National Committee on
Uniform Traffic Control Devices

13236 North 7th Street, Suite 4-259, Phoenix, Arizona 85022
Phone/Text: 231-4-NCUTCD (231-462-8823)
E-mail: secretary@ncutcd.org Website: https://ncutcd.org

National Committee on Uniform Traffic Control Devices (NCUTCD)
Recommended Changes to Proposed Text for 11th Edition of the MUTCD
Docket Number: FHWA-2020-0001

Federal Register Item Number: 623-638
NPA MUTCD Section Number: Sections 9E.01-9E.17
Legend: Base text shown in proposal is the NPA "clean" proposed text.

- NCUTCD recommendation for text to be added in final rule.
- ~~NCUTCD recommendation for text to be deleted in final rule~~.
- NCUTCD recommendation for text to be moved/relocated in final rule.
- NPA text that was not previously approved by NCUTCD but is now approved.
- Explanatory note: [Note that explains purpose of recommended change.]
- Reference in 00X-XXX-000 format refer to previous NCUTCD recommendations approved by Council and sent to FHWA, which may be seen on the NCUTCD website at https://ncutcd.org/

The following pages present NCUTCD recommendations for changes to the MUTCD NPA proposed text, tables, and figures for Chapter 9E. Below is a short summary of the NCUTCD position for each section of this chapter. A more detailed summary is provided at the beginning of each section.

- NPA #623, Section 9E.01: Changes recommended based on Council action in Spring 2021
- NPA #624, Section 9E.02: Changes recommended based on Council action in Spring 2021
- NPA #625, Section 9E.03: Changes recommended based on Council action in Spring 2021
- NPA #626, Section 9E.04: Recommended changes to text as shown
- NPA #627, Section 9E.05: Changes recommended based on Council action in Spring 2021
- NPA #628, Section 9E.06: Changes recommended based on Council action in Spring 2021
- NPA #629, Section 9E.07: Changes recommended based on Council action in Spring 2021
- NPA #630, Section 9E.08: Changes recommended based on Council action in Spring 2021
- NPA #631, Section 9E.09: Changes recommended based on Council action in Spring 2021
- NPA #632, Section 9E.10: Changes recommended based on Council action in Spring 2021
- NPA #633, Section 9E.11: Changes recommended based on Council action in Spring 2021
- NPA #634, Section 9E.12: Changes recommended based on Council action in Spring 2021
- NPA #635, Section 9E.13: Changes recommended based on Council action in Spring 2021
- NPA #636, Section 9E.14: Changes recommended based on Council action in Spring 2021
- NPA #637, Section 9E.15: Changes recommended based on prior Council action
- NPA #NA, Section 9E.16: Recommended changes to text as shown
- NPA #638, Section 9E.17: Changes recommended based on Council action in Spring 2021

Section 9E.01 Comments: NCUTCD generally agrees with 9E.01 as presented in the NPA, but recommends deleting a redundant Option statement, revising the Standard statement to note that installing bike lane symbols on a shoulder converts the shoulder into a bike lane, and revising Support statement to reference Bikes Use Shoulder Only signs in accordance with NCUTCD recommendation 11A-BIK-01.

Section 9E.01 Bicycle Lanes

Support:

Pavement markings designate that portion of the roadway for preferential use by bicycles (see Section 3D.01) Markings inform all road users of the restricted nature of the bicycle lane.

Standard:

Longitudinal pavement markings and bicycle lane symbol or word markings (see Figure 9E-1) shall be used to define bicycle lanes.

~~Option:~~

~~The pavement word markings BIKE LANE may be used instead of the bicycle symbol.~~

[delete Option as Standard above and Figure 9E-1 address word markings]

Guidance:

The first symbol or word marking in a bicycle lane should be placed at the beginning of the bicycle lane and the downstream symbol or word markings should be placed at periodic intervals along the bicycle lane based on engineering judgment.

Option:

An arrow marking (see Figure 9E-1) may be used in conjunction with the bicycle lane symbol or word marking, placed downstream from the symbol or word marking.

Where the bicycle lane symbols or word markings are used, Bike Lane signs (see Section 9B.04) may also be used, but to avoid overuse of the signs not necessarily adjacent to every set of pavement markings.

Support:

Section 3H.06 contains information on green colored pavement for use in bicycle lanes.

Standard:

The bicycle symbol or BIKE LANE pavement word marking and the pavement marking arrow shall not be used in a shoulder, unless it is converting the shoulder into ~~in to~~ a bicycle lane. [installing bike lane markings on a shoulder converts it to a bike lane]

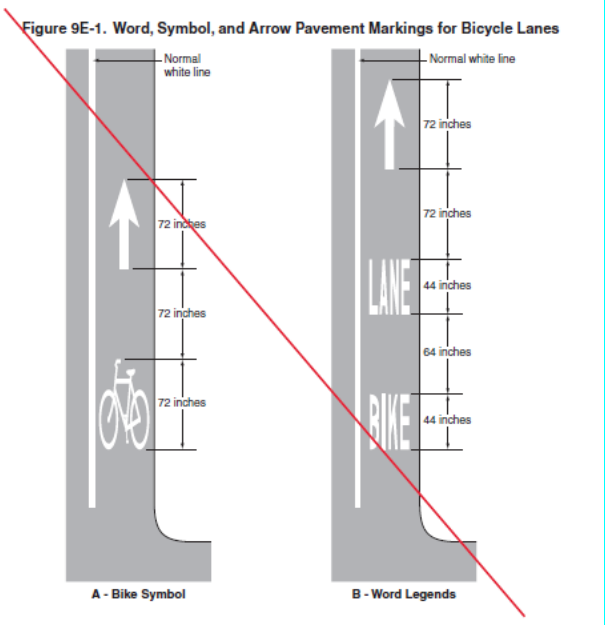
A portion of the roadway ~~travel way~~ shall not be established as both a shoulder and a bicycle lane. [editorial to be consistent with current definitions]

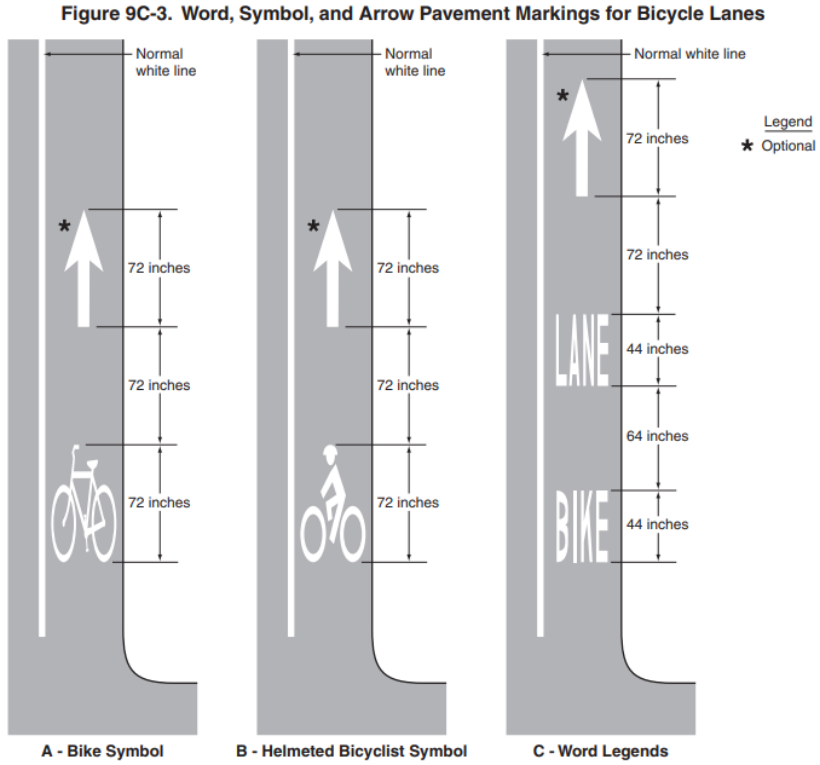
Support:

~~Where a shoulder is provided or is of sufficient width to meet the expectation of a highway user in that it can function as a space for emergency, enforcement or maintenance activities, avoidance or recovery maneuvers, Section 9B.165 contains information regarding the Bicycles Use Shoulder Only sign that can be used to convey that the shoulder may be used by bicycles.~~

Section 9B.16 contains information regarding the Bicycles Use Shoulder Only sign that can be used to convey that the shoulder on a freeway or expressway may be used by bicycles. [revise Support to reference Section 9B.16]

NCTUCD recommends replacing Figure 9E-1 in the NPA with Figure 9C-3 from the 2009 MUTCD to include the bike lane pavement marking option depicting a helmeted bicyclist.





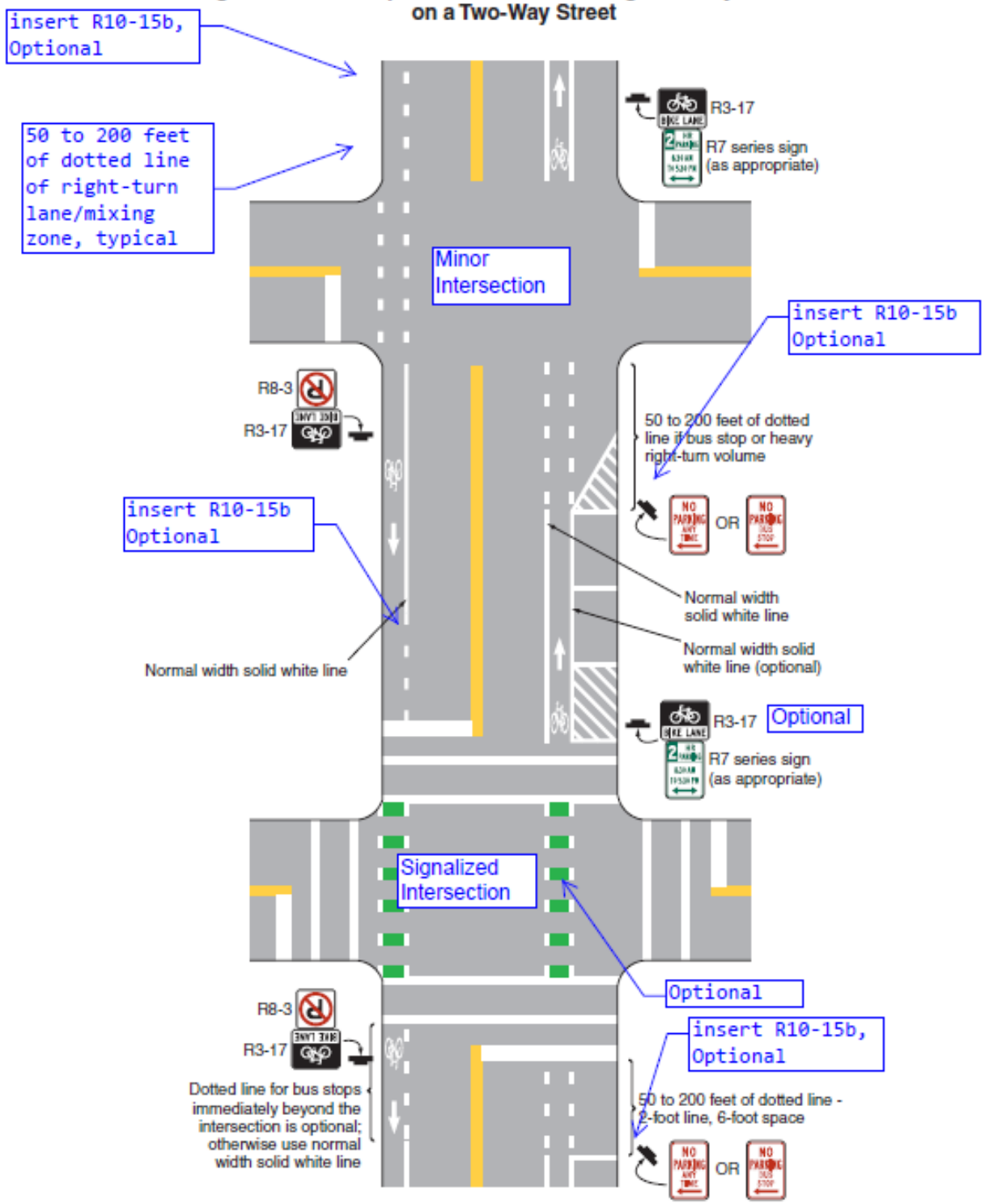
2

Support:

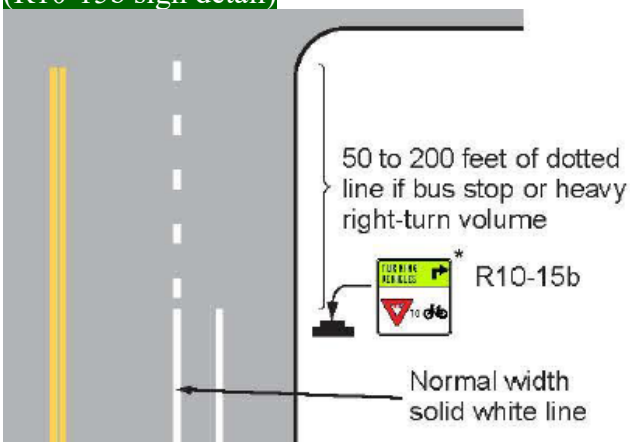
Examples of pavement markings for bicycle lanes on a two-way street are shown in Figure 9E-2.

NCUTCD generally agrees with Figure 9E-2 as presented in the NPA, but recommends including R10-15b signs and additional notes in accordance with NCUTCD recommendation 18B-BIK-01.

Figure 9E-2. Example of Pavement Markings for Bicycle Lanes on a Two-Way Street



(R10-15b sign detail)



Section 9E.02 Comments: NCUTCD generally agrees with 9E.02 as presented in the NPA, as it is consistent with NCUTCD recommendation 17A-BIK-01, but recommends the following revisions:

- Editorial changes to be consistent with current definitions
- Adding a Standard statement to clarify conditions for accommodating bicyclists in turn lanes at signalized intersections
- Delete Guidance on shifting separated bicycle lanes at intersections
- Revising Standard material on mixing zones to Guidance and Option for flexibility
- Other editorial changes.

Section 9E.02 Bicycle Lanes at Intersection Approaches

Standard:

Except as provided in Paragraph 6a, ~~a~~ through bicycle lane shall not be positioned to the right of a right turn only lane or to the left of a left turn only lane.

