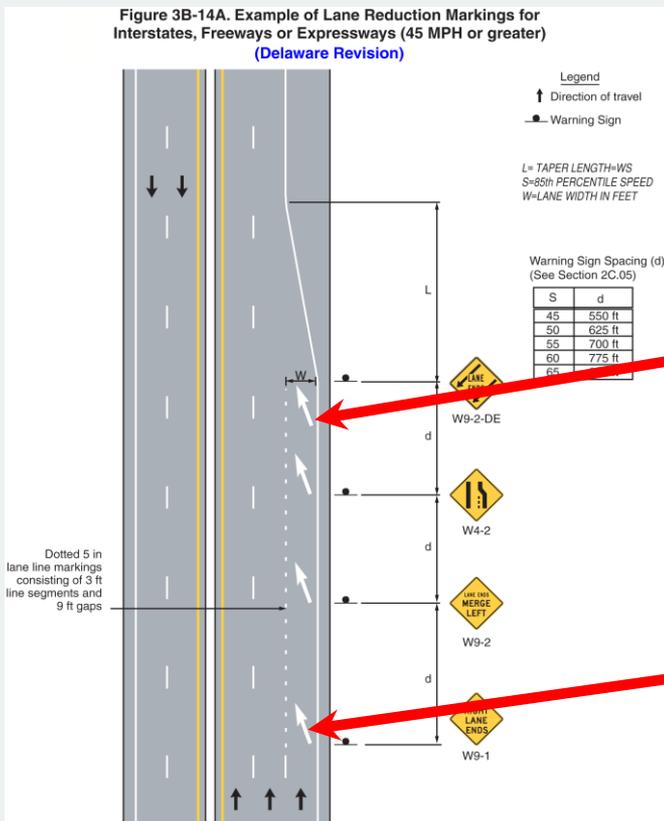
04A (DE Revision) Lane-reduction transition markings along interstates, freeways, and expressways should be installed as shown in Figure 3B-14A. Lane-reduction transition markings beyond intersections should be installed as shown in Figures 3B-14B and 3B-14C.

Option:

04B (DE Revision) Lane-reduction markings shown in Figures 3B-14A, 3B-14B, and 3B-14C may be adjusted based on engineering judgment at existing locations where space is limited due to site-specific conditions.

- DE Guidance: Figure 3B-14A for lane reductions on interstates, freeways, and expressways
- DE Option: Adjusted based on engineering judgment

SR 1 southbound at Tybouts Corner



- DE Guidance: Figures 3B-14B and 3B-14C for lane reductions beyond intersections

Figure 3B-14B. Example of Lane Reduction Beyond Intersection Marking Application along All Other Roads (Non-Interstates, Freeways or Expressways) (45 MPH or greater) (Delaware Revision)

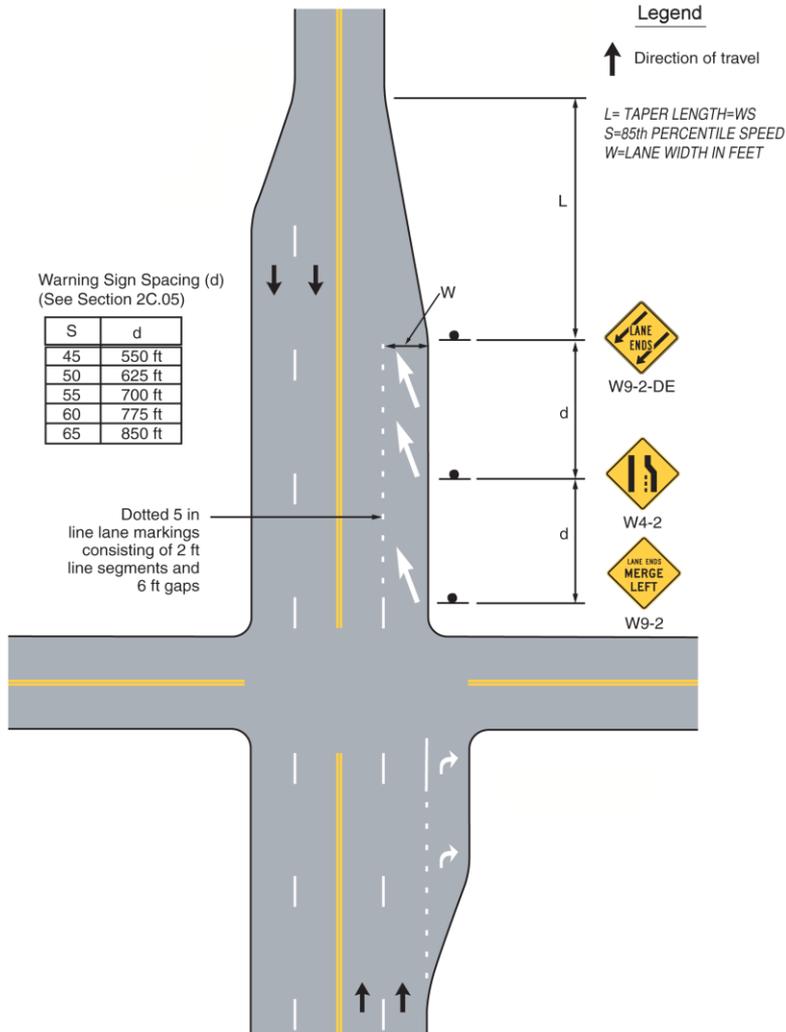
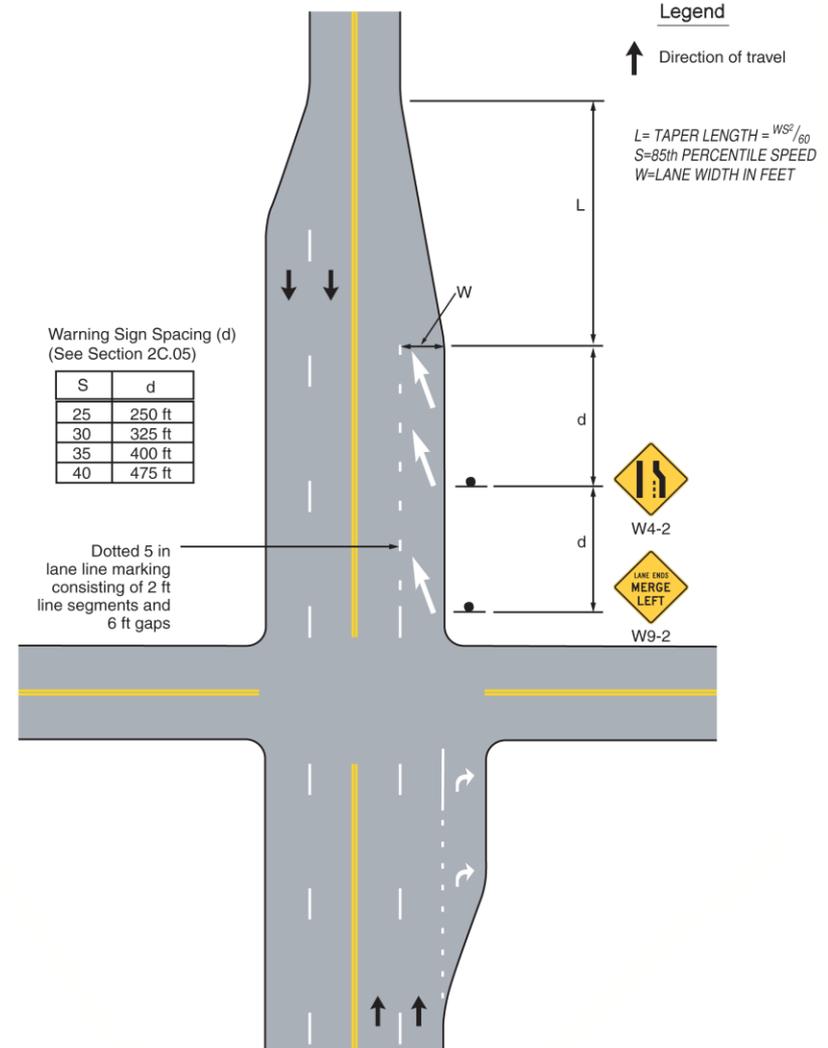


Figure 3B-14C. Example of Lane Reduction Beyond Intersection Marking Application along All Other Roads (Non-Interstates, Freeways or Expressways) (less than 45 MPH) (Delaware Revision)



Standard:

01 Pavement markings shall be used to guide traffic away from fixed obstructions within a paved roadway. Approach markings for bridge supports, refuge islands, median islands, toll plaza islands, and raised channelization islands shall consist of a tapered line or lines extending from the center line or the lane line to a point 1 to 2 feet to the right-hand side, or to both sides, of the approach end of the obstruction (see Figure 3B-15).

Guidance:

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

Support:

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

Guidance:

05 The minimum taper length should be 100 feet in urban areas and 200 feet in rural areas.

- **Obstructions within paved roads shall be marked**
- *Taper length:*
 - $L = WS$ for $S \geq 45$ MPH
 - $L = WS^2/60$ for $S < 45$ MPH
 - L (min.) urban = 100'
 - L (min.) rural = 200'



US 13 Bus. (Walnut St) at Front St

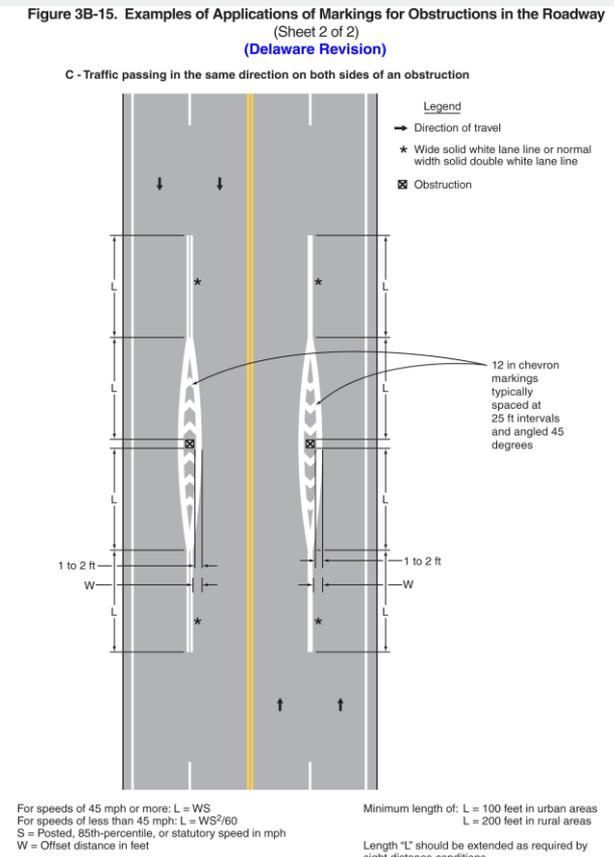
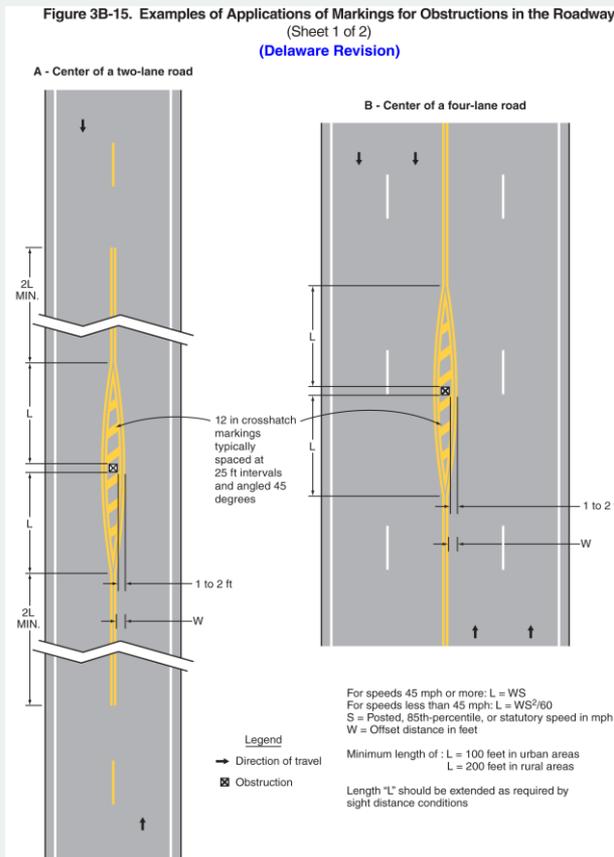
Standard:

07 If traffic is required to pass only to the right of the obstruction, the markings shall consist of a two-direction no-passing zone marking at least twice the length of the diagonal portion as determined by the appropriate taper formula (see Drawing A of Figure 3B-15).

Standard:

09 If traffic can pass either to the right or left of the obstruction, the markings shall consist of two channelizing lines diverging from the lane line, one to each side of the obstruction. In advance of the point of divergence, a wide solid white line or normal solid double white line shall be extended in place of the broken lane line for a distance equal to the length of the diverging lines (see Drawing C of Figure 3B-15).

- **Figure 3B-15, Drawings A and B for two-way traffic only passing on right**
- **Figure 3B-15, Drawing C for traffic in same direction passing on both sides**



Standard:

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

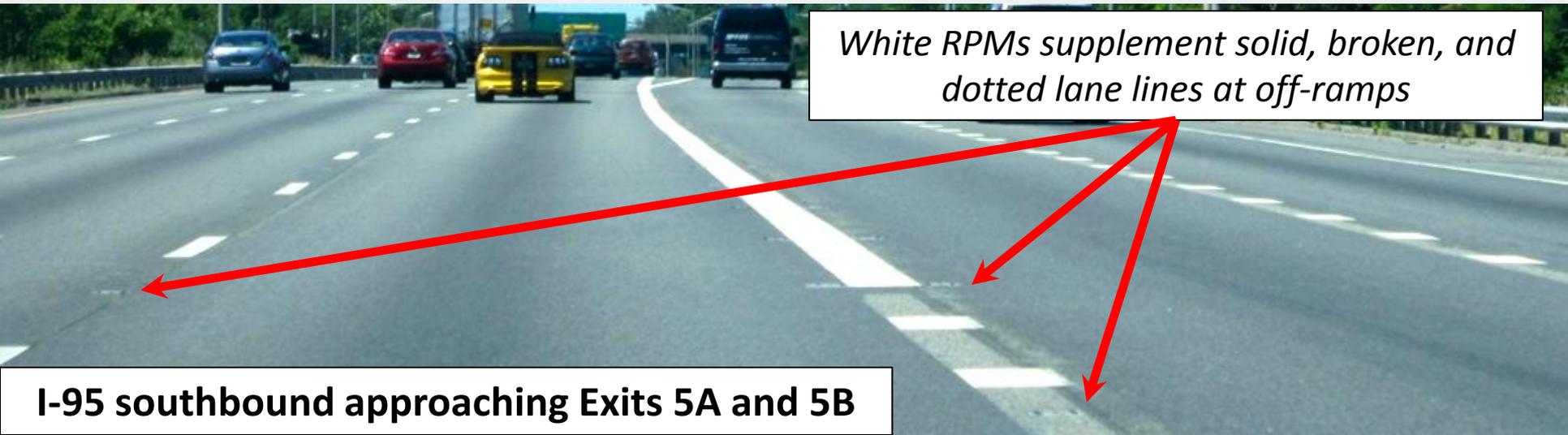
Guidance:

01A (DE Revision) Raised pavement markers should be installed along interstates, freeways, expressways, and principal arterials.

Standard:

01 (DE Revision) Retroreflective or internally illuminated raised pavement markers, or non-retroreflective raised pavement markers supplemented by retroreflective or internally illuminated markers, shall not be substituted for markings of other types along state-maintained roadways unless approved by DelDOT Traffic. (from Section 3B.14)

- **RPM matches color of line it supplements**
- *DE Guidance: Used on all interstates, freeways, expressways, and principal arterials*
- **DE Standard: Shall not be used as substitute for pavement markings unless approved by DelDOT Traffic**



01B (DE Revision) *Raised pavement markers should be considered for use along conventional roads under the following conditions:*

- A. *Roadways with posted speed limits of 45 miles per hour or greater, with horizontal and/or vertical curves, and areas of low lighting*
- B. *Locations with a history of roadway departure crashes*
- C. *Locations with advisory speed postings*
- D. *Locations where a barrier or parapet is less than 6 feet from the edge of the travel lane*

01C (DE Revision) *Raised pavement markers should also be installed on other roadways where engineering judgment indicates such a need.*

01D (DE Revision) *Raised pavement markers should not be installed along surface-treated roadways.*

01E (DE Revision) *Other than to delineate ramps and gore areas, raised pavement markers should not be installed along left or right edge lines unless there is a history of roadway departure and/or nighttime, inclement weather-related crashes.*

01F (DE Revision) *If used, raised pavement markers should be installed in accordance with Figures 3B-15A through 3B-15H.*

- **DE Guidance:**

- *Considered on roads with posted speed \geq 45 MPH*
- *Considered on other roads based on engineering judgment (i.e., curves, crash problems, poor lighting)*
- *Should not be installed on surface-treated roads*
- *Except for ramp or gore areas, should not be installed along left or right edge lines unless there is a crash history*

Option:

01 Retroreflective or internally illuminated raised pavement markers may be used as positioning guides with longitudinal line markings without necessarily conveying information to the road user about passing or lane-use restrictions. In such applications, markers may be positioned in line with or immediately adjacent to a single line marking, or positioned between the two lines of a double center line or double lane line marking.

Guidance:

02 The spacing for such applications should be $2N$, where N equals the length of one line segment plus one gap (see Section 3B.11).

