MUTCD 11TH EDITION, REVISION 1
SUPPLEMENTAL SUMMARY OF CHANGES

INSTRUCTIONS AND INFORMATION FOR USERS

This summary document is provided for informational purposes only and is intended to supplement the *Federal Register* Final Rule for Revision 1 of the 11th Edition of the *Manual on Uniform Traffic Control Devices for Streets and Highways* (MUTCD).

The summary is organized into two sections: (1) Technical Corrections and (2) Editorial Changes. Within each section, each change is shown in line with the corresponding MUTCD 11th Edition Section, Figure, or Table number ordered in as close a sequence as practical.

Please note minor errata corrections, such as punctuation, are not listed in this summary.

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MUTCD 11th Edition Section, Figure, or Table Number	Section 1 Technical Corrections
Table 1B-1	FHWA revises Table 1B-1 to list the actual compliance dates of "January 18, 2029" and "January 18, 2034," rather than "5 years from the effective date of this edition of the MUTCD" and "10 years from the effective date of this edition of the MUTCD."
Sec. 1B.06	FHWA revises Paragraph 4 to clarify that safety and operational benefits are the reason for potential inclusion of a change in a future MUTCD rulemaking.
Sec. 1C.02	FHWA edits the definition of "paved" by removing the word "roadway" from the description of the surface, since a roadway might have an unpaved surface.
Sec. 2B.30	FHWA modifies Paragraph 1 to reflect the R3-8 series in general rather than the specific signs noted because Section 2B.30 contains the R3-8x series signs for use with bicycles lanes and the provisions in Section 2B.27 allow for the modification of the signs at roundabouts to utilize the arrow symbol displays in Figure 2B-5. FHWA updates Figure 2B-4 and Table 2B-1 accordingly to include the R3-8z series signs shown in the SHS.
Sec. 2C.06	FHWA revises Paragraph 1 to reference Section 2C.59 for the use of Advisory Speed plaques on the approach to horizontal curves. FHWA adds this reference to ensure that practitioners are aware the provisions for plaques that may accompany a horizontal alignment warning sign are in the later Section in Chapter 2C. FHWA also adds a new Note 6 to Table 2C-4 with a similar reference to Section 2C.59. Also, FHWA relocates and revises Paragraph 3 to Section 2C.10 to address an inadvertent conflict between the two Sections and to consolidate the information about the optional use of the One-Direction Large Arrow (W1-6) sign into one Section rather than two.
Sec. 2C.10	FHWA reorders Paragraphs 1 and 2 and adds items A and B from Paragraph 3 of Section 2C.06 to Paragraph 2 clarifying conditions for the optional use of a One-Direction Large Arrow (W1-6) sign.
Sec. 2C.13	FHWA changes Paragraph 1 from Option to Support since the text describes when the W13-20 sign and W13-20aP sign are used and is more appropriate as a Support. FHWA also makes other editorial revisions in Paragraphs 2 and 3.
Sec. 2C.59	FHWA revises Paragraph 12 to specifically list the 2nd Edition of the "Traffic Control Devices Handbook," 2013, Institute of Transportation Engineers as a reference where MUTCD users can obtain information for the engineering practices for the determination of the recommended advisory speed for a horizontal curve.
Sec. 2D.11	FHWA adds Paragraph 17 to clarify that when used as a component of a guide sign, the county name and the legend COUNTY is Optional on the County Route (M1-6) sign. Similar to the Interstate Route (M1-1 and M1-1a) signs, not including the county name on the County Route sign when used on guide signs is to limit the informational load imposed on the road user and because the relative scale of the county name to other legend elements displayed on the guide sign would be considerably smaller. This might also allow larger numerals to be used on the County Route sign when used as a component of guide signs. Several figures in the original Notice of Proposed Amendments (2D-13 Sheet 2 of 3, 2D-14, and 2E-23) and Final Rule for the 11th Edition illustrate the difference. As the text did not consistently reflect the intent, FHWA clarifies the provisions to inquiring practitioners.
Sec. 2D.58	FHWA revises Paragraph 2 to add "that is also" to clarify designation as a trail, auto tour route, or byway is separate from the officially designated name of a highway used for navigational, official mapping, and address purposes (see Section 2D.56).

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Sec. 2E.18	FHWA revises Paragraph 2 to clarify the intent of the provision for the directional arrow to be located adjacent to the legend, consistent with the more precise term used in Paragraph 3 and illustrated throughout the figures in Chapter 2E.
Sec. 2E.40	FHWA revises Paragraph 4 by removing the word "if" and reorganizing the remaining wording in the provision to improve readability and avoid any potential confusion. FHWA makes this change as a conforming edit, which does not change the existing underlying requirement. Also, FHWA revises Paragraph 14 to clarify Exit Direction and Pull-Through signs are the signs that may be added in the vicinity of the theoretical gore to reinforce positive guidance.
Sec. 2E.54	FHWA revises Paragraph 9 by deleting the redundant text "display OPEN or CLOSED" as the changeable legend is described and referenced in Paragraph 8.
Sec. 2J.05	FHWA revises Paragraph 2 to clarify all lettering on business identification sign panels should be mixed-case, except within a logo. FHWA makes this revision for consistency with the change in Section 2K.03
Sec. 2K.02	FHWA revises Paragraph 6 to clarify logos, not business identification sign panels, may be displayed in place of a word legend on a tourist-oriented directional sign and to align with the definition of business identification sign panels in Section 1C.02.
Sec. 2K.03	FHWA revises Paragraph 1 to clarify all lettering on business identification sign panels should be mixed-case, except within a logo. FHWA makes this change since Figures 2K-1 and 2K-2 were updated in the 11th Edition to show mixed-case and the new language reinforces this recommendation.
Sec. 2N.02	FHWA deletes Paragraph 10 to remove the Guidance for the background of Emergency Management signs to be retroreflective, as Chapter 2A requires all signs to be retroreflective and does not provide exception for emergency management signs. Also, FHWA adds a new Support paragraph referencing Chapter 2A for general provisions for all signs including emergency management signs.
Secs. 3B.01, 3B.06, 3B.07, 3B.08, 3B.09	FHWA reorganizes the Option and Support statements to allow curved transitions for dotted extension lane lines, channelizing lines, and edge lines to Sections 3B.07, 3B.08, and 3B.09, respectively. FHWA also relocates Option and Support statements to allow curved transitions for center lines. Corresponding to these revisions, FHWA also revises Paragraph 10 in Section 3B.06 to remove "edge line," "channelizing", and "dotted extension line" and revises Paragraph 11 in Section 3B.06 to remove ", and turn lanes".
Secs. 3B.11, 3B.31, 3C.11	FHWA removes "diverging" from the term "diverging diamond interchange with transposed alignment crossroad" for consistency throughout the text. In Section 3C.11, the FHWA adds "with transposed alignment crossing" to this term. Also, FHWA adds "diverging diamond interchange" as one of the other terms that the diamond interchange with a transposed alignment crossover is known as. FHWA makes these changes to provide consistency throughout the MUTCD.
Sec. 3B.18	FHWA combines Paragraphs 1 and 2 to consolidate and streamline the provisions.

MUTCD 11th Edition Section, Figure, or Table Number	Section 1 Technical Corrections
Sec. 3B.18 cont'd	FHWA renumbers Paragraphs 3, 4, and 5 and updates the paragraph references due to the consolidation of Paragraphs 1 and 2.
Sec. 3B.25	FHWA revises Paragraph 5 to add a cross-reference to the beginning of the sentence. FHWA makes this change to resolve the conflict with Paragraph 3 of Section 3J.03.
Sec. 3C.02	FHWA revises Paragraph 6 to replace "roadway" with "approach to an intersection or midblock crossing location" to more clearly define the location for the recommended installation of traffic control devices or other measures.
Sec. 3C.03	FHWA revises Paragraph 9 to add "At marked crosswalk locations" to the beginning of the sentence. This is to provide additional clarification since curb ramps may be provided at marked and unmarked crosswalk locations. This is in alignment with the existing Support provision in Paragraph 4 of Section 3C.01. Also, FHWA revises Paragraph 10 to replace "transverse line crosswalk markings" with "crosswalk marking designs" since the Guidance applies to all crosswalk types, not just transverse line crosswalk markings.
Sec. 3C.07	FHWA revises Paragraph 1 to better clarify the description of ladder crosswalks. FHWA also revises Paragraph 7 to replace "parallax phenomenon due to" with "distortion due to perspective (foreshortening) caused by" in order to use simpler, less technically complex language.
Sec. 4D.05	FHWA revises Item A of Paragraph 1 to clarify the one exception to this Standard only applies to a combined left-turn/right-turn lane and no through movement. FHWA makes this change because some practitioners have expressed the potential confusion with language allowing this exception for any single-lane approach.
Sec. 4H.02	FHWA revises Paragraph 1 to clarify the prohibition of using bicycle signal faces to allow conflicting bicycle movements from perpendicular or nearly perpendicular directions to enter the intersection at the same time. FHWA makes this change to clarify that the intent of this provision was to prohibit a "bicycle scramble" phase where there is a single bicycle signal phase that allow bicycles on perpendicular approaches to proceed at the same time.
Sec. 4I.06	FHWA revises Paragraph 19 to clarify the high conflicting turning vehicle volumes could be either left-turns or right-turns.
Sec. 4L.02	FHWA revises Paragraph 15 to add a reference to Chapter 4K to provide further information on locator tones.
Sec. 4S.03	FHWA adds a new Support paragraph to provide reference to Section 4I.05 for more information about pedestrian push button detector location criteria and Chapter 4K for more information on push button locator tones.
Sec. 4U.02	FHWA adds a new Support paragraph to provide reference to Section 4I.05 for more information about pedestrian push button detector location criteria and Chapter 4K for more information on push button locator tones.
Sec. 5B.02	FHWA changes Item C of Paragraph 2 to clarify the consideration for agencies seeking to better accommodate driving automation systems to support AVs when using dotted edge line extensions. FHWA changes this provision to clarify that it applies to the downstream end of the channelizing line adjacent to the through lane or from the downstream end of a solid white lane line, if used, to the downstream end of the acceleration taper at entrance ramps with an acceleration lane and update the

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Sec. 5B.02 cont'd	reference to Section 3B.07. FHWA makes this change to clarify the conditions to install dotted lane line extensions for agencies seeking to better accommodate driving automation systems and to better reflect the language in Part 3.
Sec. 6N.19	FHWA revises Paragraph 3 to relocate the cross-reference to Figure 6N-1 and adds cross-references to Sections 6G.07 and 6H.08. Also, FHWA changes Paragraph 4 to remove "YOUR" from Items A and B to provide consistency with other sign messages in the MUTCD. Additionally, FHWA changes Paragraph 5 to remove Item A since there is a static sign with the legend TAKE YOUR TURN/MERGE HERE so this is not needed. FHWA also changes the words "are typically" to "may be" for consistency with language for an Option provision.
Sec. 7C.01	FHWA revises Paragraph 1 to remove "where students are encouraged to cross between intersections" because this text conflicts with Paragraph 4 of Section 3C.02. Also, FHWA revises Paragraph 4 to add a reference to Section 3C.02 for provisions regarding crosswalk markings at non-intersection locations.
Sec. 8A.04	FHWA revises Paragraph 3 to replace "outside of a roadway" with "except where the tracks are located in the median of a street or highway" to better clarify the intent of this provision. Also, FHWA adds "traffic control signals" with a reference to Section 8D.04 to the list of traffic control devices a Diagnostic Team typically considers for highway-LRT grade crossings in semi-exclusive alignments. Lastly, FHWA adds "alone" after STOP signs to clarify the intent.
Table 8B-1	FHWA changes the minimum size for single-lane approaches for the Left (Right) Lane Signal (R10-10b) sign to 24 x 30 inches. Also, FHWA changes the minimum size for the Left (Right) Turn Lane Signal (R10-10c) sign to 24 x 30 inches (including single-lane approaches) and 30 x 36 inches for multi-lane approaches. FHWA makes these changes for consistency with other R10-10 series signs which are mounted overhead.
Sec. 8B.08	FHWA adds a new exception to Paragraph 3 for cases when the emergency phone number service is no longer in use. FHWA makes this change because without the exception, the Diagnostic Team would have to deviate from the Standard and document the decision to remove the Emergency Notification Sign (I13-1) in an engineering study. There is no reason to retain the I13-1 if the emergency phone number is no longer in service.
Sec. 8D.04	FHWA revises Paragraph 4 to add "traffic control signals" to the list of traffic control devices a Diagnostic Team typically considers for highway-LRT grade crossings where LRT speeds are 25 mph or less. Also, FHWA revises Paragraph 5 to add "or in the median of a highway or street" in concert with revisions in Section 8A.04. Lastly, FHWA adds a cross-reference in Paragraph 6 to Section 8A.04 for additional provisions for LRT grade crossings in semi-exclusive alignments.
Sec. 8D.10	FHWA revises Item C of Paragraph 5 to clarify that the blank-out sign is recommended if turning traffic is not prohibited from turning during preemption by a separate traffic signal face for that movement.
Sec. 9D.11	FHWA revises Paragraph 1 to add an option for the use of Advance Turn Arrow (M5 series) or Directional Arrow (M6 series) auxiliary plaques (see Figure 9D-1) with white arrows on green backgrounds when using Mode-Specific Directional Guide signs for Shared-Use Paths. These arrow plaques were intended to be used in this manner (as shown in Figure 9D-5), and this revision is

MUTCD 11th Edition Section, Figure, or Table Number	Section 1 Technical Corrections
Sec. 9D.11 cont'd	consistent with Option statements that are provided in other Sections (for General Information Signs, General Service Signs, and Recreational and Cultural Interest Area signs).

MUTCD 11th Edition Section, Figure, or Table Number	Section 2 Editorial Changes
Sec. 1B.06	Paragraph 4: Change the phrase "future for consideration in the next rulemaking" to "future rulemaking."
Sec. 1B.07	Paragraphs 11 and 13: Change the reference from "Paragraph 9" to “Paragraph 10.”
Sec. 1C.02	Paragraph 3: Definitions 54, 130, 154: Uncapitalize the word “A.” Paragraph 3: Change the alphabetical order of Definitions 111, 158, and 159. Paragraph 3, Definition 116: Delete the hyphen in all instances of “left-turn” and “right-turn.” Paragraph 3, Definition 120: Delete the phrase “elimination of a through lane by.” Paragraph 3, Definition 160: Hyphenate “weight bearing.” Paragraph 3, Definition 187: Uncapitalize the word “An.” Paragraph 3, Definition 229: Uncapitalize the word “See.” Paragraph 3, Definition 247: Uncapitalize the word “Roadways.”
Figure 2A-3	Drawing B: Remove the arrowhead pointing to the STOP sign from the line between the STOP sign and the STOP sign location shown in the “B - Channelized Intersection” detail.
Figure 2A-4	Sheet 4 of 4: Change the lane-use arrow pavement markings on the main figure and in the inset from normal to curved-stem lane-use arrow pavement markings to match the regulatory and guide signs. Add the missing “)” after “Circular Intersection” in the Sign Schedule.
Sec. 2A.07	Paragraph 3: Change the phrase “if no Minimum size is shown” to “if no size is shown in the Minimum column.”
Sec. 2A.13	Paragraph 1: Remove the words “all four sheets in”. Paragraph 2: Remove the words “all four sheets in”.
Table 2A-5	Change the name of the W11-8 sign from “Fire Station” to “Emergency Vehicle.”
Table 2B-1	Sheet 2 of 6: Add row for “Advance Circular Intersection Lane Control (2 Lanes). Sheet 2 of 6: Add asterisks to the “Minimum” column for R4-1, R4-2, R4-3, and R4-7. Sheet 3 of 6: Add asterisk to the “Minimum” column for R4-16. Sheet 5 of 6: Change spelling of “No All-Terrian Vehicles” to “No All-Terrain Vehicles.” Sheet 6 of 6: Change “Push Button for 2 Seconds for Extra Crossing Time” to “Push Button for 2 Seconds for Extra Crossing Time (plaque).”
Sec. 2B.10	Paragraph 2: Change Items D and E to sub-items 1 and 2 under Item C.
Figure 2B-3	Change the dollar currency symbol to match the typographical symbol and punctuation in the Standard Alphabet in the *Standard Highway Signs* publication.
Figure 2B-4	Sheet 1 of 2: Add signs R3-8zd, R3-8ze, R3-8zf, and R3-8zg.

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Figure 2B-24	Add space between the crosswalk and the sign location to improve readability of the figure.
Sec. 2B.21	Paragraph 7, Item E: Change spelling of word “precentile” to “percentile." Paragraph 18: Change reference title of “Traffic Control Devices Handbook” to “2nd Edition of the “Traffic Control Devices Handbook,” 2013, Institute of Transportation Engineers”.
Sec. 2B.27	Paragraph 5: Replace the lower-case “l” in the word “lane” in the first sentence with an upper-case ”L”.
Figure 2B-9	Sheet 1 of 3: Face the north arrow to the right instead of upwards.
Figure 2B-18	On the right-side illustration, mark the two Two-Way Traffic (W6-3) signs on the left side on the approach to the intersection as optional with an asterisk. On the right-side illustration, mark the End One Way (R6-7) signs as optional with an asterisk.
Figures 2B-22, 2B-23	Mark the Roundabout Circulation Plaque (R6-5P) as “(optional).”
Figure 2B-24	Mark the Roundabout Circulation Plaque (R6-5P) as “(see Section 2B.51, Par.1).”
Sec. 2B.52	Paragraph 4: Delete the period at the end of Item B.
Sec. 2B.53	Paragraph 27: Delete the word “the” between “with” and “those”. Move the period outside of the parentheses.
Figure 2B-27	Sign R10-3b: Add a short line under the phase “START CROSSING” and “DON’T START”.
Sec. 2B.59	Paragraph 3: Delete the extra parenthesis after the word “green”. Delete the parenthesis after the word “STOP”. Paragraph 9. Remove the word “STEADY” from “STOP ON STEADY RED YIELD ON FLASHING RED AFTER STOP” and change “RED-YIELD" to “RED–YIELD.”
Table 2C-1	Sheet 2 of 4: Change the size of the Right (Left) Lane for Exit Only sign (W9-7) for Conventional Roads from 132 x 72 to 60 x 36 and for Expressway from 132 x 72 to 96 x 60.
Figure 2C-2	Sheet 1 of 2: Show “35 MPH” on both W13-1P plaques, both W13-1aP plaques, and Note 4.
Table 2C-3	Note 2: Remove “Right” before “Lane Ends” in the second sentence to reflect the provisions for the use of the signs in Section 2C.47
Table 2C-4	Table B, Footnote 5: Change the reference from “Section 2C.06” to “Section 2C.10.” Change “One Direction Large Arrow” to “One-Direction Large Arrow.” Add Footnote 6 to “Devices for Change in Horizontal Alignment” as “See Section 2C.59 for the use of the Advisory Speed Plaque.”
Sec. 2C.12	Paragraph 9: Add the word “Speed” to “Combination Horizontal Alignment/Advisory Exit signs” to read “Combination Horizontal Alignment/Advisory Exit Speed signs.” Paragraph 17: Do not italicize this paragraph.