Option:

A through bicycle lane may be positioned to the right of a right-turn only lane or to the left of a left-turn only lane provided that the bicycle lane is controlled by a traffic signal that displays bicycle signal indications. Refer to Chapter 9F for Standard, Guidance and Options regarding bicycle signals and phasing.

Support:

Unless controlled by a bicycle signal indication, a bicyclist continuing straight through an intersection from the right of a right-turn lane or from the left of a left-turn lane would be inconsistent with normal traffic behavior and would violate the expectations of right- or left-turning motorists.

Guidance:

When the right (or left) through lane is dropped to become a right- (or left-) turn only lane, the bicycle lane markings should stop at least 100 feet before the beginning of the right- (or left-

) turn lane. Through bicycle lane markings should resume to the left (or right) of the right- (or left-) turn only lane.

An optional through-right (or through-left) turn lane next to a right- (or left-) turn only lane should not be used where there is a through bicycle lane. If a capacity analysis indicates the need for an optional through-right turn lane, the bicycle lane should be discontinued at the intersection approach.

Standard:

A ~~Bicycle~~ bicycle lane~~s~~ located on an intersection approach between general purpose ~~contiguous~~ lanes for motor vehicle movements shall be marked with at least one bicycle symbol and at least one arrow pavement markings as provided in Paragraph 9 of Section 9E.01. [editorial to be consistent with current definitions]

~~Bicycle~~ A bicycle lane~~s~~ shall not be marked within a general purpose lane, either with dotted or any other line markings. [editorial]

Option:

Where there is insufficient width in the roadway to include both a bicycle lane and a general purpose turn lane, bicycle travel may be accommodated within ~~through~~ the turn lane or general purpose lane, using shared-lane markings. [editorial]

Standard

Bicyclists making a through movement shall not be accommodated in the turn lane where the turn lane is controlled by a traffic control signal and the turning movement is not always permitted to proceed simultaneously with the adjacent through movement. [clarify conditions for accommodating bicyclists in turn lanes at signalized intersections]

Support:

Examples of bicycle lane markings on approaches to intersections are shown in Figures 9E-3, ~~and~~ 9E-4~~.~~, and 9E-9. [editorial]

Guidance:

The longitudinal line defining a bicycle lane should be dotted on approaches to intersections where turning vehicles may cross the path of through-moving bicycles.

NCUTCD generally agrees with Figure 9E-3 as presented in the NPA, but recommends revisions on Sheet 3 of 3 to correct a Left Turn Only Lane marking.

Figure 9E-3. Example of Bicycle Lane Markings on an Approach to an Intersection
(Sheet 1 of 3)

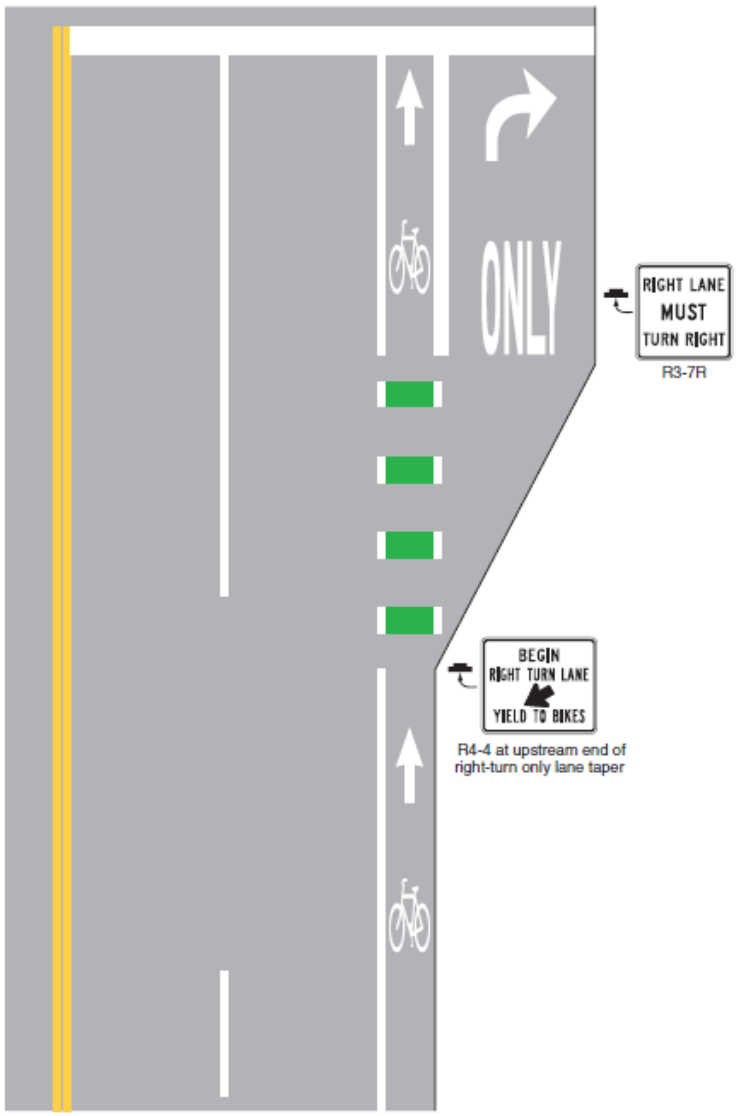
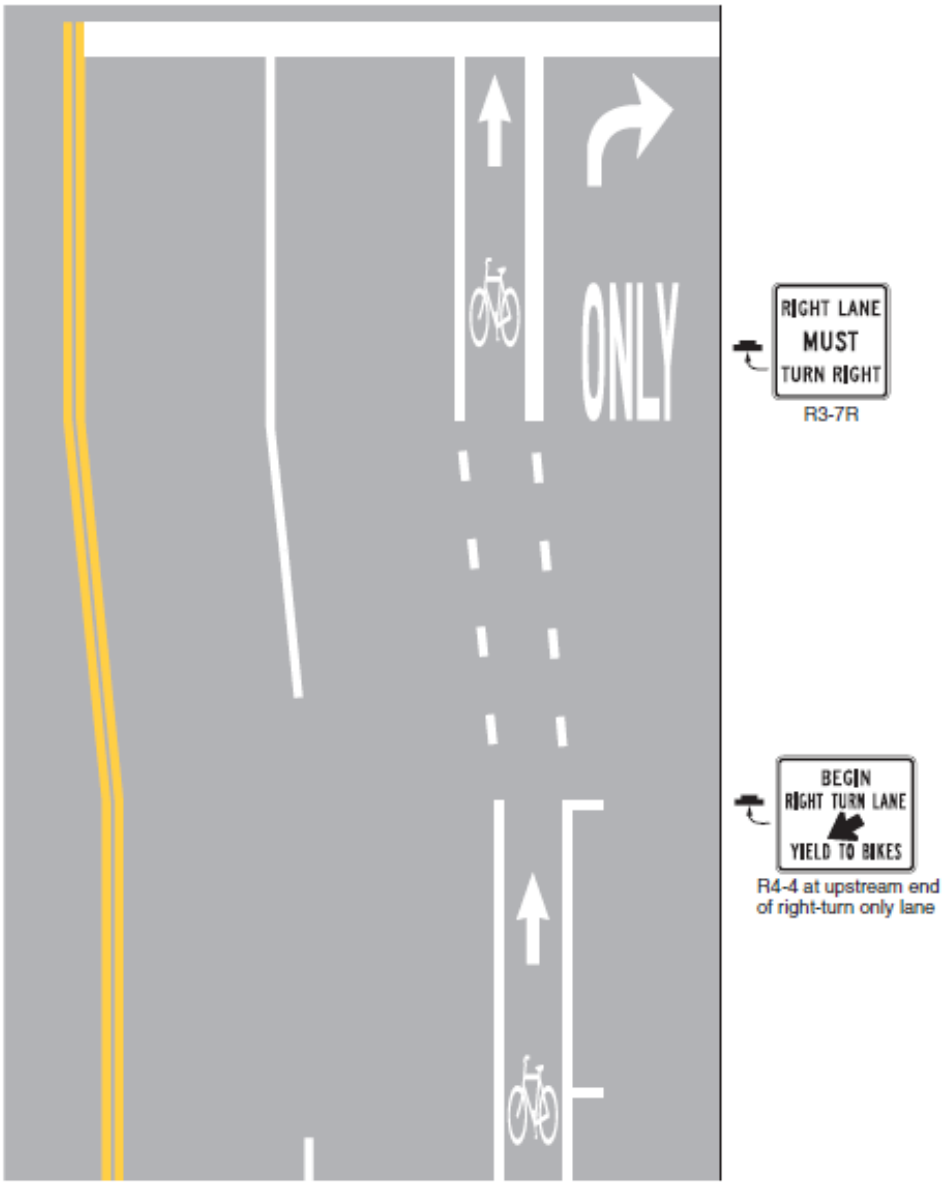
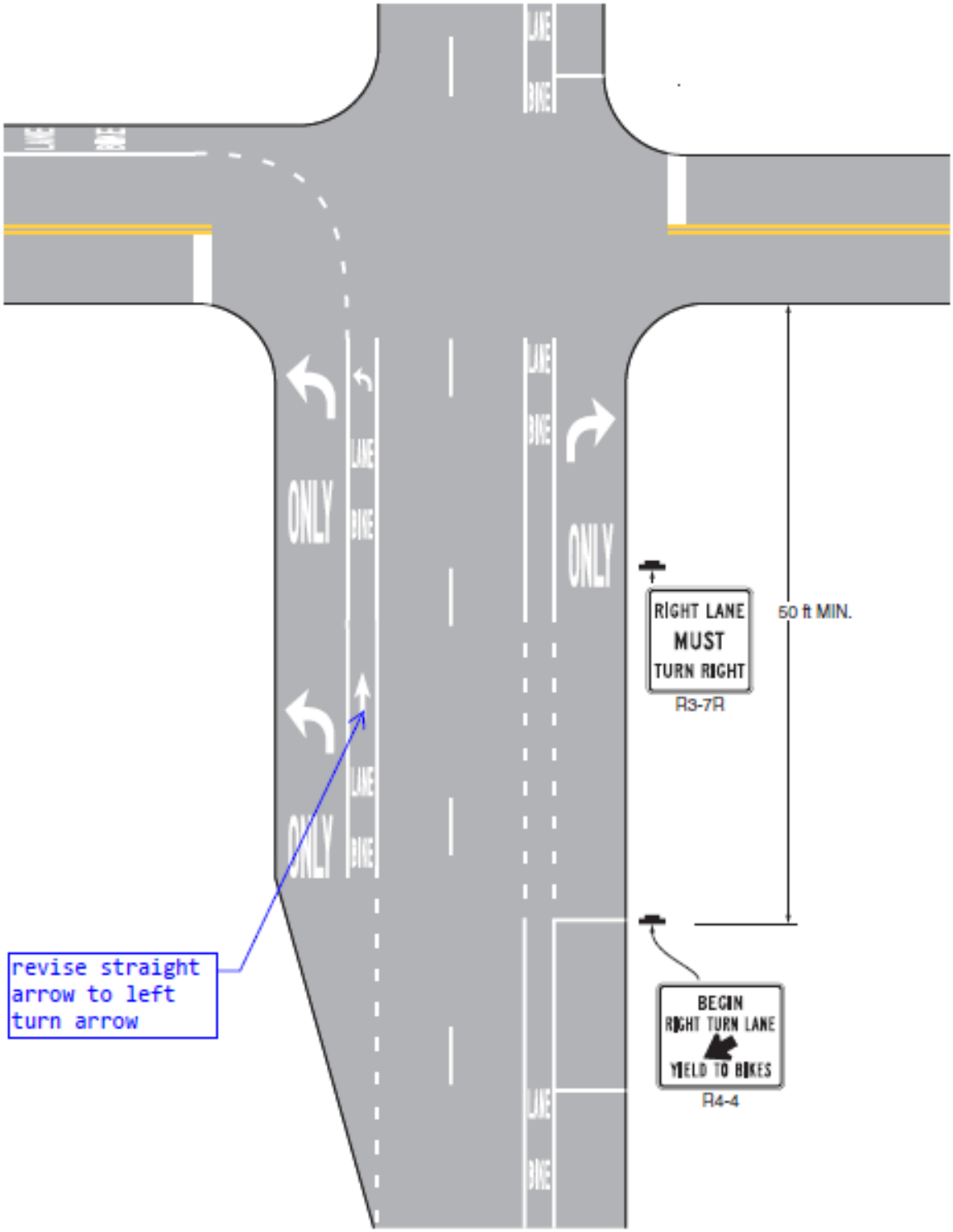


Figure 9E-3. Example of Bicycle Lane Markings on an Approach to an Intersection
(Sheet 2 of 3)



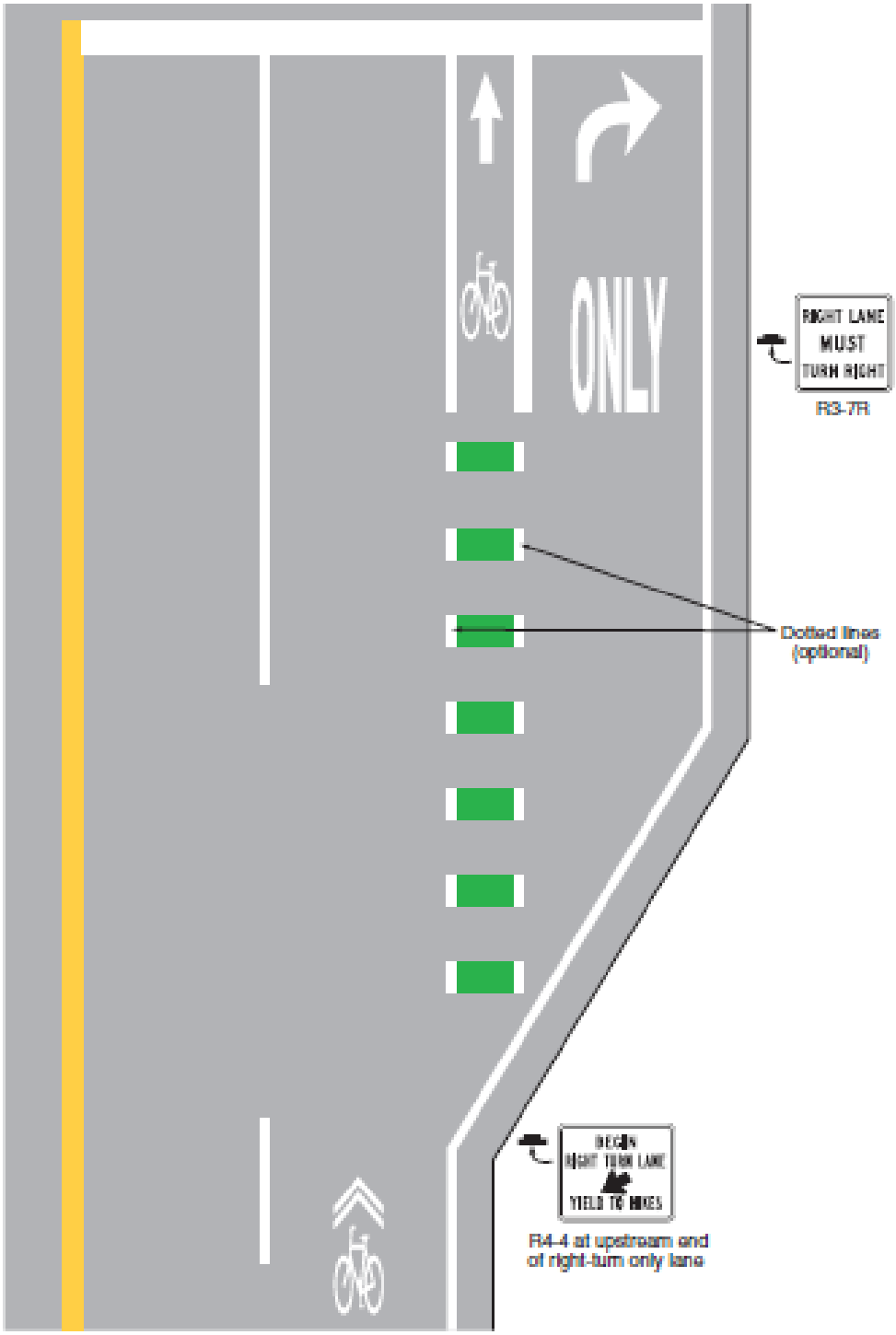
168

Figure 9E-3. Example of Bicycle Lane Markings on an Approach to an Intersection
(Sheet 3 of 3)



NCUTCD agrees with Figure 9E-4 as presented in the NPA.