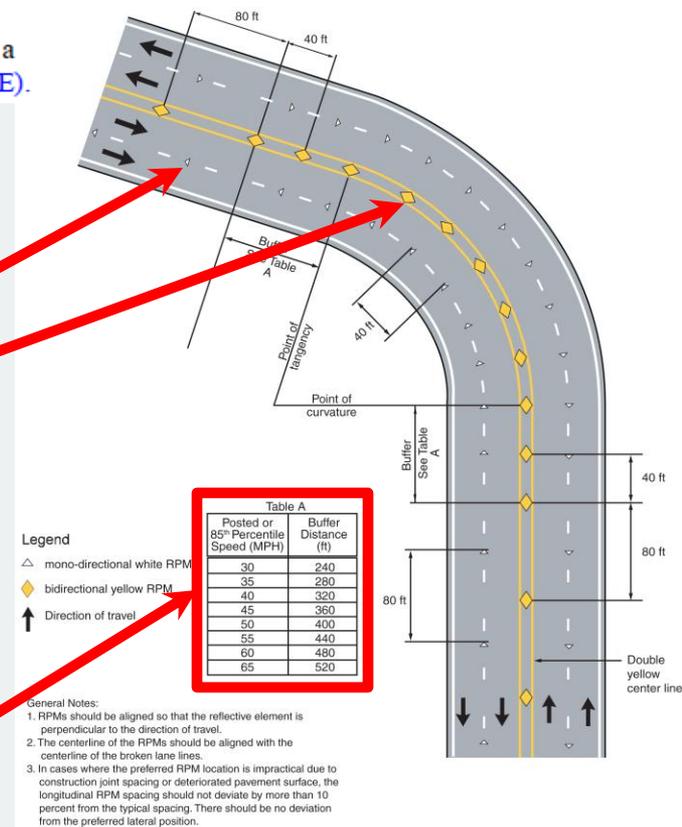
Option:

03 Where it is desired to alert the road user to changes in the travel path, such as on sharp curves or on transitions that reduce the number of lanes or that shift traffic laterally, the spacing may be reduced to N or less
04 (DE Revision) To improve the visibility of horizontal curves, center lines may be supplemented with retroreflective or internally illuminated raised pavement markers for the entire curved section as well as for a distance in advance of the curve that approximates 5 seconds of travel time (see Figures 3B-15D and 3B-15E).

(from Section 3B.13)

- DE Guidance (Figures 3B-15A through 3B-15H):
 - Adjacent to single solid lines
 - In line with broken and dotted lane lines
 - Between double yellow center lines
 - Longitudinally spaced at 80' intervals along double yellow center lines and broken (10' lines; 30' gaps) lane lines
 - Longitudinal spacing reduced to 40' on curves and within "buffer" in advance of curves

Figure 3B-15E. Example of Raised Pavement Marker (RPM) Application at Curves along Multi-Lane Roads (Delaware Revision)





SR 9 east of SR 1

Yellow RPM installed between double yellow center line



White RPM installed adjacent to solid white lane line

SR 16 westbound at SR 36 / St. Johnstown Rd

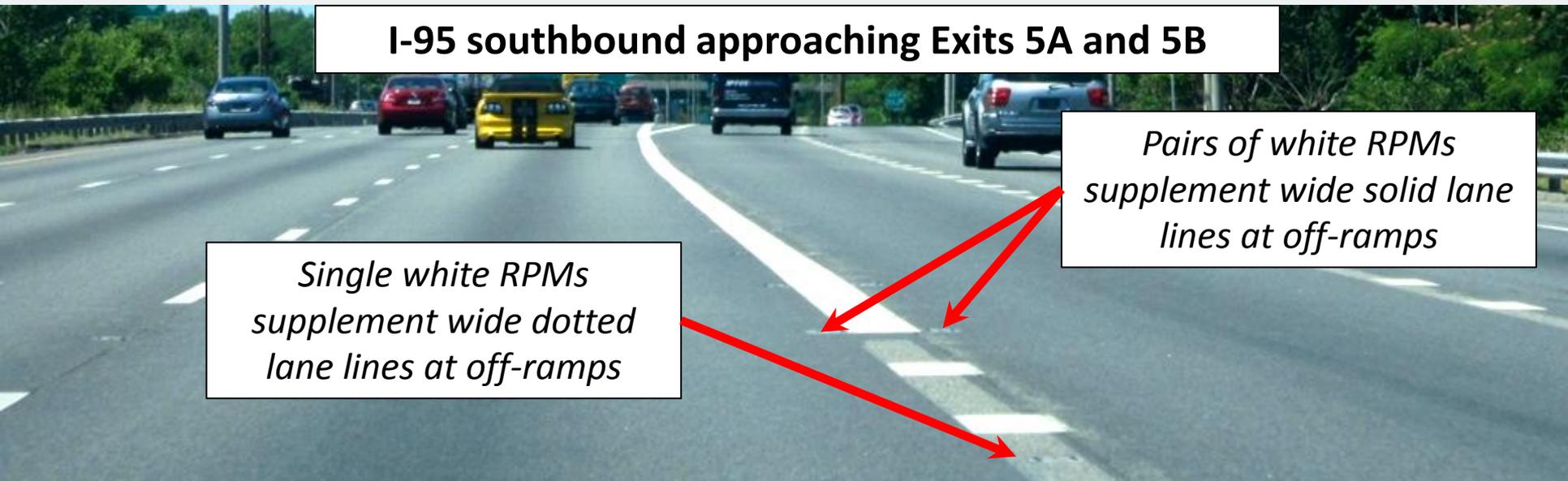
Guidance:

01 *(DE Revision)* The use of retroreflective or internally illuminated raised pavement markers for supplementing longitudinal line markings should comply with the following:

A. *Lateral Positioning*

1. *When supplementing double line markings other than double yellow center lines, pairs of raised pavement markers placed laterally in line with or immediately outside of the two lines should be used.*
2. *When supplementing wide solid line markings, pairs of raised pavement markers placed laterally adjacent to each other should be used.*
3. *When supplementing wide dotted lane line markings, single raised pavement markers should be aligned with the centerline of the dotted lane line markings.*

- *RPM pairs aligned with or immediately outside of double lines (other than double yellow center lines)*
- *DE Guidance: RPM pairs supplement wide solid lines; single RPMs supplement wide dotted lane lines*



I-95 southbound approaching Exits 5A and 5B

Pairs of white RPMs supplement wide solid lane lines at off-ramps

Single white RPMs supplement wide dotted lane lines at off-ramps

B. Longitudinal Spacing

- 1. When supplementing solid line markings, raised pavement markers at a spacing no greater than N (see Section 3B.11) should be used, except that when supplementing channelizing lines or edge line markings, a spacing of no greater than $N/2$ should be used.*
- 2. When supplementing broken line markings, a spacing of N or $2N$ should be used depending on the application. However, when supplementing broken line markings identifying reversible lanes, a spacing of no greater than N should be used.*
- 3. When supplementing dotted lane line markings, a spacing of 48 feet should be used.*
- 4. When supplementing longitudinal line extension markings through at-grade intersections, one raised pavement marker for each short line segment should be used.*
- 5. When supplementing line extensions through freeway interchanges, a spacing of no greater than N should be used.*

- *DE Guidance:*

- *Solid lines – 20' or 40' spacing depending on application*
- *Broken lines – 40' or 80' spacing depending on application*
- *Dotted lines – 48' spacing*

Figure 3B-15C. Example of Raised Pavement Marker (RPM) Application on Exit Ramps (Delaware Revision)

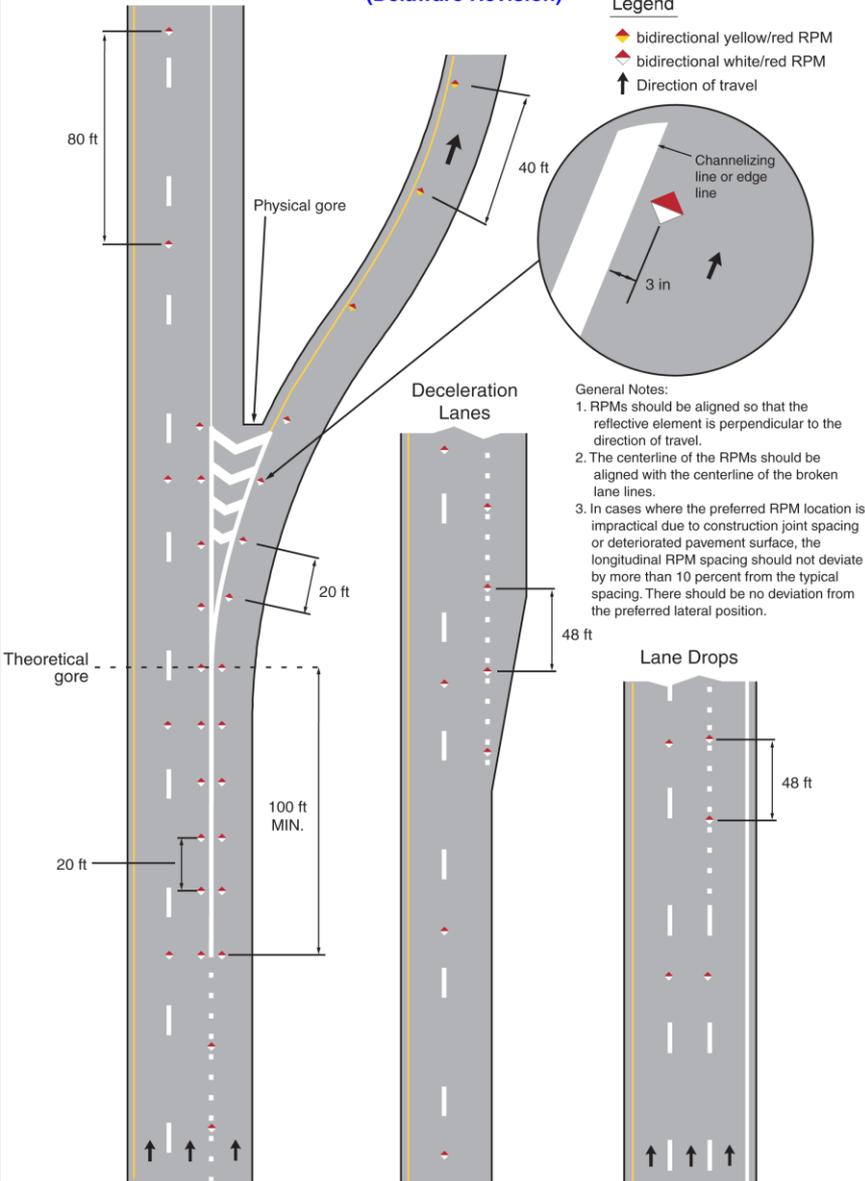


Figure 3B-15F. Example of Raised Pavement Marker (RPM) Application for Left-Turn Lane (Delaware Revision)

Notes:

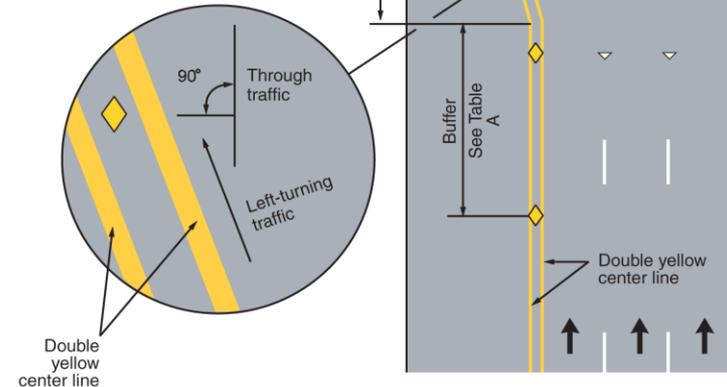
1. RPMs supplementing the double yellow center line should be installed between the two lines and oriented as shown in the detail below.
2. RPMs supplementing the double yellow center line along the length of the left-turn lane and taper should be spaced 20 ft apart if $A < 200$ ft. If $A \geq 200$ ft, RPMs should be spaced 40 ft apart along the length of the left-turn lane and taper, where A is the length of full-width left-turn lane and taper.
3. In cases where the preferred RPM location is impractical due to construction joint spacing or deteriorated pavement surface, the longitudinal RPM spacing should not deviate by more than 10 percent from the typical spacing. There should be no deviation from the preferred lateral position.
4. RPM spacing for all dotted lane lines should be 48 ft.
5. RPMs supplementing solid lines should be installed adjacent to the solid line. See inset in Figure 3B-15B for placement.

Legend

- △ mono-directional white RPM
- ◆ bidirectional yellow RPM
- ↑ Direction of travel

Table A

Posted or 85 th Percentile Speed (MPH)	Buffer Distance (ft)
30	240
35	280
40	320
45	360
50	400
55	440
60	480
65	520

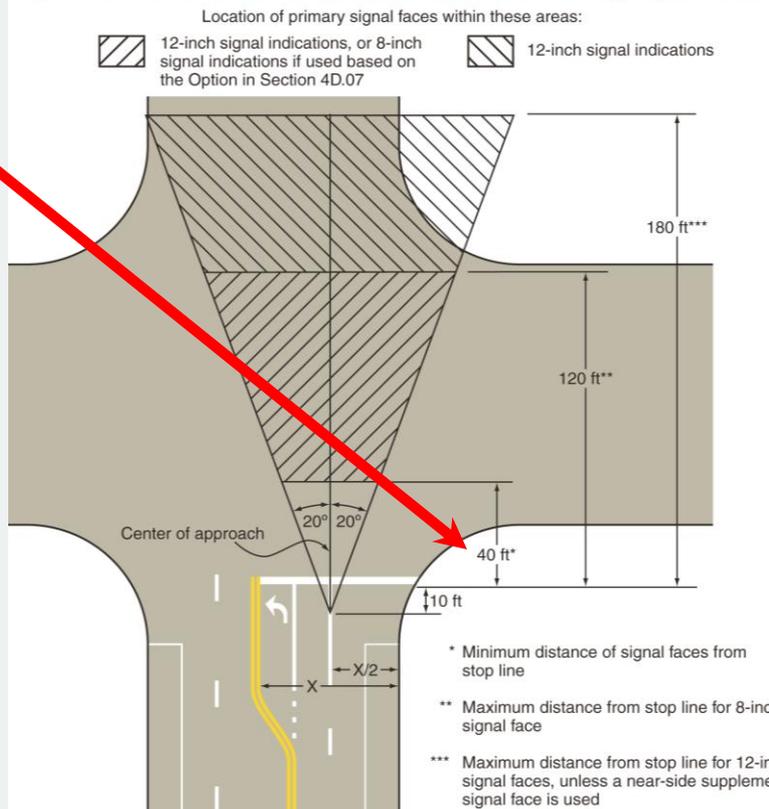


Guidance:

- 01 *Stop lines should be used to indicate the point behind which vehicles are required to stop in compliance with a traffic control signal.*
- 01A (DE Revision) *Stop lines should be installed on all approaches to signalized intersections.*
- 01B (DE Revision) *Stop lines should be installed on all stop-controlled approaches with crosswalks.*
- 01C (DE Revision) *Except as provided in Paragraph 1D, stop lines should be installed on all state-maintained stop-controlled approaches and on all stop-controlled approaches to state-maintained roadways.*
- 01D (DE Revision) *Stop lines should not be installed at the intersection of two subdivision streets unless a crosswalk is present or engineering judgment indicates such a need.*

- *Stop lines across all signal-controlled movements*
 - **Primary signal heads $\geq 40'$ from stop line**
- *DE Guidance:*
 - *Stop-controlled approaches with crosswalks*
 - *State-maintained stop-controlled approaches*
 - *Stop-controlled approaches to state-maintained roadways*
 - *Not installed at intersection of two subdivision streets unless crosswalk is present or based on engineering judgment*

Figure 4D-4. Lateral and Longitudinal Location of Primary Signal Faces



Option:

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

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

Standard:

04 Except as provided in Section 8B.28, stop lines shall not be used at locations where drivers are required to yield in compliance with a YIELD (R1-2) sign or a Yield Here To Pedestrians (R1-5 or R1-5a) sign or at locations on uncontrolled approaches where drivers are required by State law to yield to pedestrians.

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

- Yield lines may used with YIELD or Yield Here to Pedestrians signs
- **Stop lines prohibited on yield-controlled approaches (except rail crossings)**
- **Yield lines prohibited on stop-controlled and signal-controlled approaches**

Stop lines should be installed for all signal-controlled right-turn movements



Valley Rd at Fitness Way / Lantana Dr

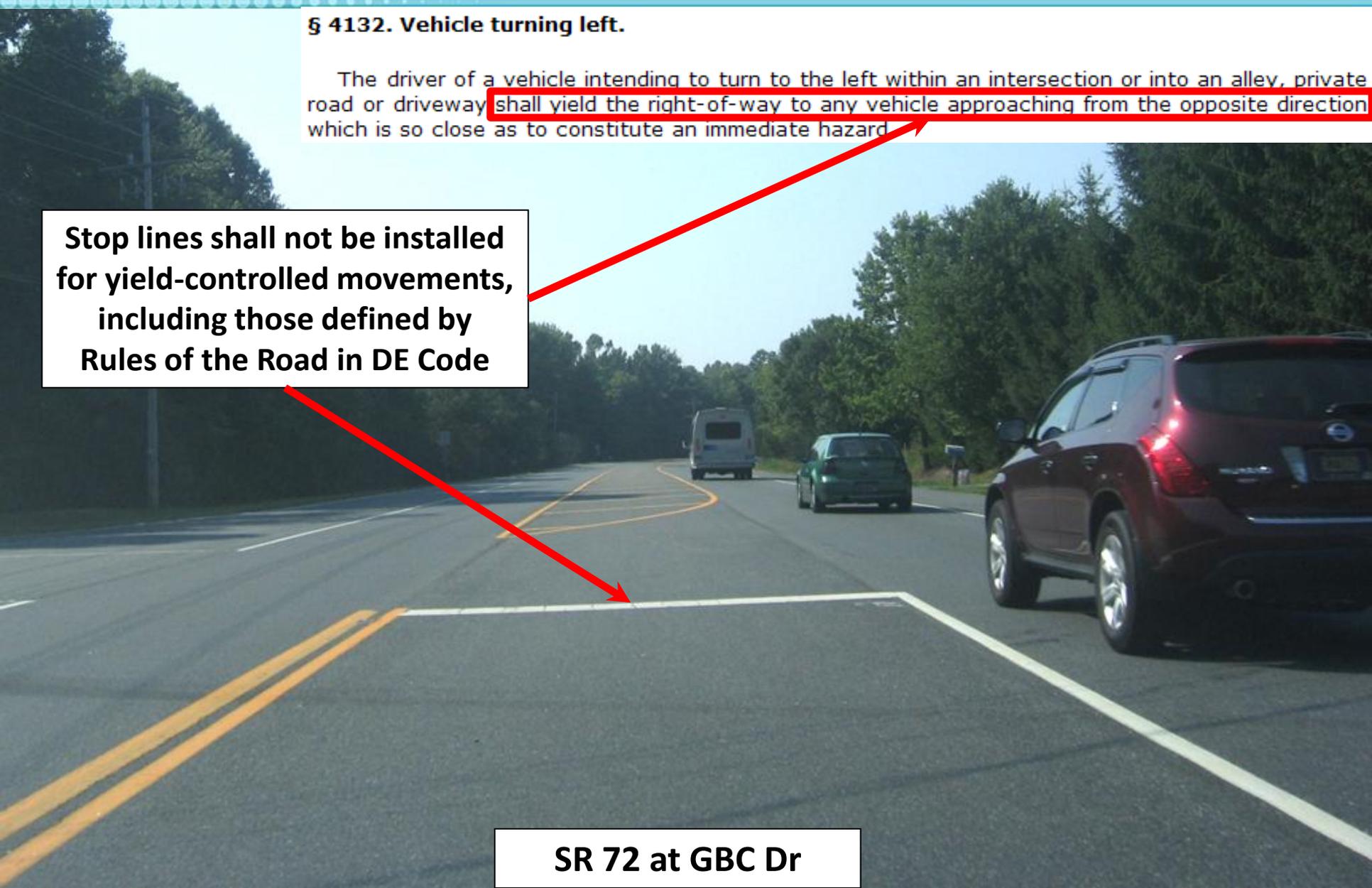


§ 4132. Vehicle turning left.