MUTCD 11th Edition Section, Figure, or Table Number	Section 2 Editorial Changes
Figure 2C-3	Sheet 3, Item C: Add Chevron Alignment (W1-8) signs to the outside of the controlling curve ramp proper. Sheet 4: Remove the direction of travel arrow on the bottom of the figure in the shoulder.
Figure 2C-13	Sheets 1, 2, and 3: Remove the word “optional” adjacent to the W16-2P sign. Sheet 5: In the note, change the spelling of “pacement” to “placement.”
Sec. 2C.60	Paragraph 2: Change the text, “6 months” to “12 months” to align with the provisions for the NEW plaque (W16-15P) in Section 2A.11.
Sec. 2C.71	Paragraph 5: Change the reference from “Section 2B.40” to “Section 2B.39”.
Table 2D-2	Sheet 1 of 2: Add indents for subheadings. Sheet 1 of 2, for Post-Mounted Signs in the rows under Item B. Destination and Other Guide Signs: • Change the Distance Numerals to 4 inches on single-lane roadways less than 30 mph • Change the Distance Fraction Numerals to 3 inches on single-lane roadways less than 30 mph • Change the Distance Words – Upper-Case to 3 inches on single-lane roadways less than 30 mph • Change the Action Message Words – Upper-Case to 4 inches on single-lane roadways less than 30 mph • Change the Distance Numerals to 6 inches on multi-lane roadways less than 30 mph • Change the Distance Fraction Numerals to 4.5 inches on multi-lane roadways less than 30 mph • Change the Distance Words – Upper-Case to 4.5 inches on multi-lane roadways less than 30 mph Sheet 2 of 2: Add indents for subheadings. Sheet 2 of 2, Row 2: Delete the text “, U.S., State,”. Sheet 2 of 2, for Overhead-Mounted Signs in the rows under Item A. Intersection or Interchange Advance Guide Signs and Entrance Direction Guide Signs: • Change the Distance Fraction Numerals to 8 inches minimum and 10 inches desirable on roadways greater than 55 mph. • Change the Distance Words - Upper-Case to 8 inches minimum and 10 inches desirable on roadways greater than 55 mph. • Change the Action Message Words – Upper-Case to 8 inches minimum and 10 inches desirable on roadways greater than 55 mph. Sheet 2 of 2, for Overhead-Mounted Signs in the rows under Item B. Destination and Other Guide Signs: • Change the Distance Fraction Numerals to 8 inches minimum and 10 inches desirable on roadways greater than 55 mph. • Add a blank space between “than” and “55”. • Change the Distance Words – Upper-Case to 8 inches minimum and 10 inches desirable on roadways greater than 55 mph. • Change the Action Message Words – Upper-Case to 8 inches minimum and 10 inches desirable on roadways greater than 55 mph.

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Figure 2D-2	A – Cardinal directions and orientations, notes under the sign on the right: Change the words "'South' is a cardinal direction" to "'South' is a pre-directional designation."
Sec. 2D.08	Paragraph 16: Change "circulatory" island to "central" island. Paragraph 25: Change the reference from "Section 2D.41" to "Section 2E.41."
Sec. 2D.09	Paragraph 5: Change the reference from "Paragraph 6" to "Paragraph 7."
Sec. 2D.25	Paragraph 1: Change the reference from "Chapter 6F" to "Chapter 6I."
Table 2D-5	Split the row corresponding to 10.67 to 13.33 inch principal legend height into two rows. In the row corresponding to a 13.33-inch principal legend height, change the minimum height of the turn arrow to 25.333 inches. In the row corresponding to a 10.67-inch principal legend height, change the minimum height of the straight arrow to 25.5 inches, and change the minimum height of the turn arrow to 20.188 inches. In the row corresponding to an 8-inch principal legend height, change the minimum height of the straight arrow to 21 inches, and change the minimum height of the turn arrow to 16.625 inches.
Figure 2D-13	Sheet 1 of 3, Drawing A: Add the County Name legend to the independently mounted County Route (M1-6) signs. Sheet 2 of 3: Revise the inset shape and background geometry to show the northbound right turn lane.
Sec. 2D.45	Paragraph 9: Add the words "the combination of lower-case letters with" between the words "are" and "the" in the last sentence. Paragraph 35: Change the reference from Paragraphs "3, 4, 6, 9, 12 through 14, and 18 through 20" to "5, 7, 8, 13, 14, 20, 21, 23, and 28 through 30."
Sec. 2D.51	Paragraph 3, Item A, and Paragraph 7: Change the language "Weigh Station Advance (D8-1)" to "Weigh Station Ahead (D8-1a) or Advance Weigh Station Distance (D8-1)" to allow the use of a D8-1a sign as shown in Figure 2D-23, thereby allowing engineering judgment to determine the appropriate action message or distance legend depending on site specifics. Paragraph 3, Item B: Change the language "Weigh Station Advance Direction (D8-2) sign" to "Weigh Station Advance Direction (D8-2) or Advance Weigh Station Distance (D8-1) sign" to allow the use of a D8-1 sign with a distance legend, thereby allowing engineering judgment to determine the appropriate action message or distance legend depending on site specifics. Paragraph 5: Delete the word "Advance" between the words "the" and "Weigh."
Figure 2D-23	Footnote *: Add the sign designation "D8-1" between "D8-1a" and "or" to read "D8-1a, D8-1, or the D8-2 sign." Revise the asterisk note to replace "within the sign border or on a supplemental sign panel" with "on the sign or on a supplemental plaque or sign panel." Add the word "or" next to the Weigh Station Ahead (D8-1a) sign and show an Advance Weigh Station Distance (D8-1) sign.

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Sec. 2D.53	Paragraph 3: Delete the word “Advance” between the words “Lane” and “(D17-4).”
Figures 2D-26, 2D-27	Remove the word “optional” adjacent to the W16-2P plaque.
Sec. 2D.54	Paragraph 1: Delete the word “Advance” between the words “Turn-Out” and “(D17-5).”
Sec. 2D.55	Paragraphs 33 and 34: Change the reference from “Section 1C.05” to “Section 1A.05.”
Figure 2D-39	In Note 2, change the text “clockwise” to “counterclockwise.”
Sec. 2E.03	Paragraph 1, Item H: Delete the Item “At-Grade Intersection signs (see Section 2E.58);” and re-letter the remaining items.
Sec. 2E.07	Paragraph 4: Change the referenced edition and format of the AASHTO Guidelines for Supplemental Guide Signing to the “’Guidelines for the Selection of Supplemental Guide Signing, 5th Edition,’ 2016, AASHTO.”
Table 2E-4	In the Overhead column, add an asterisk with a corresponding note below the table stating, “Where a larger size is shown for the interchange classification of the interchange, that larger size is used for overhead-mounted guide signs for that interchange.” Change the existing single asterisks in the Numerals row for the Major Category a, and Overhead columns, and the corresponding note to a double asterisk.
Table 2E-5	In the row under Item L. Overhead Arrow-per-Lane Signs: • Change the Arrowhead (Type D Directional Arrow) to 20/16.25. • Change the Arrow Shaft Width to 7.5/6.094. • Change the Arrow Height of the Through arrow to 48/39. • Change the Arrow Heights of the Left Only and Right Only arrows to 38/30.875. • Change the Arrow Height of the Optional-Diverge (Through with Left or Right) arrow to 48/39. • Change the Arrow Height of the Optional-Split (Left and Right) arrow to 42/34.125.
Figure 2E-2	To the right of match line B: Change the distances shown on the advance guide signs to ½ MILE and 1 MILE.
Sec. 2E.22	Paragraph 11: Change the Exit Number plaque designation “E1-5P” to “E1-5P through E1-5eP.” Paragraph 12: Change the Left Exit Number plaque designation “E1-5bP” to “E1-5fP through E1-5kP.” Paragraph 20: In the second sentence switch the order of the words “exit” and “interchange” to read “interchange exit.”
Figures 2E-3, 2E-5, 2E-6, 2E-7, 2E-8, 2E-11, 2E-26, 2E-27, 2E-28, 2E-29, 2E-30, 2E-31, 2E-32 (Sheets 1 and 2), 2E-56, 2E-58	In the legend, delete the word “sign” within the text “Reference location sign”.

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Figure 2E-6	I-407, change the reference location numbers and associated interchange and exit numbers to be ascending from west to east. In the legend, delete the word “sign” within the text “Reference location sign”. In the inset, change the “Spur” label for I-407 to “Loop,” and change the exit numbers “47 A” and “47 B” to “1 A” and “1 B,” respectively.
Figure 2E-7	I-3: Remove the symbol showing the “Junction of two Interstate routes” and Interchange numbers 11 and 15 between reference locations 11 and 12. I-3 and I-103 (north) Inset: Change the interstate shield “I-407” to “I-103”. I-3: Change Interchange number 1 to Interchange number 4, and delete the asterisk. I-303: Add a “Spur” label. I-303: Change Interchange number 4 to Interchange number 1, and add an asterisk. I-3 and I-303 (South) Inset: Change the geometry and direction (to the East) of I-203 to match the direction (to the West) of I-303, change the I-203 symbol to I-303, and change the “Loop” label to “Spur.” In the legend, delete the word “sign” within the text “Reference location sign”.
Sec. 2E.23	Paragraph 7: Delete the words “to ½ mile but not more than 1 mile”.
Sec. 2E.24	Paragraph 10: Change the section reference from “2A.14” to “2A.15”. Paragraph 11: Add the word “exit” between the words “interchange” and “numbers.”
Sec. 2E.25	Paragraph 7: Delete the words “(see Section 2E.40)” in the first sentence.
Sec. 2E.28	Paragraph 1: Change the Section reference “2E.39 through 2E.42” to “2E.39, 2E.40, and 2E.42.” Paragraph 2: Change the Paragraph reference “15” to “14.” Paragraph 11: Switch the words “post-mounted and overhead” to “overhead and post-mounted” to correspond with the reference to Figures 2E-20 and 2E-21, respectively.
Sec. 2E.30	Paragraph 2: Change the word “interchanges” to “interchange”.
Figure 2E-20	Face the north arrow to the right instead of left.
Figure 2E-23	Drawing A: Move the down arrow on the overhead interchange advance guide sign below the ½ MILE distance legend. Drawings A and B: Relocate the W4-2R signs to the advanced placement distance. Drawing B: Add the word “optional” to the W9-1R sign and add a W16-2P plaque below the W9-1R sign.

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Sec. 2E.39	Paragraph 2: Delete the words “either the” between the words “expressways,” and “Overhead.” Change the Section reference “Sections 2E.40 and 2E.41” to “Section 2E.40”.
Sec. 2E.40	Paragraph 6, Item J: Change the Exit Number plaque designation “E1-5P” to “E1-5P through E1-5eP” and change the Left Exit Number plaque designation “E1-5bP” to “E1-5fP through E1-5kP.”
Table 2E-6	In the top row, change the spelling of “Principle” to “Principal.” In the row corresponding to a 20-inch principal legend letter height: • Change the height of the Turn Arrow to 38 inches. • Change the height of the Split Arrow to 42 inches. In the row corresponding to a 16-inch principal legend letter height: • Change the height of the Through Arrow to 39 inches. • Change the height of the Turn Arrow to 30.875 inches. • Change the height of the Through with Turn Arrow to 39 inches. • Change the height of the Split Arrow to 34.125 inches.
Sec. 2E.41	Paragraph 3, Item E: Change the Exit Number plaque designation “E1-5P” to “E1-5P through E1-5eP,” change the Left Exit Number plaque designation “E1-5bP” to “E1-5fP through E1-5kP,” and change the LEFT plaque designation “E1-5aP” to “E1-5mP.”
Figures 2E-39, 2E-40	Add an E11-1e sign panel to the Exit Direction sign at the theoretical gore.
Figure 2E-41	Drawing D: Change the exit number suffix on the right exit number plaque from “A” to “B”.
Sec. 2E.42	Paragraph 6: Delete the words “either full-width or”. Paragraph 9: Replace the words “the modified” with “partial-width”.
Sec. 2E.43	Paragraph 1: Change the section reference from “2A.13” to “2A.14”.
Sec. 2E.45	Paragraph 2, Item C: Add the words “with an initial upper-case letter” between the words “heights” and “of”.
Sec. 2E.49	Paragraph 4: Change the section reference from “2E.47” to “2E.48”.
Sec. 2E.51	Paragraphs 5 and 6: Add the word “exit” between the words “interchange number” for consistency with Section 2E.22.
Sec. 2F.06	Paragraph 3: Delete the word “overhead” between the words “installed” and “at”.
Sec. 2F.08	In the Section Title: Change the name of the W9-6f warning sign to “Stop Ahead Take Ticket”. Paragraph 3: Change the name of the W9-6f warning sign to “Stop Ahead Take Ticket”.

MUTCD 11th Edition Section, Figure, or Table Number	Section 2 Editorial Changes
Figure 2F-2	Change the dollar currency symbol to match the typographical symbol and punctuation in the Standard Alphabet in the *Standard Highway Signs* publication.
Figure 2F-4	Change distance on W9-6 to “2 MILES.”
Sec. 2F.09	In the Section Title: Change the name of the W9-6hP warning plaque to “Stop Ahead Take Ticket”. Paragraph 2: Change the name of the W9-6f warning sign and W9-6hP warning plaque to “Stop Ahead Take Ticket”.
Figure 2F-14	Change the dollar and cent currency symbols to match the typographical symbols and punctuation in the Standard Alphabet in the *Standard Highway Signs* publication. Remove dimensions “114 x 66” and “96 x 66” between Drawings A and B.
Figure 2F-15	On the second sign assembly in the sequence from the south, change the distance on the right sign to ½ MILE.
Sec. 2F.17	Paragraph 4: Delete the reference, “(See Drawing B in Figure 2F-12)” as the sign described in the Option is not shown in the figure.
Sec. 2F.18	Paragraph 3: Delete the reference, “(see Figure 2F-8)”. Although the right sign in Drawing C includes the NO TOLL panel, the sign is not an Exit Gore sign as described in the Option.
Sec. 2G.03	Paragraph 15: Change the reference from “Section 2A.14” to “Section 2A.15” and add the text “or shoulder” after the word “roadway”.
Sec. 2G.04	Paragraph 2, Sentence 3: Delete the word “to” between the words “not” and “be”.
Figure 2G-2	Change the lanes applicable in the top lines of the R3-11a sign from “2 RIGHT LANES” to “LEFT LANE.”
Sec. 2G.05	Paragraph 6: Delete the sign designations “R3-11g, R3-14e, and R3-14g”. Paragraph 7: Add the sign designation “R3-11g” and change the sign designations “R3-14d, and R3-14f” to “R3-14a, and R3-14c.” Paragraph 8: Replace the text “R3-11c sign” with “Preferential Lane Operation (R3-11 and R3-14 series) signs”. Paragraph 9: Delete the sign designations “R3-11g, R3-14e, and R3-14g”. Paragraph 15: Change the reference from “Paragraph 14 of this Section” to “Paragraph 13 of this Section”.
Sec. 2G.10	Paragraph 26: Change the LEFT plaque designation “E1-5aP” to “E1-5mP.”
Figure 2G-8	Change the R3-14a sign to an R3-14 sign with the hours of operation “6AM-9AM.” In Note 1: Change the word “managed” to “preferential”.
Figure 2G-9	Change the hours of operation on the R3-13a sign to “6:30AM-9:30AM”.
Figure 2G-11	Change the E8-1 sign to an E8-1a sign.