Figure 9E-4. Example of Bicycle Lane Markings on an Approach to an Intersection that Transitions from a Shared Lane



Support:

Buffer-separated and separated bicycle lanes require additional considerations at intersections, including sight distances for bicycles and other road users, user expectations, and intersection geometry.

Option:

A buffer-separated or separated bicycle lane may be shifted closer to, or further away from the adjacent general purpose lane depending upon site-specific conditions (see Figure 9E-7, Drawing D). [editorial]

~~*Guidance:*~~

~~*A buffer-separated or separated bicycle lane should not be shifted away from the adjacent general purpose lane at an intersection unless is there is sufficient space for a vehicle to queue between the general purpose lane and the extension of the bicycle lane.*~~ [delete]

Support:

The purpose of shifting a buffer-separated or separated bicycle lane away from the adjacent general purpose lane is to allow the driver of a turning vehicle to undertake the tasks of turning and scanning for bicycle cross traffic in isolation versus simultaneously. Sufficient sight distance for both vehicle and bicycle is important in this design. (See Figure 9E-7, Drawing E). [editorial]

The purpose of shifting a buffer-separated or separated bicycle lane towards the adjacent general purpose lane is to improve the visibility of bicycles to the adjacent traffic and avoid conflicts between turning vehicles and bicycles. (See Figure 9E-7, Drawing D). [editorial]

Option:

Where a general purpose lane is needed at an intersection and the approach also includes a separated or buffer-separated bicycle lane, a mixing zone may be established to allow general purpose traffic to share the roadway space that would otherwise be ~~formerly~~ occupied by the buffer and/or bicycle lane separation (see Figure 9E-5). [editorial]

Support: [relocated from below and edited]

Mixing zones require bicycles and general traffic to share space, interrupting a buffer-separated or separated bicycle lane where bicycles are otherwise separated from general traffic. It is important to consider the use of mixing zones in the context of a bicycle facility ~~that is otherwise free of general traffic outside of crossing points at intersections and driveways.~~ and roadway.

Standard:

Mixing zones shall be used only where the bicycle lane is one-way in the same direction of travel as the adjacent general purpose lane.

~~**Mixing zones shall have yield markings indicating where general purpose traffic entering the combined bicycle lane and turn lane shall yield to bicycles in the bicycle lane.**~~ [Standard changed to Option below]

~~**Where a mixing zone continues to the intersection itself sharing space between the bicycle lane and the general purpose turn lane, shared lane markings and turn arrows shall be provided in the lane.**~~ [Standard changed to Guidance below]

~~**Where a mixing zone allows for the Re-establishment of a bicycle lane after bicycles and general purpose lanes cross paths, a buffered or physically separated space should be provided between the bicycle lane and the adjacent general purpose lane (see Figure 9E-5).**~~ [Standard is written as Guidance, changed to Guidance below]

~~Support:~~

~~Mixing zones require bicycles and general traffic to share space, interrupting a buffer-separated or separated bicycle lane where bicycles are otherwise separated from general traffic. It is important to consider the use of mixing zones in the context of a bicycle facility that is otherwise free of general traffic outside of crossing points at intersections and driveways.~~

[Support moved up]

Guidance:

Where a mixing zone allows for the re-establishment of a bicycle lane after bicycles and general purpose lanes cross paths, a buffered or physically separated space should be provided between the bicycle lane and the adjacent general purpose lane ~~(see Figure 9E-5)~~. [Standard changed to Guidance for flexibility and edited for Figure reference.]

Where a mixing zone continues to the intersection itself sharing space between the bicycle lane and the general purpose turn lane, shared lane markings ~~and turn arrows~~ should be provided in the lane. (See Figure 9E-5) [Moved from Standard above to Guidance for flexibility and edited]

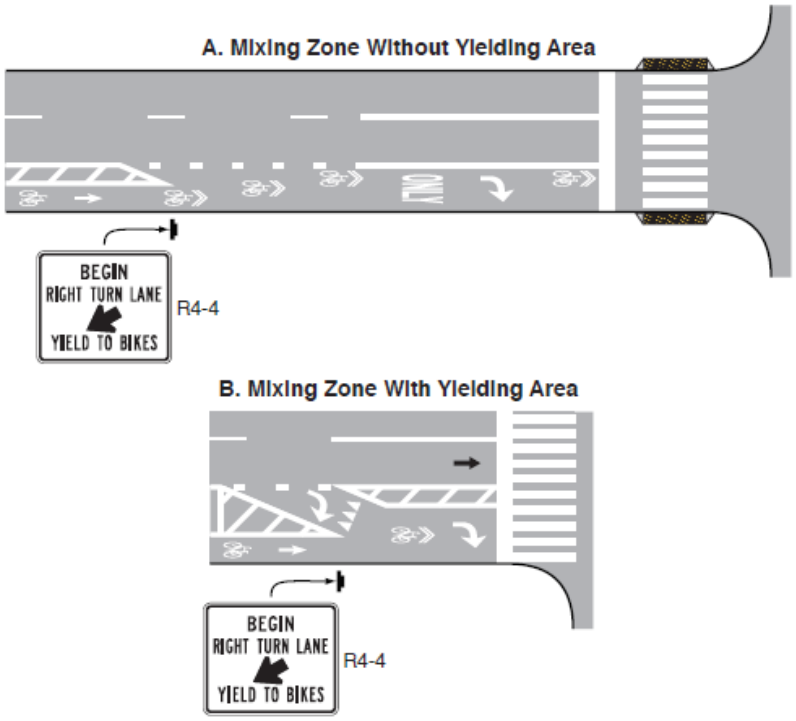
Option

Mixing zones may have yield markings indicating where general purpose traffic entering the combined bicycle lane and turn lane shall yield to bicycles in the bicycle lane. [Moved from Standard above to Option for needed flexibility]

A dotted line marking may be used to mark the entry to a mixing zone and provide an adequate linear distance for motor vehicles to enter the mixing zone.

NCUTCD agrees with Figure 9E-5 as presented in the NPA.

Figure 9E-5. Examples of Pavement Markings for Mixing Zones



Section 9E.03 Comments: NCUTCD generally agrees with 9E.03 as presented in the NPA, as it is consistent with NCUTCD recommendation 14B-BIK-03, but recommends revisions as follows:

- Remove unneeded wording in Support.
- Relocate material to improve organization of the section.
- Revise the first Standard to allow chevron markings in bike lanes and bike lane extensions. NCUTCD supports the use of chevrons where appropriate in bike lanes and bike lane extensions, such as through intersections.
- Revise Standard material on bike lane extensions for buffered or separated bike lanes to Guidance.
- Revise Standard material on bike lane extensions adjacent to a marked crosswalk to Guidance.

Section 9E.03 Extensions of Bicycle Lanes through Intersections

Support:

Extensions of bicycle lanes through intersections can help identify the paths of bicycles and guide them on movements that could be difficult to discern. Extensions of bicycle lanes through intersections also assist other users of the intersection to identify where bicycles are expected to operate and to recognize potentially unexpected conflict points.

~~The application of a bicycle lane extension in an intersection is important.~~ The design, placement, and maintenance of bicycle lane extensions through intersections, especially when contiguous to a crosswalk, have the potential to confuse pedestrians with low visual acuity. [remove unneeded wording]

The width and color of lane extension markings are discussed in Section 3B.11.

~~Option:~~

~~The bicycle symbol, the arrow marking, pavement word markings, or a combination thereof may be used in bicycle lane extensions through intersections.~~

~~Green colored pavement may be used in a bicycle lane extension consistent with Section 3H.06.~~ [move further down]

Standard:

Shared-lane markings ~~or chevron markings~~ shall not be used in bicycle lanes or bicycle lane extensions (see Section 9B.08). [chevrons approved in 14A-BIK-01]

When bicycle lanes are extended through an intersection, extensions of bicycle lanes through intersections shall use dotted line patterns. [editorial]

~~**Lane extension markings shall be used to extend a buffer-separated or separated bicycle lane through intersections and driveways.**~~ [change to Guidance and relocate down]

~~Support:~~

~~Separated and buffer-separated bicycle lanes may have alignments that are not as obvious within an intersection as a standard bicycle lane, therefore additional conspicuity is important where these types of bicycle lanes cross intersections.~~ [relocate further down]

Option: [relocated from above]

The bicycle symbol, the arrow marking, pavement word markings, or a combination thereof may be used in bicycle lane extensions through intersections.

Green colored pavement may be used in a bicycle lane extension consistent with Section 3H.06.

Guidance:

The extension of a bicycle lane through an intersection should use two lines defining both lateral limits of the bicycle lane.

Lane extension markings should be used to extend a buffer-separated or separated bicycle lane through intersections and driveways. [change from Standard above to Guidance]

Support:

Separated and buffer-separated bicycle lanes may have alignments that are not as obvious within an intersection as a standard bicycle lane, therefore additional conspicuity is important where these types of bicycle lanes cross intersections. [relocated from above]

~~**Standard:**~~

~~**Where the path of the bicycle lane through the intersection is contiguous to a crosswalk, two longitudinal dotted lines shall be provided to establish the lateral limits of the bicycle lane extension. The transverse line establishing one side of the crosswalk, or the limit of a high-visibility crosswalk pattern (see Section 3C.05) that does not employ a transverse line, shall not be used to demarcate one side of the bicycle lane extension.**~~ [change to Guidance for added flexibility]

Guidance;

Where the path of the bicycle lane through the intersection is contiguous to a crosswalk, two longitudinal dotted lines should be provided to establish the lateral limits of the bicycle lane extension. The transverse line establishing one side of the crosswalk, or the limit of a high-

visibility crosswalk pattern (see Section 3C.05) that does not employ a transverse line, should not be used to demarcate one side of the bicycle lane extension.

Section 9E.04 Comments: NCUTCD generally agrees with 9E.04 as presented in the NPA, with one minor change to delete "rotated" in the Option statement.

Section 9E.04 Bicycle Lanes at Driveways

Support:

Section 3B.11 contains information to determine if a driveway can be considered an intersection.

Option:

Bicycle lanes may be continued through a driveway using solid or dotted longitudinal line(s).

The bicycle symbol, the arrow marking, pavement word markings, or a combination thereof may be used in bicycle lane extensions through driveways.

Green-colored pavement (see Section 3H.06) may be used as a background to enhance the conspicuity of the ~~rotated~~ bicycle symbol at driveways. [delete "rotated"]

Section 9E.05 Comments: NCUTCD generally agrees with 9E.05 as presented in the NPA, but recommends adding new Support material addressing the use of separated lanes at circular intersections, revising the Standard prohibition on bike lanes to apply only to roundabouts, and add a new Guidance statement to specify minimum offset of bicycle crossings at circular intersections.

Section 9E.05 Bicycle Lanes at Circular Intersections

Support:

Separated bicycle lanes allow bicyclists to navigate a circular intersection and its crossing points without a merge into traffic or pedestrian facilities or without dismounting and using a crosswalk at the intersection crossing point. This is beneficial at multi-lane and higher speed circular intersections. [add new Support]

Option:

Separated bicycle lanes may be used in circular intersections other than roundabouts. [add for flexibility at some circular intersections]

Standard:

Bicycle lanes shall not be provided on the circulatory roadway of a roundabout. ~~**Circular intersection**~~ (see Chapter 3D). [revise to apply only to roundabouts]

Guidance:

Bicycle lane markings should stop at least 100 feet before the crosswalk, or if no crosswalk is provided, at least 100 feet before the yield line, or if no yield line is provided, then at least 100 feet before the edge of the circulatory roadway.

If used, bicycle crossings should be a minimum of 20 feet from the edge of the circular roadway. [add new Guidance statement to specify minimum offset of bicycle crossings]

Support:

Section 9E.10 contains information on using shared-lane markings to facilitate the bicycle movement through a circular intersection.

The "Guide for the Development of Bicycle Facilities" authored by the American Association of State Highway and Transportation Officials (see Section 1A.05) contains information on designing for bicycles on the sidewalk in lieu of, or in addition to, using shared-lane markings in the circular roadway of the intersection.

Section 9E.06 Comments: NCUTCD generally agrees with 9E.06 as presented in the NPA, as it is consistent with NCUTCD recommendation 18B-BIK-05, but recommends revising some Standard statements to Guidance, revising an Option statement, and adding two Guidance statements in accordance with NCUTCD recommendation 18B-BIK-05 to allow greater flexibility for marking the buffer space.