The driver of a vehicle intending to turn to the left within an intersection or into an alley, private road or driveway shall yield the right-of-way to any vehicle approaching from the opposite direction which is so close as to constitute an immediate hazard

Stop lines shall not be installed for yield-controlled movements, including those defined by Rules of the Road in DE Code

SR 72 at GBC Dr



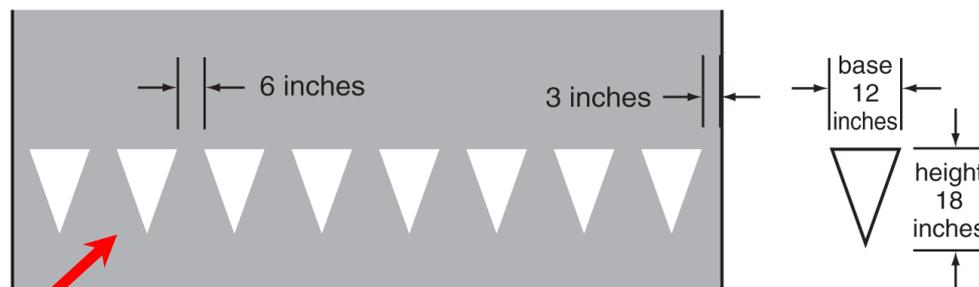
Guidance:

- 08 (DE Revision) Stop lines should be 16 inches wide except at grade crossings, where they should be 24 inches wide.
- 09 (DE Revision) The individual triangles comprising the yield line should have a base of 12 inches and a height of 18 inches. The space between the triangles should be 6 inches.

DE Guidance:

- 16" wide stop lines (except rail crossings)
- 24" wide stop lines at rail crossings
- 12" x 18" yield line symbols with 6" spaces

Figure 3B-16. Recommended Yield Line Layouts (Delaware Revision)



Note:
Yield lines may be smaller than suggested when installed on much narrower, slow-speed facilities such as shared-use paths.

10 *If used, stop and yield lines should be placed a minimum of 4 feet in advance of the nearest crosswalk line at controlled intersections, except for yield lines at roundabouts as provided for in Section 3C.04 and at midblock crosswalks. In the absence of a marked crosswalk, the stop line or yield line should be placed at the desired stopping or yielding point, but should not be placed more than 30 feet or less than 4 feet from the nearest edge of the intersecting traveled way.*

- *Stop lines installed a minimum of 4' in advance of crosswalks*
- *At locations without crosswalks, stop and yield lines should be $\geq 4'$ and $< 30'$ from edge of intersecting road*



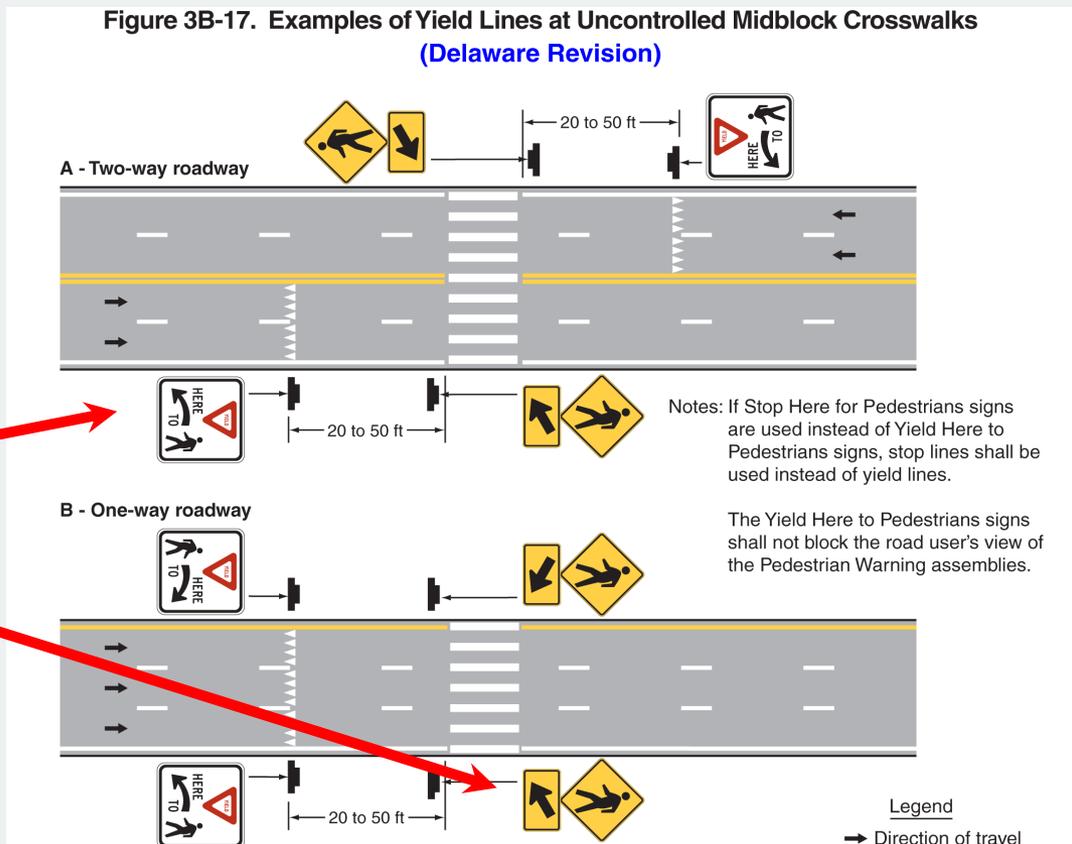
12 If yield or stop lines are used at a crosswalk that crosses an uncontrolled multi-lane approach, the yield lines or stop lines should be placed 20 to 50 feet in advance of the nearest crosswalk line, and parking should be prohibited in the area between the yield or stop line and the crosswalk (see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

Standard:

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

- Yield line installed 20' to 50' in advance of midblock crosswalk
- Parking prohibition between yield line and crosswalk
- **R1-5 signs required**
- **DE Guidance: W11-2 assemblies at crosswalk; however, R1-5 signs shall not block W11-2 assemblies**

Figure 3B-17. Examples of Yield Lines at Uncontrolled Midblock Crosswalks (Delaware Revision)



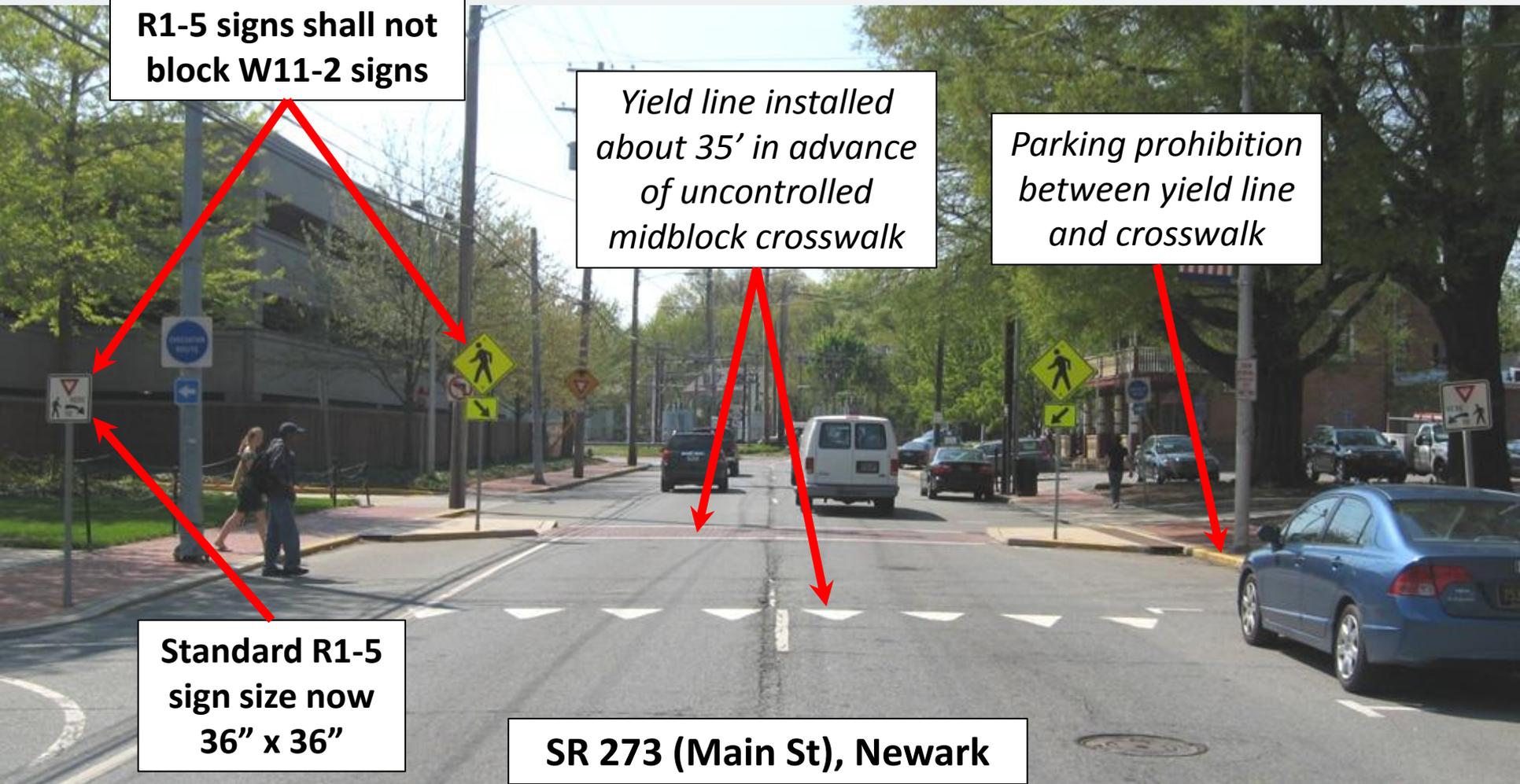
*W11-2 assemblies;
R1-5 signs shall not
block W11-2 signs*

*Yield line installed
about 35' in advance
of uncontrolled
midblock crosswalk*

*Parking prohibition
between yield line
and crosswalk*

**Standard R1-5
sign size now
36" x 36"**

SR 273 (Main St), Newark



Guidance:

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

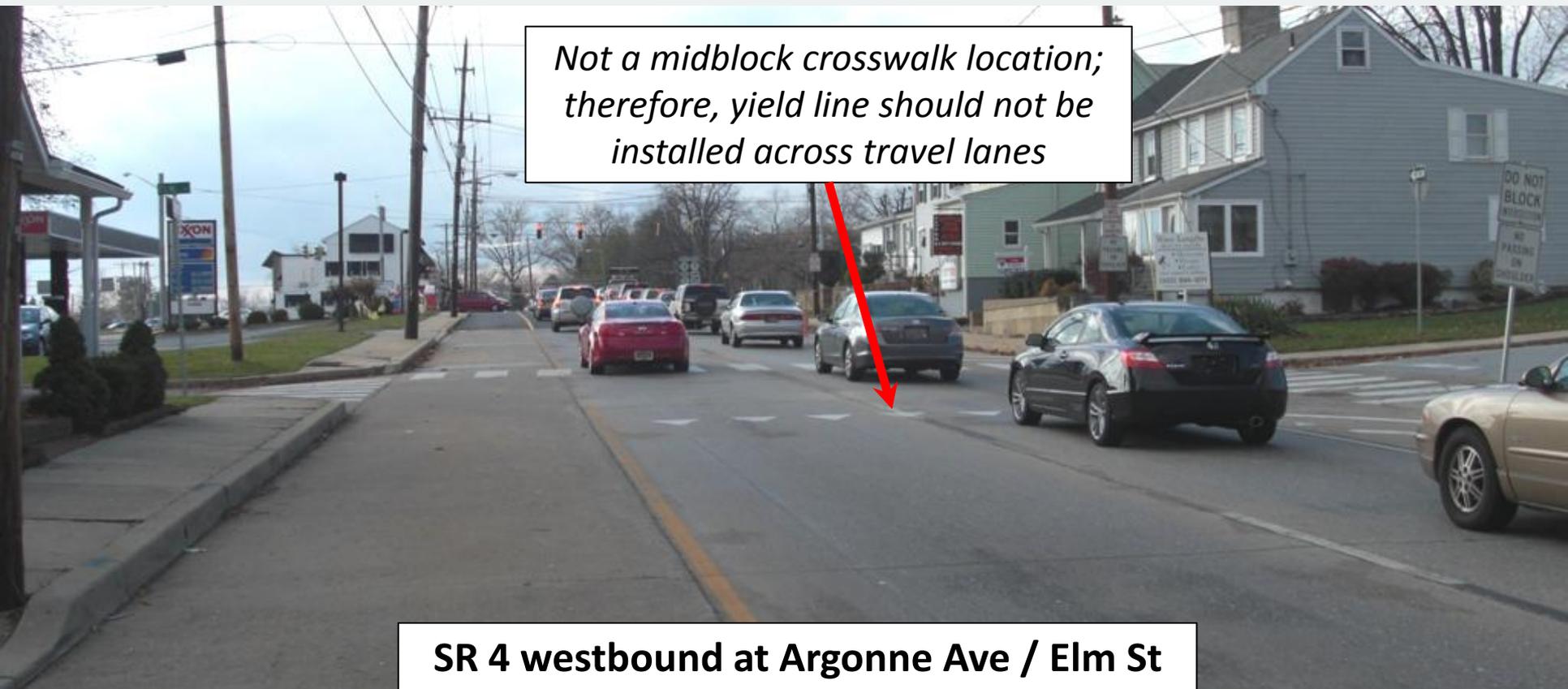
14A (DE Revision) Yield lines should not be used in advance of crosswalks located across channelized right-turn lanes with YIELD signs.

- Yield lines should not be installed in advance of crosswalks at roundabouts
- DE Guidance: Yield lines should not be installed across channelized right-turn lanes that also have crosswalks



**Salem Woods Dr at Old Baltimore Pk /
Salem Church Rd**

- DE Guidance: Yield lines should not be installed in advance of uncontrolled crosswalks at intersections*



*Not a midblock crosswalk location;
therefore, yield line should not be
installed across travel lanes*

SR 4 westbound at Argonne Ave / Elm St

Guidance:

16 (DE Revision) Staggered stop and yield lines are discouraged and should not be used along state-maintained roadways unless approved by DelDOT Traffic.

Support:

17 Staggered stop lines and staggered yield lines can improve the driver's view of pedestrians, provide better sight distance for turning vehicles, and increase the turning radius for left-turning vehicles.

- *DE Guidance: Staggered stop and yield lines are discouraged; require approval from DelDOT Traffic*



Staggered stop lines installed because of skewed approach and to increase storage along northbound Church St between Washington St and SR 1A



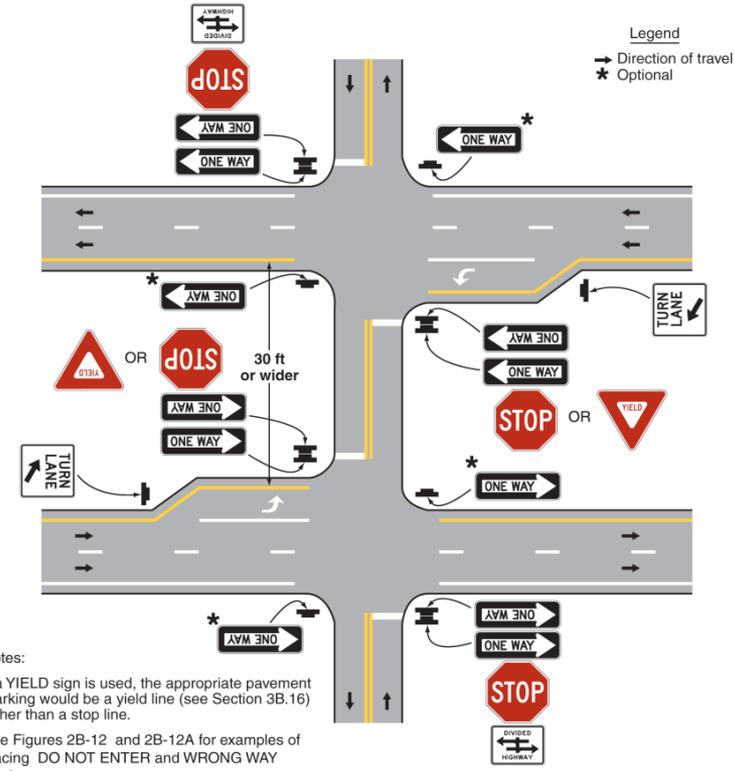
Church St at SR 1A

14B (DE Revision) Yield (stop) lines should be used within median crossovers on the approach to the second roadway of a divided highway where the median width is greater than or equal to 50 feet and where the approach is controlled by a YIELD (STOP) sign (see Figure 2B-15).