MUTCD 11th Edition Section, Figure, or Table Number	Section 2 Editorial Changes
Sec. 2G.17	Paragraph 5: Change “EXPRESS LANE(S)” to “EXPRESS or EXPRESS LANE(S)”.
Sec. 2G.18	Paragraph 5: Change the reference from “Figure 2G-19” to “Figure 2G-18”. Paragraph 6: Change the language “priced managed lane HOV Lane Operation (R3-44 or R3-44a) sign” to “Priced Managed Lane Operation (R3-44, R3-44a, or R3-44b) sign”.
Figure 2G-18	On the Priced Managed Lane Toll Rate (R3-48a) sign in the lower left corner of the figure, change the legend “ONLY” to “TOLL.” Add sign R3-44b.
Figure 2G-32	Sheet 1 of 4: Change footnote ** to read “A post-mounted Part-Time Travel on Shoulder Variable Operation (R3-51d) sign with beacons may be used in lieu of lane-use control signals at the same intervals.”
Sec. 2G.21	Paragraph 4: Change the R3-52c sign name “TRAVEL ON SHOULDER BEGINS ½ MILE” to “Part-Time Travel on Shoulder Begins Advance”. Paragraph 5: Change the R3-52a sign name “TRAVEL ON SHOULDER ENDS” to “Part-Time Travel on Shoulder Ends Advance” and change the R3-52 sign name “END TRAVEL ON SHOULDER” to “Part-Time Travel on Shoulder Ends”.
Sec. 2G.23	Paragraph 4: Add the text “Advance Emergency Turn-Out (D17-5) sign and” between the words “the” and “Emergency”.
Sec. 2G.24	Paragraph 5: Change the R3-51d sign name “TRAVEL ON SHOULDER ALLOWED WHEN FLASHING” to “Part-Time Travel on Shoulder Variable Operation”. Paragraph 6: Change the R3-51e sign name “TRAVEL ON SHOULDER ON GREEN ARROW ONLY” to “Part-Time Travel on Shoulder on Green Arrow”.
Sec. 2G.26	Paragraph 3: Change the reference from “Section 1C.05” to “Section 1A.05”.
Figure 2H-1	Change the capitalization of “Advance Turn and Directional Arrow Auxiliary Plaques for use with General Information Signs” to “Advance Turn and Directional Arrow auxiliary plaques for use with General Information signs” (to be consistent with Figure 2I-1).
Sec. 2H.03	Paragraph 1: Change the heading of this paragraph from “Support” to “Option”.
Table 2H-1	Relocate the information for the Next EV Charging (D9-17a) sign from Table 2I-1 to 2H-1 and change the column 3 Section reference from “2H, 2J” to “2H.14, 2J.06.”
Sec. 2H.12	Paragraph 5: Delete the phrase “Except as provided in Paragraph 6 of this Section”.
Sec. 2H.14	Paragraph 8: Capitalize the second use of the phrase “alternative fuels corridor” between the words “the” and “sign” to appear as “Alternative Fuels Corridor”.
Table 2I-1	Sheet 1: Change the size of the Rest Area Gore (D5-2a) sign for Expressway from 66 x 72* to 66 x 66*. Sheet 1: Change the size of the Parking Area Gore (D5-9b) sign for Conventional Road from 62 x 48* to 60 x 48* and change the size for Expressway from 88 x 66* to 84 x 66*.

MUTCD 11th Edition Section, Figure, or Table Number	Section 2 Editorial Changes
Table 2I-1 cont'd	Sheet 1: Change the size of the Picnic Area Gore (D5-10b) sign for Freeway from 92 x 78* to 84 x 78* and change the size for Expressway from 76 x 66* to 72 x 66*. Sheet 1: Change the size of the Scenic Area Gore (D5-11b) sign for Freeway from 92 x 78* to 90 x 78* and change the size for Expressway from 76 x 66* to 78 x 66*. Sheet 2: Relocate the Information for the Next EV Charging (D9-17a) sign from Table 2I-1 to Table 2H-1.
Figure 2I-1	Add "Alternative Fuel - " before each sign name as follows "Alternative Fuel – Liquefied Natural Gas (LNG)," "Alternative Fuel – Liquefied Petroleum Gas (LPG)," "Alternative Fuel – Hydrogen Fuel (HYD)," and "Alternative Fuel – Biofuel (BIO)" to signs D9-11d, D9-11e, D9-11f, and D9-11g (to be consistent with the sign names in Table 2I-1).
Sec. 2I.03	Between Paragraphs 5 and 6: Delete the header "*Guidance*". Paragraph 19: Add the word "exit" between "interchange" and "number". Paragraph 26: Remove the bold font to indicate an Option statement.
Sec. 2J.03	Paragraph 11: Add the service category "attraction" to the Option.
Figure 2J-2	Move the arrow pointing from the Food Specific Service sign to the 2nd sign location rather than the 3rd sign location.
Table 2L-4	Example 6: Change the word "MILE" in the improved message to "MILES".
Sec. 2M.09	Paragraph 5: Change "E1-5P or E1-5bP" to "E1-5P Series."
Table 2M-1	Remove Smoking* (RS-002) from Accommodations. Add Smoking* (RS-002) to General.
Sec. 3B.01	Between Paragraphs 6 and 7: Change the header "*Guidance*" to "Support". Paragraph 7: Do not italicize the font to indicate a Support statement. Between Paragraphs 7 and 8: Add the header "*Guidance"*.
Figure 3B-9	Sheet 1 of 2 Drawing A and Sheet 2 of 2, Drawing C: Add a label to the dashed line separating the lane taper and the full-width lane that designates the point where the full lane width begins.
Sec. 3B.12	Paragraph 7, Item B: Change the reference from "Drawing F in Figure 3B-21" to "Drawing I in Figure 3B-21".
Sec. 3B.14	Paragraph 5: Add the word "Warning" between "In-Roadway" and "Lights".
Figure 3B-14	Both drawings A – Lane reduction and B – Lane reduction with lateral shift to the left: Relocate the W4-2R signs to the advanced placement distance where the W9-1R and W16-2P signs and plaques are shown. Relocate the W9-1R and W16-2P signs and plaques to a location in advance of the W4-2R signs. Remove "(optional)" from W16-2P.
Figure 3B-16	Add space between the crosswalk and the sign location to improve readability of the figure.
Sec. 3B.17	Paragraph 4: Change the reference from "Section 6J.02" to "Section 6J.03".

MUTCD 11th Edition Section, Figure, or Table Number	Section 2 Editorial Changes
Sec. 3B.20	Paragraph 4: Change “provided in this Section.” to “provided in Sections 3A.03 and 3B.22.”
Figure 3B-21	Drawing E: Revise "U-Turn and through lane-use arrow” to “U-Turn and turn lane-use arrow.”
Figure 3B-22	Call out the northbound and southbound left-turn lane dotted extension lines as optional.
Sec. 3E.02	Delete “Support” between Paragraphs 10 and 11.
Figure 3E-4	Change the figure title to “Markings for Counter-Flow Preferential Lanes on Divided Highways”.
Sec. 3H.03	Paragraph 13: Replace the word “illustrations” with “illusions”.
Sec. 3H.07	Paragraph 7: Add the words "or dotted” to the Option provision between “broken” and “pattern”.
Figure 3H-5	A – Bus only lane: Revise the longitudinal marking between the general-purpose traffic lane and the preferential lane for transit to a wide broken single white lane line rather than a wide solid single white lane line for the portion adjacent to parallel on-street parking.
Figure 3I-1	Revise titles for Drawings A, B, C, and D, to “center line” rather than “centerline”. Mirror the W11-2 signs.
Sec. 4A.05	Paragraph 1, Item A: Replace the comma in the first sentence “…adjacent to the signal face, Bicyclists proceeding…” with a period.
Table 4C-1	Add the text “Condition B—Interruption of Continuous Traffic” Above the second sub table.
Figure 4C-7	In the parentheses below the figure title, change “40 MPH” to “35 MPH”.
Figure 4C-8	In the parentheses below the figure title, change “40 MPH” to “35 MPH”.
Sec. 4D.11	Paragraph 2: Replace the word “signals” with “signal”. Label Paragraph 9 as a Support statement.
Sec. 4E.04	Paragraph 5: Add Figure “4F-3” to the list of figures in parenthesis.
Figure 4F-14	A-Typical Position: Change “G” to “G**” next to the green arrow signal face (rightmost signal face).
Sec. 4H.03	Paragraph 2: Add sign R10-41c to the list of signs in parenthesis.
Figure 4I-4	Footnote **: Change the Section reference from “Section 4I.07” to “Section 4I.06”.
Sec. 4J.02	Paragraph 8: Remove the word “STEADY” from “STOP ON STEADY RED—YIELD ON FLASHING RED AFTER STOP”.
Sec. 4L.01	Paragraph 3: Remove the words “or immediately adjacent to”.
Sec. 4L.02	Paragraph 14: Change the word legend “PUSH BUTTON TO TURN ON WARNING LIGHTS/AWAIT GAP IN TRAFFIC” to “PUSH BUTTON FOR WARNING LIGHTS/WAIT FOR GAP IN TRAFFIC”.
Figure 4L-1	Add space between the crosswalk and the sign location to improve readability of the figure.
Sec. 4U.02	Between Paragraph 2 and 3: Add 3 as the reference number for the paragraph that starts with, “If In-Roadway Warning Lights are used…”. Re-number the subsequent paragraphs as “4” through “15”.

MUTCD 11th Edition Section, Figure, or Table Number	Section 2 Editorial Changes
Sec. 4U.02 cont'd	Paragraph 11 (renumbered 12): Change the word legend "PUSH BUTTON TO TURN ON WARNING LIGHTS/WAIT FOR GAP IN TRAFFIC" to "PUSH BUTTON FOR WARNING LIGHTS/WAIT FOR GAP IN TRAFFIC".
Sec. 5B.04	Paragraph 1: Add the word "AVs" after "to support" to read "Agencies seeking to better accommodate driving automation systems to support AVs,…".
Table 6B-1	Under the double asterisk, add a period at the end of the sentence "** The column headings A, B, and C are the dimensions shown in Figures 6P-1 through 6P-54."
Figure 6D-1	Change the subheading on the right-side illustration from "EMERGENCY SITUATIONS ONLY, Red Flag" to "EMERGENCY SITUATIONS ONLY, Flag" for consistency with the language in Section 6D.03.
Table 6G-1	Section reference for "Wait on Stop – Go on Slow" (R1-7a) sign: Change the reference from "6G.03" to "6L.03".
Sec. 6G.05	Paragraph 1: Change the word "user" to "users" and change the word "flow" to "follow" in the sentence, "Local Traffic Only signs (see Figure 6G-1) should be used where road user flow detours to avoid a closure some distance beyond the sign,".
Figure 6G-1	Change the dollar currency symbol to match the typographical symbol and punctuation in the Standard Alphabet in the *Standard Highway Signs* publication. Change the border color on the No Parking sign (R8-3) from black to red to be consistent with Figure 2B-25.
Sec. 6H.01	Paragraph 4: Change the reference "Paragraph 5" to "Paragraphs 5-9".
Table 6H-1	Remove the row referencing "Bike Diversion (with distance) W20-2b" from the table. Change the name of the W8-17 from "Shoulder Drop Off (symbol)" to "Shoulder Drop-Off (symbol)".
Sec. 6H.12	Paragraph 1: Change the reference from "Figure 6H-1" to "Figure 6I-1".
Sec. 6H.13	Paragraph 01: Change the reference "Figure 6H-1" to "Figure 6I-1".
Sec. 6H.26	Paragraph 03: Change "Shoulder Drop Off" to "Shoulder Drop-Off".
Sec. 6H.32	Paragraph 2: Remove the statement, "The plaque shall be at least 24 x 24 inches in size when used with a sign that is 36 x 36 inches or larger." [This is left over from the 2009 edition of the MUTCD. The Conventional Road size for the Advisory Speed Plaque (W13-1P) was reduced in Table 6H-1 from 24 x 24 in the 2009 edition to 18 x 18 in the 11th edition to be consistent with Table 2C-1.]
Sec. 6H.34	Change the Section title from "Motorcycle Plaque (W8-15P)" to "Motorcycle Plaque (W8-15aP)". Paragraph 1: Change the reference from "Motorcycle (W8-15P) plaque" to "Motorcycle (W8-15aP) plaque".
Sec. 6I.01	Paragraph 7: Label the paragraph as a Standard and display the text in bold font.
Figure 6K-1	On the "More than 36 inches" tall cone, show the alternating orange and white retroreflective stripes that are 4 to 6 inches wide per Paragraph 3 of Section 6K.03.
Figure 6L-2	Legend: Change the text for the AFAD symbol from "recommended gate" to "required gate".

MUTCD 11th Edition Section, Figure, or Table Number	Section 2 Editorial Changes
Sec. 6L.05	Paragraph 9: Change the reference from “Table 2A-5” to “Table 2A-2”.
Sec. 6N.04	Paragraph 6, first sentence: Add the word “short-term” between the words “for” and “and mobile” to read “Except for short-term and mobile operations”.
Sec. 6N.19	Paragraph 3: Change the reference from “R9-4a” to “R4-9a”.
Figure 6N-1	Change the designation “R9-4a” to “R4-9a”.
Sec. 6O.01	Paragraph 14: In the first sentence, change “all major traffic incidents” to “all major and intermediate traffic incidents”.
Figure 6P-5	Change the sign designation “W16-2P” to “W16-2aP”. Change the advance warning sign spacing from “C-B-A” to be “A-B-C”.
Figure 6P-7	Change the spelling “Typical Appiication 7” to “Typical Application 7”.
Figure 6P-8	Change the sign designation for the ROAD CLOSED XX MILES AHEAD, LOCAL TRAFFIC ONLY sign R11-3a to R11-3
Figure 6P-9	Change the sign designation for the ROAD CLOSED XX MILES AHEAD (modified) from R11-3a to R11-3.
Figure 6P-10	The W16-2P on the bottom of the figure, add “(optional)” below it to match the opposite approach.
Figure 6P-12	Add the southbound centerline no passing zone at the stop bar to mirror the northbound no passing zone.
Figure 6P-16	In Note 7: Change “SURVEY CREWS AHEAD” signs to “SURVEY CREW” signs.
Figures 6P-22, 6P-23, 6P-24, 6P-25	Remove the word “optional” from to the arrow board.
Figure 6P-23	Add an arrow panel where the left-lane closure begins.
Figure 6P-25	Add delineation to the arrow panel.
Figure 6P-28	Replace “60 inches MIN.” with “See Note 14 for width”.
Figures 6P-47, 6P-48, 6P-50	Change the word legend on the sign labeled “R9-20” to “ALLOWED USE OF FULL LANE”. In Notes: Change "IN ROADWAY plaques" to "IN ROAD plaques" per W16-1P and Section 2C.67.
Figure 6P-47	Remove the M6-2PL Directional Arrow Plaque.
Figure 6P-48	Change the sign designation for the Directional Arrow Plaque from M6-3 to M6-3P.
Figure 6P-49	Display the third PATH CLOSED (R11-2c) sign from the top of the diagram right-side up.

MUTCD 11th Edition Section, Figure, or Table Number	Section 2 Editorial Changes
Figure 6P-50	Change the sign designation for The Directional Arrow Plaque from M6-3 to M6-3P.
Figure 6P-51	Delete Note 3 on the Notes Page that states “3. The A, B, and C dimensions should be based on anticipated bicycle speeds.” Remove the W11-1 with the M6-2PR and the W11-1 with the M6-2PL. Replace both with the M4-9c. Add channelizing devices along the length of the work area.
Figures 7B-1, 7B-4, 7B-5	Change the dollar currency symbol to match the typographical symbol and punctuation in the Standard Alphabet in the *Standard Highway Signs* publication.
Sec. 7B.03	Paragraph 11: Change the reference from “Figure 7B-4” to “Figure 7B-1”.
Sec. 8A.11	Paragraph 2: Insert commas before “where” and after “Zone”.
Table 8B-1	On Sheet 1 of 2: • Change the Left (Right) Lane Signal sign (R10-10b) size for Single Lane column from “30 x 36” to “24 x 30.” • Change the Left (Right) Turn Lane Signal sign (R10-10c) sizes for Single Lane from “30 x 42” to “24 x 30”, Multi- Lane from “30 x 42” to “30 x 36”, and Minimum from “24 x 36” to “24 x 30.”
Sec. 8B.08	Paragraph 4: Delete extra period at the end of the sentence.
Sec. 8B.16	Paragraph 8: Replace “2019 edition of the “American Railway Engineering and Maintenance-of-Way Association’s Engineering Manual,”” with ““Communications and Signals Manual”, 2023 Edition, AREMA”.
Sec. 8D.03	Paragraph 5: Add the word “arm” in the final sentence between “gate” and “shall”.
Sec. 8D.05	Paragraph 7, Sentence 4: Delete the word “queue”.
Sec. 8D.12	Paragraph 6: Replace “pre-signal” with “queue cutter signal”.
Sec. 8E.08	Paragraph 4: Add a comma after “horizontally”.
Sec. 9A.01	Between Paragraphs 5 and 6: Delete the header “Support”.
Table 9A-1	Add a row: Overhead Bicycle Signal (R10-40, R10-40a, R10-41, R10-41a, R10-41b, R10-41c), 9B.22, -, 24 x 36.
Sec. 9B.02	Paragraph 3: Change sign designation “W16-20P” to “R3-7bP”.
Figure 9B-5	Change the title of the figure from "Example of Two-Stage Bicycle Turn Box when Use is Mandatory" to "Two-Stage Bicycle Turn Box where Use is Mandatory." Change the NO TURN ON CIRCULAR RED (R10-11a) signs to NO TURN ON RED (R10-11) signs.
Sec. 9B.20	Paragraph 3: Add a reference “(see Figure 9B-1)” after “R10-25”.
Sec. 9C.04 Sec. 9C.04 cont’d	Between Paragraphs 3 and 4: Add the header “*Guidance”*. Between Paragraphs 4 and 5: Remove the header “Guidance”.