Section 9E.06 Buffer-Separated Bicycle Lanes

Support:

Buffer-separated bike lanes provide additional lateral separation between a bicycle lane and a general purpose ~~travel~~ lane by a pattern of pavement markings without the presence of vertical elements or parked vehicles. Providing a buffer space between a bicycle lane and a general purpose lane can reduce vehicle encroachment into the bicycle lane. [editorial]

Providing a buffer space between a bicycle lane and a parking lane can reduce crashes involving bicycles and the opening of vehicle doors from the parking lane.

~~**Standard:**~~

~~**If used, and except as provided in Paragraph 5, a buffer space shall be marked with longitudinal lines as follows:**~~ [change to Guidance below per 18B-BIK-05]

~~**A. A solid white line along both edges of the buffer space where crossing is prohibited**~~, ~~**or**~~ [change to Guidance below per 18B-BIK-05]

~~**B. A broken single white line along one or both edges of the buffer space where crossing is allowed, with a solid white line along the other edge of the buffer space.**~~ [change to Guidance below per 18B-BIK-05]

Guidance:

A buffer between a bicycle lane and general purpose lane or parking lane should be delineated by normal width white lines. [changed to Guidance from Standard above per 18B-BIK-05]

Engineering judgment should be used to establish intermittent breaks or interruptions in the buffer space, such as for driveways or on-street parallel parking lanes, in order to convey access points or an otherwise general legal movement to cross the buffer space (see Figure 9E-6).

Option:

Buffer spaces may be established without specific longitudinal lines if contiguous facilities have longitudinal lines or other pavement markings themselves that, when installed, automatically demarcate the buffer space (see Drawings B and C of Figure 3E-3).

Standard:

Except as provided in Paragraph 8, a through buffer-separated bicycle lane shall not be positioned to the right of a right turn only lane or to the left of a left turn only lane.

Option:

A buffer-separated bicycle lane may be placed to the right of a right-turn lane (or to the left of a left-turn lane) only if a bicycle signal face (see Chapter 9F) is used and the signal phasing and signing eliminates any potential conflicts between the bicycle movement and the turning movement.

Guidance:

The width of the buffer space should be at least three times the width of the normal or wide longitudinal line used to mark the buffer space.

Where a buffer space is two to four feet wide, one-directional diagonal markings should be applied. [add per18B-BIK-05]

Where a buffer space is greater than four feet wide, chevron markings should be applied. [add per 18B-BIK-05]

Option:

Where a buffer space is less than ~~three~~ two feet wide, one-directional diagonal markings or no markings at all in the buffer space may ~~can~~ be applied. [revise per 18B-BIK-05]

Standard:

If used, one-directional diagonal markings shall slant away from traffic in the adjacent travel lane for motor vehicle traffic.

Guidance:

Where used, the spacing of chevrons or one-directional diagonal markings should be 10 feet or greater.

Support:

Chevron and one-directional diagonal markings convey that the buffer space is not an additional bicycle lane or other travel lane open to traffic.

~~**Standard:**~~

~~**A buffer space three feet or wider shall use chevron or one-directional diagonal markings within the buffer.**~~ [changed to Guidance above per 18B-BIK-05]

Guidance:

Lane extension markings should be used to extend a buffer-separated bicycle lane across intersections and driveways.

NCUTCD recommends replacing Figure 9E-6 as presented in the NPA with Figure 9C-xx from NCUTCD recommendation 18B-BIK-05 to better depict commonly-used markings for buffer-separated bicycle lanes.

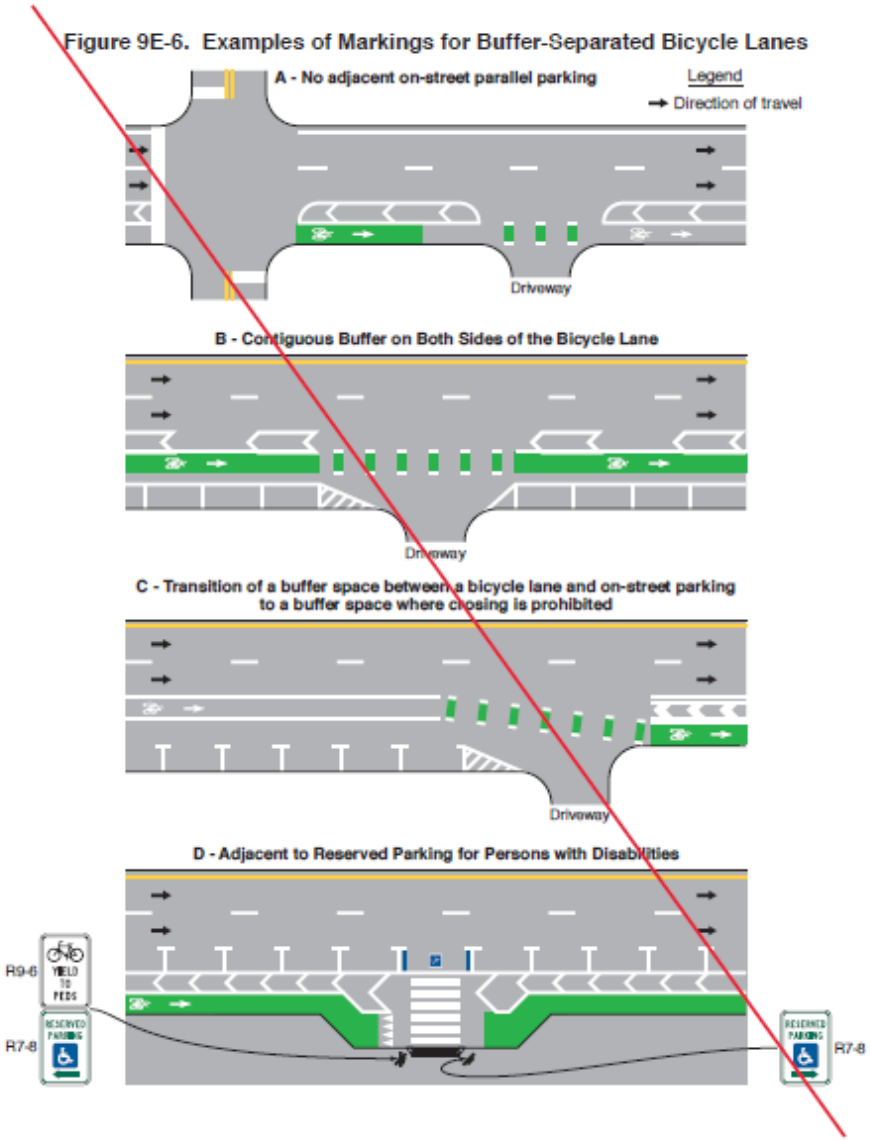
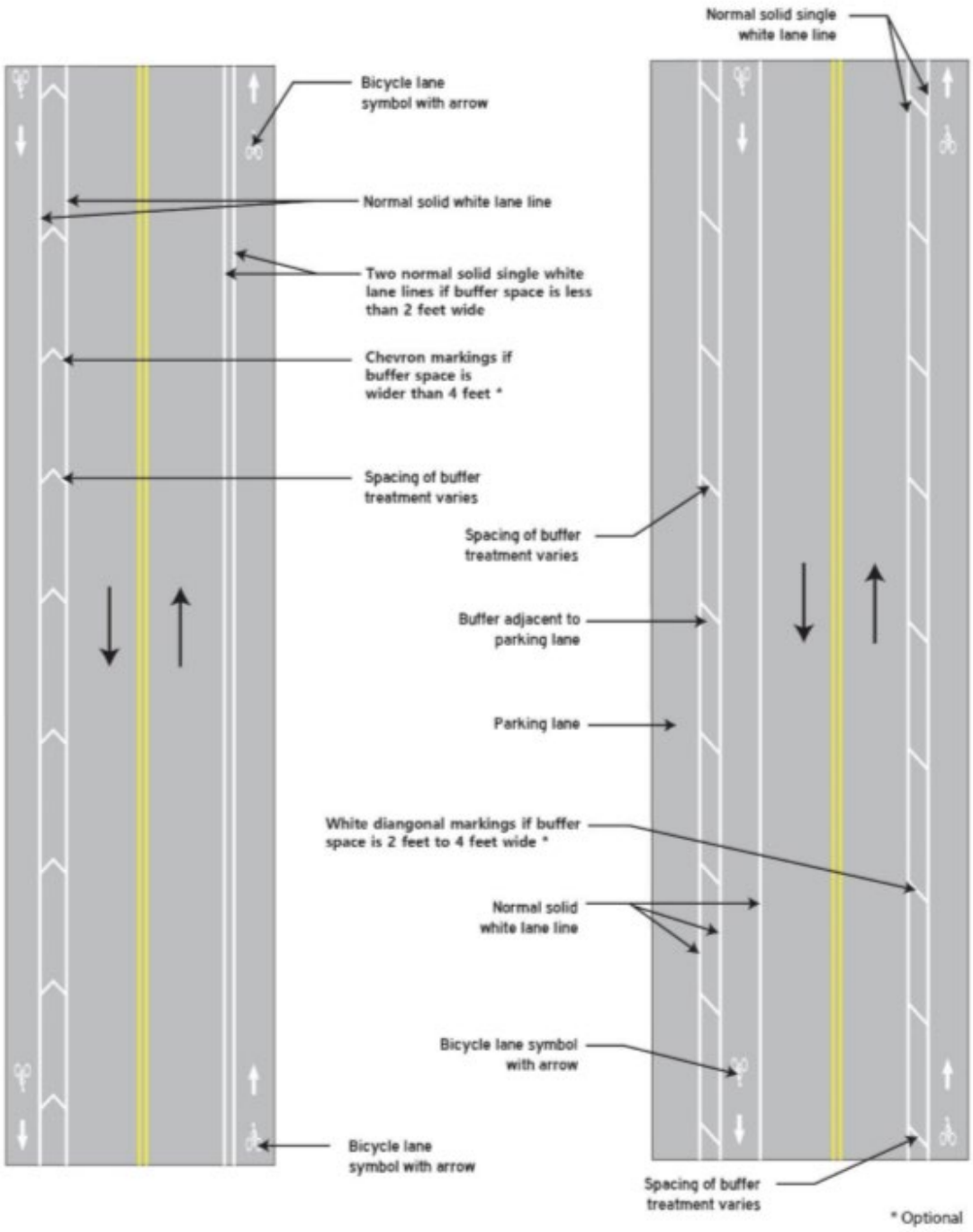


Figure 9C - XX. Example of Pavement Markings for Buffered Bicycle Lanes on a Two-Way Street



Section 9E.07 Comments: NCUTCD generally agrees with 9E.07 as presented in the NPA, but recommends editorial revisions to be consistent with current definitions, adding a new Support statement to address left-side facilities, revise the Standard addressing two-way bicycle lanes at intersections to eliminate a conflict with Section 4H.01, revise a Standard on directional arrows to Guidance to allow greater flexibility for marking separated bicycle lanes, and delete Guidance on traffic conflicts addressed in Chapter 4H.

Section 9E.07 Separated Bicycle Lanes

Support:

Separated bicycle lanes provide a physical separation between a general purpose ~~travel~~ lane and a bicycle lane through the use of ~~that contains~~ vertical objects or vertical separation between the general travel lane and bicycle lane. Providing a physical separation between a bicycle lane and a general purpose lane can reduce vehicle encroachment into the bicycle lane beyond a marked buffer alone and can in some cases prevent that encroachment altogether. [editorial change to be consistent with current definitions]

Physical separation between general purpose lanes and bicycle lanes introduces additional design considerations over buffer-separated bicycle lanes, including the awareness of a potentially unexpected conflict point for turning vehicles and the provision of adequate sight distance for all users at intersections and driveway crossings.

Option:

Vertical elements used to provide separation between general purpose lanes and bicycle lanes may include, but are not limited to tubular markers, raised island, ~~medians~~, or parked vehicles. [editorial change to be consistent with current definitions]

Support:

Where on-street parking is provided adjacent to ~~in~~ the buffer area of a separated bicycle lane, pedestrians will have to access those vehicles, including added space consideration for ADA accessible parking spots. [editorial change and addition of ADA considerations]

Guidance:

BIKE LANE (R3-7) signing should be used where a separated bicycle lane may be confused for a general purpose lane.

Standard:

Where a parking lane serves as the separation between a general purpose ~~travel~~ lane and a separated bicycle lane, a buffer space shall be provided between the parking lane and the bicycle lane to allow for opening doors of parked vehicles. [editorial change to be consistent with current definitions]

Support:

Separated bicycle lanes may be designed for one-way or two-way bicycle travel. Providing one-way separated bicycle lanes in the same direction as and on the right side of the general purpose lane, ~~whether on a one-way or~~ on a two-way roadway, accommodates the expectations of road users and may create fewer conflict points at intersections or driveway crossings. [editorial change to be consistent with current definitions]

One-way or two-way separated bicycle lanes located on the left side of one-way streets can reduce conflicts with transit operations or right turns on red. [add new Support for left-side facilities.]

Option:

Separated bicycle lanes may be provided on one or both sides of a roadway or in a center median.

Support:

The presence of two-way separated bicycle lanes on one side of a roadway or in a center median introduces additional challenges and conflict points. The 2015 FHWA "Separated Bike Lane Design Guide" ~~The "Guide for Development of Bicycle Facilities" authored by the American Association of State Highway and Transportation Officials (see Section 1A.05)~~ contains information on design considerations when selecting the design for a separated bicycle lane. [editorial change to be consistent with current publications]

Information regarding the design requirements for pedestrians who would interact with a separated bicycle lane can be found in the "Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG)" (see Section 1A.05) and the Public Rights-of-Way Accessibility Guidelines (PROWAG) (see Section 1A.05).

Standard:

The edge line and lane line colors used for separated bicycle lanes shall conform to the requirements in Chapter 3A (see Figure 9E-7).

Where two-way separated bicycle lanes are provided on one side of a roadway or in a center median, conflicting vehicle traffic at signalized intersections shall be prohibited by signal indications to cross the two-way separated bicycle lane when bicycle traffic is allowed to proceed through the intersection except if an engineering study has been conducted and concludes that the conflicting simultaneous permissive turning movements are appropriate. ~~See Chapter 4H~~. [Change to remove conflict with Section 4H.01]

Right turns and left turns on red shall be prohibited across separated bicycle lanes while bicycle traffic is allowed to proceed through the intersection. [editorial]

~~**Directional arrows shall be used in conjunction with the bicycle lane symbol or word marking in separated bicycle lanes, placed downstream from the symbol or word marking**~~

Guidance [Standard changed to Guidance for flexibility]

Directional arrows should be used in conjunction with the bicycle lane symbol or word marking in separated bicycle lanes, placed downstream from the symbol or word marking.