Option:
14C (DE Revision) Yield (stop) lines may be used within median crossovers on the approach to the second roadway of a divided highway where the median width is greater than or equal to 30 feet and less than 50 feet and where the approach is controlled by a YIELD (STOP) sign where engineering judgment indicates such a need (see Figure 2B-15).

- DE Guidance: Install stop line (or yield line) within median of divided highway where median width $\geq 50'$
- DE Option: Use engineering judgment at locations with median widths $\geq 30'$ and $< 50'$

Figure 2B-15. ONE WAY, TURN LANE, and Divided Highway Crossing Signing for Median Openings along Divided Highways with Median Widths of 30 Feet or Wider (Delaware Revision)



Notes:
If a YIELD sign is used, the appropriate pavement marking would be a yield line (see Section 3B.16) rather than a stop line.
See Figures 2B-12 and 2B-12A for examples of placing DO NOT ENTER and WRONG WAY signing.
Double yellow center line should be placed in the median if the median width is greater than or equal to 50 ft. Engineering judgement should be used to determine whether a double yellow center line should be placed in the median if the median width is greater than or equal to 30 ft and less than 50 ft.

Option:

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

Standard:

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

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

03 Do Not Block Intersection markings shall be accompanied by one or more Do Not Block Intersection (DRIVEWAY) (CROSSING) (R10-7) signs (see Section 2B.53), one or more Do Not Stop On Tracks (R8-8) signs (see Section 8B.09), or one or more similar signs.

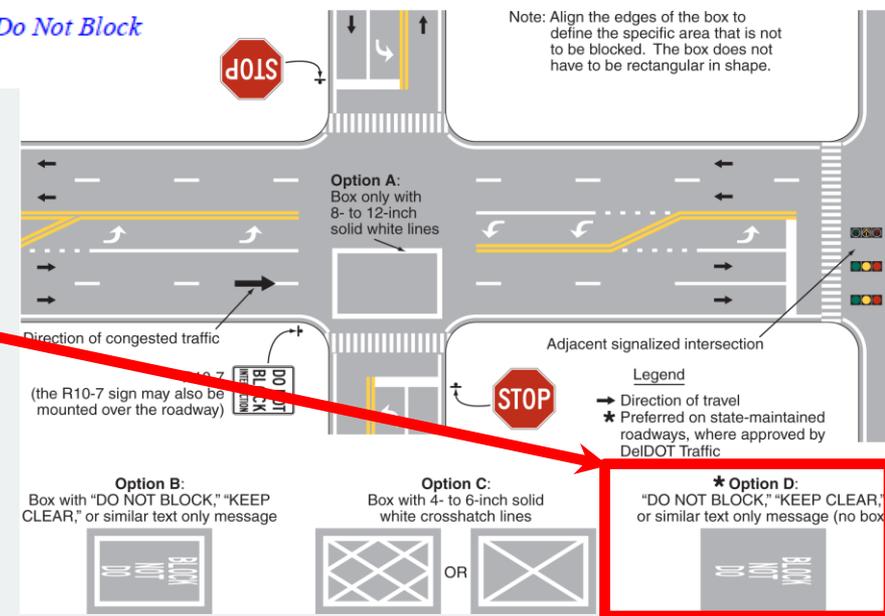
Guidance:

03A (DE Revision) If approved by DelDOT Traffic for used along state-maintained roadways, Do Not Block Intersection markings should be as described in option D of Paragraph 2 and Figure 3B-18.

*** Option D:**
“DO NOT BLOCK,” “KEEP CLEAR,”
or similar text only message (no box)



Figure 3B-18. Do Not Block Intersection Markings (Delaware Revision)



- Supplement regulatory signs
- *DE Guidance: Option D preferred where approved by DelDOT Traffic*

Standard:

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

Guidance:

05 *(DE Revision) If 12-inch wide transverse lines are used to mark a temporary crosswalk or patterned pavement crosswalk, the crosswalk width should be measured between the two lines (see Figure 3B-19).*

Standard:

15 **(DE Revision) If crosswalk markings are used for permanent applications other than with patterned pavement or other aesthetic treatments, they shall consist of 24-inch wide solid white longitudinal lines separated by gaps of 24 inches (see Figure 3B-19).**

Guidance:

15A *(DE Revision) The design and placement of the lines and gaps should avoid the wheel paths if possible.*

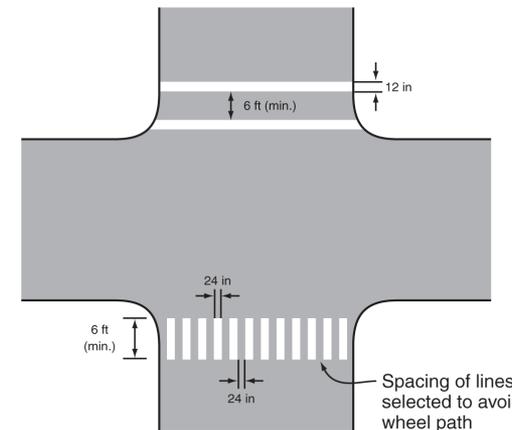
15B *(DE Revision) When patterned pavement or other aesthetic treatments are used to depict crosswalks, 12-inch wide transverse solid white lines should be used to define the crosswalk.*

Option:

15C *(DE Revision) Twelve-inch solid white transverse crosswalk markings may be used for temporary crosswalk installations (see Chapter 6F for additional guidance).*

- **DE Standard: 24" wide longitudinal ("piano key") markings spaced 24" apart**
- *Designed to avoid vehicle wheel paths*
- *DE Guidance: 12" wide transverse lines used to delineate patterned or brick crosswalks*
- *DE Option: 12" wide transverse lines used for temporary crosswalks*

Figure 3B-19. Examples of Crosswalk Markings (Delaware Revision)



Notes:
Transverse crosswalks should be used to delineate patterned and brick crosswalks.
Transverse crosswalks may also be used for temporary crosswalks.



Crosswalks shall consist of solid white lines

San Francisco, CA

CORRECT

Patterned and brick crosswalks should be delineated with 12" wide transverse crosswalk markings, not solely concrete borders

INCORRECT



SR 1A at Church St



SR 1A at 2nd St

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

09 *New marked crosswalks alone, without other measures designed to reduce traffic speeds, shorten crossing distances, enhance driver awareness of the crossing, and/or provide active warning of pedestrian presence, should not be installed across uncontrolled roadways where the speed limit exceeds 40 mph and either:*

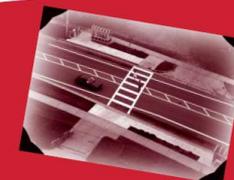
- A. *The roadway has four or more lanes of travel without a raised median or pedestrian refuge island and an ADT of 12,000 vehicles per day or greater; or*
- B. *The roadway has four or more lanes of travel with a raised median or pedestrian refuge island and an ADT of 15,000 vehicles per day or greater.*

- *Uncontrolled crosswalks installed based on engineering studies*
- *Guidelines based on number of lanes, speed limit, ADT, median, etc.*
- More criteria in NCHRP Report 562 and FHWA Publication HRT-04-100

Safety Effects of Marked Versus Unmarked Crosswalks at Uncontrolled Locations Final Report and Recommended Guidelines

FHWA PUBLICATION NUMBER: HRT-04-100

SEPTEMBER 2005



U.S. Department of Transportation
Federal Highway Administration

Research, Development, and Technology
Turner-Fairbank Highway Research Center
6300 Georgetown Pike
McLean, VA 22101-2296



TCRP
REPORT 112

TRANSIT
COOPERATIVE
RESEARCH
PROGRAM

IMPROVING PEDESTRIAN SAFETY
AT UNSIGNALIZED CROSSINGS

NATIONAL
COOPERATIVE
HIGHWAY RESEARCH
PROGRAM

NCHRP
REPORT 562

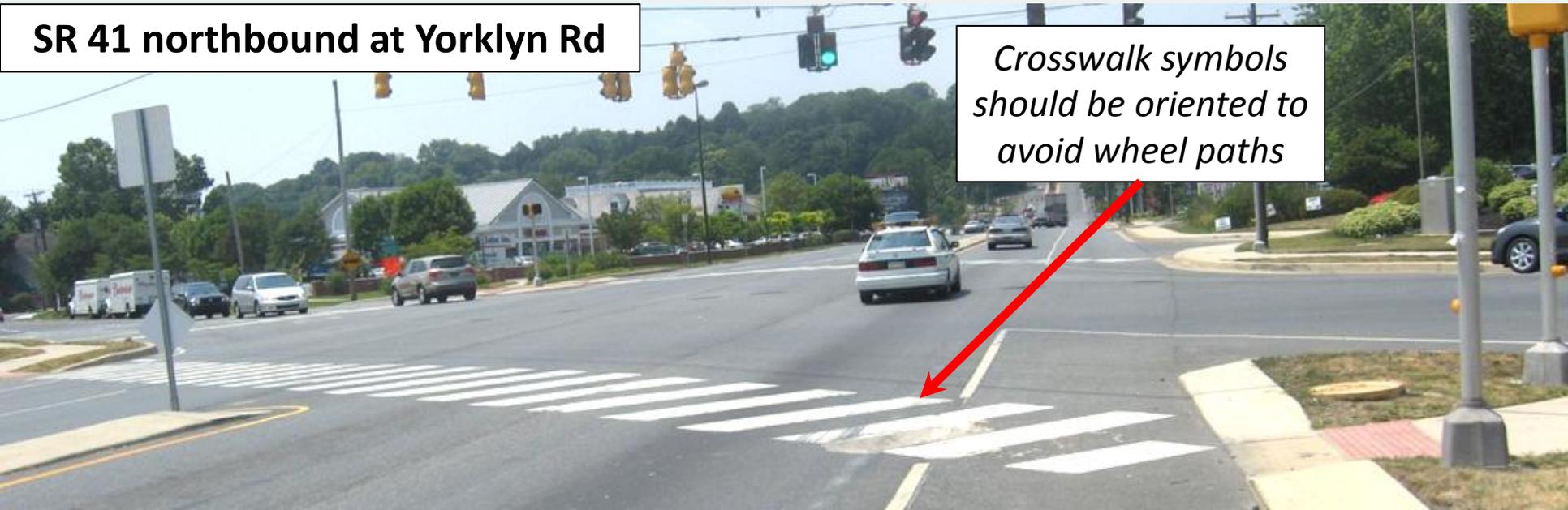
05A (DE Revision) *Crosswalk markings on roadways with a posted speed limit (or 85th-percentile speed) of 40 mph or greater and at locations with high pedestrian activity should be 10 feet wide. Crosswalk markings on other roadways should be 6 feet wide.*

05B (DE Revision) *Crosswalk markings on all approaches to an intersection with one or more roadways with a posted speed limit (or 85th-percentile speed) of 40 mph or greater or with high pedestrian activity should be 10 feet wide.*

- **DE Guidance:**
 - 6' crosswalks across roads < 40 MPH (posted or 85th-percentile speed)
 - 10' crosswalks across roads \geq 40 MPH
 - 10' crosswalks in areas with high pedestrian volumes
 - Intersection of high-speed and low-speed roads should have 10' crosswalks on all approaches, not varying sizes

SR 41 northbound at Yorklyn Rd

Crosswalk symbols should be oriented to avoid wheel paths



Option:

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

A. Regulatory:

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

B. Warning:

1. STOP AHEAD
2. YIELD AHEAD
3. YIELD AHEAD triangle symbol
4. SCHOOL XING
5. SIGNAL AHEAD
6. PED XING
7. SCHOOL
8. R X R
9. BUMP
10. HUMP
11. Lane-reduction arrows

C. Guide:

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

Standard:

03 Word, symbol, and arrow markings shall be white, except as otherwise provided in this Section.

Guidance:

- 05 Letters and numerals should be 6 feet or more in height.
- 06 Word and symbol markings should not exceed three lines of information.

- Words, symbols, and arrows may be used based on engineering judgment
- **Shall be white**
- *Letters and numerals $\geq 6'$ in height*
- *No more than 3 lines of information*



STOP word marking installed
to reinforce unanticipated
stop condition along SR 5

SR 5 at Hollyville Rd / Hollymount Rd

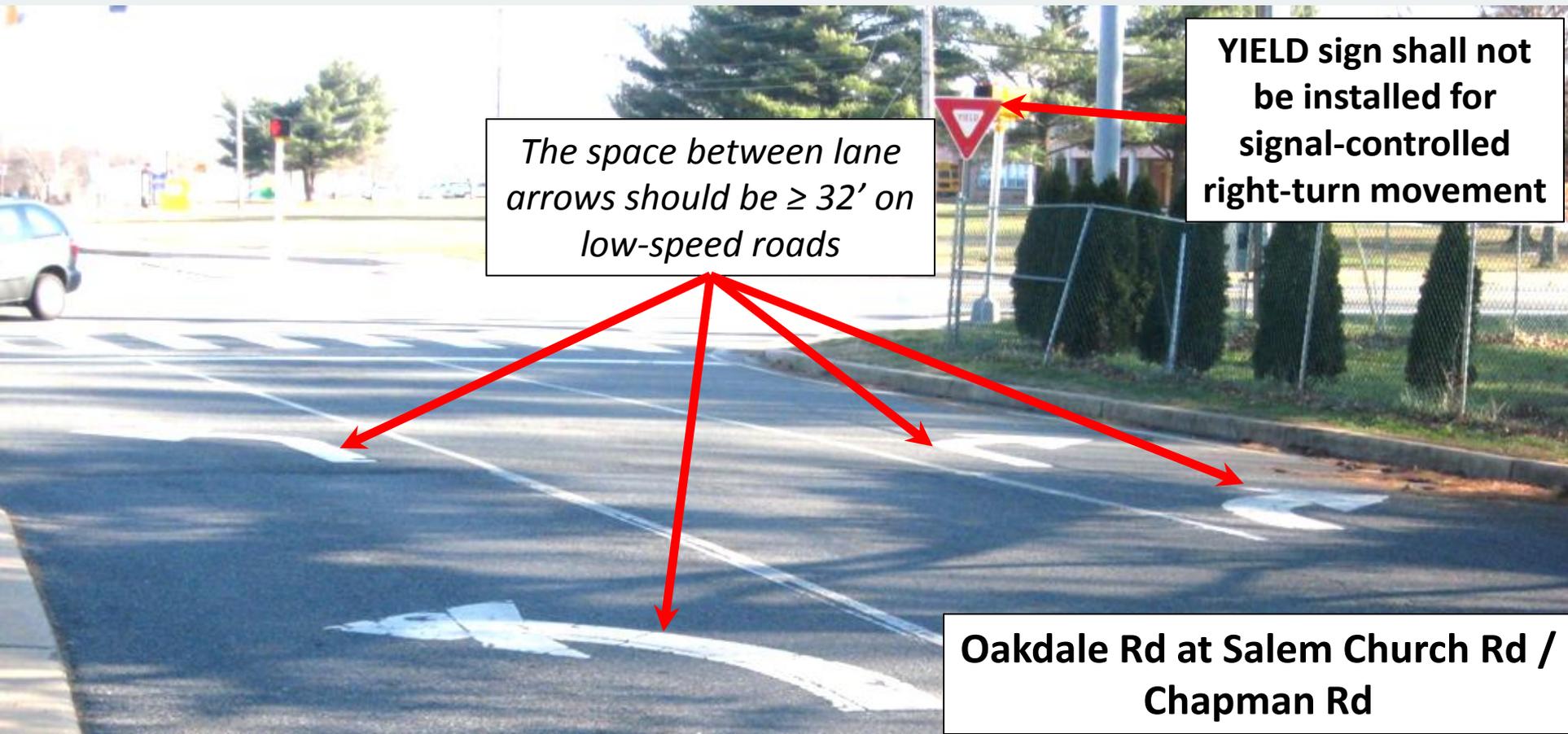
07 *If a pavement marking word message consists of more than one line of information, it should read in the direction of travel. The first word of the message should be nearest to the road user.*

- *Multi-line word messages installed in the direction of travel*



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

- *Longitudinal space between words, symbols, and arrows should be a minimum of 4 times the character height*



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

Guidance:
13A (DE Revision) Colored pavement markings displaying logos, emblems, symbols or patterns (other than those specifically permitted elsewhere in this Manual) should not be used, particularly in urban areas, or at/near intersections, so as to minimize diversion of attention from the roadway and other signs or pavement markings intended to convey regulatory, warning, or guidance information to motorists, consistent with Section 3A.01.

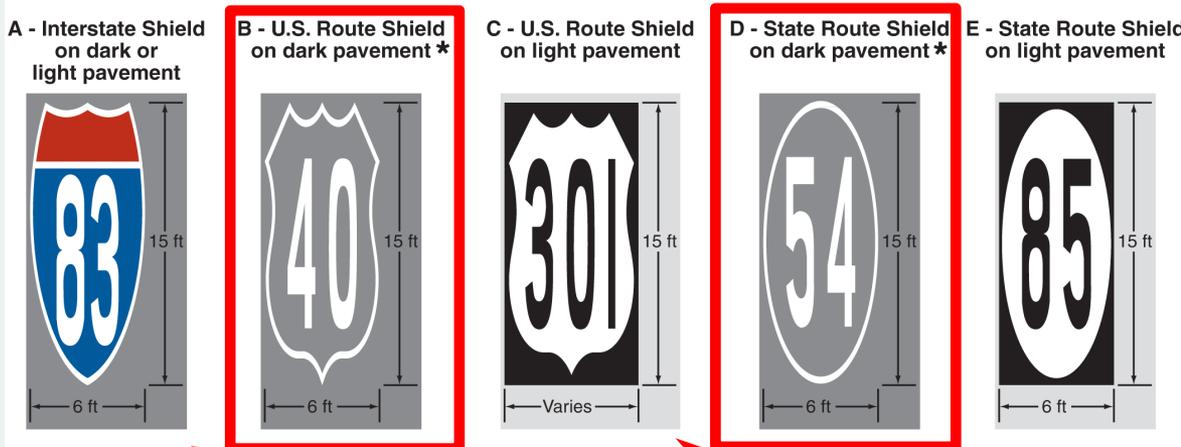
13B (DE Revision) If used along state-maintained roadways, pavement markings simulating route shield signs should be as shown in options B or D of Figure 3B-25. DelDOT Traffic should be contacted for additional guidance regarding the installation of pavement markings simulating route shield signs along state-maintained roadways.