MUTCD 11th Edition Section, Figure, or Table Number	Section 2 Editorial Changes
	Paragraph 4: Change from regular font to *italicized font*, as this paragraph is Guidance, not an Option.
Sec. 9D.01	Section title: Change the phrase, “Bicycle Destination Signs” to “Bicycle Destination and Distance Signs”.
Sec. 9D.04	Paragraph 2: Add the word “and” between “Highway” and “Transportation”.
Sec. 9D.05	Paragraph 1: Change the phrase, “the Bicycle Route (M1-8 or M1-8a) sign” to “the Numbered Bicycle Route (M1-8 or M1-8a) sign”.
Sec. 9D.08	Between Paragraphs 12 and 13: Add the header “Support”.
Sec. 9D.13	Between Paragraphs 8 and 9: Add the header “Support”.
Figure 9D-7	Change title from "…when Use is Optional" to "…where Use is Optional".
Sec. 9E.02	Paragraph 6: Add the phrase "or word marking" after the phrase "bicycle symbol".
Sec. 9E.05	Paragraph 3: Change the word “circular” to “circulatory”. Paragraph 8: Change the text “The FHWA’s information guide ‘Improving Intersections for Pedestrians and Bicycles’” to “The ‘Improving Intersections for Pedestrians and Bicyclists Informational Guide’ (FHWA-SA-22-017), FHWA”.
Sec. 9E.07	Paragraph 14: Add the phrase, “edges of the” between the words “The” and “buffer space”. FHWA separates Paragraph 7 into two paragraphs. The first sentence of Paragraph 7 is shown as an Option statement. The second sentence of Paragraph 7 is shown as a Support statement.
Figure 9E-7	Drawings D and F: Add edge line extension pavement markings in the form of a dotted line from the south leg to the east leg of the intersection in addition to the tubular markers with a callout indicating “optional”. Drawing G: On the north leg of the intersection, place the stop line for southbound traffic, not northbound traffic. Change the edge line extension from the south leg to the east leg of the intersection to a dotted line with a callout indicating "optional".
Figure 9E-8	Add space between the crosswalk and the sign location to improve readability of the figure.
Sec. 9E.11	Paragraph 4, Item C: Delete the word “or” from the phrase “parallel or motor”.
Sec. 9E.17	Paragraph 8: Change the phrase, “If used in buffer-separated bicycle lanes” to “If used in separated bicycle lanes”.
Appendix A2, Table A2-2	In the third table of four, revise the conversion showing 130 feet to 675 meters, 140 feet to 700 meters, 150 feet to 750 meters, and 180 feet to 800 meters to a conversion showing 130 feet to 40 meters, 140 feet to 43 meters, 150 feet to 46 meters and 180 feet to 55 meters.
Appendix A2, Table A2-4	In the fourth table of four, change the conversion showing 65 mph to 110 km/h to a conversion showing 70 mph to 110 km/h.

WISCONSIN MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES
INTRODUCTION

The Department of Transportation of the State of Wisconsin, referred to hereinafter as the "Department", has in accordance with Wisconsin Statutes designated the 11th edition of the Manual on Uniform Traffic Control Devices for Streets and Highways (hereinafter designated the Uniform Manual or MUTCD) and addendums, developed by the National Committee on Uniform Traffic Control Devices (NC) and approved by the Federal Highway Administration (FHWA), including all revisions and errata, as the official Wisconsin Manual on Uniform Traffic Control Devices subject to the modifications set forth in this Supplement. The MUTCD as addended, expanded and modified by this Supplement is applicable to the design, use, application, installation, maintenance, and operation of all traffic control devices on all streets, highways, pedestrian and bicycle facilities, and site roadways open to public travel.

Statutory reference to the adoption and authority of the Uniform Manual and Supplement is contained in the following sections:

Wisconsin State Statute 84.02(4)(e) The department shall adopt a manual establishing a uniform system of traffic control devices for use upon highways of this state. The system shall be consistent with and, so far as practicable, conform to current nationally recognized standards for traffic control devices.

Wisconsin State Statute 84.02(4)(f) The department shall adopt a manual establishing a uniform system of signs, signals, markings and devices for the purpose of regulating, warning or guiding bicycle traffic on highways, streets, and bikeways, as defined in Wisconsin State Statute 84.60(1)(a). The system shall be consistent with and shall conform to the system established under par. (e).

Wisconsin State Statute 349.065 Local authorities shall place and maintain traffic control devices upon highways under their jurisdiction to regulate, warn, guide or inform traffic. The design, installation and operation or use of new traffic control devices placed and maintained after the adoption of the uniform traffic control devices manual under Wisconsin State Statute 84.02(4)(e) shall conform to the manual. After January 1, 1977, all traffic control devices placed and maintained by local authorities shall conform to the manual.

From time to time there may be revisions to the Wisconsin MUTCD. These will be incorporated in the Wisconsin MUTCD only upon approval of the Department.

The Secretary has delegated to the State Traffic Engineer of the Department of Transportation the authority to make such interpretations, provided that all interpretations tending to cause a substantive change in the provisions of the Manual shall be approved by the Director of the Bureau of Traffic Operations prior to issuance.

Wisconsin supplemental language is shown in blue text within the document.

PART 1
GENERAL

CHAPTER 1A. GENERAL

CHAPTER 1B. LEGAL REQUIREMENTS FOR TRAFFIC CONTROL DEVICES

CHAPTER 1C. DEFINITIONS, ACRONYMS, AND ABBREVIATIONS

CHAPTER 1D. PROVISIONS APPLICABLE TO TRAFFIC CONTROL DEVICES

CHAPTER 1A. GENERAL

Section 1A.01 Purpose of the MUTCD

Support:

01 The purpose of the MUTCD is to establish uniform national criteria for the use of traffic control devices that meet the needs and expectancy of road users on all streets, highways, pedestrian and bicycle facilities, and site roadways open to public travel.

02 This purpose is achieved through the following objectives:

A. Promote safety, inclusion, and mobility for all users of the road network;
B. Promote efficiency through creating national uniformity in the meaning and appearance of traffic control devices;
C. Promote national consistency in the use, installation, and operation of traffic control devices; and
D. Provide basic principles for traffic engineers to use in making decisions regarding the use, installation, operation, maintenance, and removal of traffic control devices.

03 Uniformity of the meaning of traffic control devices is vital to their effectiveness. Uniformity means treating similar situations in a similar way. Uniformity of devices simplifies the task of the road user because it aids in recognition and understanding, thereby reducing perception/reaction time. Uniformity assists road users, law enforcement officers, and traffic courts by giving everyone the same interpretation. Uniformity assists public highway officials through efficiency in manufacture, installation, maintenance, and administration.

04 The use of uniform traffic control devices also requires uniform and appropriate application.

05 The applicability of the MUTCD to facilities open to public travel is independent of the type of ownership or jurisdiction (public or private) and the source of funding (Federal, State, local, or private).

06 This Manual presumes the user of the MUTCD has sufficient working knowledge, professional training and experience, and education in the principles of traffic engineering. Other resources can be consulted to understand the basis for decisions that are made in which engineering study or judgment will be applied.

Section 1A.02 Traffic Control Devices – General Description

Support:

01 As defined in Section 1C.02 of this Manual, traffic control devices include all signs, signals, markings, channelizing devices, or other devices that use colors, shapes, symbols, words, sounds, and/or tactile information for the primary purpose of communicating a regulatory, warning, or guidance message to road users on a street, highway, pedestrian facility, bikeway, pathway, or site roadway open to public travel.

02 Infrastructure elements that restrict the road user's travel paths or vehicle speeds, such as islands, curbs, speed humps, and other raised roadway surfaces, are not traffic control devices. Transverse or longitudinal rumble strips are also not traffic control devices. Operational devices associated with the application of traffic control strategies such as fencing, roadway lighting, barriers, and attenuators are shown in this Manual for context, but their design, application, and usage are not specified since they are not traffic control devices.

03 Certain types of signs and other devices that do not have any traffic control purpose are sometimes placed within the highway right-of-way by or with the permission of the public agency or the official having jurisdiction over the street or highway. These signs and other devices are not considered to be traffic control devices and provisions regarding their design and use are not included in this Manual. Among these signs and other devices are the following:

A. Devices whose purpose is to assist highway maintenance personnel, such as markers to guide snowplow operators, devices that identify culvert and drop inlet locations, and devices that precisely identify highway locations for maintenance or mowing purposes;
B. Devices whose purpose is to assist fire or law enforcement personnel, such as markers that identify fire hydrant locations, signs that identify fire or water district boundaries, speed measurement pavement markings, small indicator lights to assist in enforcement of red light violations, and photo enforcement systems;
C. Devices whose purpose is to assist utility company personnel and highway contractors, such as markers that identify underground utility locations;
D. Signs posting local non-traffic ordinances; and
E. Signs giving civic organization meeting information.

Section 1A.03 Target Road Users

Support:

01 Traffic control devices can be targeted at operators of motor vehicles, including driving automation systems, and at vulnerable road users.

02 Targeted operators of motor vehicles include motorists, public transportation operators, truck drivers, and motorcyclists. Targeted users also include vulnerable road users, who have little to no protection from crash forces. These users are defined in Title 23, U.S.C. 148(a). They include bicyclists and pedestrians, including persons with disabilities. Pedestrians with disabilities might be blind or vision-impaired, have mobility limitations, or other impairments. Protection of vulnerable users is a priority in this Manual as directed in Section 11135 of the Infrastructure Investment and Jobs Act.

03 Operators of motor vehicles and vulnerable road users are both likely to be present on roadways where adjacent land use suggests that trips could be served by varied modes. Application of traffic control devices on these roadways requires careful consideration of measures to set and design for appropriate speeds; separation of various users in time and space; improvement of connectivity and access for pedestrians, bicyclists, and transit riders, including for people with disabilities; and implementation of safety countermeasures.

Section 1A.04 Use of the MUTCD

Support**:**

01 Traffic control device principles in the MUTCD are developed for and used by individuals who are duly authorized and qualified to conduct traffic control device activities.

Standard:

02 Where the content of this Manual requires a decision for implementation, such decisions shall be made by an engineer, or an individual under the supervision of an engineer, who has the appropriate levels of experience and expertise to make the traffic control device decision. Those decisions shall be made using engineering judgment or engineering study, as required by the MUTCD provision.

Support:

03 Section 1C.02 contains definitions of "engineering study" and "engineering judgment."

Guidance:

04 In making traffic control device decisions, individuals should consider the impacts of the decision on the following: safety and operational efficiency (mobility) of all road users at that location, the effective use of agency resources, cost-effectiveness, and enforcement and education aspects of traffic control devices.

Support:

05 Throughout this Manual the headings Standard, Guidance, Option, and Support, the meanings of which are defined in Section 1C.01, are used to classify the nature of the text that follows. Figures and tables, including the notes contained therein, supplement the text and might constitute a Standard, Guidance, Option, or Support. The user needs to refer to the appropriate text to classify the nature of the figure, table, or note contained therein.

Guidance:

06 Except when a specific numeral is required or recommended by the text of a Section of this Manual, numerals displayed on the images of devices in the figures that specify quantities such as times, distances, speed limits, and weights should be regarded as examples only. When installing any of these devices, the numerals should be appropriately altered to fit the specific situation.

07 Similarly, destination names, route numbers, and State route shields that are displayed on the images of devices in the figures should be regarded as examples only. When installing any of these devices, the destination names, route numbers, and State route shields should be appropriately altered to fit the specific situation.

Support:

08 The information contained in Paragraphs 9 and 10 of this Section will be useful when reference is being made to a specific portion of text in this Manual.

09 There are nine Parts in this Manual and each Part includes one or more Chapters. Each Chapter includes one or more Sections. Parts are identified by a single-digit numerical identification, such as "Part 2 – Signs." Chapters are identified by the Part number and a letter, such as "Chapter 2B – Regulatory Signs." Sections are identified by the Chapter number and letter followed by a decimal point and a 2-digit number, such as "Section 2B.03 – Size of Regulatory Signs." In some Chapters, the Sections are grouped together by subject into

unnumbered sub-chapters with a heading, such as “Signing for Right-of-Way at Intersections” (for Sections 2B.06 through 2B.20).

10 Each Section includes one or more paragraphs. The paragraphs are indented and are identified by a number. Paragraphs are counted from the beginning of each Section without regard to the intervening text headings (Standard, Guidance, Option, or Support) or any intervening text in embedded Figures or Tables. Some paragraphs have lettered or numbered items. As an example of how to cite this Manual, the phrase “[n]ot less than 40 feet beyond the stop line” that appears in Section 4D.08 of this Manual would be referenced in writing as “Section 4D.08, Par.1, A.1,” and would be verbally referenced as “Item A.1 of Paragraph 1 of Section 4D.08.”

Section 1A.05 Relation to Other Publications

Standard:

01 To the extent that they are incorporated by specific reference, the latest editions of the following publications shall be a part of this Manual: “Standard Highway Signs” publication (FHWA), and “Color Specifications for Retroreflective Sign and Pavement Marking Materials” (appendix to Subpart F of Part 655 of Title 23 of the Code of Federal Regulations).

Support:

02 The “Standard Highway Signs” publication includes standard alphabets and symbols and arrows for signs and pavement markings.

03 The MUTCD is not a roadway design manual, and engineers seeking guidance on design should refer to appropriate roadway design guides recognized by the Federal Highway Administration as needed for the design application.

04 Other publications are referenced in this Manual as useful resources, but they are not regulatory in nature and are not independently legally enforceable.

Section 1A.06 Uniform Vehicle Code – Rules of the Road

Support:

01 The “Uniform Vehicle Code” (UVC) is one of the publications referenced in the MUTCD. The UVC contains a model set of motor vehicle codes and traffic laws for use throughout the United States, the intent of which is to promote national uniformity in these laws. The Rules of the Road contained in the UVC are intended to be recommendations for States to adopt in their State statutes and are not independently legally enforceable.

Guidance:

02 The actions required of road users to obey regulatory devices should be specified by State statute, or in cases not covered by State statute, in local ordinances or resolutions. Such statutes, ordinances, and resolutions should be consistent with the “Uniform Vehicle Code.”

CHAPTER 1B. LEGAL REQUIREMENTS FOR TRAFFIC CONTROL DEVICES

Section 1B.01 National Standard

Standard:

01 The Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD) is incorporated by reference in 23 Code of Federal Regulations (CFR), Part 655, Subpart F and shall be recognized as the national standard for all traffic control devices installed on any street, highway, bikeway, or site roadway open to public travel (see definition in Section 1C.02) in accordance with 23 U.S.C. 109(d) and 402(a).

02 In accordance with 23 CFR 655.603(a), the MUTCD shall apply to all of the following types of facilities:

- **A. Any street, roadway, or bikeway open to public travel, either publicly or privately-owned;**
- **B. Streets and roadways on sites that are off the public right-of-way that are open to public travel without full-time access restrictions. Examples include roadways within shopping centers, office parks, airports, sports arenas, other similar business and/or recreation facilities, governmental office complexes, schools, universities, recreational parks, and other similar publicly-owned complexes and/or recreation facilities. The above-described examples of streets and roadways are referred to in this Manual as site roadways open to public travel;**
- **C. Publicly-owned toll roads, including those under the jurisdiction of a public agency, public authority, or public-private partnership;**
- **D. Privately-owned toll roads where the public is allowed to travel without access restriction. This includes gated toll roads or roadways where the general public is able to pay to access the facility; and**
- **E. Grade crossings of publicly-owned roadways with railroads or light rail transit.**

03 The MUTCD shall not apply to the following types of facilities:

- **A. Roadways within private gated properties where access to the general public is restricted at all times;**
- **B. Grade crossings of privately-owned roadways with railroads; and**
- **C. Parking areas, including the driving aisles within those parking areas, that are either publicly or privately-owned.**

Support:

04 The policies and procedures of the Federal Highway Administration (FHWA) to obtain basic uniformity of traffic control devices are as described in 23 CFR 655, Subpart F.

05 Section 15-116 of the UVC (see Section 1A.06) states, "No person shall install or maintain in any area of private property used by the public any sign, signal, marking, or other device intended to regulate, warn, or guide traffic unless it conforms with the State manual and specifications adopted under Section 15-104." Adoption by agencies of such a provision through statute or ordinance can help maintain the integrity of official traffic control devices and provide continuity of uniformity at locations that are not subject to the provisions of this Manual.

Section 1B.02 State Adoption and Conformance

Support:

01 All States have officially adopted the National MUTCD either in its entirety, with supplemental provisions, or as a separate published document. The National MUTCD has also been adopted by the National Park Service, the U.S. Forest Service, the U.S. Military Command, the Bureau of Indian Affairs, the Bureau of Land Management, and the U.S. Fish and Wildlife Service.

Standard:

02 States or other Federal agencies that have their own MUTCDs or Supplements shall revise these MUTCDs or Supplements to be in substantial conformance with changes to the National MUTCD within 2 years of the effective date of the Final Rule for the changes [23 CFR 655.603(b)(3)]. Substantial conformance of such State or other Federal agency MUTCDs or Supplements shall be as defined in 23 CFR 655.603(b)(1).

03 For the purposes of Paragraph 2 of this Section, policies, directives, specifications, standard drawings, or similar documents that are issued by an agency and that change or modify Standard, Guidance, or Option provisions in this Manual shall be considered as supplements to the MUTCD and shall also be revised to be in substantial conformance with the National MUTCD.

Section 1B.03 Compliance of Devices

Standard:

01 The U.S. Secretary of Transportation, under authority granted by the Highway Safety Act of 1966, decreed that traffic control devices on all streets and highways open to public travel in accordance with 23 U.S.C. 109(d) and 402(a) in each State shall be in substantial conformance with the Standards issued or endorsed by the FHWA.

Support:

02 23 CFR 655.603 also requires traffic control devices on all streets, highways, bikeways, and site roadways open to public travel in each State be in substantial conformance with standards issued or endorsed by the Federal Highway Administrator.

Standard:

03 After the effective date of a new edition of the MUTCD or a revision thereto, or after the adoption thereof by the State, whichever occurs later, new or reconstructed devices installed shall comply with the new edition or revision, as required by 23 CFR 655.603.

04 In cases involving Federal-aid projects for new construction, reconstruction, resurfacing, restoration, or rehabilitation of a facility to which this Manual applies, the traffic control devices installed (temporary or permanent) shall comply with the most recent edition of the National MUTCD before that highway is opened or re-opened to the public for unrestricted travel [23 CFR 655.603(d)(2) and (d)(3)].

05 Unless a particular device is no longer serviceable (see definition in Section 1C.02), non-compliant devices on existing highways and bikeways shall be brought into compliance with the current edition of the National MUTCD as part of the systematic upgrading of substandard traffic control devices (and installation of new required traffic control devices) required pursuant to the Highway Safety Program, 23 U.S.C. §402(a).

Support:

06 The FHWA has the authority to establish other target compliance dates for implementation of particular changes to the MUTCD [23 CFR 655.603(d)(1)].

Standard:

07 The target compliance dates established by the FHWA shall be as shown in Table 1B-1.

08 Design, application, and placement of traffic control devices other than those adopted in this Manual shall be prohibited unless the provisions of Sections 1B.04 through 1B.08 are followed regarding official interpretations, experiments, changes to the MUTCD, and interim approvals granted by the FHWA.