Support:

Additional information on signals for bicycle facilities is found in Chapter 4H.

~~*Guidance:*~~

~~*Conflicting traffic at signalized intersections should be prohibited by signal indications to cross a one-way separated bicycle lane with the same direction of travel as the adjacent general purpose lane when bicycle traffic is allowed to proceed through the intersection,*~~ [delete - addressed in Chapter 4H]

Standard:

The buffer space for separated bicycle lane shall be marked with solid longitudinal lines.

A marked buffer space two feet or wider for a separated bicycle lane, including those buffer spaces where tubular markers are provided, shall use chevron or one-directional diagonal markings within the buffer, unless physical separation is provided that occupies the majority of the buffer space, such as medians or parked vehicles.

Guidance:

Where used in the buffer area of a separated bicycle lane, the spacing of chevrons or one-directional diagonal markings should be 10 feet or greater.

Crosswalks that cross a separated bicycle lane should be marked consistent with the style of crosswalk marking provided across the adjacent general purpose lane.

Support:

Where on-street parking is provided in the buffer area of a separated bicycle lane, the chevron or diagonal marking provisions in Section 9E.06 apply to the area outside of the marked parking area within the buffer (see Figure 9E-7).

Section 9B.210 ~~-~~contains information on the TURNING VEHICLES YIELD ~~LEFT TURN YIELD TO Bicycles (R10-12b)~~ sign~~s~~ series used with traffic signals and contra-~~counter-~~flow bicycle lanes. [revise per 18B-BIK-01]

Intersection treatments for separated bicycle lanes can vary depending on the geometric and operational conditions at the intersection (see Section 9E.02).

NCUTCD agrees with Figure 9E-7 as presented in the NPA.

Figure 9E-7. Examples of Lane Markings for Separated Bicycle Lanes
(Sheet 1 of 3)

Figure 9E-7. Examples of Lane Markings for Separated Bicycle Lanes
(Sheet 2 of 3)

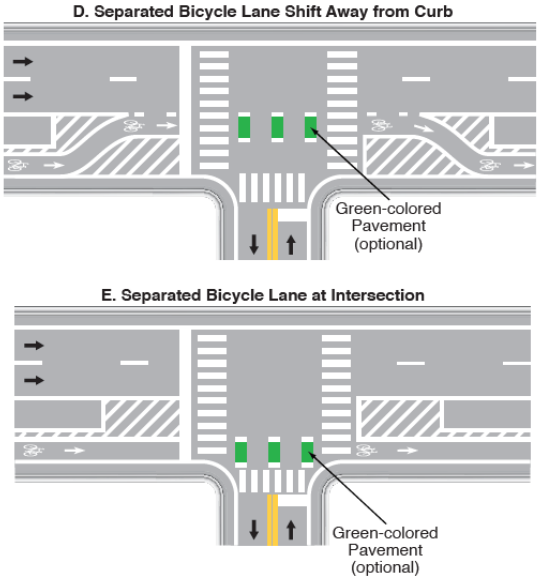
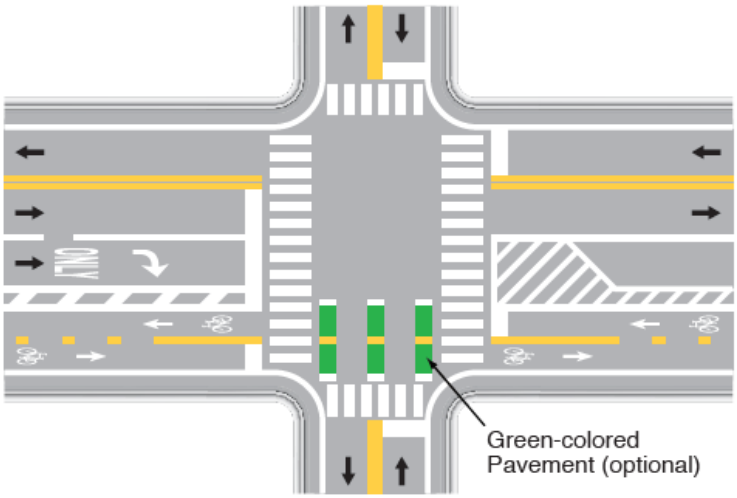


Figure 9E-7. Examples of Lane Markings for Separated Bicycle Lanes
(Sheet 3 of 3)



Section 9E.08 Comments: NCUTCD generally agrees with 9E.08 as presented in the NPA, as it is consistent with NCUTCD recommendation 14A-BIK-06, but recommends revisions as follows:

- Revise all instances of "counter-flow" to "contra-flow"
- Revise Standard on placement between general purpose lanes and on-street parking to Guidance for greater flexibility for marking contra-flow bicycle lanes
- Revise Standard on signing at intersections to Guidance for greater flexibility for signing contra-flow bicycle lanes
- Other editorial revisions as needed

Section 9E.08 Contra~~Counter~~-flow Bicycle Lanes

Support:

Contra~~Counter~~-flow bicycle lanes are one-directional and provide a lawful path of travel for bicycles in the opposite direction from general traffic on a roadway that allows general traffic to travel in only one direction. [revise per 14A-BIK-06]

Contra~~Counter~~-flow bicycle lanes establish two-way traffic on a roadway. Section 9B.20 contains information on the LEFT TURN YIELD TO Bicycles (R10-12b) sign used with traffic signals and contra~~counter~~-flow bicycle lanes. [revise per 14A-BIK-06]

Guidance:

Where used, a contra~~-counter~~-flow bicycle lane should be marked such that bicycles in the contra~~counter~~-flow lane travel on their right-hand side of the road in accordance with normal rules of the road, with opposing traffic on the left. [revise per 14A-BIK-06]

Standard:

Contra~~Counter~~-flow bicycle lanes shall use double yellow center line pavement marking (see Section 3B.01), a buffer per Section ~~3B.24~~3B-25, raised median island (see Section

3J.043), or some form of physical separation where the speed limit is 30 mph or below. [revise per 14A-BIK-06 and Figure reference]

Standard:

For speed limits 35 mph or above, a buffer per Section 3B.254, a painted or raised median island, or some form of physical separation shall be used to separate a contra ~~counter~~-flow bicycle lane from the adjacent travel lane. [revise per 14A-BIK-06 and Figure reference]

~~**Counter-flow bicycle lanes shall not be used between a general purpose lane and an on-street parallel parking lane for motor vehicles.**~~ [Standard statement revised to Guidance below]

Guidance:

Contra-flow bicycle lanes should not be used between a general purpose lane and an on-street parallel parking lane for motor vehicles.

~~Support:~~

~~Since counter-flow bicycle movements can be unexpected, lane extension markings can help road users identify where counter-flow bicycle movements cross intersections.~~

~~**Standard:**~~ [Standard statements revised to Guidance below per 14A-BIK-06]

~~*Where signs are provided to regulate turns from streets or driveways that intersect with a roadway that has a counter-flow bicycle lane, ONE WAY signs (see Section 2B.51) shall not be used. Movement Prohibition signs (see Section 2B.28) with supplemental Except Bicycles (R3-7bP) plaque(s) shall be used (see Figure 9E-6).*~~

~~*If a DO NOT ENTER (R5-1) sign(s) is used at egress points for motor vehicle traffic, the Except Bicycles plaque(s) shall be placed under the DO NOT ENTER sign (see Figure 9E-8) where a counter-flow bicycle lane is used.*~~ [Standard statements revised to Guidance below per 14A-BIK-06]

Guidance:

Where signs are provided to regulate turns from streets or driveways that intersect with a roadway that has a contra-flow bicycle lane, ONE WAY signs (see Section 2B.50) should not be used. Movement Prohibition signs (see Section 2B.26) with supplemental Except Bicycles (R3-7bP) plaque(s) should be used (see Figure 9E-8).

If a DO NOT ENTER (R5-1) sign(s) is used at egress points for motor vehicle traffic, the Except Bicycles plaque(s) should be placed under the DO NOT ENTER sign (see Figure 9E-8) where a contra-flow bicycle lane is used.

Standard:

Where intersection traffic controls are provided (e.g. stop or yield signs, traffic signals, etc.), appropriate devices shall be provided and oriented towards bicycles in the contra~~counter~~-flow lane. [revise per 14A-BIK-06]

At signalized locations, appropriate bicycle signalization (See Chapter ~~9F~~ 4H) shall be provided and oriented towards bicycles in the contra~~counter~~-flow lane, including a method for contra~~counter~~-flow bicycles to ~~actuate~~ receive the green phase for the contra~~counter~~-flow movement. [revise per 14A-BIK-06]

Support:

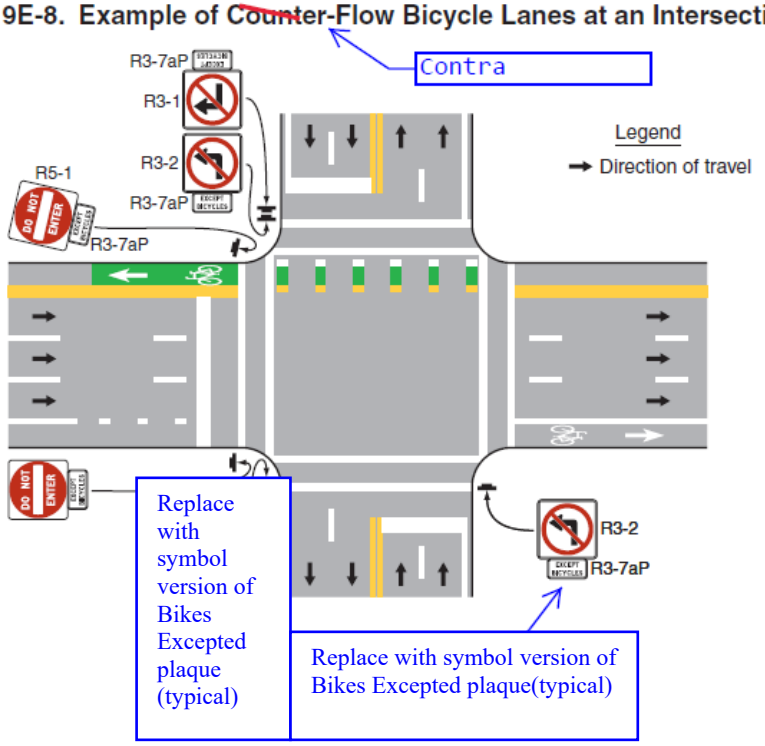
Higher levels of traffic control or additional signalization, signing and/or pavement marking treatments can be helpful for intersecting traffic where the contra~~counter~~-flow bicycle movement is unexpected. [revise per 14A-BIK-06]

Guidance:

An appropriate Bicycle Cross Traffic Warning plaque (see Section 9C.06) should be used below a STOP sign on the cross-street at intersections where a contra~~counter~~-flow bicycle lane is provided on the primary street. [revise per 14A-BIK-06]

NCUTCD generally agrees with Figure 9E-8 as presented in the NPA, but recommends replacing "Counter-Flow" with "Contra-Flow" in the title and replacing R3-7aP EXCEPT BICYCLES plaques with the symbol version in accordance with NCUTCD recommendation 09A-BIK-01.

Figure 9E-8. Example of ~~Counter~~-Flow Bicycle Lanes at an Intersection



Section 9E.09 Comments: NCUTCD recommends revising 9E.09 as follows:

- Add mixing zones to the list of appropriate situations
- Delete the Standard statement prohibiting green-colored pavement behind the shared lane marking and add an Option statement permitting this treatment - NCUTCD supports the use of green-colored pavement behind the shared lane marking in accordance with NCUTCD recommendation 16B-BIK-01
- Revise the Guidance statement on lateral positioning to Option
- Other editorial revisions as needed

Section 9E.09 Shared-Lane Marking

Option:

The shared-lane marking shown in Figure 9E-9 may be used to:

A. Assist bicyclists with lateral positioning in a shared lane with on-street parallel parking in order to reduce the chance of a bicyclist's impacting the open door of a parked vehicle,

B. Assist bicyclists with lateral positioning in lanes that are too narrow for a motor vehicle and a bicycle to travel side by side within the same traffic lane,

C. Alert road users of the lateral location bicycles are likely to occupy within the traveled way,

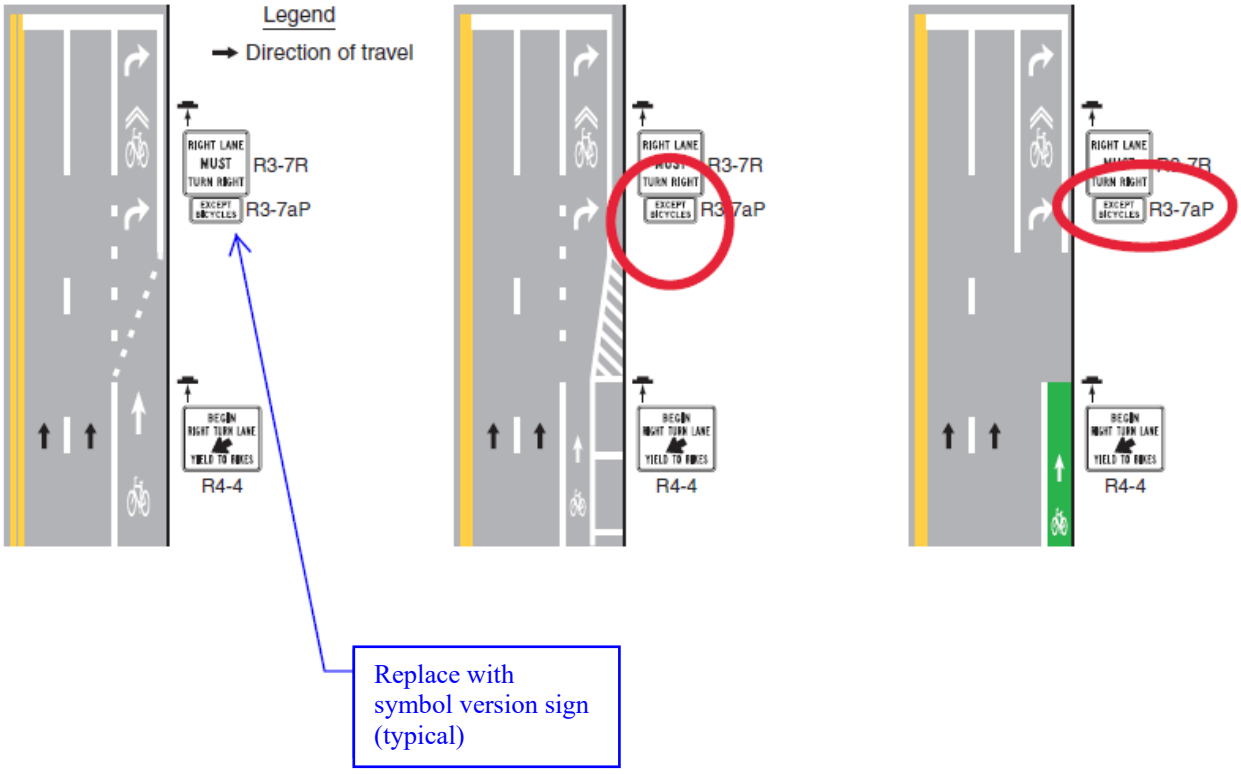
D. Encourage safe passing of bicycles by motor vehicles, ~~and~~

E. Reduce the incidence of wrong-way bicycling in the roadway, and

F. Assist bicyclists with lateral positioning in mixing zones. [added to list]

NCUTCD generally agrees with Figure 9E-5 as presented in the NPA, but recommends replacing R3-7aP EXCEPT BICYCLES plaques with the symbol version in accordance with NCUTCD recommendation 09A-BIK-01.