- Elongated route shield pavement markings supplement guide signs

- DE Guidance:*

- Should not be used where they will divert attention from other signs or pavement markings
- Options B and D are preferred; DelDOT Traffic should be contacted for guidance

Figure 3B-25. Examples of Elongated Route Shields for Pavement Markings (Delaware Revision)



- Notes:
1. See the "Standard Highway Signs and Markings" book for other sizes and details
 2. Colors and elongated shapes simulating State route shield signs may be used for route shield pavement markings where appropriate

Legend

★ Preferred on state-maintained roadways, where approved by DelDOT Traffic



Route shield pavement marking installed to preposition motorists in advance of the turns to SR 141



Pavement marking should have oval outline to simulate route marker sign

SR 4 westbound (Justis St), Newport

Standard:

14 Except at the ends of aisles in parking lots, the word **STOP** shall not be used on the pavement unless accompanied by a stop line (see Section 3B.16) and **STOP** sign (see Section 2B.05). At the ends of aisles in parking lots, the word **STOP** shall not be used on the pavement unless accompanied by a stop line.

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

Option:

16 (DE Revision) A **YIELD AHEAD** word pavement marking may be used on approaches to intersections where the approaching traffic will encounter a **YIELD** sign at the intersection.

Standard:

17 (DE Revision) The **YIELD AHEAD** word pavement marking shall not be used unless a **YIELD** sign (see Section 2B.08) is in place at the intersection.

- STOP and YIELD AHEAD word markings reinforce stop and yield conditions
- **STOP shall not be installed without stop line and STOP sign (except in parking lots)**
- **YIELD AHEAD shall not be installed without downstream YIELD sign**



**STOP marking shall not
be used without a
corresponding stop line**

San Francisco, CA

Support:

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

Guidance:

21 (DE Revision) Lane-use arrow markings (see Figures 3B-11 and 3B-24) should be used in lanes designated for the exclusive use of a turning movement, including turn bays, except where engineering judgment determines that physical conditions or other markings (such as a dotted extension of the lane line through the taper into the turn bay) clearly discourage unintentional use of a turn bay by through vehicles. Lane-use arrow markings should also be used in lanes from which movements are allowed that are contrary to the normal rules of the road (see Drawing B of Figure 3B-13). For exclusive turn lanes with a full-width turn lane length less than 200 feet, one arrow should be placed at the upstream end of the full-width turn lane and one arrow should be placed 30 feet in advance of the stop line. For turn lanes with a full-width turn lane length equal to or greater than 200 feet and less than or equal to 500 feet, one arrow should be placed at the upstream end of the full-width turn lane and one arrow should be placed 30 feet in advance of the stop line, and one arrow should be placed at one-half the length of the full-width turn lane (see Drawings A, B, D, and E of Figure 3B-11).

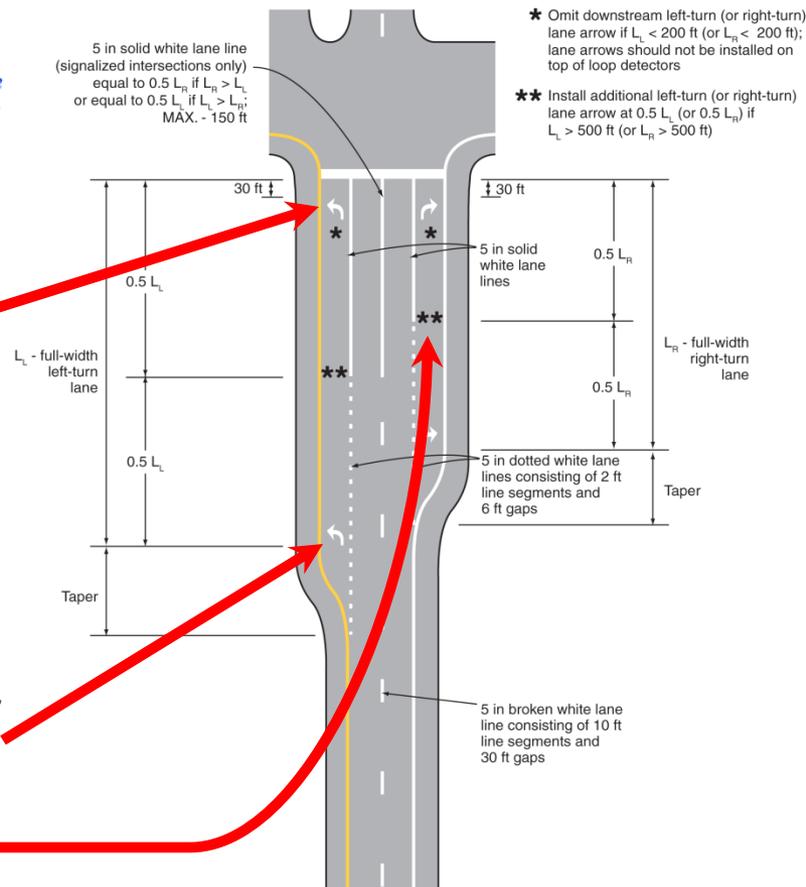
21A (DE Revision) If used on approaches to signalized intersection, lane-use arrow markings should not be installed on top of loop detectors.

DE Guidance:

- Downstream arrow installed 30' in advance of stop line, if present, or edge of conflicting road
- Downstream arrow should avoid loop detector at signal
- Omit downstream arrow if $L < 200'$
- Upstream arrow installed at beginning of full-width turn lane (i.e., end of taper)
- Install third arrow at $0.5L$ if $L > 500'$

Figure 3B-11. Examples of Applications of Conventional Road Auxiliary Lane and Lane-Drop Markings
(Sheet 4 of 5)
(Delaware Revision)

D – Exclusive turn lanes at an intersection



Standard:

25 (DE Revision) Where through lanes approaching an intersection or added lanes from an upstream intersection become mandatory turn lanes, lane-use arrow markings (see Drawings A, B, and C of Figure 3B-11 and Figure 3B-24) shall be used and shall be accompanied by standard signs.

Guidance:

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

Option:

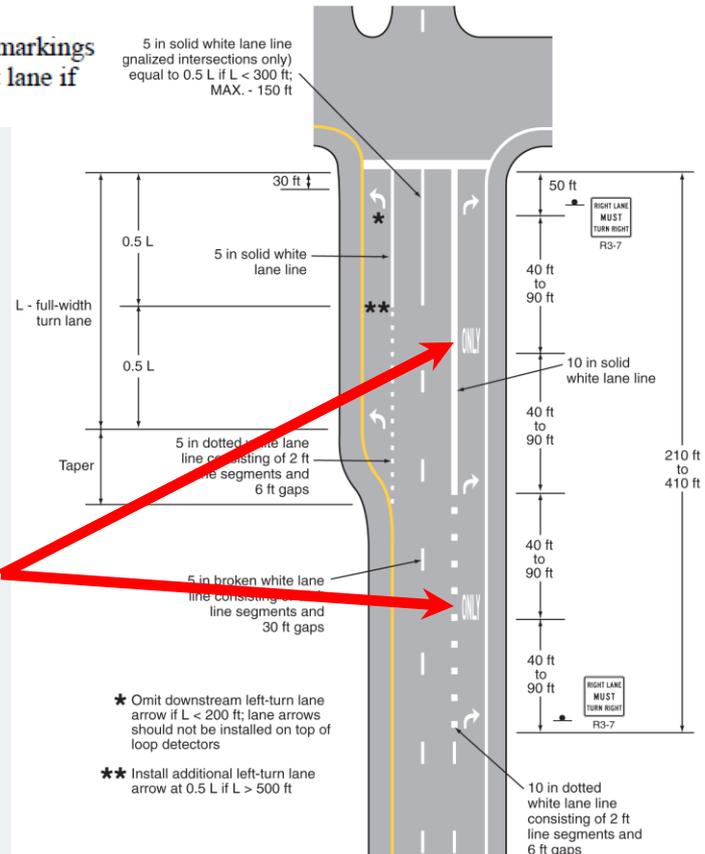
27 On freeways or expressways where a through lane becomes a mandatory exit lane, lane-use arrow markings may be used on the approach to the exit in the dropped lane and in an adjacent optional through-or-exit lane if one exists.

- **Arrows shall be used at lane drops at intersections along conventional roads**
- **Corresponding regulatory signs also required at lane drops**
- *ONLY markings used in addition to arrows and signs*
- Arrows may be used to supplement interstate, freeway, and expressway lane drops



Figure 3B-11. Examples of Applications of Conventional Road Auxiliary Lane and Lane-Drop Markings (Sheet 1 of 5)
(Delaware Revision)

A – Right-turn lane drop at an intersection
(Posted or 85th-percentile speed < 35 MPH)



Lane arrows and R3-7 signs
used at lane drops

Shall be wide
(10") dotted
lane line

*ONLY markings used
at lane drops*

SR 2 / SR 72 (Library Ave) north of SR 4

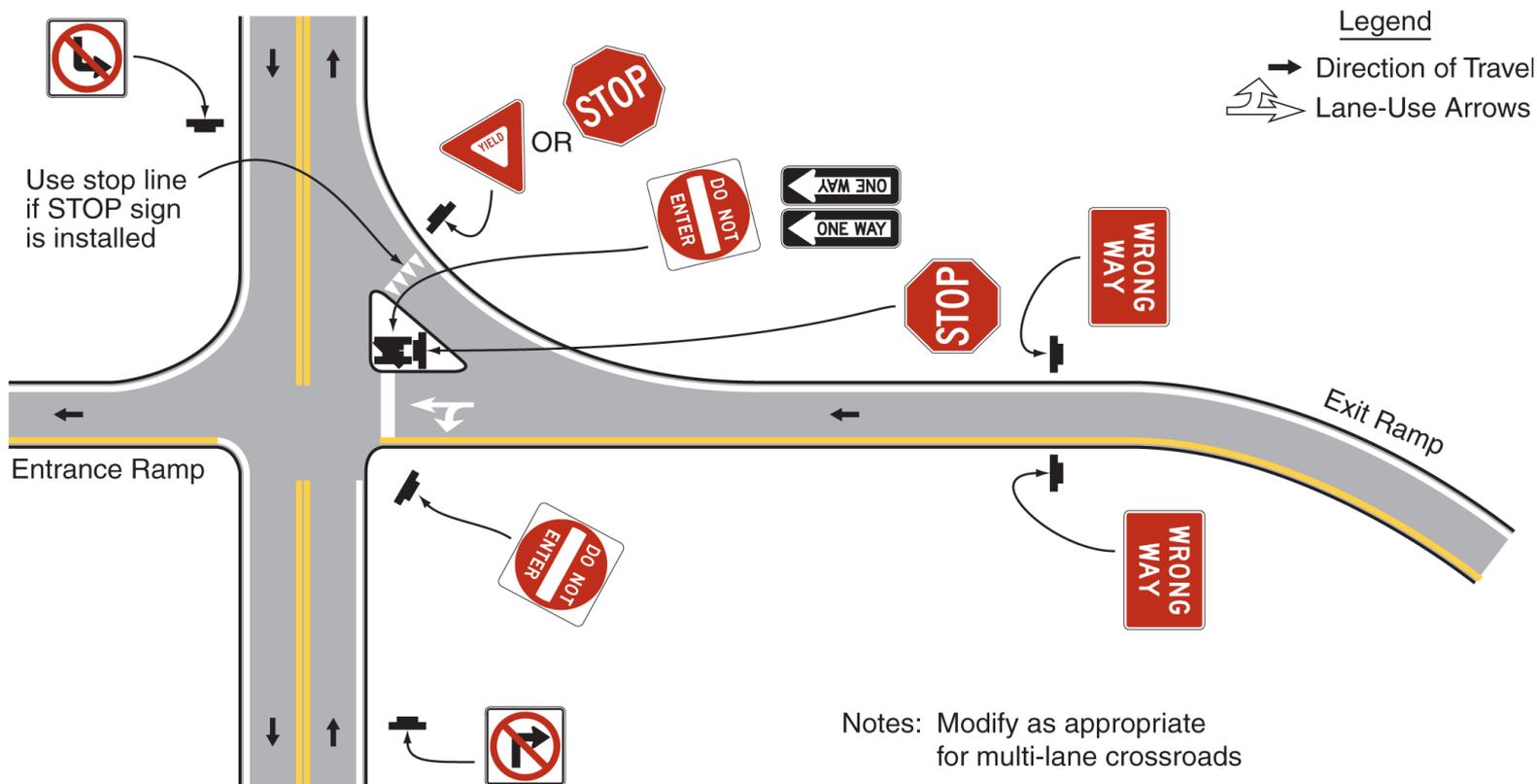


Guidance:

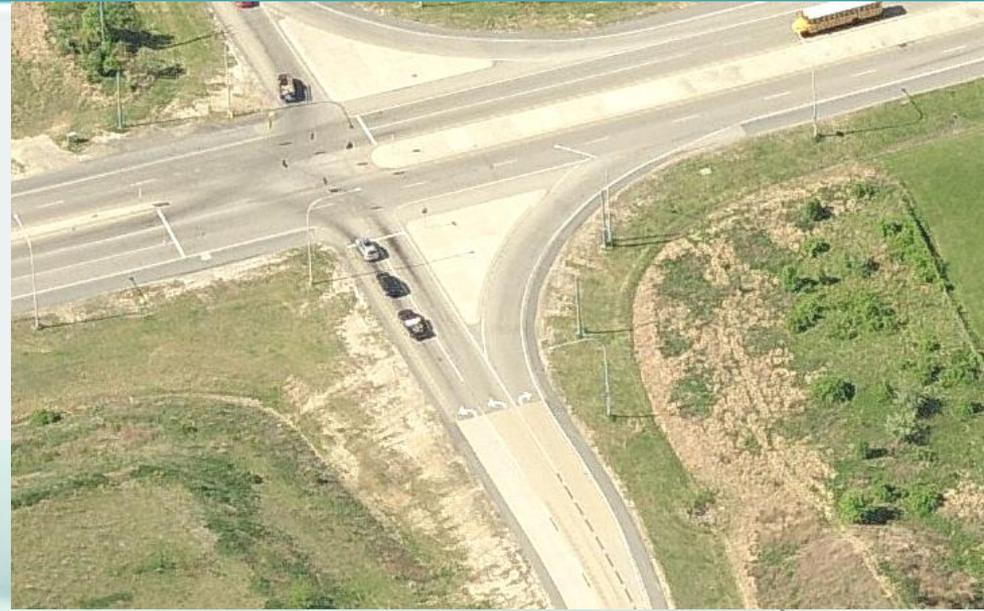
36 *Where crossroad channelization or ramp geometrics do not make wrong-way movements difficult, the appropriate lane-use arrow should be placed in each lane of an exit ramp near the crossroad terminal where it will be clearly visible to a potential wrong-way road user (see Figure 2B-18).*

- *Arrows installed along off-ramps deter wrong-way movements*

Figure 2B-18. Example of Application of Regulatory Signing and Pavement Markings at an Exit Ramp Termination to Deter Wrong-Way Entry (Delaware Revision)



*Lane arrows help
deter wrong-way
entries onto SR 1*



SR 1 northbound off-ramp to SR 299

Standard:

02 (DE Revision) Speed measurement markings, if used, shall be white, and shall be 12 inches in width.

02A (DE Revision) Speed measurement marking shall not extend across the entire width of any travel lanes.

Option:

03 (DE Revision) When at least one paved shoulder of sufficient width is available, speed measurement markings may be placed entirely on the shoulder (see Drawing A of Figure 3B-10). If no shoulder is available, speed measurement markings may be 24 inches long and centered on the center line and lane lines. In addition, a 24-inch long speed measurement marking may be placed on the edge line extending toward the center line or lane lines. Speed measurement markings may be installed at 1/4-mile intervals over a 1-mile length of roadway.

Advisory signs may be used in conjunction with these markings.

- **DE Standard: Shall not extend across entire width of any travel lane similar to stop lines**
- DE Option:
 - 12" wide line marked on shoulder, if present
 - If no shoulder, 24" long, 12" wide line centered on the center line and lane line



Guidance:

02 *If used, speed reduction markings should be reserved for unexpected curves and should not be used on long tangent sections of roadway or in areas frequented mainly by local or familiar drivers, (e.g., school zones). If used, speed reduction markings should supplement the appropriate warning signs and other traffic control devices and should not substitute for these devices.*

Standard:

03 **If used, speed reduction markings shall be a series of white transverse lines on both sides of the lane that are perpendicular to the center line, edge line, or lane line. The longitudinal spacing between the markings shall be progressively reduced from the upstream to the downstream end of the marked portion of the lane.**

Guidance:

04 *Speed reduction markings should not be greater than 12 inches in width, and should not extend more than 18 inches into the lane.*

Standard:

05 **Speed reduction markings shall not be used in lanes that do not have a longitudinal line (center line, edge line, or lane line) on both sides of the lane.**

- *Reserved for unexpected locations*
- *Transverse lines $\leq 12''$ wide extending $\leq 18''$ into the lane*



I-195 approaching BWI Airport, Maryland

Guidance:

01A (DE Revision) White chevron markings should be placed in the neutral area of exit ramp gores (see Figures 3B-8, 3B-8A, 3B-10 and 3B-10A).