Support:

09 Many of the provisions in this Manual that are explicitly prohibitive have been included to address practices that have been shown to be ineffective, unsafe, or inconsistent with uniformity. A provision of mandatory or recommended practice represents the accepted and established practice that promotes uniformity and consistency. The absence of a provision in this Manual that explicitly prohibits a particular practice, use, design, application, operation, or other aspect of a traffic control device does not, in itself, constitute acceptability or permission to use the device in a manner not provided for in this Manual.

Table 1B-1. Target Compliance Dates Established by the FHWA

MUTCD Section(s)	Subject Area	Specific Provision	Compliance Date
2B.64	Weight Limit Signs	Paragraph 14 - requirement for additional Weight Limit sign with the advisory distance or directional legend in advance of applicable section of highway or structure	January 18, 2029
2C.25	Low Clearance Signs (W12-2)	Paragraph 1 - Required posting of the Low Clearance Advance (W12-2) sign in advance of the structure	January 18, 2029
2C.25	Low Clearance Signs (W12-2a, W12-2b)	Paragraph 8 - Recommended posting of Low Clearance Overhead (W12-2a or 12-2b) signs on an arch or other structure under which the clearance varies greatly	January 18, 2029
3A.05	Maintaining Minimum Retroreflectivity	Implementation and continued use of a method that is designed to maintain retroreflectivity of longitudinal pavement markings (see Paragraph 1 of Section 3A.05)	September 6, 2026
8B.16	High-Profile Grade Crossings	Paragraphs 3 and 7 - Recommended installation of Low Ground Clearance and/or Vehicle Exclusion signs and detour signs for vehicles with low ground clearances that might hang up on high-profile grade crossings at locations with a known history	January 18, 2029
8D.09 through 8D.12	Highway Traffic Signals at or Near Grade Crossings	Assessment and determination of appropriate treatment to achieve compliance (preemption, movement prohibition, pre-signals, queue cutter signals)	January 18, 2034

Table 1B-1. Target Compliance Dates Established by the FHWA

MUTCD Section(s)	Subject Area	Specific Provision	Compliance Date
2B.64	Weight Limit Signs	Paragraph 14 - requirement for additional Weight Limit sign with the advisory distance or directional legend in advance of applicable section of highway or structure	5 years from the effective date of this edition of the MUTCD
2C.25	Low Clearance Signs (W12-2)	Paragraph 1 - Required posting of the Low Clearance Advance (W12-2) sign in advance of the structure	5 years from the effective date of this edition of the MUTCD
2C.25	Low Clearance Signs (W12-2a, W12-2b)	Paragraph 8 - Recommended posting of Low Clearance Overhead (W12-2a or 12-2b) signs on an arch or other structure under which the clearance varies greatly	5 years from the effective date of this edition of the MUTCD
3A.05	Maintaining Minimum Retroreflectivity	Implementation and continued use of a method that is designed to maintain retroreflectivity of longitudinal pavement markings (see Paragraph 1 of Section 3A.05)	September 6, 2026
8B.16	High-Profile Grade Crossings	Paragraphs 3 and 7 - Recommended installation of Low Ground Clearance and/or Vehicle Exclusion signs and detour signs for vehicles with low ground clearances that might hang up on high-profile grade crossings at locations with a known history	5 years from the effective date of this edition of the MUTCD
8D.09 through 8D.12	Highway Traffic Signals at or Near Grade Crossings	Assessment and determination of appropriate treatment to achieve compliance (preemption, movement prohibition, pre-signals, queue cutter signals)	10 years from the effective date of this edition of the MUTCD

Guidance:

10 Agencies should contact the FHWA when considering employing a practice or application that is not explicitly addressed in this Manual to ensure continued compliance with the provisions in this Manual.

Support:

11 The FHWA reviews and interprets the provisions in this Manual for agencies on an as-needed basis, which can lead to the issuance of official interpretations (see Section 1B.04), or interim approvals (see Section 1B.07).

Standard:

12 A non-compliant traffic control device that is being replaced or refurbished because it is damaged, missing, or no longer serviceable (see definition in Section 1C.02) for any reason shall be replaced with a compliant device, except as provided for in Paragraph 13 of this Section.

Option:

13 A non-compliant traffic control device may be replaced in kind when engineering judgment indicates it is more appropriate because:

A. One compliant device in the midst of a series of adjacent non-compliant devices would be confusing to road users, and/or

B. The schedule for replacement of the whole series of non-compliant devices will result in achieving timely compliance with the MUTCD.

Section 1B.04 Interpretations

Support:

01 The FHWA issues authoritative interpretations of this Manual when necessary to provide clarity in response to unique situations for device application or general requests for clarification of a provision.

02 An interpretation includes a consideration of the application and operation of standard traffic control devices, the official meanings of standard traffic control devices, or the variations from standard device designs and design requirements.

Guidance:

03 Requests for an interpretation of this Manual should contain the following information:

A. A concise statement of the interpretation being sought;

B. A description of the condition that provoked the need for an interpretation;

C. Any illustration that would be helpful to understand the request; and

D. Any supporting research data that is pertinent to the item to be interpreted.

Support:

04 Section 1B.08 contains information on submitting a request for interpretation.

Section 1B.05 Experimentation

Support:

01 Requests for experimentation (see Section 1B.08) include consideration of field deployment for the purpose of testing or evaluating a new traffic control device, its application or manner of use, or a provision not specifically described in this Manual.

Standard:

02 A traffic control device or application that does not comply with the provisions of this Manual shall not be used on any street, highway, bikeway, or site roadway open to public travel (see definition in Section 1C.02) without first receiving official approval to experiment from the FHWA's Office of Transportation Operations.

The Department shall be sent copies of any correspondence sent to FHWA for permission to experiment, interim approval or changes. Copies of the correspondence shall be sent to the State Traffic Engineer at DOTStateTrafficEngineer@dot.wi.gov

Support:

03 A request for permission to experiment (see Section 1B.08) will be considered only when submitted by the public agency or toll facility authority responsible for the operation of the road or street on which the experiment is to take place. For a site roadway open to public travel, the request will be considered only if it is submitted by the private owner or official having jurisdiction.

04 A request for experimentation with a novel device or application across multiple jurisdictions as a single experiment with a common hypothesis, evaluation plan, and evaluation team will be considered when submitted jointly by all the authorities responsible for operation of the roads or streets on which the experiment is to take place. Similarly, a request to add experimental sites to an experimentation approved for another jurisdiction will be considered when submitted jointly by the all the authorities for operation of the roads or streets on which the experiment is then to take place.

05 Manufacturers or inventors of novel devices are encouraged to engage the services of a qualified traffic engineer or other professional who is versed in traffic control devices. Early engagement during the concept and development processes will help ensure the efficacy of the device with regard to human factors, operational, safety, and other considerations prior to an agency requesting experimentation.

06 In some cases, an off-roadway closed-course or laboratory study might be required before a request for experimentation can be considered. The purpose of such a study is to determine whether testing the experimental device or application in an open-road setting could result in an undue safety risk.

Guidance:

07 *Before requesting permission to experiment with a new device or application, an owner of a site roadway open to public travel should first check for any laws, regulations, and/or directives covering the application of the MUTCD that might apply.*

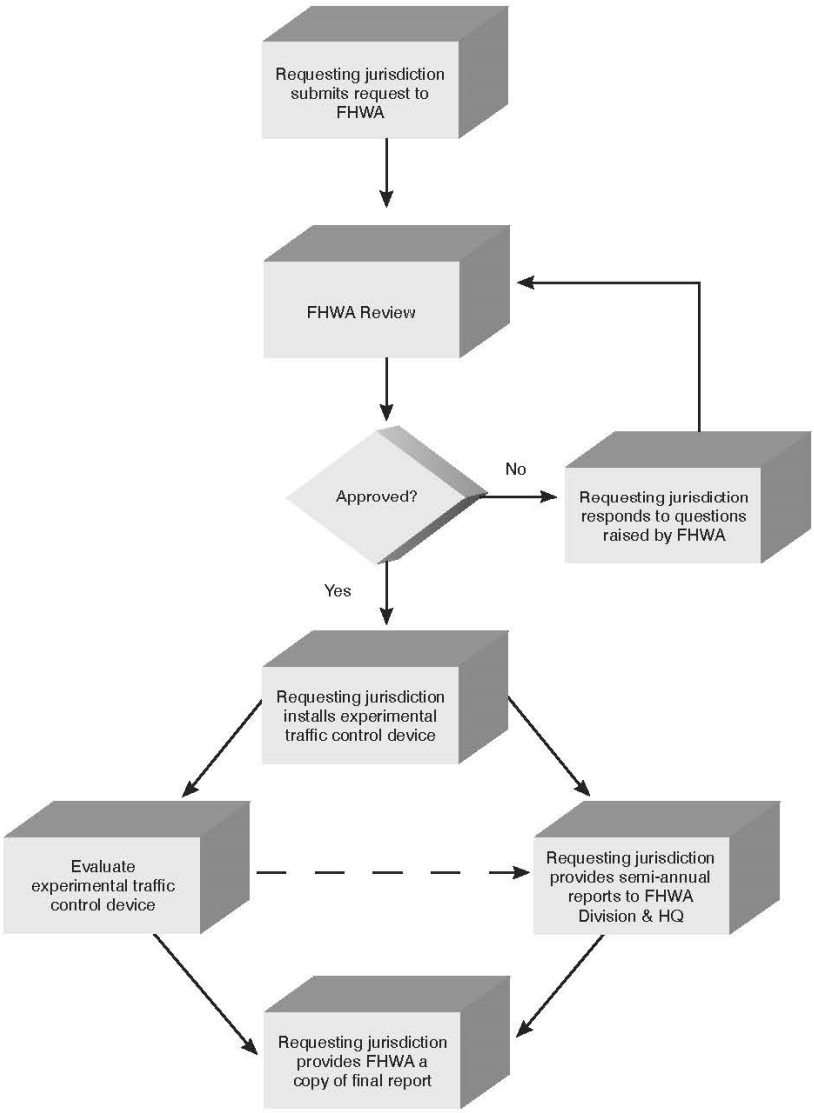
Option:

08 An agency may request a preliminary assessment of the viability of a potential request for experimentation by submitting an abstract that briefly describes the experimental concept.

Support:

09 A diagram indicating the process for requesting and conducting experimentations with traffic control devices is shown in Figure 1B-1.

Figure 1B-1. Process for Requesting and Conducting Experimentations for New Traffic Control Devices



Standard:

10 The request for permission to experiment shall contain the following:

A. A statement indicating the nature of the problem and a hypothesis establishing the premise of the experiment.

B. A description of the proposed change to the traffic control device or application of the traffic control device, including the manner in which it deviates from the provisions of this Manual, and how it is expected to be an improvement over existing provisions.

C. Illustrations that would help to explain the traffic control device or use of the traffic control device.

D. Any supporting data explaining how the traffic control device was developed, including if it has been tested, in what ways it was found to be adequate or inadequate, and how this choice of device or application was derived.

E. Comparison of the proposed device to other compliant devices or treatments, either individually or in combination, that address the same condition, if applicable.

F. A legally-binding statement that the experimental device or application is in the public domain, in accordance with Paragraph 16 of this Section.

G. The time period and location(s) of the experiment.

H. Control sites for comparison purposes or justification for not using control sites.

I. A detailed research and evaluation plan that provides for close monitoring of the experimentation, throughout all stages of its field implementation. The evaluation plan shall include an appropriate evaluation methodology, such as before and after analysis, or other appropriate methodology as well as quantitative data describing the performance of the experimental device.

J. An agreement to provide semi-annual progress reports for the duration of the experimentation, in accordance with the schedule provided in Paragraph 12 of this Section, and an agreement to provide a report of the final results of the experimentation to the FHWA's Office of Transportation Operations within 3 months following completion of the experimentation (see Paragraph 14 of this Section). The FHWA's Office of Transportation Operations shall have the right to terminate approval of an agency's experiment if reports are not received in accordance with this schedule.

K. An agreement to restore the site of the experiment to a condition that complies with the provisions of this Manual within 3 months following the end of the time period of the experiment. This agreement shall also provide that the agency sponsoring the experimentation will terminate the experimentation at any time that it determines that safety concerns are directly or indirectly attributable to the experimentation and the agency shall provide timely notification to the FHWA's Office of Transportation Operations. The FHWA's Office of Transportation Operations shall have the right to terminate approval of the experimentation at any time if there is an indication of safety or operational concerns, or if the terms of the approval are not being adhered to. If, as a result of the experimentation, a request is made that this Manual be changed to include the device or application being experimented with, the FHWA's Office of Transportation Operations will determine whether the device or application can be permitted to remain in place until an official rulemaking action has occurred.

11 Where an item in Paragraph 10 of this Section is determined to not be applicable to the type of experiment, device, or application, the request shall provide sufficient explanation.

12 The required semi-annual progress reports shall be submitted throughout the course of an approved experiment in accordance with the following schedule:

A. No later than August 1st for the preceding period of January through June; and

B. No later than February 1st for the preceding period of July through December.

13 The experimenting agency shall submit a semi-annual progress report for any approved experiment even if no work was performed during the previous reporting period. Failure to submit two consecutive progress reports shall result in termination of the experiment and shall constitute rescission of the FHWA's approval to the experimenting agency, requiring restoration of the site(s) to a condition that complies with the provisions of this Manual within 3 months.

14 The experimenting agency shall submit a final report within 3 months of the conclusion of an approved experiment. If a final report is not received by the FHWA's Office of Transportation Operations, and the experimenting agency fails to notify the FHWA of any mitigating circumstances within 6 months of the end of the approved experimentation period, then the experiment shall be considered terminated and shall constitute rescission of the FHWA's approval to the experimenting agency, requiring restoration of the site(s) to a condition that complies with the provisions of this Manual within 3 months.

Support:

15 Under certain circumstances the FHWA Office of Transportation Operations might allow an experimental device or device application that has been shown to be effective and without safety concerns to remain in use after the experiment has ended. This typically would occur if the device or application is actively being considered for interim approval under the provisions of Section 1B.07.

Standard

16 A request for experimentation that involves a new traffic control device or a new application of an existing traffic control device shall include from the agency conducting the experiment, the manufacturer and/or developer of the device, and the supplier of the device, a legally-binding statement certifying that the traffic control device is not protected by a patent, trademark, or copyright in accordance with Section 1D.06,

and that the traffic control device is in the public domain and can be used freely in traffic control device design and application without infringement or claim of trade secret misappropriation. The legally-binding statement shall also state that the agency conducting the experiment, the manufacturer and/or developer of the device, and the supplier of the device are aware that if patent, trademark, or copyright protection is established in the future for the device or application, such action will result in its removal from the MUTCD, cancellation of its interim approval, or cancellation of the authorization for experimentation.

Support:

17 For the purpose of the Standard in Paragraph 16 of this Section, traffic control device refers to those aspects of a sign, signal, marking or other device which regulates, warns, or guides traffic. The limitation on patent, trademark, or copyright protection does not include the legal protection of individual elements of such devices. For example, manufacturing methods, assembly methods, or individual components of such devices can be protected, whereas the traffic control device cannot be subject to protection so long as it remains in this Manual. As a further example, an internal circuit board for an electronic traffic control device can be legally protected, but the electronic traffic control device itself or its operational function cannot be legally protected by any of the above forms of intellectual property rights.

Section 1B.06 Changes to the MUTCD

Support:

01 Continuing advances in technology and approaches to traffic safety will produce changes in the highway, vehicle, and road-user proficiency; therefore, portions of the system of traffic control devices in this Manual will require updating. It is important to have a procedure for recognizing these developments and for introducing new ideas and modifications into the system.

02 A change includes consideration of a new device to replace a present standard device, an additional device to be added to the list of standard devices, or a revision to a traffic control device application or placement criteria.

Guidance:

03 Requests for a change to this Manual (see Section 1B.08) should contain the following information:

A. A statement indicating what change is proposed;

B. Any illustration that would be helpful to understand the request; and

C. Any supporting research data that is pertinent to the item to be reviewed.

Support:

04 Requests for a change to this Manual will be evaluated to consider the potential safety and operational benefits needed to justify inclusion in a future rulemaking to issue a new edition or revision of the Manual. A diagram indicating the process for incorporating new traffic control devices into this Manual is shown in Figure 1B-2.