Figure 9E-9. Example of Shared-Lane Markings on an Approach to an Intersection



Guidance:

The shared-lane marking should not be placed on roadways that have a speed limit of 40 mph or more.

Standard:

Shared-lane markings shall not be used in:

A. **Shoulders,**

B. **Bicycle lanes or in designated extensions of bicycle lanes through intersections or driveways,**

C. **A travel lane ~~that~~ in which light-rail transit vehicles also travel,**

D. **The transition area where a motor vehicle entering a mandatory ~~an exclusive~~ turn lane must weave across bicycle traffic in bicycle lanes,** [editorial]

E. **Two-stage turn boxes,**
F. **Bicycle Boxes,**
G. **Shared-use paths or shared-use path crossings, or**
H. **Physically separated bikeways, either in the roadway or on an independent right-of-way**

~~**Green-colored pavement shall not be applied as a background to shared-lane markings (see Section 3H.06).**~~ [Standard revised to Option per 16B-BIK-01]

Option:

Green colored pavement may be applied as a background underlay to enhance the conspicuity of Shared Lane Markings. [per16B-BIK-01]

Guidance:

If used in a shared lane with on-street parallel parking, shared-lane markings should be placed so that the centers of the markings are a minimum of 12 feet from the face of the curb, or from the edge of the pavement where there is no curb.

If used on a street without on-street parking that has an outside travel lane that is less than 14 feet wide, Shared Lane Markings should be placed so that the centers of the markings are a minimum of 4 feet from the face of the curb, or from the edge of the pavement where there is no curb.

~~*Where they are used in travel lanes that are too narrow for bicycles and motor vehicles to operate safely side-by-side), Shared Lane Markings should be placed in the center of the travel lane.*~~ [Guidance changed to Option below per 16A-BIK-01]

At non-intersection locations, the Shared Lane Marking should be spaced at intervals not less than 50 feet and not greater than 250 feet.

The first Shared Lane Marking downstream from an intersection should be placed no more than 50 feet from the intersection.

Option:

Where they are used in travel lanes that are too narrow for bicycles and motor vehicles to operate safely side-by-side), Shared Lane Markings may be placed in the center of the travel lane. [Guidance changed to Option statement per 16B-BIK-01]

Section 9B.14 describes a Bicycles May Use Full Lane sign that may be used in addition to or instead of the shared-lane marking to inform road users that bicycles might occupy the travel lane.

Guidance:

If the Bicycles May Use Full Lane sign~~s~~ (R4-11) is used as an addition to Shared Lane Marking, the marking should be placed so that the centers of the markings are in the approximate center of the travel lane.

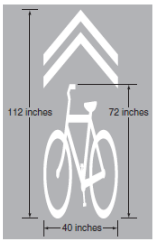
Option:

The shared-lane marking may be used (See Figure 9E-9) where the width of the roadway is insufficient to continue a bicycle lane or separated bikeway on the approach to the intersection, or it is advantageous to terminate the bicycle lane or separated bikeway in order to provide for a shared lane.

The shared-lane marking may be used on an approache~~s~~ to an intersection~~s~~ (See Figure ~~9E-4~~ 9E-5) in a ~~exclusive~~ turn lanes to continue a bicycle lane where there is insufficient width in the roadway for both the bicycle lane and turn lane. [editorial]

[NCUTCD recommends restoring Figure 9C-9 from the 2009 MUTCD for the shared lane marking symbol in Chapter 2E.

Figure 9C-9. Shared Lane Marking



Section 9E.10 Comments: NCUTCD generally agrees with 9E.10 as presented in the NPA, as it is consistent with NCUTCD recommendation 16B-BIK-01, but recommends adding a Guidance statement to provide improved guidance for positioning of the shared lane marking in the lane in a circular intersection.

Section 9E.10 Shared-Lane Markings for Circular Intersections

Guidance:

Shared-lane markings should not be used in the circulatory roadway of the circular intersection if the circulatory roadway is multi-lane.

If used, shared-lane markings should be placed at the center of the travel lane. [revise per 16B-BIK-01]

Support:

The "Guide for Development of Bicycle Facilities" authored by the American Association of State Highway and Transportation Officials (see Section 1A.05) contains information on designing for bicycles on the sidewalk in lieu of, or in addition to, using shared-lane markings in the circular roadway of the intersection.

Section 9E.11 Comment: NCUTCD generally agrees with 9E.11 as presented in the NPA, as it is consistent with NCUTCD recommendation 14A-BIK-01, but recommends deleting a redundant Standard statement and adding a Guidance statement regarding position of the turn box relative to the stop line and crosswalk.

Section 9E.11 Two-Stage Bicycle Turn Boxes

Support:

Two-stage bicycle turn boxes allow bicyclists ~~bicycles~~ the opportunity to make turns at an intersection or crossing point that does not require them to merge into traffic upstream or to dismount and use a crosswalk at the intersection or crossing point. [editorial]

Section 9B.18~~7~~ contains information on regulatory signing that shall be used in conjunction with a two-stage bicycle turn box pavement marking where bicyclists are required to use the turn box. ~~use of the turn box is required.~~ [editorial]

Section 9D.13 contains information on guide signing that can be used in conjunction with a two-stage bicycle turn box pavement marking where bicyclists are not required to use the turn box. ~~use of the turn box is optional.~~ [editorial]

Standard:

If used, two-stage bicycle turn boxes shall be located:

A. In an area between the closest through bicycle or motor vehicle movement and the parallel crosswalk (see Drawing A of Figure 9E-10), or

B. In an area between the through bicycle movement and the parallel pedestrian crossing movement if no crosswalk is established (see Drawing B of Figure 9E-10), or

C. On the innermost side of the bicycle facility provided that the two-stage turn box is located in a portion of the intersection where parallel or motor vehicle traffic does not travel; such as projections of islands or parking lanes (see Drawing C of Figure 9E-10), or

D. In an area between the through bicycle movement and a pedestrian facility for T-intersections (see Drawing D of Figure 9E-10).

A two-stage bicycle turn box shall consist of at least one bicycle symbol pavement marking, and at least one pavement marking arrow.

A turn arrow in the appropriate direction shall be used if a two-stage turn box is used with a one-way bicycle lane, and a through arrow in the appropriate direction shall be used if a two-stage turn box is used with a two-way bikeway ~~bicycle lane~~ (see Figure 9E-11). ~~two-stage bicycle turn boxes that facilitate turns from a one-way bikeway, the bicycle symbol shall precede the pavement marking turn arrow in the direction of bicycle travel.~~ [Delete portion of Standard statement which is repeated below]

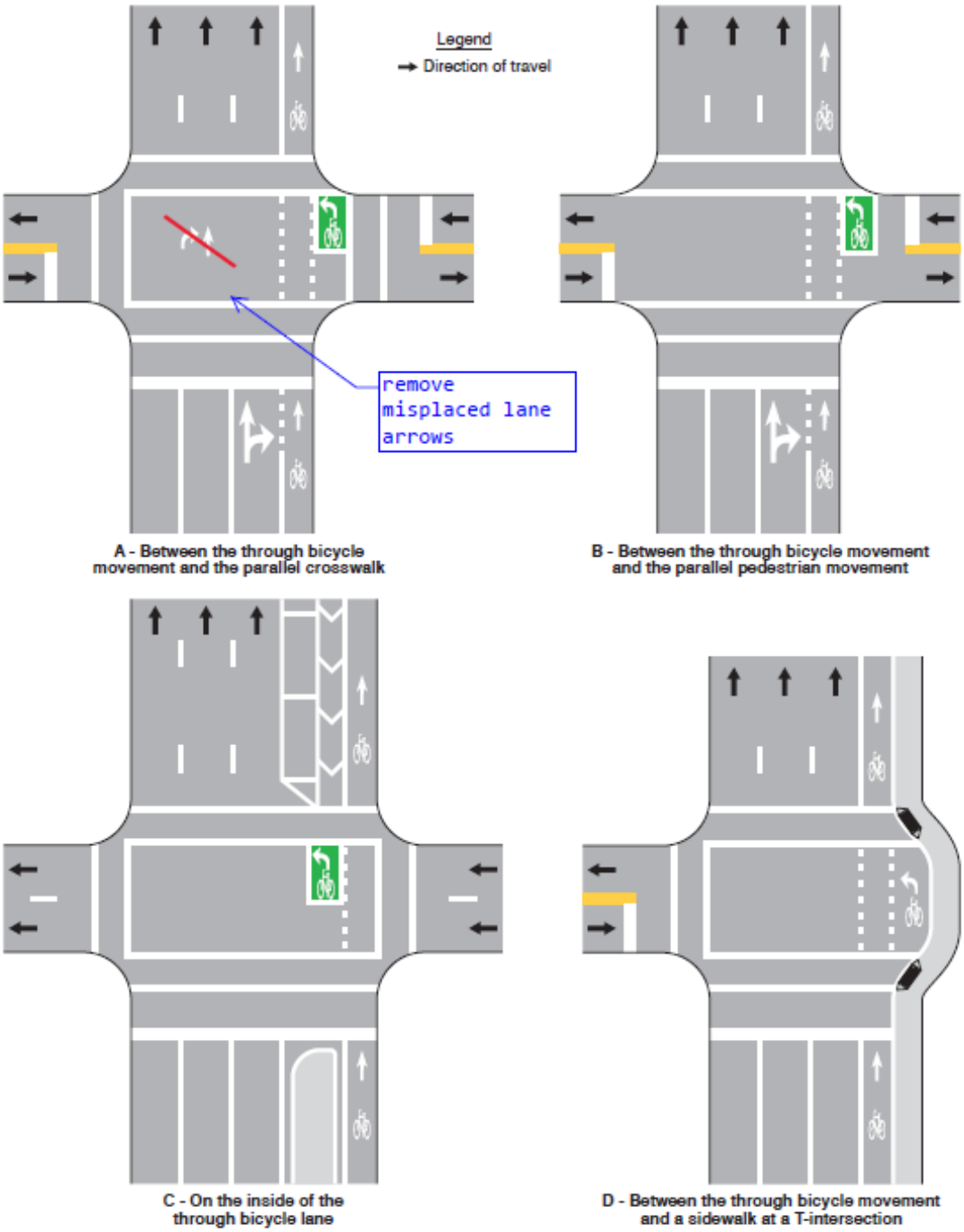
A two-stage bicycle turn box shall be bounded on all sides by a solid white line.

For two-stage bicycle turn boxes that facilitate turns from a one-way bikeway, the bicycle symbol shall precede the pavement marking turn arrow in the direction of bicycle travel.

Passive detection of bicycles in the two-stage bicycle turn box shall be provided if the signal phase that permits bicycles to enter the intersection during the second stage of their turn is actuated.

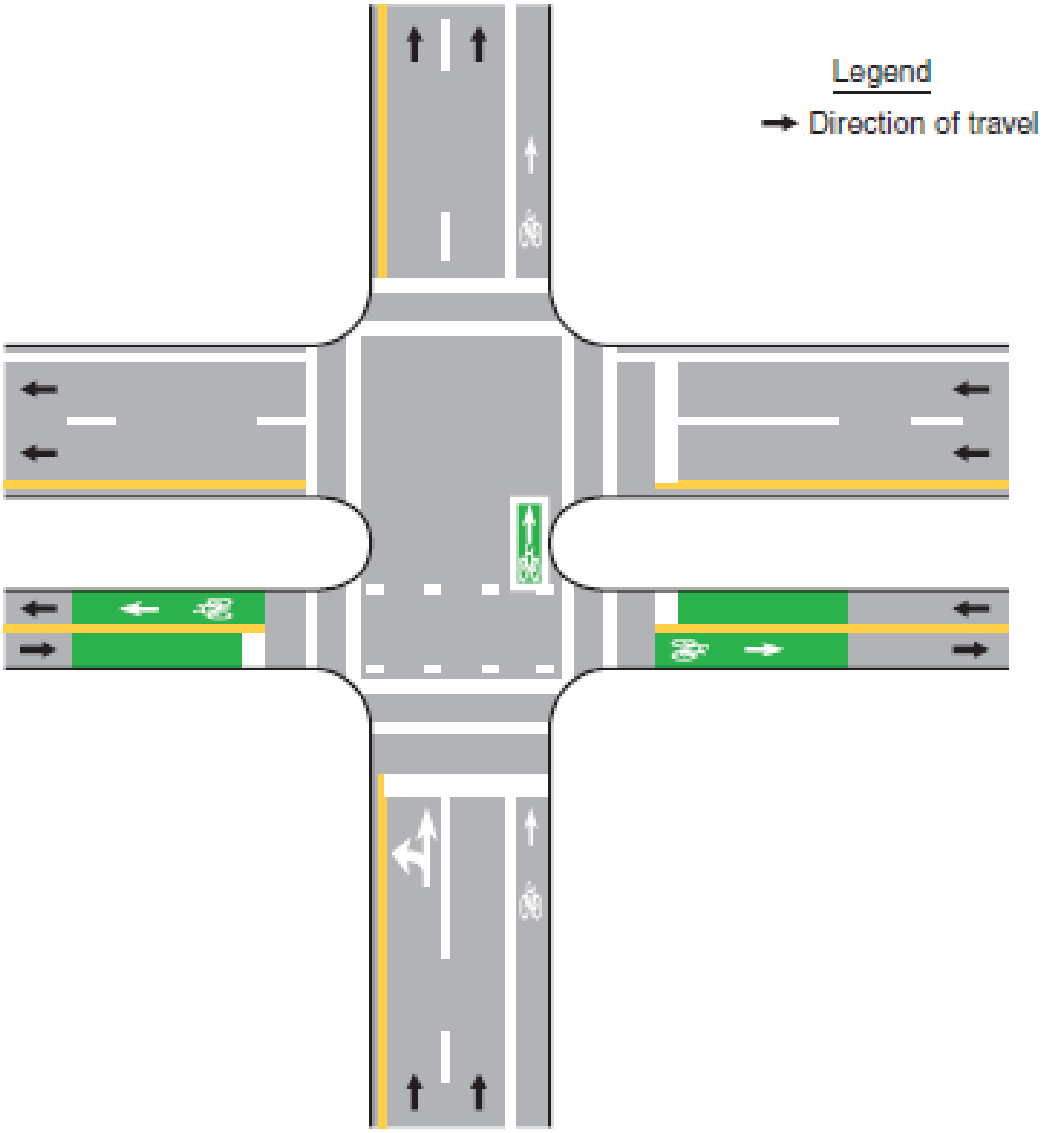
NCUTCD generally agrees with Figure 9E-10 as presented in the NPA, but recommends deleting misplaced lane arrow markings in example A.