Standard:

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

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

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

White crosshatch markings installed to discourage motorists from driving in the shoulder

- Discourage motorists from driving across certain areas
- *DE Guidance: Used in diverge neutral areas*
- **White "V" shaped markings when separating traffic in same direction**
- **Yellow markings when separating traffic in opposing directions**
- **Yellow markings on left shoulders**
- **White markings on right shoulders**



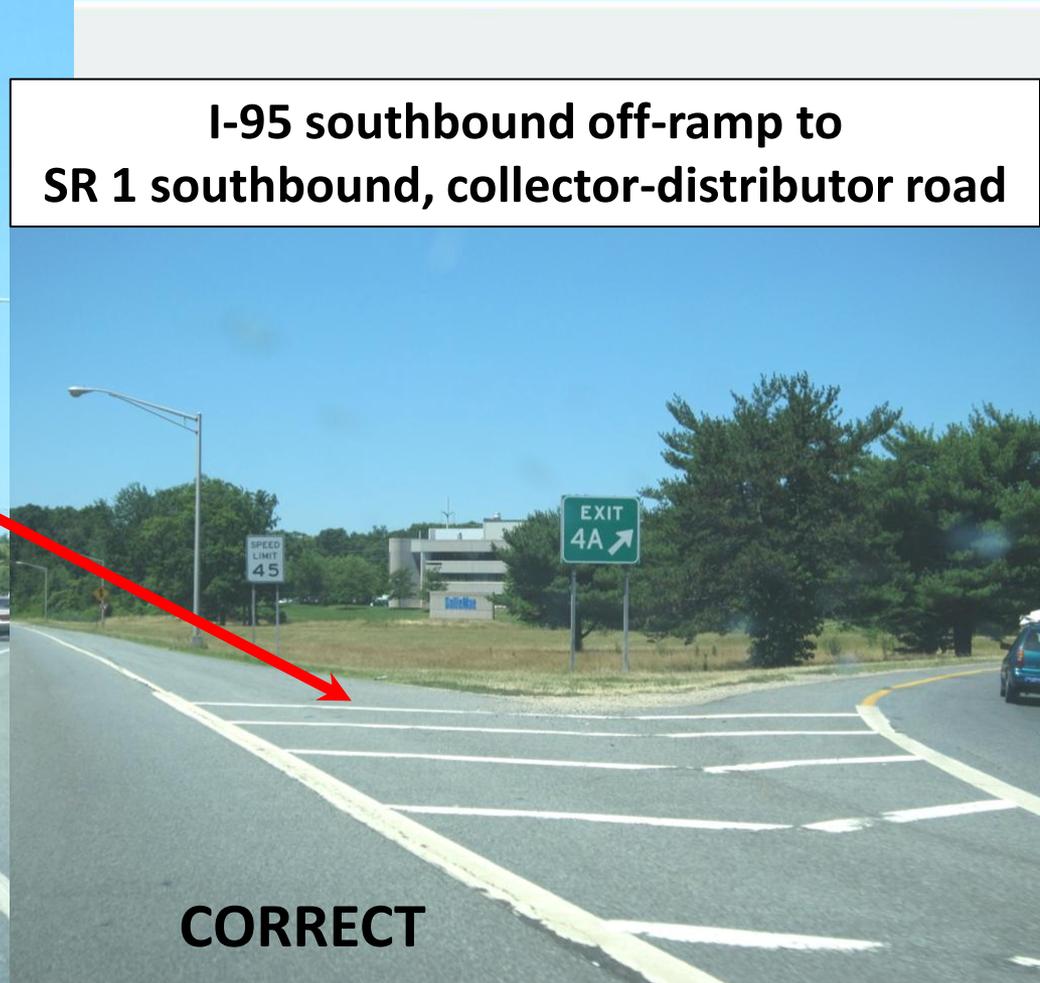
SR 4 westbound at SR 7

INCORRECT

Chevrons should be installed within the neutral area at off-ramps



**I-95 southbound off-ramp to
SR 1 southbound, collector-distributor road**



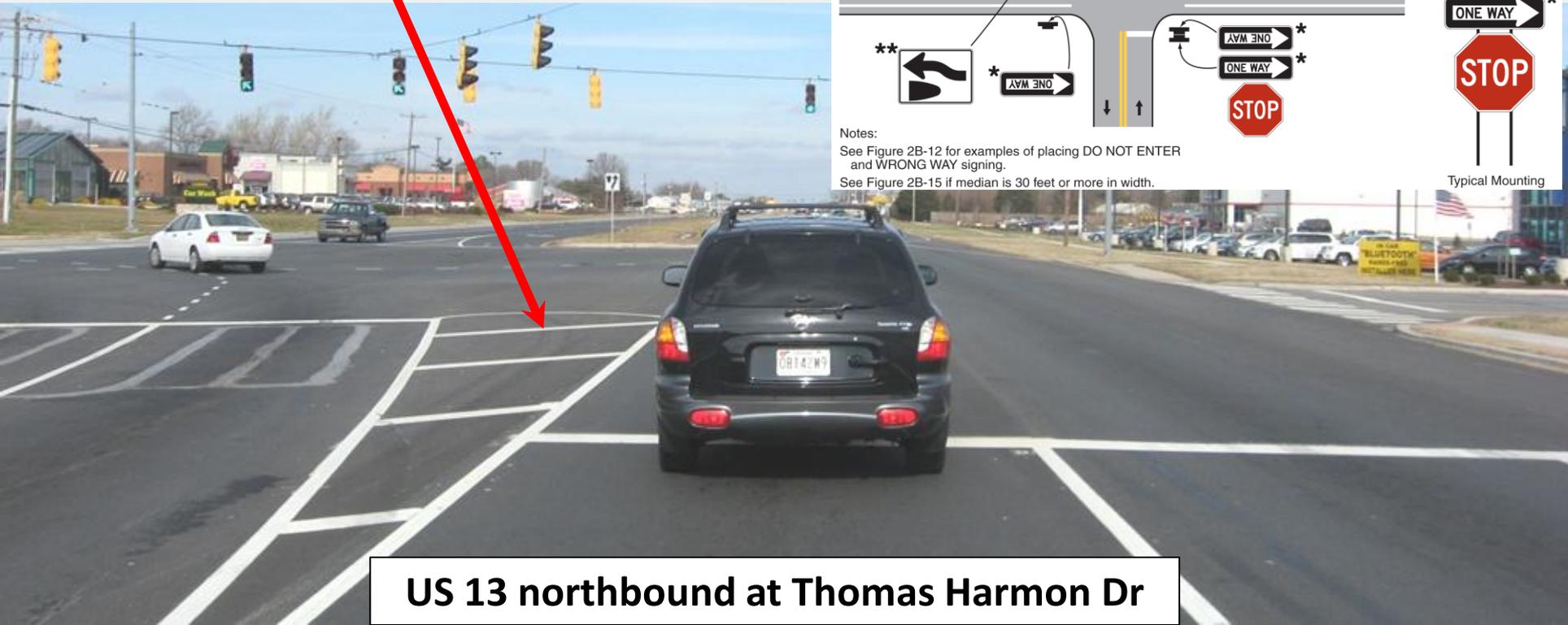
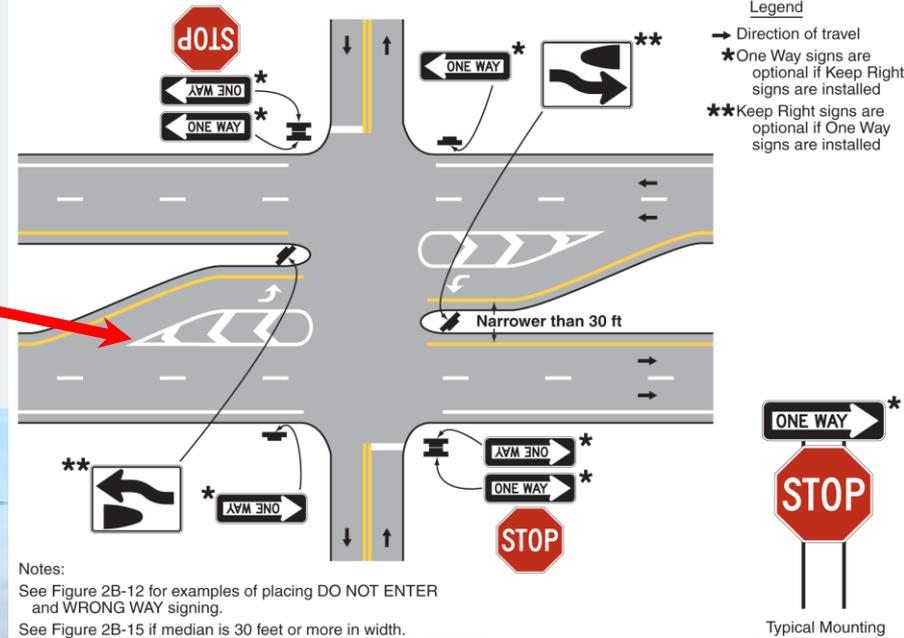
CORRECT

**I-95 southbound off-ramp to
SR 1 southbound, mainline**

Chevrons separating traffic in the same direction shall point toward traffic

Chevrons at offset left-turn lanes shall be "V" shaped

Figure 2B-17. ONE WAY Signing for Divided Highways with Median Widths Narrower Than 30 Feet and Separated Left-Turn Lanes



US 13 northbound at Thomas Harmon Dr

Guidance:

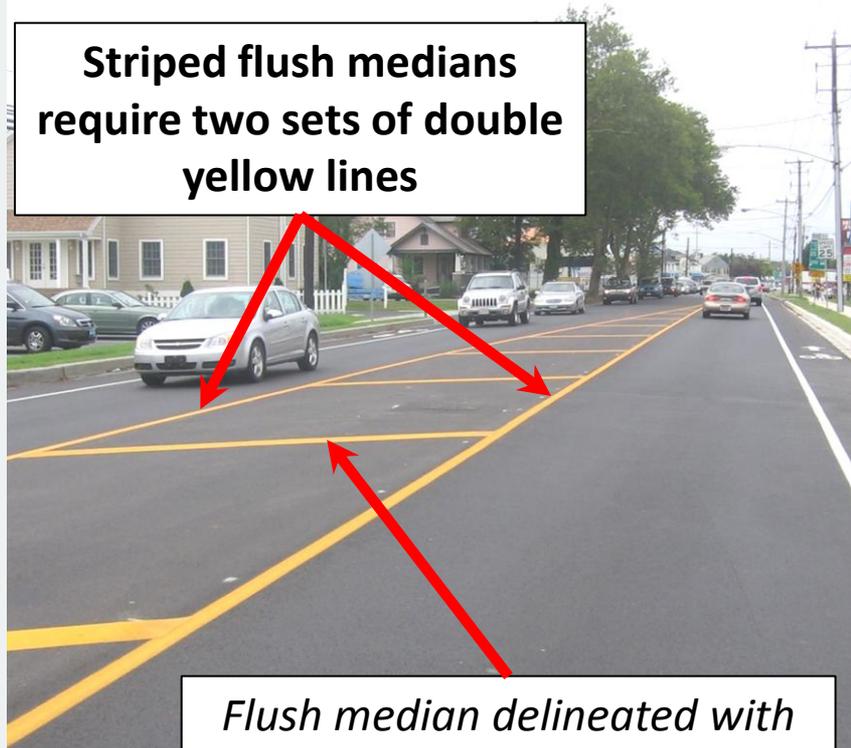
05 (DE Revision) The chevrons and diagonal lines used for crosshatch markings should be 12 inches wide along all roadways. The longitudinal spacing of the chevrons or diagonal lines should be 50 feet along interstates, expressways, and freeways and 25 feet along all other roadways. The chevrons and diagonal lines should form an angle of approximately 45 degrees with the longitudinal lines that they intersect.

- *DE Guidance:*

- *12" wide markings*
- *Angled at approx. 45 degrees with respect to adjacent travel lane(s)*
- *Spaced at 25' along conventional roads*
- *Spaced at 50' along interstates, freeways, and expressways*

SR 1A west of Church St

**Striped flush medians
require two sets of double
yellow lines**



*Flush median delineated with
12" crosshatch markings
spaced 25' at 45 degree angle*

Standard:

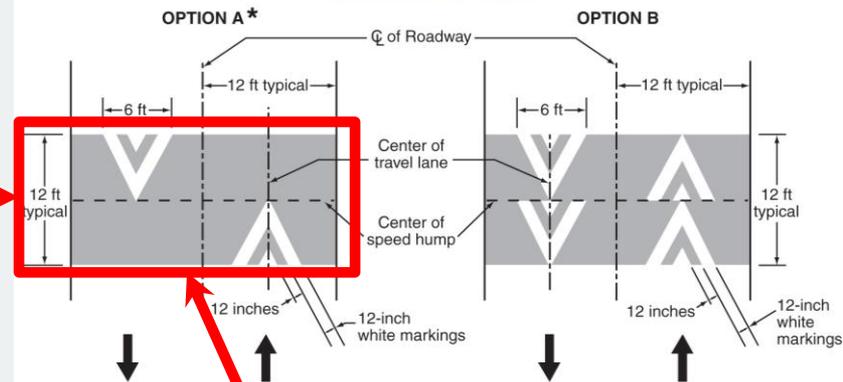
01 If speed hump markings are used, they shall be a series of white markings placed on a speed hump to identify its location. If markings are used for a speed hump that does not also function as a crosswalk or speed table, the markings shall comply with Option A, B, or C shown in Figure 3B-29. If markings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

Guidance:

01A (DE Revision) If used along state-maintained roadways, speed hump markings should be as shown in Option A of Figure 3B-29 or Option A of Figure 3B-30.

- **Shall be white and shall comply with Figure 3B-29**
- *DE Guidance: Option A is preferred on state-maintained roads*

Figure 3B-29. Pavement Markings for Speed Humps without Crosswalks (Delaware Revision)



Speed hump markings shall be white and shall comply with Figure 3B-29



Myrtle Ave west of Claymont Train Station



Weldin Rd roundabout (Blue Ball)

Standard:

- 01 **Multi-lane approaches to roundabouts shall have lane lines.**
- 02 **A through lane on a roadway that becomes a dropped lane (mandatory turn lane) at a roundabout shall be marked with a dotted white lane line in accordance with Section 3B.04.**

Guidance:

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

Standard:

- 04 **Continuous concentric lane lines shall not be used within the circulatory roadway of roundabouts.**

**SR 1A roundabout,
Rehoboth Beach**

- **Lane line required on multi-lane approaches**
- *Lane lines should be installed within circulatory road of multi-lane roundabouts*



Guidance:

- 01 *A white edge line should be used on the outer (right-hand) side of the circulatory roadway.*
- 02 *(DE Revision) Where a white edge line is used for the circulatory roadway, it should be as follows (see Figure 3C-1):*
 - A. *A solid line adjacent to the splitter island, and*
 - B. *A wide dotted line consisting of 2-foot line segments and 2-foot gaps across the lane(s) entering the roundabout.*

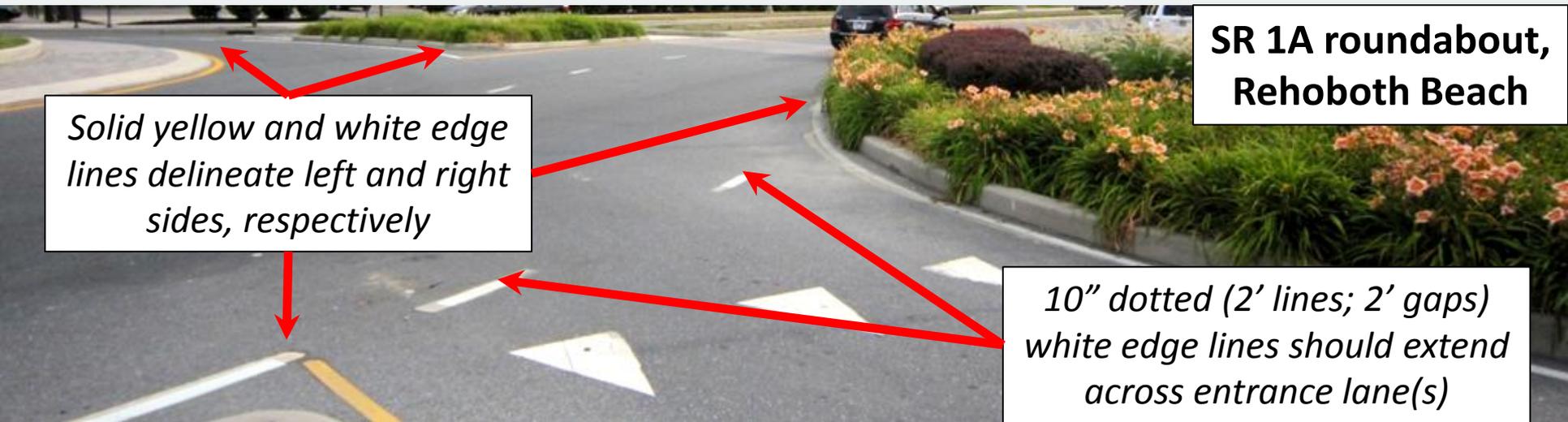
Standard:

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

Guidance:

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

- *White edge lines should be installed on right side*
- *DE Guidance:*
 - *Yellow edge lines should be installed on left side*
 - *10" dotted (2' lines; 2' gaps) white edge line extensions across entrance lane(s)*



**SR 1A roundabout,
Rehoboth Beach**

Solid yellow and white edge lines delineate left and right sides, respectively

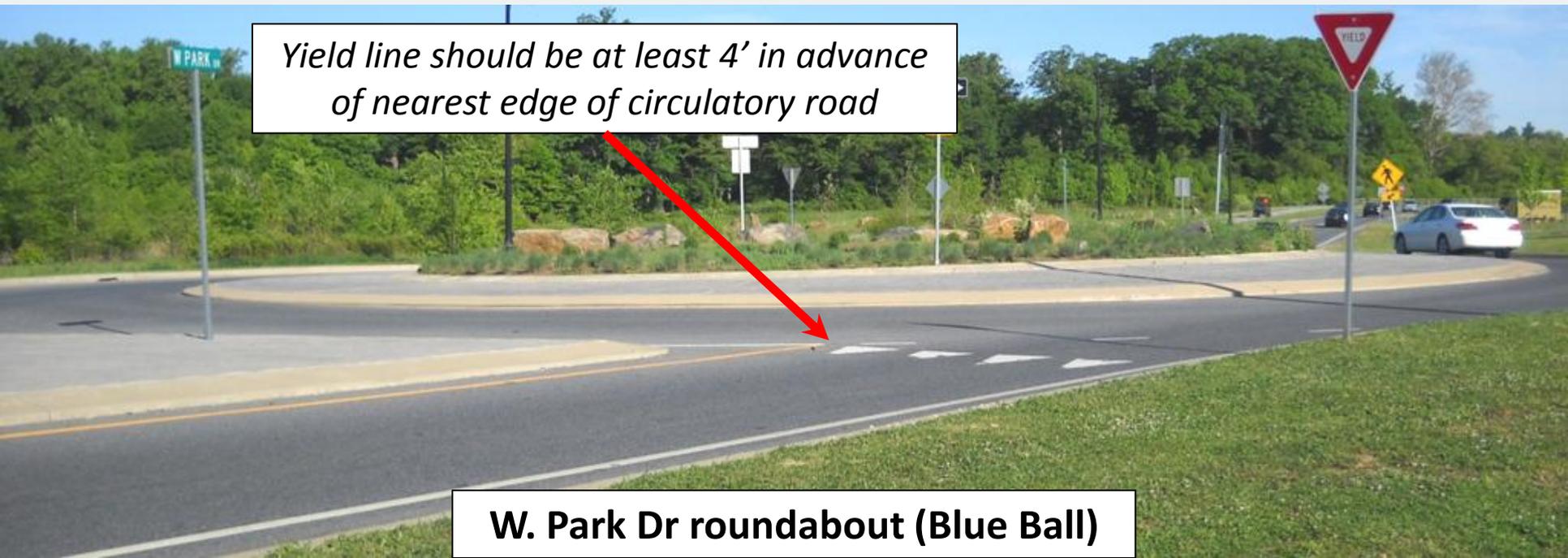
10" dotted (2' lines; 2' gaps) white edge lines should extend across entrance lane(s)

Guidance:

01 *(DE Revision)* A yield line (see Section 3B.16) *should* be used to indicate the point behind which vehicles are required to yield at the entrance to a roundabout (see Figure 3C-1). Yield lines should be installed a minimum of 4 feet in advance of the nearest edge of the circulatory roadway.