Section 1B.07 Interim Approvals

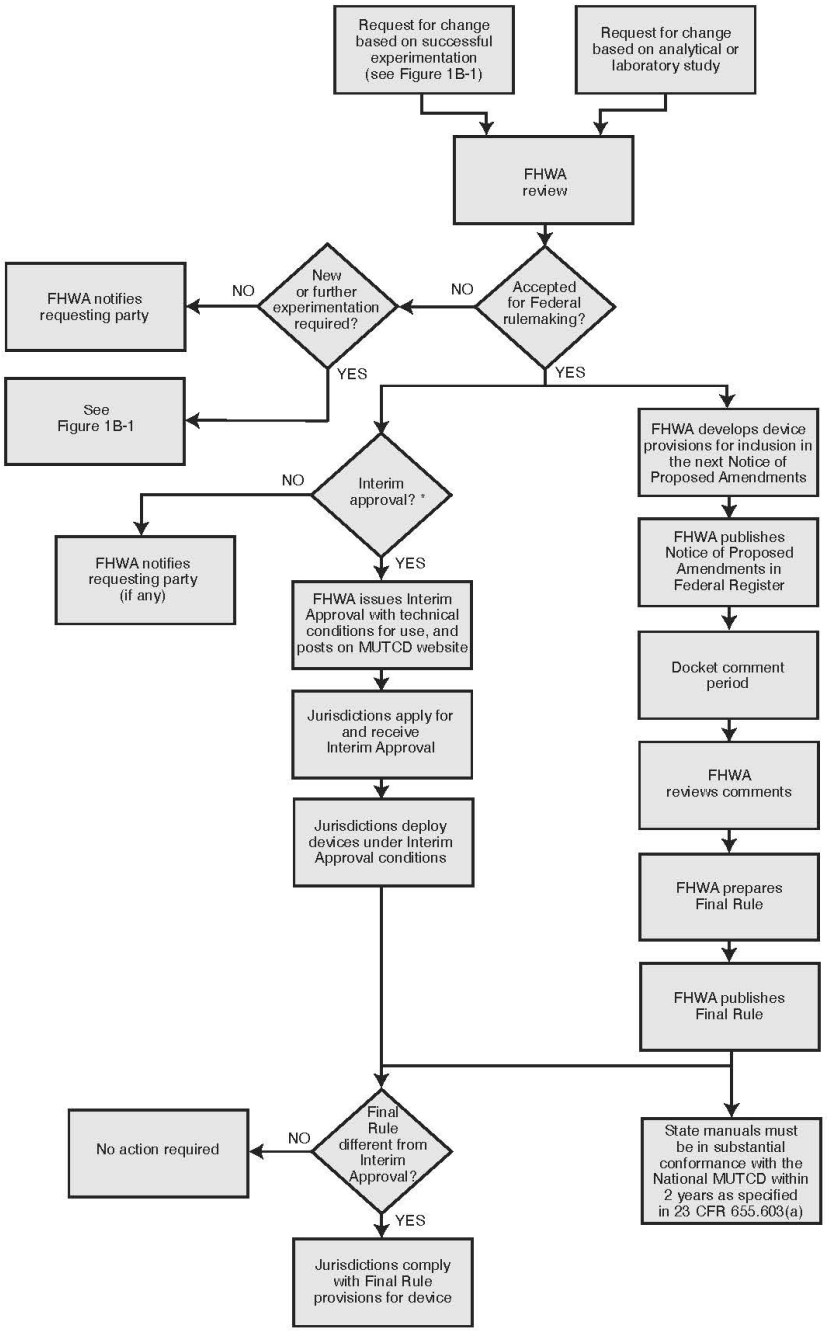
Support:

01 Interim approval allows for provisional use, pending official rulemaking, of a new traffic control device, a revision to the application or manner of use of an existing traffic control device, or a provision not specifically described in this Manual.

02 The FHWA issues an interim approval by official memorandum signed by the Associate Administrator for Operations and posts this memorandum on the MUTCD Web site.

03 Interim approval allows for the optional use of a traffic control device or application and does not create a new mandate or recommendation for its use. Interim approval includes conditions that jurisdictions, toll facility operators, or owners of site roadways open to public travel agree to comply with in order to use the traffic control device or application until an official rulemaking action has occurred.

Figure 1B-2. Process for Incorporating New Traffic Control Devices into the MUTCD



*A change request to allow the use of a new traffic control device is considered for Interim Approval when FHWA determines that the change will have a substantial national safety or operational benefit and that it would not be in the public interest to wait the intervening time period before the device could otherwise be officially incorporated into the MUTCD through rulemaking.

04 The issuance by FHWA of an interim approval might result in the traffic control device or application being proposed for adoption in the next scheduled rulemaking process to issue a new edition or revision of this Manual. If the device or application under interim approval is not proposed in the next rulemaking for a new edition or revision, then a statement of the status of the interim approval, whether it is to be rescinded or remain in effect, will be included in the Federal Register notice for the rulemaking.

05 Interim approval is considered based on the results of experimentation, and/or results of analytical or laboratory studies with a traffic control device or application that analytically demonstrates a device effectively communicates its intended meaning. Interim approval considerations include an assessment of relative risks, benefits, costs, impacts, and other factors.

06 Section 1B.08 contains information on submitting a request for interim approval.

07 Interim approval is ordinarily considered only after published authoritative research and experimentation sufficiently demonstrate that the device or application provides a significant safety or operational improvement. Individual experiments by various jurisdictions, without a research report on the overall findings of the experimental device or application, will not ordinarily qualify for issuance of an interim approval.

08 Interim approval ordinarily is not considered based solely on non-U.S. experience with a new traffic control device or application. Differences in regulations, enforcement and penalties, and driver licensing requirements, among other factors, can result in dissimilar road-user behavior. Additionally, due to variations in conventions for traffic control device design, a non-U.S. traffic control device concept might need to be adapted to U.S. criteria to ensure consistency with the provisions and principles of this Manual. However, documented non-U.S. experience can be considered in the development of requests for experimentation (see Section 1B.05) and within the evaluation plan for traffic control device research.

Standard:

09 A jurisdiction, toll facility operator, or owner of a site roadway open to public travel that desires to use a traffic control device or application for which FHWA has issued an interim approval shall request and receive permission from FHWA in writing prior to applying the device or application.

10 The request to place a traffic control device or application under an existing interim approval shall contain the following:

- **A. A description of where the device or application will be used, such as a list of specific locations or highway segments or types of situations, or a statement of the intent to use the device or application jurisdiction-wide;**
- **B. An agreement to abide by the specific conditions for use of the device or application as contained in the FHWA's interim approval memorandum;**
- **C. An agreement to maintain and continually update a list of locations where the device or application has been installed; and**
- **D. An agreement to:**
  1. **Restore the site(s) of the interim approval to a condition that complies with the provisions in this Manual within 3 months following the issuance of a Final Rule on this traffic control device or application; and**
  2. **Terminate use of the device or application installed under the interim approval at any time that it determines that safety concerns are directly or indirectly attributable to the device or application. The FHWA's Office of Transportation Operations shall have the right to terminate the interim approval at any time if there is an indication of safety, operational, or other concerns.**

Option:

11 A State may submit a request for permission to use a device or application under an existing interim approval for all jurisdictions in that State, as long as the request contains the information required in Paragraph 10 of this Section.

Standard:

12 A jurisdiction, toll facility operator, or owner of a site roadway open to public travel that elects to use a device or application under a statewide interim approval shall inform the State of its use of the device or application.

13 Under a statewide interim approval, the respective jurisdictions, toll facility operators, and owners of site roadways open to public travel shall maintain and continually update a record of all locations on their roads where the device or application is implemented (see Item C of Paragraph ~~9~~ 10 of this Section) and shall furnish this information to the State.

Section 1B.08 Requesting Official Interpretations, Experiments, Changes to the MUTCD, or Interim Approvals

Guidance:

01 A local jurisdiction, toll facility operator, or owner of a site roadway open to public travel that is requesting permission to experiment or permission to use a device or application under an existing interim approval should first check for any State laws, regulations, and/or directives covering the application of the MUTCD provisions that might apply.

Standard:

02 Except as provided in Paragraph 3 of this Section, requests for an interpretation, permission to experiment, a change to the MUTCD, granting of an interim approval, or permission to use an existing interim approval shall be submitted electronically to the Federal Highway Administration (FHWA), Office of Transportation Operations, MUTCD team, at the following e-mail address: MUTCDofficialrequest@dot.gov.

Option:

03 If electronic submittal is not possible, requests for an interpretation, permission to experiment, a change to the MUTCD, granting of an interim approval, or permission to use an existing interim approval may instead be mailed to the Office of Transportation Operations, HOTO-1, Federal Highway Administration, 1200 New Jersey Avenue, SE, Washington, DC 20590.

Support:

04 Communications regarding other MUTCD matters that are not related to official requests will receive quicker attention if they are submitted electronically to the MUTCD Team Leader or to the appropriate individual MUTCD technical lead team member. Their e-mail addresses are available through the links contained on the "MUTCD Team" page on the MUTCD Web site at http://mutcd.fhwa.dot.gov/team.htm.

05 For additional information concerning interpretations, experimentation, changes, or interim approvals, visit the MUTCD Web site at http://mutcd.fhwa.dot.gov.

CHAPTER 1C. DEFINITIONS, ACRONYMS, AND ABBREVIATIONS USED IN THIS MANUAL

Section 1C.01 Definitions of Headings Used in this Manual

Standard:

01 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. In limited, location-specific cases, the results of a documented engineering study (see Section 1D.03) might indicate a deviation from one or more requirements of a Standard provision to be appropriate. 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 Option statements.

B. Guidance—a statement of recommended practice in typical situations, with deviations allowed if engineering judgment or engineering study (see Section 1D.03) indicates the deviation to be appropriate. All Guidance statements are labeled, and the text appears in unbold italic type. The verb "should" is typically used. The verbs "shall" and "may" are not used in Guidance statements. Guidance statements are sometimes modified by Option statements.

C. Option—a statement of practice that is a permissive condition and carries no requirement or recommendation. Option statements sometimes 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.

Section 1C.02 Definitions of Words and Phrases Used in this Manual

Standard:

01 Unless otherwise defined in this Section, or in other Parts of this Manual, words or phrases shall have the meaning(s) as defined in the "Uniform Vehicle Code," "AASHTO Transportation Glossary (Highway Definitions)," or other appropriate publications.

02 Where a term that is defined in this Section or elsewhere in this Manual has a different definition in another resource or in common use, the definition herein shall govern for purposes of the applicability of the provisions of this Manual.

03 The following words and phrases, when used in this Manual, shall have the following meanings:

1. **Accessible Pedestrian Signal—a device that communicates information about pedestrian signal timing in a non-visual format such as audible tones and/or speech messages and vibrating surfaces.**
2. **Accessible Pedestrian Signal Detector—a device designated to assist the pedestrian who has vision or physical disabilities in activating the pedestrian phase.**
3. **Active Grade Crossing—a grade crossing equipped with automatic traffic control devices, such as flashing-light signals, gates, and/or traffic control signals, that are activated upon the detection of approaching rail traffic.**
4. **Actuated—a type of traffic control signal operation in which some or all signal phases are operated on the basis of actuation.**
5. **Actuation—initiation of, a change in, or an extension of a traffic signal phase or a sign legend through the operation of any type of detector.**
6. **Advance Preemption—the notification of approaching rail traffic that is forwarded to the highway traffic signal controller unit or assembly by the railroad or light rail transit equipment in advance of the activation of the railroad or light rail transit warning devices.**
7. **Advance Preemption Time—the period of time that is the difference between the required maximum highway traffic signal preemption time and the activation of the railroad or light rail transit warning devices.**

8. **Advisory Speed—a recommended speed for all vehicles operating on a section of highway and based on the highway design, operating characteristics, and conditions.**
9. **Agency—an organization with the responsibility for providing, maintaining, and/or operating a public or private road system.**
10. **Alley—a street or highway intended to provide access to the rear or side of lots or buildings in urban areas and not intended for the purpose of through vehicular traffic.**
11. **Annual Average Daily Traffic (AADT)—the total volume of traffic passing a point or segment of a highway facility in both directions for one year divided by the number of days in the year. Normally, periodic daily traffic volumes are adjusted for hours of the day counted, days of the week, and seasons of the year to arrive at annual average daily traffic.**
12. **Application—in regard to a traffic control device, the act of deciding to use a device, generally or at a particular location for a particular condition.**
13. **Approach—all lanes of traffic moving toward an intersection or a midblock location from one direction, including any adjacent parking lane(s).**
14. **Arterial Highway (Street)—a general term denoting a highway primarily used by through traffic, usually on a continuous route or a highway designated as part of an arterial system.**
15. **Automated Vehicle—see Driving Automation System.**
16. **Automatic Lane—see Exact Change Lane within the definition of Toll Collection.**
17. **Average Daily Traffic (ADT)—the average 24 hour volume, being the total volume during a stated period divided by the number of days in that period. Normally, this would be periodic daily traffic volumes over several days, not adjusted for days of the week or seasons of the year.**
18. **Average Day—a day representing traffic volumes normally and repeatedly found at a location, typically a weekday when volumes are influenced by employment or a weekend day when volumes are influenced by entertainment or recreation.**
19. **Backplate—see Signal Backplate.**
20. **Barrier-Separated Lane—a preferential lane or other special purpose lane that is separated from the adjacent general-purpose lane(s) by a physical barrier.**
21. **Beacon—a highway traffic signal with one or more signal indications that operates in a flashing mode. Types of beacons include:**
    (a) **Emergency-Vehicle Hybrid Beacon—a special type of beacon (see Hybrid Beacon).**
    (b) **Intersection Control Beacon—a beacon used only at an intersection to control two or more directions of travel.**
    (c) **Pedestrian Hybrid Beacon—a special type of beacon (see Hybrid Beacon).**
    (d) **Rectangular Rapid-Flashing Beacon (RRFB)—a pedestrian-activated and/or bicycle-activated device comprising two horizontally arranged, rapidly flashed, rectangular-shaped yellow indications that is used to provide supplemental emphasis for a pedestrian, school, or trail crossing warning sign at a marked crosswalk across an uncontrolled approach.**
    (e) **Speed Limit Sign Beacon—a beacon used only to supplement a SPEED LIMIT sign.**
    (f) **Stop Beacon—a beacon used only to supplement a STOP sign, a DO NOT ENTER sign, or a WRONG WAY sign.**
    (g) **Warning Beacon—a beacon used only to supplement an appropriate warning or regulatory sign or marker.**
22. **Bicycle—a pedal-powered vehicle upon which the human operator sits.**
23. **Bicycle Box—a designated area on the approach to a signalized intersection, between an advance motorist stop line and the crosswalk or intersection, intended to provide bicyclists a visible place to wait in front of stopped motorists during the red signal phase.**
24. **Bicycle Facilities—a general term denoting improvements and provisions that accommodate or encourage bicycling, including parking and storage facilities, and shared roadways not specifically defined for bicycle use.**
25. **Bicycle Lane—a portion of a roadway that has been designated for preferential or exclusive use by bicyclists. A typical bicycle lane is delineated from the adjacent general-purpose lane(s) by**

longitudinal pavement markings and bicycle lane symbol or word markings and, if used, signs. Other types of bicycle lanes include:

(a) Buffer-Separated Bicycle Lane—a bicycle lane that is separated from the adjacent general-purpose lane(s) by a pattern of standard longitudinal pavement markings that is wider than a normal or wide lane line marking.

(b) Counter-Flow Bicycle Lane—a one-directional bicycle lane that provides 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. Counter-flow bicycle lanes are designated by the traffic control devices used for other bicycle lanes.

(c) Separated Bicycle Lane—an exclusive facility for bicyclists that is located within or directly adjacent to the roadway and that is physically separated from motor vehicle traffic with a vertical element. Separated bicycle lanes are differentiated from other bicycle lanes by a vertical element.

26. Bicycle Signal Face–-a signal face that displays only bicycle symbol signal indications, that exclusively controls a bicycle movement from a designated bicycle lane or from a separate facility such as a shared-use path, and that displays signal indications that are applicable only to the bicycle movement.

27. Bicycle Symbol Signal Indication–-a red, yellow, or green signal indication that displays a bicycle symbol rather than a circular or arrow indication.

28. Bikeway—a generic term for any road, street, path, or way that in some manner is specifically designated for bicycle travel, regardless of whether such facilities are designated for the exclusive use of bicycles or are to be shared with other transportation modes.

29. Blank-Out Sign—a sign that displays a single predetermined message only when activated. When not activated, the sign legend is not visible.

30. Buffer-Separated Lane—a preferential lane or other special purpose lane that is separated from the adjacent general-purpose lane(s) by a pattern of standard longitudinal pavement markings that is wider than a normal or wide lane line marking. The buffer area might include rumble strips, textured pavement, or channelizing devices such as tubular markers or traversable curbs, but does not include a physical barrier.

31. Business Identification Sign Panel—a panel containing a word legend or logo used to identify a business on a Specific Service sign.

32. Busway—a traveled way that is used exclusively by buses.

33. Cantilevered Signal Structure—a structure, also referred to as a mast arm, that is rigidly attached to a vertical pole and is used to provide overhead support of highway traffic signal faces or grade crossing signal units.

34. Center Line Markings—the yellow pavement marking line(s) that delineates the separation of traffic lanes that have opposite directions of travel on a roadway. These markings need not be at the geometrical center of the pavement.

35. Changeable Message Sign—a sign that is capable of displaying more than one message (one of which might be a "blank" display), changeable manually, by remote control, or by automatic control. Electronic-display changeable message signs are referred to as Dynamic Message Signs in the National Intelligent Transportation Systems (ITS) Architecture and are referred to as Variable Message Signs in the National Electrical Manufacturers Association (NEMA) standards publication.

36. Channelizing Line—a solid wide or double white line marking used to form islands where traffic in the same direction of travel is permitted on both sides of the island.

37. Circular Intersection—an intersection that has an island, generally circular in design, located in the center of the intersection where traffic passes to the right of the island. Circular intersections include roundabouts, rotaries, and traffic circles.

38. Circulatory Roadway—the roadway within a circular intersection on which traffic travels in a counterclockwise direction around an island in the center of the circular intersection.

39. Clear Storage Distance—when used in Part 8, the distance available for vehicle storage measured between 6 feet from the rail nearest the intersection to the intersection stop line or the normal stopping point on the highway. At skewed grade crossings and intersections, the 6-foot distance shall be measured perpendicular to the nearest rail either along the center line or edge line of the highway,

as appropriate, to obtain the shorter distance. Where exit gates are used, the distance available for vehicle storage is measured from the point where the rear of the vehicle would be clear of the exit gate arm. In cases where the exit gate arm is parallel to the track(s) and is not perpendicular to the highway, the distance is measured either along the center line or edge line of the highway, as appropriate, to obtain the shorter distance.