Figure 9E-10. Examples of Two-Stage Turn Box Locations in Intersections



NCUTCD agrees with Figure 9E-11 as presented in the NPA.

Figure 9E-11. Example of a Two-Stage Turn Box Location In an Intersection With a Two-Way Bikeway



Option:

For two-stage turn boxes that facilitate turns from a two-way bikeway, a through arrow pavement marking may be used to orientate bicycles in the direction of the movement to be accomplished by the second stage of the turn (see Figure 9E-11).

Guidance:

Engineering judgment should be used to develop the size of the two-stage bicycle turn box. Factors considered should include intersection geometry and keeping queued bicycles away

from moving traffic, as well as peak hour bicycle volumes so that there would be no overflow of the two-stage turn box that ~~does not~~ subjects any bicyclist to conflicting movements. [editorial]

A two-stage turn queuing box should be located downstream of the crosswalk and downstream of the stop line. [added Guidance statement from 14A-BIK-01]

Option:

The two-stage turn box may use green-colored pavement.

Standard:

If used, green-colored pavement shall encompass the full limit of the two-stage turn box.

Where the path of vehicles lawfully turning on red would pass through a two-stage bicycle turn box, the cross street shall implement a full-time turns on red prohibition.

Section 9E.12 Comments: NCUTCD generally agrees with 9E.12 as presented in the NPA, as it is consistent with NCUTCD recommendation 13B-BIK-01, but recommends adding two Option statements regarding left-side bicycle lanes and extension of the box across multiple lanes.

Section 9E.12 Bicycle Box

Option:

A bicycle box (see Figure 9E-12) may be used to increase the visibility of stopped bicycles on the approach to a signalized intersection during the portion of the signal cycle when a red signal indication is being displayed to motor vehicles in the approach lane(s) that is behind the box.

A bicycle box may be used at intersections to shift bicycle traffic from one side of a roadway to another to continue onward. [Option added to accommodate left-side bicycle lanes.]

Guidance:

At intersections where a discernible number of conflicts between vehicles turning across through bicycles in a bicycle lane has been demonstrated during the green interval of a signal, other treatments should be used. ~~the bicycle box should not be used~~ [editorial]

Other treatments should be considered for conflicts between turning vehicles and through bicycles such as using leading or exclusive signal phases, or separating turning traffic from through traffic through exclusive turn lanes.

A bicycle lane should be used on the approach to a bicycle box.

A bicycle box should not be contiguous with a crosswalk. A stop line on the downstream end of the bicycle box should be used to mark the location where bicycles are required to stop.

Option

A bicycle box may extend across more than one general purpose approach lane for motor vehicles. [Option added to accommodate use of box on multi-lane approaches]

Standard:

If used, the distance from the upstream edge of the bicycle box that is nearest to the stop line for motor vehicles to the downstream edge of the bicycle box that is nearest the crosswalk or intersection shall be at least 10 feet. At least one bicycle symbol marking (see Figure 9E-12) shall be used in the bicycle box.

Where an existing stop line for motor vehicles is relocated upstream to install a new bicycle box, the yellow change and red clearance intervals (see Section 4F.17) shall be

recalculated and if necessary, reprogrammed to accommodate the length of the bicycle box.

Countdown pedestrian signals (see Section 4I.05) for the crosswalk or pedestrian crossing movement that crosses the approach shall be installed when a ~~accompany~~ bicycle box~~es that~~ extends across more than one approach lane for motor vehicles. [editorial]

Turns on red shall be prohibited from any approach lane that is behind the bicycle box. ~~the lane where a bicycle box is placed.~~ [editorial]

Guidance:

Countdown pedestrian signals for the crosswalk or pedestrian crossing movement that crosses the approach should accompany bicycle boxes where it is demonstrated that bicycles arrive at the intersection at or near the end of the red signal indication being displayed to traffic in the approach lane(s) that is behind the box.

Option:

Green-colored pavement may be used in a bicycle box.

Standard:

If used, green-colored pavement shall encompass ~~be used in~~ the full limit~~s~~ of the bicycle box. [editorial]

Support:

Section 9B.02 contains information on the Except Bicycles plaque that can be used below the STOP HERE ON RED (R10-6 or R10-6a) sign (see Section 2B.63) to exempt the bicycle from the requirement of the advance stop line. [editorial]

NCUTCD generally agrees with Figure 9E-12 as presented in the NPA, but recommends adding titles to figures and on sheet 2 of 2 replacing R3-7aP EXCEPT BICYCLES plaques with the symbol version in accordance with NCUTCD recommendation 09A-BIK-01.

add Figure title **Figure 9E-12.** (Sheet 1 of 2)

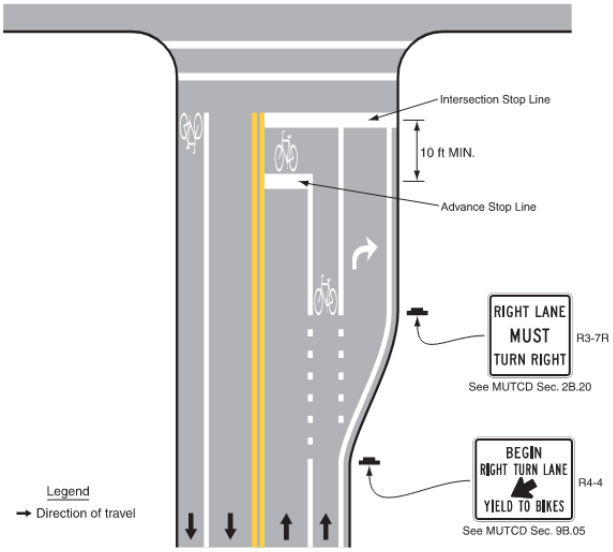
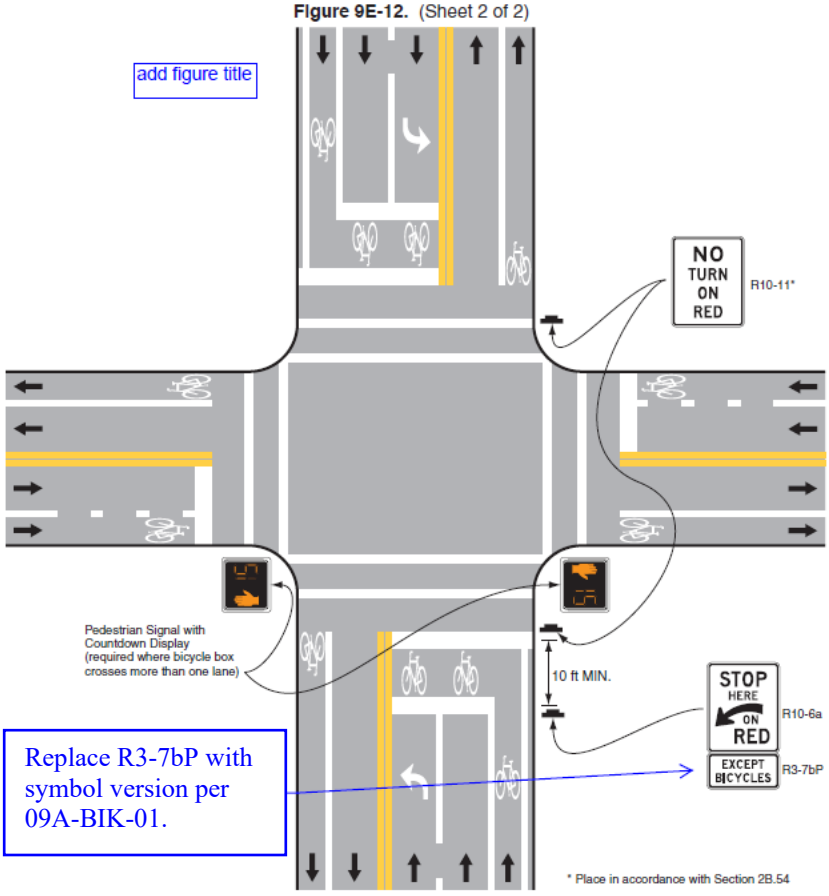


Figure 9E-12. (Sheet 2 of 2)



Section 9E.13 Comments: NCUTCD generally agrees with 9E.13 in the NPA but recommends changing the Standard statement regarding markings for paths at crossings of unpaved roads to Guidance and the Guidance statement on colored pavement at intersections to Option.

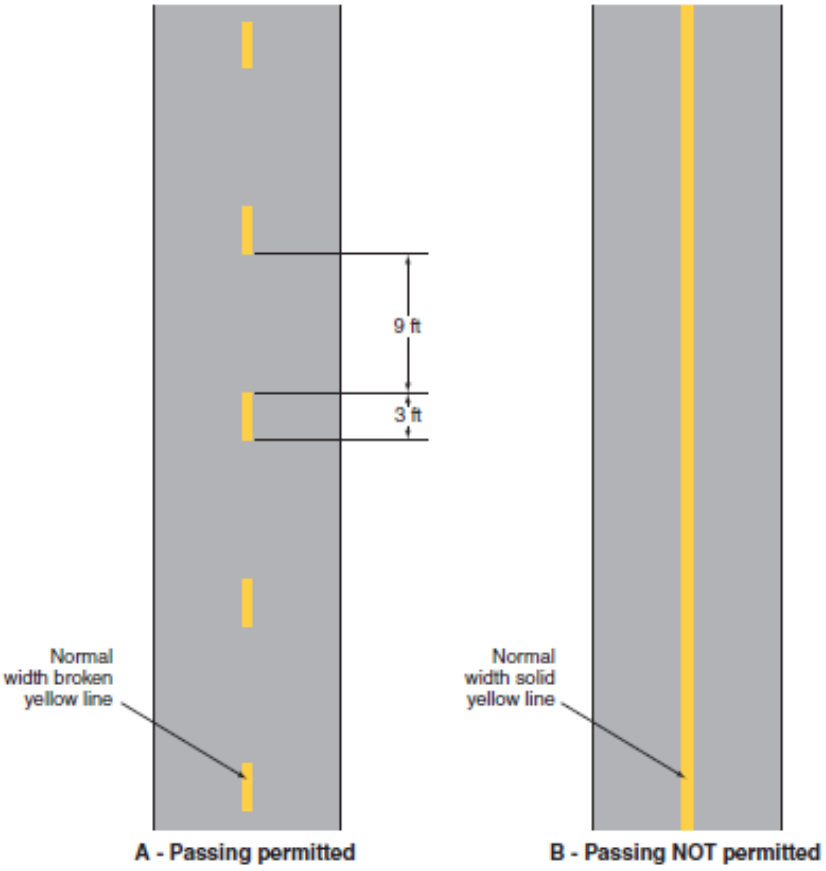
Section 9E.13 Shared-Use Paths

Option:

Where shared-use paths are of sufficient width to designate two minimum width lanes, a solid yellow center line may be used to separate the two directions of travel where passing or traveling to the left of the line is not permitted. A broken yellow center line may be used where passing is permitted (see Figure 9E-13).

NCUTCD agrees with Figure 9E-13 as presented in the NPA.

Figure 9E-13. Examples of Center Line Markings for Shared-Use Paths



Guidance:

Broken lines used on shared-use paths should have a nominal 3-foot segment with a 9-foot gap.

Option:

A solid white line may be used on shared-use paths to separate different types of users in the same direction. The R9-7 sign (see Section 9B.13) may be used to supplement the solid white line.

Smaller size pavement word markings and symbols may be used on shared-use paths. Where arrows are needed on shared-use paths, half-size layouts of the arrows may be used (see Section 3B.20).

~~**Standard:**~~

~~**Where a shared-use path crosses a roadway, crosswalk markings shall be used (see Chapter 3C).**~~ [Standard changed to Guidance and add "paved roadway" to allow flexibility for unpaved roads]

Guidance:

Where a shared-use path crosses a paved roadway, crosswalk markings should be used (see Chapter 3C).

Option:

Where pedestrian and bicycle movements on a shared-use path are separated on the approach to a roadway crossing, parallel bicycle and pedestrian crossing markings may be used as shown in Figure 9E-14.

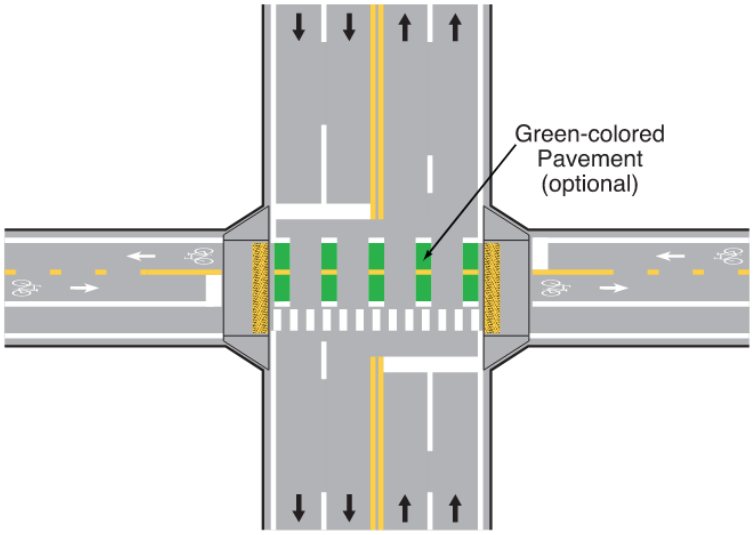
If parallel bicycle and pedestrian crossing markings are used where a shared-use path crosses a roadway, crossing areas for bicycles may ~~should~~ use green-colored pavement. ~~if the shared-use path crossing has a high volume of either mode.~~ [revise Guidance below to Option to conform with Figure 9E-14].