10 If used, stop and yield lines should be placed a minimum of 4 feet in advance of the nearest crosswalk line at controlled intersections, except for yield lines at roundabouts as provided for in Section 3C.04 and at midblock crosswalks. In the absence of a marked crosswalk, the stop line or yield line should be placed at the desired stopping or yielding point, but should not be placed more than 30 feet or less than 4 feet from the nearest edge of the intersecting traveled way. **(from Section 3B.16)**

- *DE Guidance: Installed along all approaches to state-maintained roundabouts; 4' (min.) from nearest edge of circulatory road*



Option:

- 01 Lane-use arrows may be used on any approach to and within the circulatory roadway of any roundabout.
- 02 YIELD (word) and YIELD AHEAD (symbol or word) pavement markings (see Figure 3C-1) may be used on approaches to roundabouts.
- 03 Word and/or route shield pavement markings may be used on an approach to or within the circulatory roadway of a roundabout to provide route and/or destination guidance information to road users (see Figure 3C-14).

Guidance:

- 04 *Within the circulatory roadway of multi-lane roundabouts, normal lane-use arrows (see Section 3B.20 and Figure 3B-24) should be used.*
- 05 *On multi-lane approaches with double left-turn and/or double right-turn lanes, lane-use arrows as shown in Figures 3C-7 and 3C-8 should be used.*

Option:

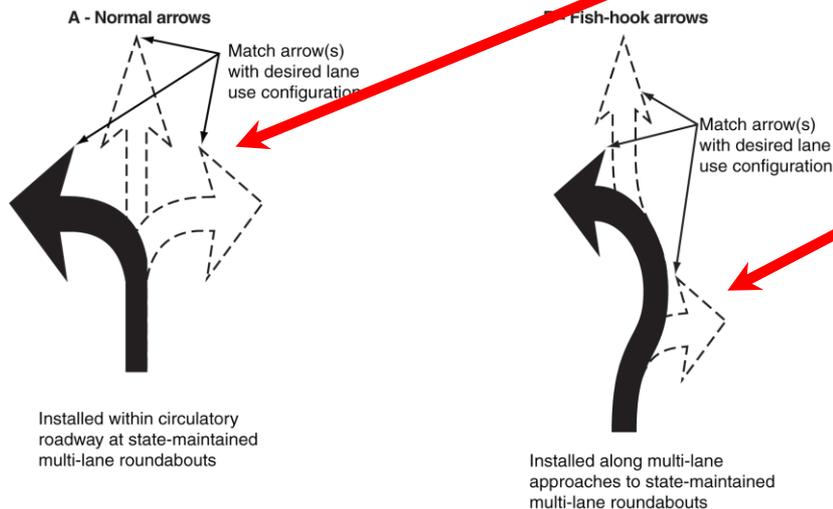
- 06 If used on approaches to a roundabout, lane-use arrows may be either normal or fish-hook arrows, either with or without an oval symbolizing the central island, as shown in Figure 3C-2.

Guidance:

- 06A *(DE Revision) Lane-use arrows along the approaches to state-maintained roundabouts should be fish-hook arrows (see Figure 3C-2).*

- Optional use of words, symbols, and arrows
- *Normal arrows within circulatory road at multi-lane roundabouts*
- *DE Guidance: Fish-hook arrows on approaches to state-maintained multi-lane roundabouts*

Figure 3C-2. Lane-Use Arrow Pavement Marking Options for Roundabout Approaches (Delaware Revision)



SR 1A roundabout, Rehoboth Beach

Distance between crosswalk and nearest edge of circulatory road should be $\geq 20'$

Yield line should be at least 4' in advance of nearest edge of circulatory road

YIELD word markings are optional at roundabouts

Brick crosswalks should be delineated with 12" wide transverse crosswalk markings, not solely concrete borders

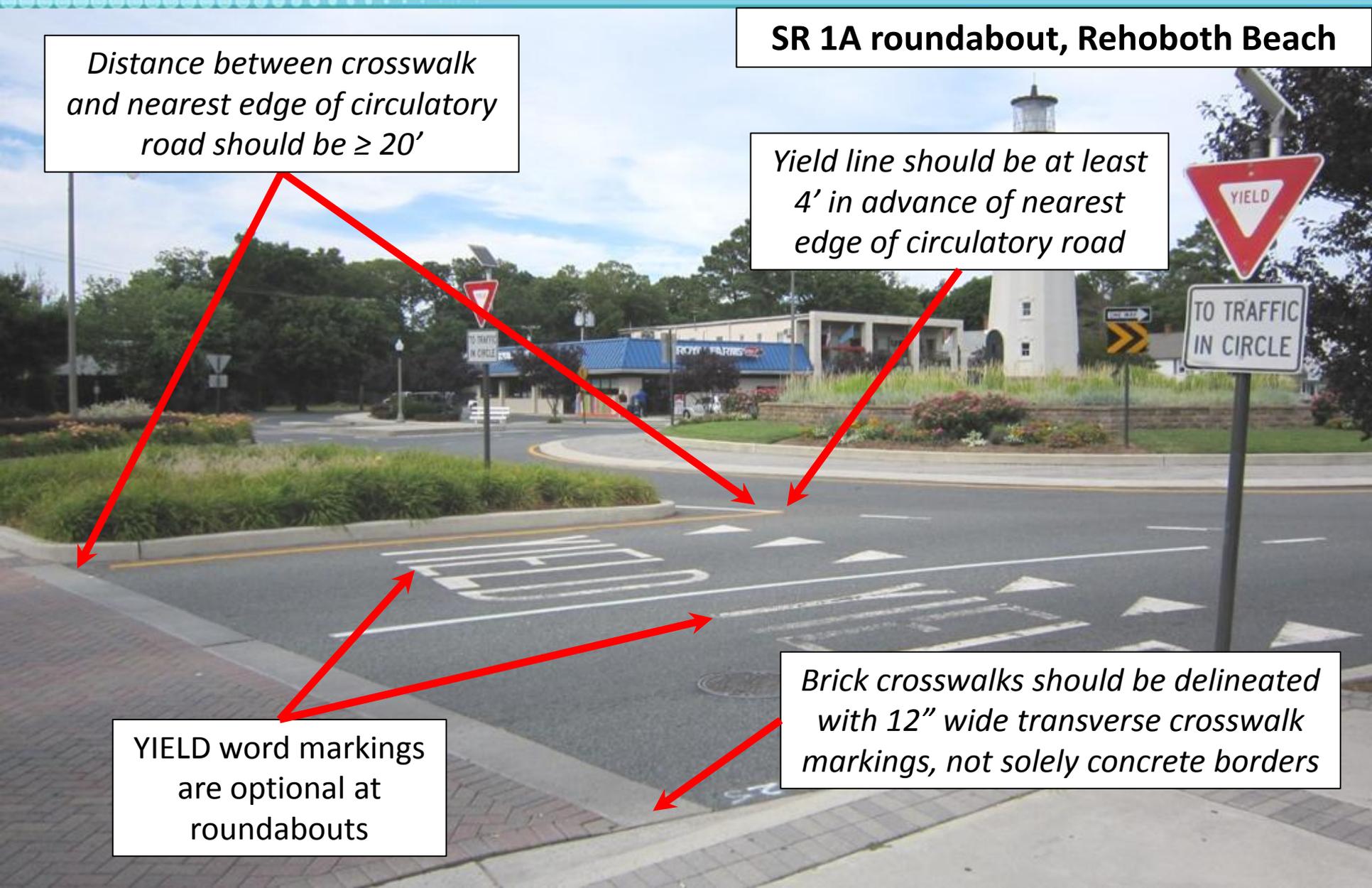
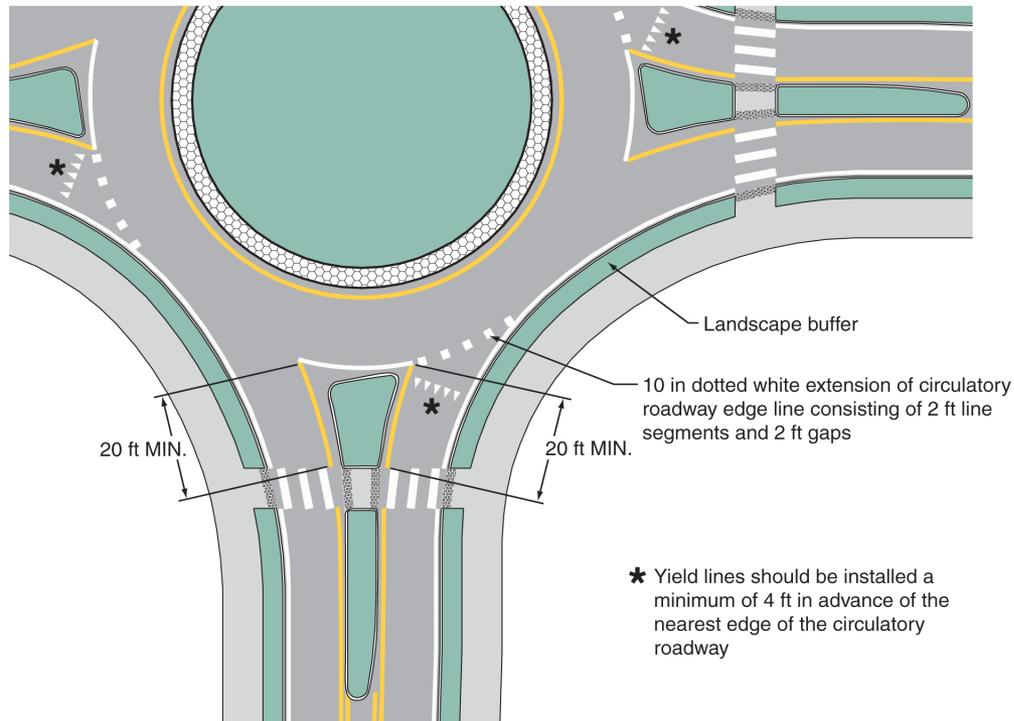
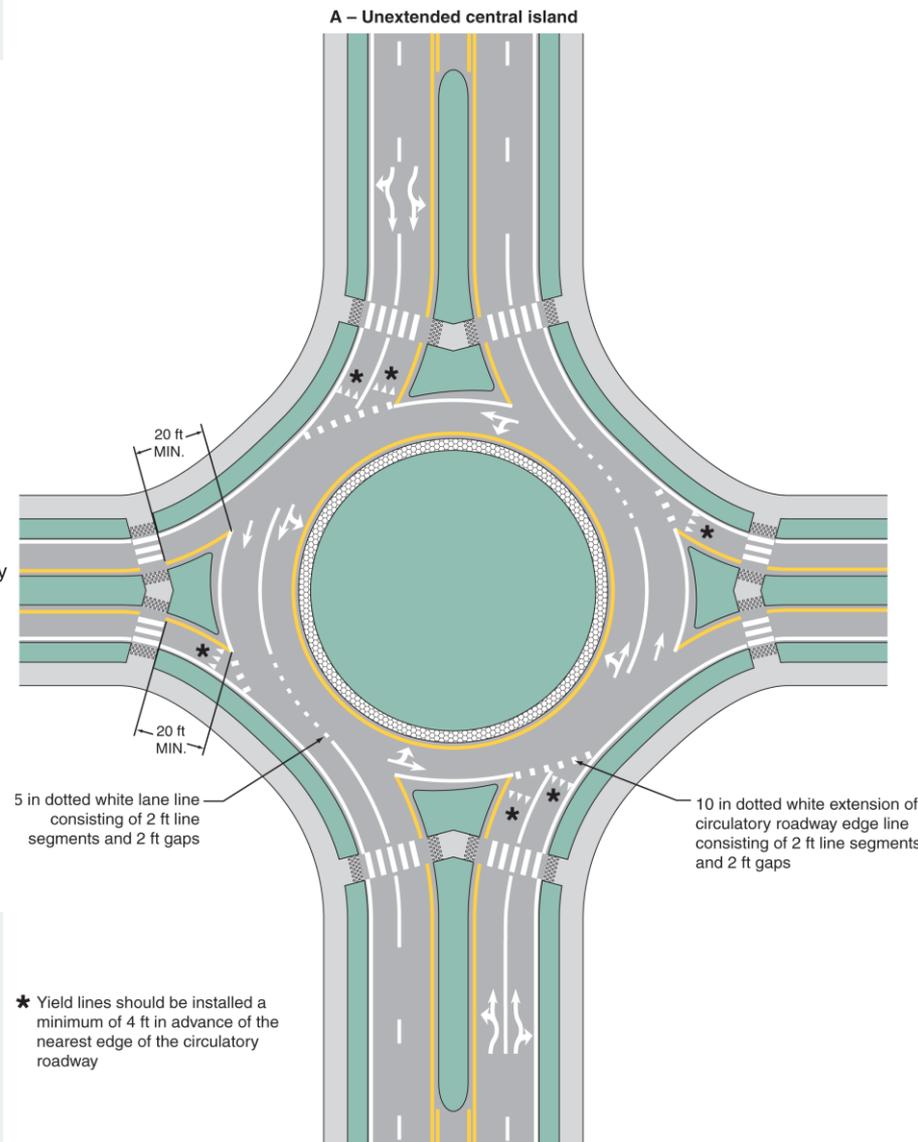


Figure 3C-1. Example of Markings for Approach and Circulatory Roadways at a Roundabout (Delaware Revision)



* Yield lines should be installed a minimum of 4 ft in advance of the nearest edge of the circulatory roadway

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

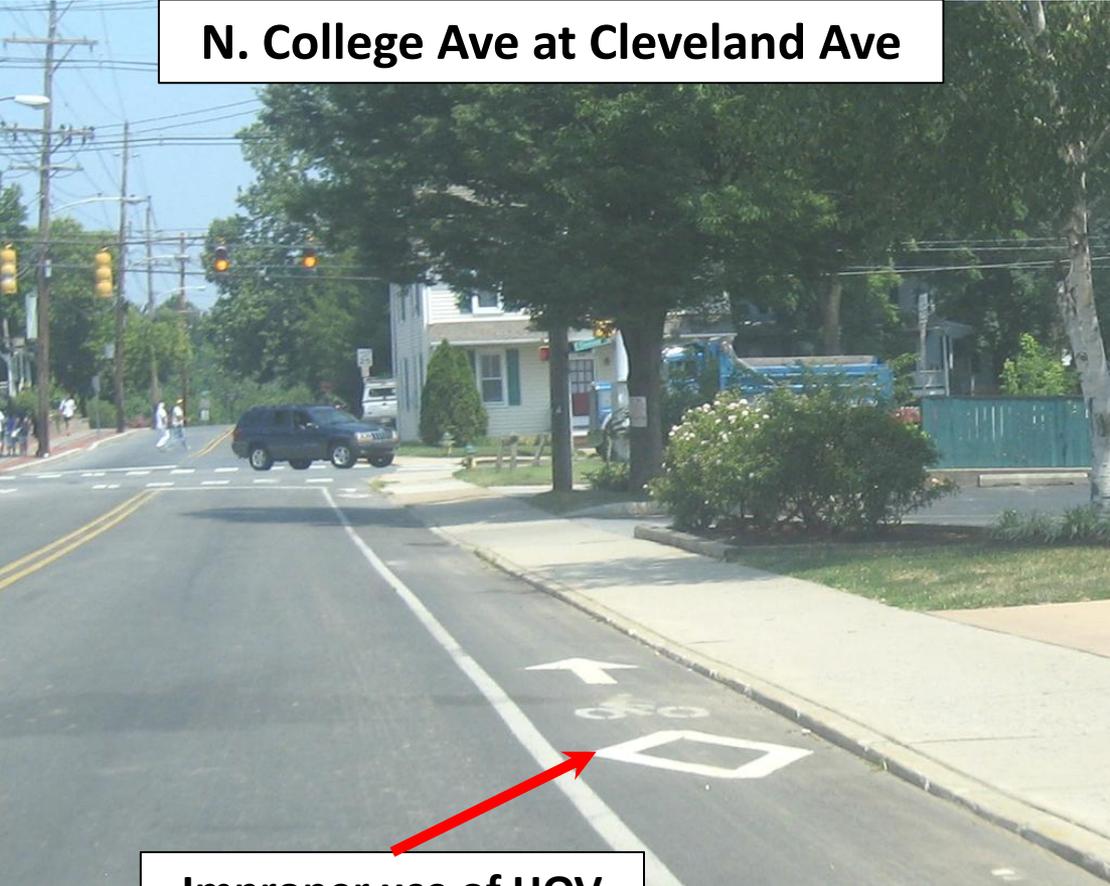


* Yield lines should be installed a minimum of 4 ft in advance of the nearest edge of the circulatory roadway