40. **Clear Zone—the total roadside border area, starting at the edge of the traveled way, that is available for an errant driver to stop or regain control of a vehicle. This area might consist of a shoulder, a recoverable slope, and/or a non-recoverable, traversable slope with a clear run-out area at its toe.**
41. **Collector Highway—a term denoting a highway that in rural areas connects small towns and local highways to arterial highways, and in urban areas provides land access and traffic circulation within residential, commercial, and business areas and connects local highways to the arterial highways.**
42. **Conflict Monitor—a device used to detect and respond to improper or conflicting signal indications and improper operating voltages in a traffic controller assembly.**
43. **Constant Warning Time Detection—a means of detecting rail traffic that provides relatively uniform warning time for the approach of through rail traffic that is not accelerating or decelerating after being detected.**
44. **Contiguous Lane—a lane, preferential or otherwise, that is separated from the adjacent lane(s) only by a normal or wide lane line marking.**
45. **Controller Assembly—a complete electrical device mounted in a cabinet for controlling the operation of a highway traffic signal.**
46. **Controller Unit—that part of a controller assembly that is devoted to the selection and timing of the display of signal indications.**
47. **Conventional Road—a street or highway other than an expressway or freeway.**
48. **Counter-Flow Lane—a lane operating in a direction opposite to the normal flow of traffic designated for peak direction of travel during at least a portion of the day. Counter-flow lanes are usually separated from the off-peak direction lanes by tubular markers or other flexible channelizing devices, temporary lane separators, or movable or permanent barrier.**
49. **Crashworthy—the ability of a roadside safety hardware device or appurtenance to minimize risks to vehicle occupants by allowing a vehicle impacting the appurtenance to be slowed before stopping, redirected, or to continue without significant resistance. Section 1D.11 contains additional information about crashworthiness.**
50. **Crosswalk—(a) that part of a roadway at an intersection included within the connections of the lateral lines of the sidewalks on opposite sides of the highway measured from the curbs or in the absence of curbs, from the edges of the traversable roadway, and in the absence of a sidewalk on one side of the roadway, the part of a roadway included within the extension of the lateral lines of the sidewalk at right angles to the center line; (b) any portion of a roadway at an intersection or elsewhere distinctly indicated as a pedestrian crossing by pavement marking lines on the surface, which might be supplemented by contrasting pavement texture, style, or color.**
51. **Crosswalk Lines—white pavement marking lines that identify a crosswalk.**
52. **Cycle Length—the time required for one complete sequence of signal indications.**
53. **Dark Mode—the lack of all signal indications at a signalized location. The dark mode is most commonly associated with power failures, ramp meters, hybrid beacons, beacons, and some movable bridge signals.**
54. **Dedicated Lane—a lane on a freeway or expressway that provides access to: (a) either an exit lane or the mainline, but not both, at a freeway or expressway exit, or (b) only one roadway at a freeway or expressway split.**
55. **Delineator—a retroreflective device mounted at the side of the roadway in a series to indicate the alignment of the roadway, especially at night or in adverse weather.**
56. **Design Vehicle—the longest vehicle permitted by statute of the road authority (State or other) on that roadway.**
57. **Designated Bicycle Route—a system of bikeways designated by the jurisdiction having authority with appropriate directional and informational route signs, with or without specific bicycle route numbers.**

58. **Detectable—a continuous edge within 6 inches of the surface so that pedestrians with vision disabilities can sense its presence and receive usable guidance information.**
59. **Detector—a device used for determining the presence or passage of motor vehicles, bicycles, or pedestrians.**
60. **Detection Plate—a smooth continuous plate used on pedestrian channelizing devices to facilitate the use of low-vision canes for pedestrians with vision disabilities. The bottom edge of the detection plate shall be no more than 2 inches above the walkway and the top edge of the detection plate shall be at least 8 inches above the walkway. The detection plate shall share the same vertical plane as the hand trailing edge of the pedestrian channelizing device.**
61. **Diagnostic Team—a group of knowledgeable representatives of the parties of interest in a grade crossing or group of grade crossings (see 23 CFR Part 646.204).**
62. **Downstream—a term that refers to a location that is encountered by traffic subsequent to an upstream location as it flows in an "upstream to downstream" direction. For example, "the downstream end of a lane line separating the turn lane from a through lane on the approach to an intersection" is the end of the lane line that is closest to the intersection.**
63. **Driveway—an access from a roadway to a building, site, or abutting property.**
64. **Driving Aisle—circulation area for motor vehicles within a parking area, typically between rows of parking spaces. Driving aisles provide one-way or two-way travel. Driving aisles are exempted from compliance with MUTCD provisions.**
65. **Driving Automation System—technology that automates some or all aspects of the driving task to assist or replace the human vehicle operator. Section 5A.03 contains descriptions of the automation levels.**
66. **Dropped Lane—see Lane Drop.**
67. **Dual-Arrow Signal Section—a type of signal section designed to include both a yellow arrow and a green arrow.**
68. **Dynamic Envelope—the clearance required for light rail transit traffic or a train and its cargo overhang due to any combination of loading, lateral motion, or suspension failure (see Figure 8C-3).**
69. **Dynamic Exit Gate Operating Mode—a mode of operation where the exit gate operation is based on the presence of vehicles within the minimum track clearance distance.**
70. **Dynamic Message Sign—see Changeable Message Sign.**
71. **Edge Line Markings—white or yellow pavement marking lines that delineate the right or left edge(s) of a traveled way.**
72. **Electronic Toll Collection (ETC) Account Only Lane—a non-attended toll lane that is restricted to use only by vehicles with a registered toll payment account.**
73. **Emergency-Vehicle Hybrid Beacon—see Hybrid Beacon.**
74. **Emergency-Vehicle Traffic Control Signal—see Highway Traffic Signal.**
75. **Engineer—see Professional Engineer.**
76. **Engineering Judgment—the evaluation of available pertinent information including, but not limited to, the safety and operational efficiency of all road users, and the application of appropriate principles, provisions, and practices as contained in this Manual and other sources, for the purpose of deciding upon the design (see Section 1D.03), use, installation, or operation of a traffic control device. Engineering judgment shall be exercised by a professional engineer (see definition in this Section) with appropriate traffic engineering expertise, or by an individual working under the supervision of such an engineer, through the application of procedures and criteria established by the engineer. Documentation of engineering judgment is not required.**
77. **Engineering Study—the analysis and evaluation of available pertinent information including, but not limited to, the safety and operational efficiency of all road users, and the application of appropriate principles, provisions, and practices as contained in this Manual and other sources, for the purpose of deciding upon the design (see Section 1D.03), use, installation, or operation of a traffic control device. An engineering study shall be performed by a professional engineer (see definition in this Section) with appropriate traffic engineering expertise, or by an individual working under the supervision of**

such an engineer, through the application of procedures and criteria established by the engineer. An engineering study shall be documented in writing.

78. **Entrance Gate—an automatic gate that can be lowered across the lanes approaching a grade crossing to block road users from entering the grade crossing.**
79. **Exclusive Alignment—a light rail transit track(s) or a bus rapid transit busway that is grade-separated or protected by a fence or traffic barrier. No grade crossings exist along the track(s) or busway. Motor vehicles, bicycles, and pedestrians are prohibited within the right-of-way. Subways and elevated structures are included within this definition.**
80. **Exit Gate—an automatic gate that can be lowered across the lanes departing a grade crossing to block road users from entering the grade crossing by driving in the opposing traffic lanes.**
81. **Exit Gate Clearance Time—for Four-Quadrant Gate systems at grade crossings, the amount of time provided to delay the descent of the exit gate arm(s) after entrance gate arm(s) begin to descend.**
82. **Exit Gate Operating Mode—for Four-Quadrant Gate systems at grade crossings, the mode of control used to govern the operation of the exit gate arms.**
83. **Expressway—a divided highway with partial control of access.**
84. **Fail-Safe—when used in Part 8, a railroad signal design philosophy applied to a system or device such that the result of a hardware failure or the effect of a software error shall either prohibit the system or device from assuming or maintaining an unsafe state or shall cause the system or device to assume a state that is known to be safe.**
85. **Flagger—a person who actively controls the flow of vehicular traffic into and/or through a temporary traffic control zone using hand-signaling devices or an Automated Flagger Assistance Device (AFAD).**
86. **Flasher—a device used to turn highway traffic signal indications on and off at a repetitive rate of approximately once per second.**
87. **Flashing—an operation in which a light source, such as a traffic signal indication or LEDs in a sign, is turned on and off repetitively.**
88. **Flashing-Light Signals—a warning device consisting of two red signal indications arranged horizontally that are activated to flash alternately when rail traffic is approaching or present at a grade crossing.**
89. **Flashing Mode—a mode of operation in which at least one traffic signal indication in each vehicular signal face of a highway traffic signal is turned on and off repetitively.**
90. **Four-Quadrant Gate System—an exit gate system that includes entrance and exit gates that control and block road users on all lanes entering and exiting the grade crossing.**
91. **Freeway—a divided highway with full control of access.**
92. **Full-Actuated—a type of traffic control signal operation in which all signal phases function on the basis of actuation.**
93. **Gate—an automatically-operated or manually-operated traffic control device that is used to physically obstruct road users such that they are discouraged from proceeding past a particular point on a roadway or pathway, or such that they are discouraged from entering a particular grade crossing, ramp, lane, roadway, or facility.**
94. **General-Purpose Lane—a highway lane or set of lanes, other than a Managed Lane (see definition in this Section) or a Preferential Lane (see definition in this Section), that all or most of the traffic that is allowed on that highway is also allowed to use. Certain classes of vehicles, such as commercial vehicles or vehicles exceeding a certain weight or size, might be prohibited from using one or more of the general-purpose lanes. A general-purpose lane might also be restricted to certain uses, such as passing or turning or as an auxiliary lane.**
95. **Gore Area—see Physical Gore and Theoretical Gore.**
96. **Grade Crossing—the general area where a highway and a railroad and/or light rail transit route cross at the same level, within which are included the tracks, highway, and traffic control devices for traffic traversing that area.**
97. **Grade Crossing Warning System—the flashing-light signals, with or without automatic gates, together with the necessary control equipment used to inform road users of the approach or presence of rail traffic at a grade crossing.**

98. **Guide Sign—a sign that shows route designations, highway names, destinations, directions, distances, services, points of interest, or other geographical, recreational, or cultural information.**

99. **High-Occupancy Vehicle (HOV)—a motor vehicle carrying at least two (or more than two if the signs for a specific roadway indicate a higher minimum occupancy requirement) persons, including carpools, vanpools, and buses.**

100. **Highway—a general term for denoting a public way for purposes of travel by vehicles and vulnerable road users, including the entire area within the right-of-way.**

101. **Highway-Light Rail Transit Grade Crossing—the general area where a highway and a light rail transit route cross at the same level, within which are included the light rail transit tracks, highway, and traffic control devices for traffic traversing that area.**

102. **Highway-Rail Grade Crossing—the general area where a highway and a railroad cross at the same level, within which are included the railroad tracks, highway, and traffic control devices for highway traffic traversing that area.**

103. **Highway Traffic Signal—a power-operated traffic control device by which traffic is warned or directed to take some specific action. These devices do not include power-operated signs (except as provided in Chapters 4S and 4T), steadily-illuminated raised pavement markers, gates, flashing-light signals (see Section 8D.02), warning lights (see Section 6L.07), or steady-burning electric lamps. Highway traffic signals include:**

    (a) **Flashing Beacon—see Beacon.**

    (b) **In-Roadway Warning Lights—a special type of highway traffic signal installed in the roadway surface to warn road users that they are approaching a condition on or adjacent to the roadway that might not be readily apparent and might require the road users to reduce speed and/or come to a stop.**

    (c) **Lane-Use Control Signal—a signal face or comparable display on a full-matrix Changeable Message Sign (see Chapters 2L and 4T) displaying indications to permit or prohibit the use of specific lanes of a roadway or a shoulder where driving is sometimes permitted, or to indicate the impending prohibition of such use.**

    (d) **Traffic Control Signal (Traffic Signal)—a highway traffic signal placed at intersections, movable bridges, fire stations, midblock crosswalks, alternating one-way sections of a single lane road, private driveways, or other locations that require conflicting traffic to be directed to stop and permitted to proceed in an orderly manner. These devices do not include pedestrian hybrid beacons (see Chapter 4J) or emergency-vehicle hybrid beacons (see Chapter 4N). Traffic control signals include vehicular signal indications, pedestrian signal indications, and bicycle symbol signal indications. Special traffic control signals include:**

        (1) **Emergency-Vehicle Traffic Control Signal—a traffic control signal that directs all conflicting traffic to stop in order to permit the driver of an authorized emergency vehicle to proceed into the roadway or intersection.**

        (2) **Movable Bridge Traffic Control Signal—a traffic control signal installed at a movable bridge to notify traffic to stop during periods when the roadway is closed to allow the bridge to open.**

        (3) **Portable Traffic Control Signal—a temporary component of a traffic control signal on a mobile support with one or more signal faces that is designed so that it can be easily transported, deployed, or relocated as part of a temporary traffic control signal, or during construction and maintenance as a temporary part of a permanent traffic control signal installation.**

        (4) **Pre-Signal—traffic control signal faces that are located upstream from a signalized intersection and are operated in conjunction with the traffic control signal faces at the downstream signalized intersection in a manner that is designed to keep the area between the stop line for the upstream traffic control signal faces and the stop line for the downstream signalized intersection clear of queued vehicles. When used in conjunction with a grade crossing, the pre-signal is operated for the purpose of preventing vehicles from queuing within the minimum track clearance distance. Supplemental near-side traffic control signal faces for the downstream signalized intersection are not considered to be pre-signals.**

(5) Queue Cutter Signal—an independently-controlled traffic control signal (not operated in conjunction with the traffic control signal faces at a downstream signalized intersection) located at a grade crossing that controls traffic in one direction only on the roadway for the purpose of keeping the minimum track clearance distance clear of vehicles. The display of red signal indications is activated from a downstream queue detection system, by time of day, by approaching rail traffic, by an approaching bus on a busway, or by a combination of any of these methods.

(6) Ramp Control Signal—a traffic control signal installed to control the merging flow of traffic onto a freeway at an entrance ramp or at a freeway-to-freeway ramp connection.

(7) Temporary Traffic Control Signal—a traffic control signal that is installed for a limited time period using fixed or portable traffic control signal units.

104. HOV Lane—any preferential lane designated for exclusive use by high-occupancy vehicles for all or part of a day—including a designated lane on a freeway, other highway, street, or independent roadway on a separate right-of-way.

105. Hybrid Beacon—a special type of beacon that is intentionally placed in a dark mode (no indications displayed) between periods of operation and, when operated, displays both steady and flashing traffic control signal indications. Hybrid beacons include:

(a) Emergency-Vehicle Hybrid Beacon—used to warn and control traffic at an unsignalized location to assist authorized emergency vehicles in entering or crossing a street or highway.

(b) Pedestrian Hybrid Beacon—used to warn and control traffic at an unsignalized location to assist pedestrians in crossing a street or highway at a marked crosswalk.

106. Identification Marker—a shape, color, and/or pictograph that is used as a visual identifier for a destination guide signing system of a community wayfinding system or a shared-use path system for an area.

107. Inherently Low Emission Vehicle (ILEV)—any kind of vehicle that, because of inherent properties of the fuel system design, will not have significant evaporative emissions, even if its evaporative emission control system has failed.

108. In-Roadway Warning Lights—see Highway Traffic Signal.

109. Interchange—a system of interconnecting roadways providing for traffic movement between two or more highways that do not intersect at grade.

110. Interchange Lane Drop—see Lane Drop.

111. Intermediate Interchange—an interchange with an urban or rural route that is not a major or minor interchange as defined in this Section.

112. Intersection—intersection is defined as follows:

(a) The area embraced within the prolongation or connection of the lateral curb lines, or if none, the lateral boundary lines of the roadways of two highways that join one another at, or approximately at, right angles, or the area within which vehicles traveling on different highways that join at any other angle might come into conflict.

(b) The junction of an alley, driveway, or site roadway with a public roadway or highway shall not constitute an intersection, unless the public roadway or highway at said junction is controlled by a traffic control device.

(c) If a highway includes two roadways separated by a median, then every crossing of each roadway of such divided highway by an intersecting highway shall be a separate intersection if the opposing left-turn paths cross and there is sufficient interior storage for the design vehicle (see Figure 2A-5).