~~Guidance:~~

~~If parallel bicycle and pedestrian crossing markings are used where a shared-use path crosses a roadway, crossing areas for bicycles should use green-colored pavement if the shared-sue path crossing has a high volume of either mode.~~

NCUTCD generally agrees with Figure 9E-14 as presented in the NPA, but notes the width of the crosswalk appears to be too narrow in the figure when compared to other markings.

Figure 9E-14. Pavement Markings for a Shared-Use Path with Mode Separation



Section 9E.14 Comments: NCUTCD generally agrees with 9E.14 as presented in the NPA, but recommends revising one Standard statement to a Guidance statement to allow use of bicycle route pavement markings in separated bicycle facilities to provide route connectivity and continuity. NCUTCD also recommends deleting the Standard statement prohibiting markings from substituting for signs as it conflicts with the adjacent Guidance statement, and other editorial changes as needed.

Section 9E.14 Bicycle Route Pavement Markings

Option:

Bicycle route pavement markings simulating guide signs for bicycle routes (see Section 9D.02 through 9D.07) and route auxiliary plaques (see Section 9D.08) may be used to supplement guide signing to help bicyclists in navigation (see Figure 9E-15). [editorial]

Standard:

Bicycle route pavement markings ~~route markers shall~~ shall be limited to shared-use paths, buffered bicycle lanes, or separated bicycle lanes. Bicycle route pavement markings ~~route markers~~ shall not be used in standard bicycle lanes, ~~bufferseparated bicycle lanes,~~ or in shared lanes. [revise Standard statement to allow use on other types of separated bicycle facilities]

~~**Except as provided in Paragraph 4, bicycle route pavement markings simulating official guide signs for bicycle routes shall be supplemental to the sign(s) and shall not be a substitute for the sign(s).**~~ [delete as it conflicts with Guidance statement below]

Guidance:

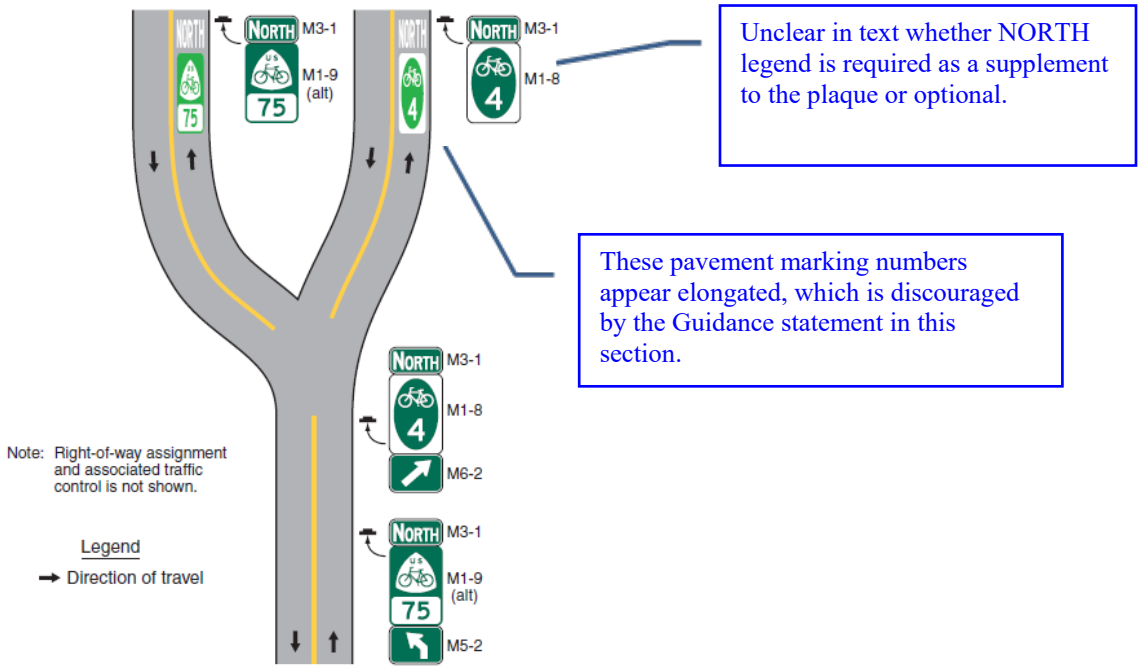
A systematic methodology of locating the guide sign adjacent to the bicycle route pavement marking should be used that includes locations where either the sign or the pavement marking can exist alone to avoid overuse of the guide sign or the pavement marking. [editorial]

~~*The route marker*~~ *Bicycle route pavement markings should not be elongated.* [editorial]

The location, size, and materials of the ~~route marker~~ bicycle route pavement markings should be considered that will minimize loss of traction for bicycles under wet conditions. [editorial]

NCUTCD generally agrees with Figure 9E-15 as presented in the NPA, but notes that the pavement marking graphics appear elongated, which is not consistent with provisions in Section 9E-14. The figure is also unclear as to whether the cardinal direction marking is required or optional.

Figure 9E-15. Example of Placement Route Markers for Shared-Use Paths



Section 9E.15 Comments: NCUTCD agrees with 9E.15 as presented in the NPA with minor editorial revisions.

Section 9E.15 Bicycle Detector Symbol

Option:

The bicycle detector symbol (see Figure 9C-16) may be placed on the pavement indicating the optimum position for a bicycle to actuate the signal.

Appropriately sized WAIT HERE FOR GREEN word markings may be placed on the pavement immediately below the bicycle detector symbol.

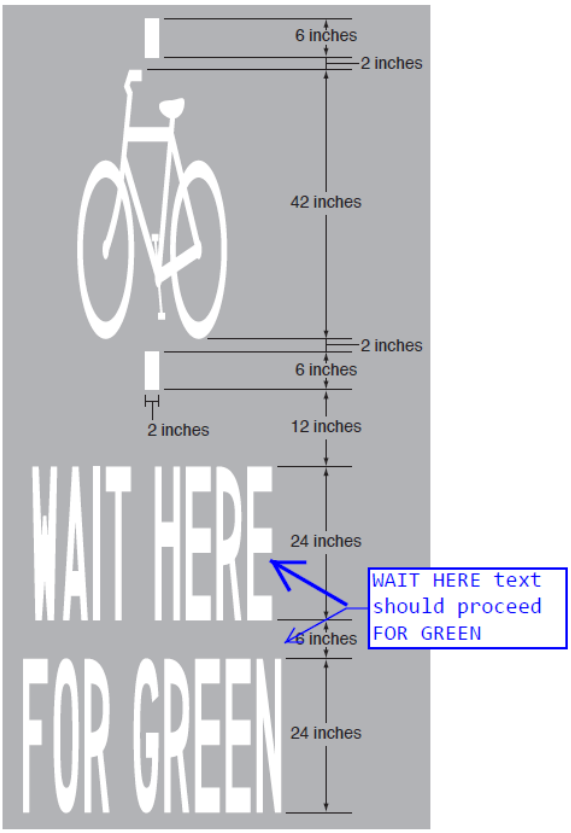
A R10-22 sign (see Section ~~9B.21~~9B.20) may be installed to supplement the bicycle detector symbol pavement marking. [editorial]

Support:

The Standard Highway Signs and Markings Book contains details for incorporating green-colored pavement as a background enhancement to the bicycle detector symbol.

NCUTCD recommends revising Figure 9E-16 so the word legend under the bicycle symbol reads in standard word legend marking order; e.g. first words farthest upstream, in accordance with NCUTCD recommendation 18B-BIK-06.

Figure 9E-16. Bicycle Detector Pavement Marking



Section 9E.16 Comments: NCUTCD generally agrees with Section 9E.16 as presented in the NPA, but recommends adding an Option statement to allow yellow diagonal markings to provide added conspicuity to the obstruction markings.

Section 9E.16 Pavement Markings for Obstructions

Guidance:

Markings as shown in Figure 9E-17 should be used at the location of obstructions in the center of a shared-use path or physically separated bikeway including vertical elements intended to physically prevent unauthorized motor vehicles from entering the path.

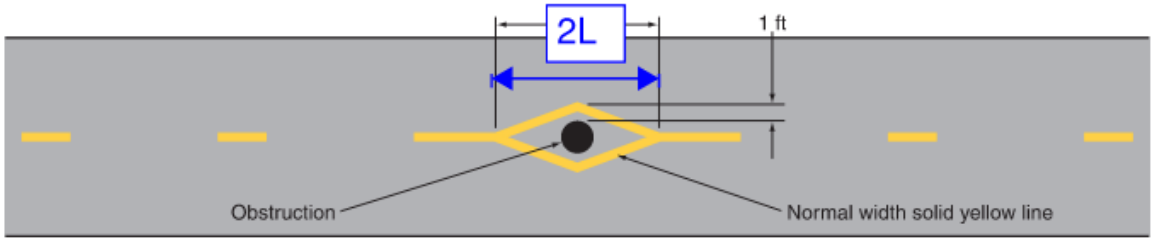
In roadway situations where it is not practical to eliminate a drain grate or other roadway obstruction that is inappropriate for bicycle travel, white markings applied as shown in Figure 9E-17 should be used to guide bicyclists around the condition.

Option:

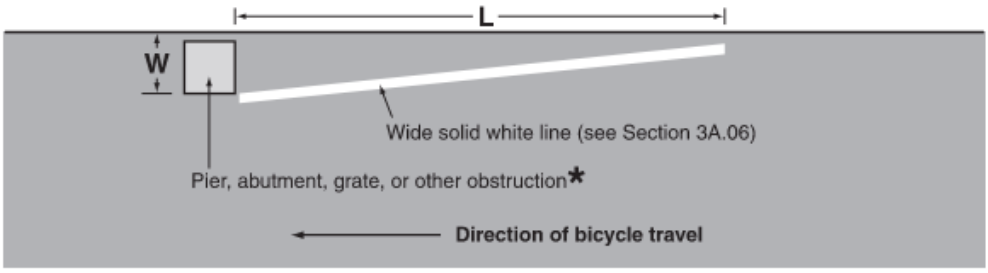
For locations with an obstruction in the center of a shared-use path or physically separated bikeway, yellow diagonal markings may be placed between the solid yellow lines adjacent to the obstruction as per Section 3B.14. [add Option for disgonal markings]

NCUTCD generally agrees with Figure 9E-17 as presented in the NPA, but recommends adding longitudinal dimensions for the marking taper for the in-path obstruction.

Figure 9E-17. Examples of Obstruction Pavement Markings



A - Obstruction within the path



B - Obstruction at edge of path or roadway

L = WS, where W is the offset in feet and S is bicycle approach speed in mph

* Provide an additional foot of offset for a raised obstruction and use the formula L = (W+1) S for the taper length

---

Section 9E.17 Comments: NCUTCD recommends revising 9E.17 in accordance with NCUTCD recommendation 17A-BIK-01:

- Revise the first Support statement to include tubular marker deleted from Guidance below, delete text that conflicts with the definition of a buffer-separated bicycle lane in Section 9E.06, and edit to illustrate hazards posed by raised devices to all road users
- Add Guidance on lateral offset of channelizing devices
- Add a Support statement to include measures to mitigate the potential hazards of raised devices drawn from research findings
- Revise the Standard statement on device color to Guidance to allow agencies to use different device colors where contrast is needed for device visibility, such as tubular markers in snow conditions
- Delete Guidance that conflicts with the definition of a buffer-separated bicycle lane in Section 9E.06

Section 9E.17 Raised Devices

Support:

Chapter 3I contains information on using channelizing devices to emphasize pavement marking patterns associated with certain bicycle facilities. A common application is the use of tubular markers (Section 3I.02) as channelizing devices for bicycle facilities. ~~The most common application is the use of flexible raised devices in the buffer space of a buffer-separated bicycle lane (see Section 9E.06).~~ [Delete text conflicting with 9E.06]

Using inflexible raised devices immediately adjacent to ~~the~~a travel path ~~of the bicycle~~ without a buffer creates a collision potential for all road user types~~bicyclists.~~ [editorial to illustrate the hazards posed by raised devices to all road users]

Option:

In accordance with Chapter 3I, channelizing devices may be used to emphasize a pavement marking pattern that establishes a bicycle lane or other bicycle facility provided that the installation of channelizing devices does not prevent motor vehicles from turning when the turn requires the motor vehicle to merge with the bicycle lane or facility as required by law or ordinance.

Guidance:

~~*If used, channelizing devices for bicycle facilities should be tubular markers (see Section 3I.02)*~~ [relocate to Support above]

The selection of a raised device for use with bicycle facilities should consider the collision potential of the both the post and the base since the base may be present in the event the post is struck and missing.

Channelizing devices should be placed at least one foot from the edge of any lane and measures taken to reduce the likelihood of being struck by a road user. [add Guidance on lateral offset]

Support:

Measures to reduce the likelihood of a road user striking a channelizing device include marking a buffer space, improving lighting, improving reflectivity, or the periodic addition of taller vertical elements to runs of shorter elements. [add Support to mitigate potential hazards]

~~**Standard:**~~

~~**Channelizing devices that are used to emphasize the pavement marking patterns of bicycle facilities shall not incorporate the color green into either the device or its retroreflective element to supplement the presence of green-colored pavement.**~~

Guidance:

Channelizing devices should be the same color as the pavement they supplement, except where conditions, such as the presence of snow, warrant the use of a more contrasting color.

[Revise Standard to Guidance to allow agencies to use other colors]

~~*Guidance:*~~

~~*If used in buffer-separated bicycle lanes, channelizing devices should be placed in the buffer space and at least one foot from the longitudinal bicycle lane pavement marking*~~.

[Delete Guidance statement conflicting with definition of buffer-separated bicycle lane in Section 9E.06]