Relocated
from 3B

CHAPTER 3D. MARKINGS FOR PREFERENTIAL LANES

N. College Ave at Cleveland Ave



**Improper use of HOV
only lane symbol**

SR 1 north of Dartmouth Dr



ETC-only lanes shall have symbols and preferential lane markings



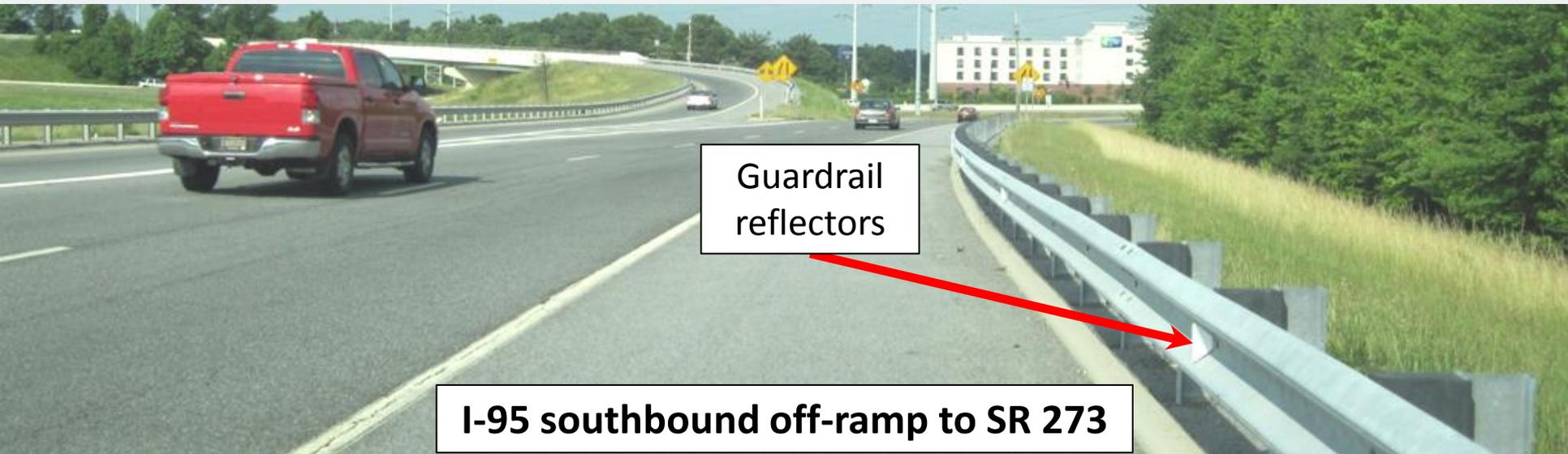
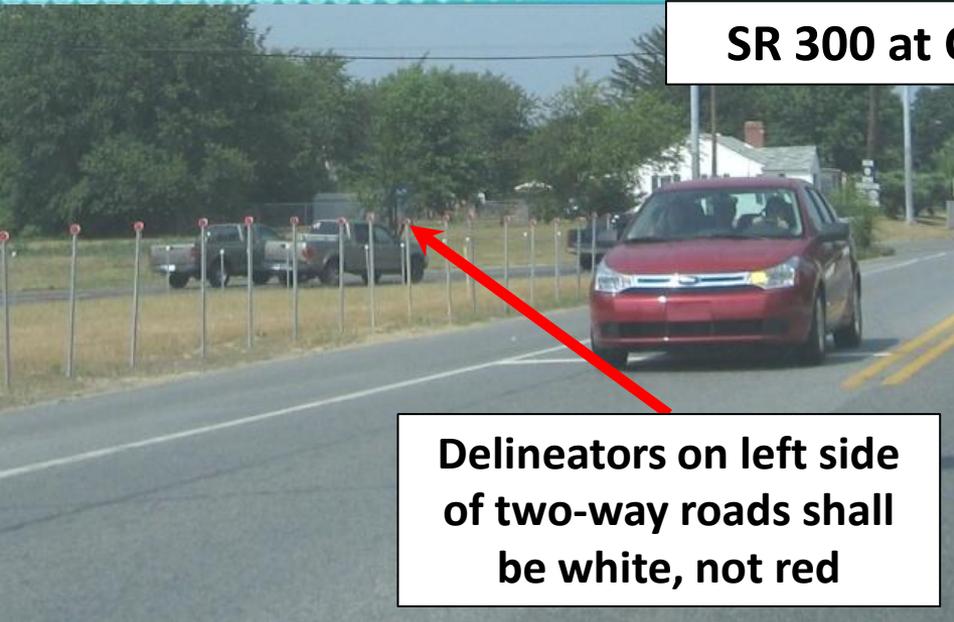
I-95 southbound approaching Newark Toll Plaza



Toll booth islands shall have obstruction markings

Biddles Toll Plaza

SR 300 at Carter Rd



Section 3G.01 General

Support:

- 01 Colored pavements consist of differently colored road paving materials, such as colored asphalt or concrete, or paint or other marking materials applied to the surface of a road or island to simulate a colored pavement.
- 02 If non-retroreflective colored pavement, including bricks and other types of patterned surfaces, is used as a purely aesthetic treatment and is not intended to communicate a regulatory, warning, or guidance message to road users, the colored pavement is not considered to be a traffic control device, even if it is located between the lines of a crosswalk.

Standard:

- 03 If colored pavement is used within the traveled way, on flush or raised islands, or on shoulders to regulate, warn, or guide traffic or if retroreflective colored pavement is used, the colored pavement is considered to be a traffic control device and shall be limited to the following colors and applications:
 - A. Yellow pavement color shall be used only for flush or raised median islands separating traffic flows in opposite directions or for left-hand shoulders of roadways of divided highways or one-way streets or ramps.
 - B. White pavement color shall be used for flush or raised channelizing islands where traffic passes on both sides in the same general direction or for right-hand shoulders.
- 04 Colored pavements shall not be used as a traffic control device, unless the device is applicable at all times.

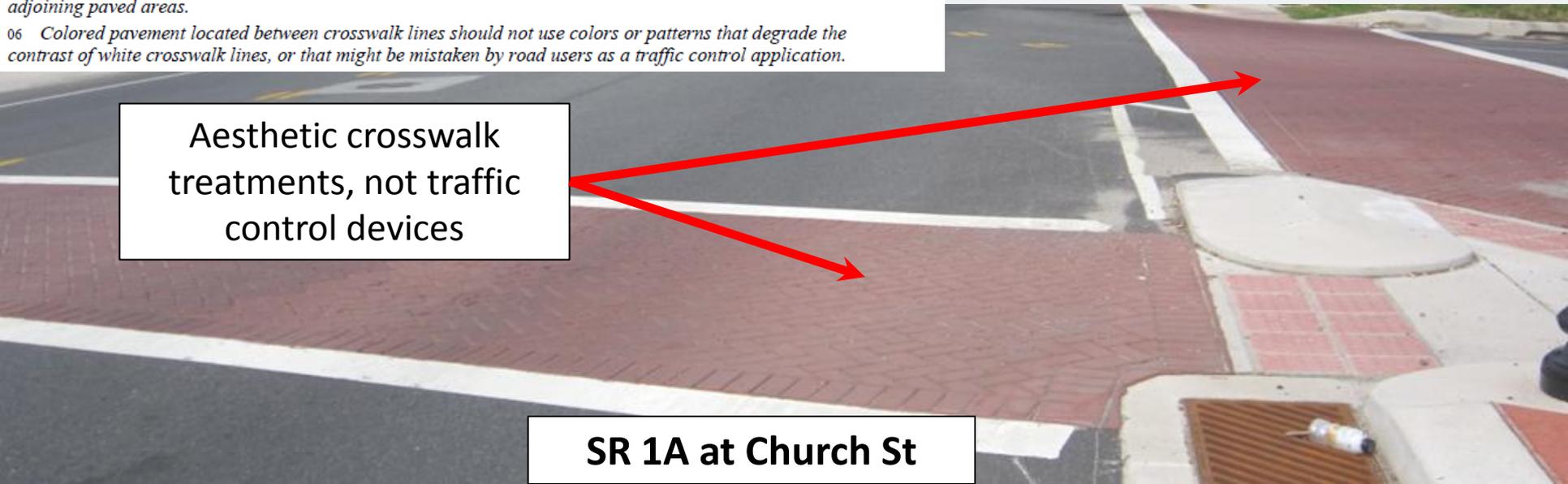
Guidance:

- 05 Colored pavements used as traffic control devices should be used only where they contrast significantly with adjoining paved areas.
- 06 Colored pavement located between crosswalk lines should not use colors or patterns that degrade the contrast of white crosswalk lines, or that might be mistaken by road users as a traffic control application.

- Non-retroreflective colored pavement used for aesthetic purposes that does not regulate, warn, or guide traffic is not a traffic control device

Aesthetic crosswalk treatments, not traffic control devices

SR 1A at Church St



Formerly 3F

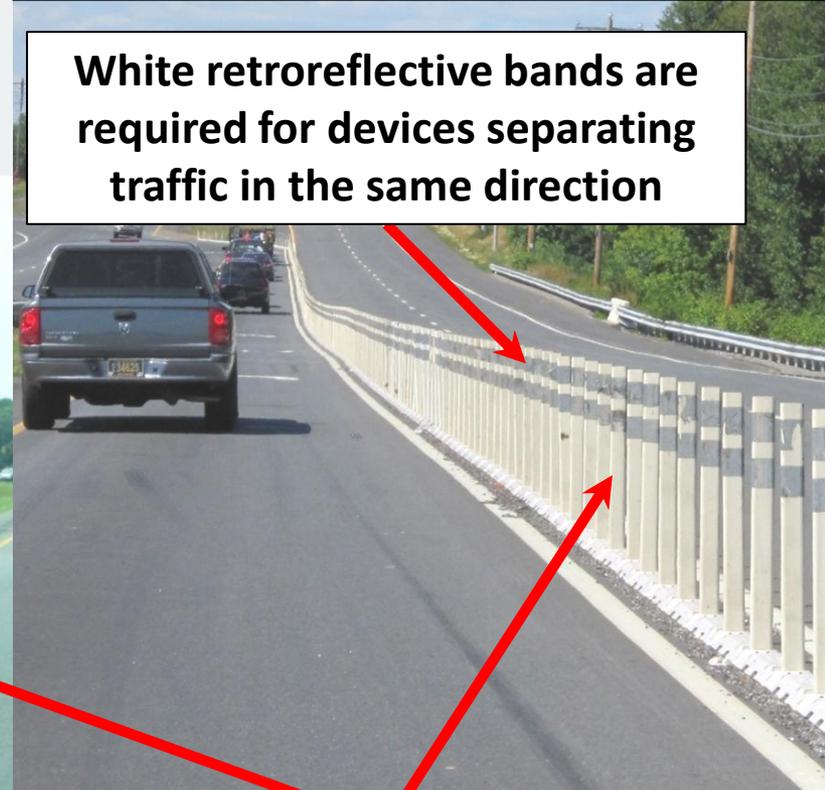
OF PAVEMENT MARKING PATTERNS

Yellow retroreflective bands are required for devices separating traffic in opposing directions



US 113 southbound at Arrow Safety Rd

**US 13 northbound at Scott Run
(SR 1 "free" ramp)**

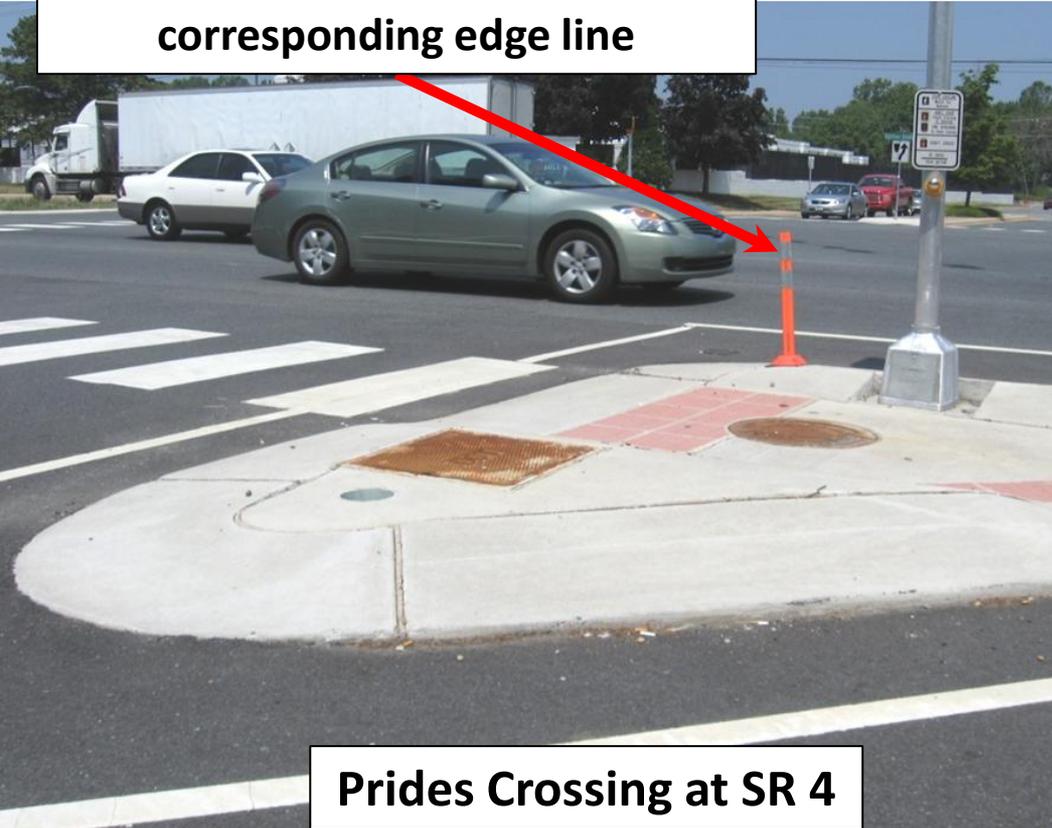


White retroreflective bands are required for devices separating traffic in the same direction

Channelizing devices shall be either orange or same color as the marking they supplement

Formerly 3G

Retroreflective bands on island delineators shall match the corresponding edge line



Prides Crossing at SR 4

New design guidelines for channelizing islands in DeIDOT Road Design Manual (June 2010 revision)

Old Baltimore Pk at Otts Chapel Rd



- The points of crossing or conflict should be studied carefully to determine if such conditions would be better separated or consolidated to simplify design with appropriate control devices added to ensure safe operation.
- Refuge areas for turning vehicles should be provided clear of through traffic.
- Prohibited turns should be blocked wherever possible.
- Location of essential control devices should be established as a part of the design of a channelized intersection.
- Channelization may be desirable to separate the various traffic movements where multiple-phase signals are used.

Islands should be sufficiently large to command attention, and to accommodate pedestrian refuge and pedestrian signal poles where they are needed. Curbed islands normally should be no smaller than 50 ft² [5 m²] for urban streets and about 75 ft² [7 m²] for rural intersections; however, 100 ft² [9 m²] minimum is preferable for both. Triangular islands should not be less than 12 ft [3.6 m], preferably 15 feet [4.5 m], on a side before rounding the corners; those with five foot wide curb ramps, pedestrian refuge and pedestrian signal poles should have sides that are at least 15 ft [4.5 m] and preferably 20 feet [6.0 m] on a tangent side resulting in a minimum island area of 175 ft² [16 m²]. Islands with pedestrian signals and curb ramps wider than five feet will have to be larger accordingly. Median islands narrower than 8 ft [2.4 m] from back of curb to back of curb cannot be mowed effectively; therefore they should be paved. Elongated or divisional islands should not be less than 4 ft [1.2 m] wide, 6 ft [1.8 m] if pedestrians are anticipated and 20 to 25 ft [6.0 to 8.0 m] long.

7.3.3 ISLANDS

Design of islands is the principal concern in channelization. An island is a defined area between traffic lanes for control of vehicle movements. It may range from an area delineated by barrier curbs to a pavement area marked with paint.

Islands provide three major functions:

DeIDOT has adopted general rules for the placement of islands. The first preference is to design the intersection with radii that accommodate the selected design vehicle path with-

James St bridge, Newport



Transverse rumble strips



Longitudinal center line rumble stripe

US 301 north of Middletown

Delaware Department of Transportation
Division of Transportation Solutions
Design Guidance Memorandum

**UPDATE IN
PROGRESS**

Memorandum Number 1-18 Revised

- 1. Road Design Manual
- 2. Bridge Design Manual
- 3. Utilities Design Manual
- 4. Real Estate Manual
- 5. Standard Specifications
- 6. Standard Construction Details

Title: Continuous Center Line and Longitudinal Edgeline Rumble Strips Effective date: x

Sections to Implement:

- Project Development
- Bridge
- Team Support
- Utilities
- Planning
- Quality
- Maintenance & Operations
- DTC
- Traffic
- Other _____

I. Purpose

To define when and where center line or continuous edgeline longitudinal rumble strips should be applied within the state highway system. (See Figures 1 through 4.)

Today's presentation will be posted on DeIDOT's DE MUTCD website

http://www.deldot.gov/information/pubs_forms/manuals/de_mutcd/index.shtml

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Publications And Forms

Delaware MUTCD

Sign up here for e-mail notification when updates have been made on the MUTCD manual!

INFORMATION
Adobe Acrobat Reader is required

DRAFT 2011 Delaware MUTCD Training	
Part 2	Signs 
Part 6	Temporary Traffic Control 

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- May 16th – Parts 4 & 7 (Traffic Signals & School Areas)
- June 15th – Parts 8 & 9 (Railroads & Bicycle Facilities)
- T² course registration

<http://www.ce.udel.edu/dct/T2Courses.html>