(d) At a location controlled by a traffic control signal, regardless of the distance between the separate intersections as defined in (c) above:

(1) If a stop line, yield line, or crosswalk has not been designated on the roadway (within the median) between the separate intersections, the two intersections and the roadway (median) between them shall be considered as one intersection;

(2) **Where a stop line, yield line, or crosswalk is designated on the roadway on the intersection approach, the area within the crosswalk and/or beyond the designated stop line or yield line shall be part of the intersection; and**

(3) **Where a crosswalk is designated on a roadway on the departure from the intersection, the intersection shall include the area extending to the far side of such crosswalk.**

113. **Intersection Control Beacon—see Beacon.**
114. **Interval—the part of a signal cycle during which signal indications do not change.**
115. **Island—a defined area between traffic lanes for control of vehicular movements, for toll collection, or for pedestrian or bicyclist refuge. It includes all end protection and approach treatments. Within an intersection area, a median or an outer separation is considered to be an island.**
116. **Jughandle Turn—a left-turn or U-turn that, in conjunction with special geometry, is made by initially making a right turn or diverging to the right. With other special geometry, a right turn or U-turn makes a jughandle turn by initially making a left turn or diverging to the left.**
117. **Lane Drop—a through lane that becomes a mandatory turn lane on a conventional roadway, or a through lane that becomes a mandatory exit lane on a freeway or expressway. The end of an acceleration lane and reductions in the number of through lanes that do not involve a mandatory turn or exit are not considered lane drops.**
118. **Lane Line Markings—white pavement marking lines that delineate the separation of traffic lanes that have the same direction of travel on a roadway.**
119. **Lane Reduction—a gradual narrowing of the travel pavement (taper) through physical construction or pavement markings at which traffic in the lane being eliminated must merge into the adjacent through lane and continue in the same direction of travel. A lane reduction can occur outside the influence of an intersection or interchange, or within an interchange a short distance downstream of the gore of an exit ramp. Through lanes that become a mandatory turn or exit are considered lane drops rather than lane reductions.**
120. **Lane-Use Control Signal—see Highway Traffic Signal.**
121. **Legend—see Sign Legend.**
122. **Lens—see Signal Lens.**
123. **Light Rail Transit Traffic (Light Rail Transit Equipment)—every device in, upon, or by which any person or property can be transported on light rail transit tracks, including single-unit light rail transit cars (such as streetcars and trolleys) and assemblies of multiple light rail transit cars coupled together.**
124. **Loading Zone—a specially marked, signed or designated area for the loading or unloading of vehicles (passenger or freight).**
125. **Locomotive Horn—an air horn, steam whistle, or similar audible warning device (see 49 CFR Part 229.129) mounted on a locomotive or control cab car. The terms "locomotive horn," "train whistle," "locomotive whistle," and "train horn" are used interchangeably in the railroad industry.**
126. **Logo—a distinctive emblem or trademark that identifies a commercial or non-commercial business, program, or organization.**
127. **Longitudinal Markings—pavement markings that are generally placed parallel and adjacent to the flow of traffic such as lane lines, center lines, edge lines, channelizing lines, and others.**
128. **Louver—see Signal Louver.**
129. **Low-Volume Rural Road—a category of paved or unpaved conventional or special-purpose roadways having an AADT of less than 400 vehicles and lying outside of built-up or urbanized areas of cities, towns, and communities.**
130. **Major Interchange—an interchange with another freeway or expressway, or an interchange with a high-volume multi-lane highway, principal urban arterial, or major rural route where the interchanging traffic is heavy or includes many road users unfamiliar with the area.**
131. **Major Street—the street normally carrying the higher volume of vehicular traffic.**
132. **Malfunction Management Unit—see Conflict Monitor.**

133. **Managed Lane—a highway lane or set of lanes, or a highway facility, for which variable operational strategies such as direction of travel, tolling, pricing, and/or vehicle type or occupancy requirements are implemented and managed in real-time in response to changing conditions. Managed lanes are typically buffer-separated or barrier-separated lanes parallel to the general-purpose lanes of a highway in which access is restricted to designated locations. There are also some highways on which all lanes are managed.**
134. **Manual Lane—see Attended Lane within the definition of Toll Collection.**
135. **Maximum Highway Traffic Signal Preemption Time—the maximum amount of time needed following initiation of the preemption sequence for the highway traffic signals to complete the timing of the right-of-way transfer time, queue clearance time, and separation time.**
136. **Median—the portion of a highway separating opposing directions of the traveled way or the area between two roadways of a divided highway measured from edge of traveled way to edge of traveled way. The median excludes turn lanes. The median width might be different between intersections, interchanges, and at opposite approaches of the same intersection.**
137. **Minimum Track Clearance Distance—the length along a highway over the track(s) where a vehicle could be struck by rail traffic. The minimum track clearance distance is measured from a point upstream from the track(s) on the approach to the grade crossing to a point downstream from the track(s) on the departure from the grade crossing. The length along the highway between the two points is the minimum track clearance distance.**
138. **Minor Interchange—an interchange where traffic is local and very light, such as interchanges with land service access roads. Where the sum of the exit volumes is estimated to be lower than 100 vehicles per day in the design year, the interchange is classified as local.**
139. **Minor Street—the street normally carrying the lower volume of vehicular traffic.**
140. **Mixed-Use Alignment—a light rail transit track(s), a busway, or a bus only lane(s) where the light rail transit (LRT) or bus rapid transit (BRT) vehicles operate in mixed traffic with all types of road users. This includes streets, transit malls, and pedestrian malls where the right-of-way is shared. In a mixed-use alignment, the light rail transit or the bus rapid transit traffic does not have the right-of-way over other road users at grade crossings and intersections. If the LRT traffic or buses are controlled by traffic control signals or LRT signal faces at an intersection with a roadway, the alignment is considered to be mixed-use even if some of the approaches to the intersection are used exclusively by LRT traffic or buses.**
141. **Movable Bridge Resistance Gate—a type of traffic gate, which is located downstream of the movable bridge warning gate, that provides a physical deterrent to vehicle and/or pedestrian traffic when placed in the appropriate position.**
142. **Movable Bridge Signal—see Highway Traffic Signal.**
143. **Movable Bridge Warning Gate—a type of traffic gate designed to warn, but not primarily to block, vehicle and/or pedestrian traffic when placed in the appropriate position.**
144. **Multi-Lane—more than one lane moving in the same direction. A multi-lane street, highway, or roadway has a basic cross-section comprised of two or more through lanes in one or both directions. A multi-lane approach has two or more lanes moving toward the intersection, including turning lanes.**
145. **Neutral Area—the paved area between the channelizing lines separating an entrance or exit ramp or a channelized turn lane or channelized entering lane from the adjacent through lane(s).**
146. **Object Marker—a device used to mark obstructions within or adjacent to the roadway.**
147. **Occupancy Requirement—any restriction that regulates the use of a facility or one or more lanes of a facility for any period of the day based on a specified minimum number of persons in a vehicle.**
148. **Occupant—a person driving or riding in a car, truck, bus, or other vehicle.**
149. **On-Street Parking—parking within or along, and accessed directly from, a public roadway or a site roadway open to public travel.**
150. **Open-Road ETC Lane—a non-attended lane that is designed to allow toll payments to be electronically collected from vehicles traveling at normal highway speeds. Open-Road ETC lanes are typically physically separated from the toll plaza, often following the alignment of the mainline lanes,**

with toll plaza lanes for cash toll payments being on a different alignment after diverging from the mainline lanes or a subset thereof.

151. **Open-Road Tolling Point—the location along an Open-Road ETC lane at which roadside or overhead detection and receiving equipment are placed and vehicles are electronically assessed a toll.**
152. **Opposing Traffic—vehicles that are traveling in the opposite direction. At an intersection, vehicles entering from an approach that is approximately straight ahead would be considered to be opposing traffic, but vehicles entering from approaches on the left or right would be considered to be conflicting traffic rather than opposing traffic.**
153. **Option Lane—a lane on a freeway, expressway, or conventional road multi-lane exit or multi-lane split that widens on the approach to allow access, without changing lanes, to:**
    (a) Both an exit lane and the mainline at a freeway or expressway exit; or
    (b) Both diverging roadways at a freeway, expressway, or conventional road split.
154. **Overhead Sign—a sign that is placed such that a portion or the entirety of the sign or its support is directly above the roadway or shoulder such that vehicles travel below it. Typical installations include signs placed on cantilever arms that extend over the roadway or shoulder, signs placed on sign support structures that span the entire width of the pavement, signs placed on mast arms or span wires either independently or that also support traffic control signals, and signs placed on highway bridges that cross over the roadway.**
155. **Parking Area—a parking lot or parking garage that is separated from a roadway. Parallel, perpendicular, or angle parking spaces along a roadway are not considered a parking area.**
156. **Parking Space—an area marked or designated for storage of a vehicle while the driver is not present.**
157. **Passive Grade Crossing—a grade crossing where none of the automatic traffic control devices associated with an Active Grade Crossing Warning System are present and at which the traffic control devices consist entirely of signs and/or markings.**
158. **Pathway—a general term denoting a public way for purposes of travel by authorized users outside the traveled way and physically separated from the roadway by an open space or barrier and either within the highway right-of-way or within an independent alignment. Pathways include shared-use paths, but do not include sidewalks.**
159. **Pathway Grade Crossing—the general area where a pathway and railroad and/or light rail transit tracks cross at the same level, within which are included the tracks, pathway, and traffic control devices for pathway traffic traversing that area.**
160. **Paved—having a surface that has both a structural (weight-bearing) and a sealing purpose for the roadway, such as a bituminous surface treatment, mixed bituminous concrete, or Portland cement concrete.**
161. **Pedestrian—a person on foot, in a wheelchair, on other devices determined by local law to be equivalent, which might include skates or a skateboard.**
162. **Pedestrian Change Interval—an interval during which the flashing UPRAISED HAND (symbolizing DONT WALK) signal indication is displayed.**
163. **Pedestrian Clearance Time—the time provided for a pedestrian crossing in a crosswalk, after leaving the curb or edge of pavement, to travel to the far side of the traveled way or to a median.**
164. **Pedestrian Facility—a general term denoting a location where improvements and provisions have been made to accommodate or encourage pedestrian activity.**
165. **Pedestrian Hybrid Beacon—see Hybrid Beacon.**
166. **Pedestrian Signal Head—a signal head, which contains the symbols WALKING PERSON (symbolizing WALK) and UPRAISED HAND (symbolizing DONT WALK), that is installed to direct pedestrians at a traffic control signal.**
167. **Permissive Mode—a mode of traffic control signal operation in which left or right turns are permitted to be made after yielding to pedestrians, if any, and/or opposing traffic, if any. When a CIRCULAR GREEN signal indication is displayed, both left and right turns are permitted unless otherwise prohibited by another traffic control device. When a flashing YELLOW ARROW or flashing RED ARROW signal indication is displayed, the turn indicated by the arrow is permitted.**

168. **Physical Gore—a longitudinal point where a physical barrier or the lack of a paved surface inhibits road users from crossing from a ramp or channelized turn lane or channelized entering lane to the adjacent through lane(s) or vice versa.**
169. **Pictograph—a pictorial representation used to identify a governmental jurisdiction, an area of jurisdiction, a governmental or other public transportation agency or provider, a military base or branch of service, a governmental-approved university or college, a governmental-approved institution, or a toll payment system.**
170. **Plaque—a traffic control device intended to communicate specific information to road users through a word, symbol, or arrow legend that is placed immediately adjacent to a sign to supplement the message on the sign. The difference between a plaque and a sign is that a plaque cannot be used alone. The designation for a plaque includes a "P" suffix.**
171. **Platoon—a group of vehicles or pedestrians traveling together as a group, either voluntarily or involuntarily, because of traffic signal controls, geometrics, or other factors.**
172. **Portable Traffic Control Signal—see Highway Traffic Signal.**
173. **Post-Exit Ramp Lane Reduction—see Lane Reduction.**
174. **Post-Mounted Sign—a sign that is placed to the side of the roadway such that no portion of the sign or its support is directly above the roadway or shoulder.**
175. **Posted Speed Limit—a speed limit determined by law or regulation and displayed on Speed Limit signs.**
176. **Preemption—the transfer of normal operation of a traffic control signal or a hybrid beacon to a special control mode of operation.**
177. **Preemption Clearance Interval—the part of a traffic signal sequence displayed as a result of a preemption request when vehicles are provided the opportunity to clear the railroad or light rail transit tracks, or a movable bridge, prior to the arrival of the train or boat for which the traffic signal is being preempted.**
178. **Preemption Interconnection—the electrical connection between the railroad or light rail transit active warning system and the highway traffic signal controller assembly for the purpose of preemption.**
179. **Preemption Time Variability—the result that occurs when the traffic signal controller enters the Preemption Clearance Interval with less than the maximum design Right-of-Way Transfer Time or the speed of a train approaching the grade crossing varies.**
180. **Preferential Lane—a highway lane or set of lanes, or a highway facility, reserved for the exclusive use of one or more specific types of vehicles or of vehicles with a specific minimum number of occupants.**
181. **Pre-Signal—see Highway Traffic Signal.**
182. **Pretimed Operation—a type of traffic control signal operation in which none of the signal phases function on the basis of actuation.**
183. **Primary Signal Face—one of the required or recommended minimum number of signal faces for a given approach or separate turning movement, but not including near-side signal faces required as a result of the far-side signal faces exceeding the maximum distance from the stop line.**
184. **Principal Legend—place names, street names, and route numbers displayed on guide signs.**
185. **Priority Control—a means by which the assignment of right-of-way is obtained or modified.**
186. **Private Road—see Site Roadways Open to Public Travel.**
187. **Professional Engineer (P.E.)—an individual who has fulfilled education and experience requirements and passed examinations that, under State licensure laws, permit the individual to offer engineering services within areas of expertise directly to the public.**
188. **Protected Mode—a mode of traffic control signal operation in which left or right turns are permitted to be made only when a left or right GREEN ARROW signal indication is displayed.**
189. **Public Road—any road, street, or similar facility under the jurisdiction of and maintained by a public agency and open to public travel.**
190. **Push Button—a button to activate a device or signal timing for pedestrians, bicyclists, or other road users.**

191. **Push Button Information Message—a recorded message that can be actuated by pressing a push button when the walk interval is not timing and that provides the name of the street that the crosswalk associated with that particular push button crosses and can also provide other information about the intersection signalization or geometry.**
192. **Push Button Locator Tone—a repeating sound that informs approaching pedestrians that a push button exists to actuate pedestrian timing or receive additional information and that enables pedestrians with vision disabilities to locate the push button.**
193. **Queue Clearance Time—when used in Part 8, the time required for the design vehicle of maximum length stopped just inside the minimum track clearance distance to start up and move through and clear the entire minimum track clearance distance.**
194. **Queue Cutter Signal—see Highway Traffic Signal.**
195. **Quiet Zone—a segment of a rail line, within which is situated one or a number of consecutive public highway-rail grade crossings at which locomotive horns are not routinely sounded per 49 CFR Part 222.**
196. **Rail Traffic—every device in, upon, or by which any person or property can be transported on rails or tracks and to which all other traffic must yield the right-of-way by law at grade crossings, including trains, one or more locomotives coupled (with or without cars), other railroad equipment, and light rail transit operating in exclusive or semi-exclusive alignments. Light rail transit operating in a mixed-use alignment, to which other traffic is not required to yield the right-of-way by law, is a vehicle and is not considered to be rail traffic.**
197. **Raised Pavement Marker—a device mounted on or in a road surface that has a height generally not exceeding approximately 1 inch above the road surface for a permanent marker, or not exceeding approximately 2 inches above the road surface for a temporary flexible marker, and that is intended to be used as a positioning guide and/or to supplement or substitute for pavement markings. Raised pavement markers might also be recessed into or flush with the pavement surface.**
198. **Ramp Control Signal—see Highway Traffic Signal.**
199. **Red Clearance Interval—an interval that follows a yellow change interval and precedes the next conflicting green interval.**
200. **Regulatory Sign—a sign that gives notice to road users of traffic laws or regulations.**
201. **Retroreflectivity—a property of a surface that allows a large portion of the light coming from a point source to be returned directly back to a point near its origin.**
202. **Road—see Roadway.**
203. **Road User—a vehicle operator, bicyclist, or pedestrian, including persons with disabilities, within the highway or on a site roadway open to public travel.**
204. **Roadway—that portion of a highway improved, designed, or ordinarily used for vehicular travel and parking lanes, but exclusive of the sidewalk, berm, or shoulder even though such sidewalk, berm, or shoulder is used by persons riding bicycles or other human-powered vehicles. In the event a highway includes two or more separate roadways, the term roadway as used in this Manual shall refer to any such roadway separately, but not to all such roadways collectively.**
205. **Roadway Network—a geographical arrangement of intersecting roadways.**
206. **Roundabout—a circular intersection with yield control at entry, which permits a vehicle on the circulatory roadway to proceed, and with deflection of the approaching vehicle counter-clockwise around a central island.**
207. **Rumble Strip—a series of intermittent, narrow, transverse areas of rough-textured, slightly raised, or depressed road surface that extend across the travel lane to alert vehicle operators to unusual traffic conditions or are located along the shoulder, along the roadway center line, or within islands formed by pavement markings to alert road users that they are leaving the travel lanes.**
208. **Rural Highway—a type of roadway normally characterized by lower volumes, higher speeds, fewer turning conflicts, and less conflict with pedestrians.**
209. **Scanning Graphic—a graphic designed for scanning by machine, and includes bar codes, quick-response (QR) codes or other matrix bar code formats, or similar graphics.**

210. School—a public or private educational institution recognized by the State education authority for one or more grades K through 12 or as otherwise defined by the State.

211. School Zone—a designated roadway segment approaching, adjacent to, and beyond school buildings or grounds, or along which school related activities occur.

212. Semi-Actuated—a type of traffic control signal operation in which at least one, but not all, signal phases function on the basis of actuation.

213. Semi-Exclusive Alignment—a light rail transit track(s) or a bus rapid transit busway that is in a separate right-of-way or that is along a street or railroad right-of-way where motor vehicles, bicycles, and pedestrians have limited access and cross only at designated locations, such as at grade crossings where road users must yield the right-of-way to the light rail transit or the bus rapid transit traffic.

214. Separate Turn Signal Face—a signal face that exclusively controls a turn movement and that displays signal indications that are applicable only to the turn movement.

215. Separation Time—the component of maximum highway traffic signal preemption time during which the minimum track clearance distance is clear of vehicular traffic prior to the arrival of rail traffic.

216. Serviceable—a condition in which a traffic control device appears (day and night) and operates as intended, beyond which it requires replacement due to damage or wear. Whether a device is serviceable will depend on the type of device under consideration. In general, if the device is capable of being serviced with minimal effort or replacement parts so that it continues to appear and operate as intended, and the device is otherwise substantially intact, then it can be considered to be in serviceable condition. If the device is damaged or not operational beyond reasonable repair, then it is likely no longer serviceable.

217. Shared Roadway—a roadway that is officially designated and marked as a bicycle route, but which is open to motor vehicle travel and upon which no bicycle lane is designated.

218. Shared Turn Signal Face—a signal face, for controlling both a turn movement and the adjacent through movement, that always displays the same color of circular signal indication that the adjacent through signal face or faces display.

219. Shared-Use Path—a bikeway outside the traveled way and physically separated from motorized vehicular traffic by an open space or barrier and either within the highway right-of-way or within an independent alignment. Shared-use paths are also used by pedestrians (including skaters, users of manual and motorized wheelchairs, and joggers) and other authorized motorized and non-motorized users.

220. Shoulder—a longitudinal area contiguous with the traveled way that is used for accommodation of stopped vehicles for emergency use and for lateral support of base and surface courses, and that is graded for emergency stopping. A shoulder might be paved or unpaved. A paved shoulder might be opened to part-time travel by some or all vehicles and might also be available for use by pedestrians and/or bicycles in the absence of other pedestrian or bicycle facilities.

221. Sidewalk—that portion of a street between the curb line, or the lateral line of a roadway, and the adjacent property line or on easements of private property that is paved or improved and intended for use by pedestrians.

222. Sidewalk Extension—a pedestrian facility at an intersection or midblock crosswalk which extends the sidewalk by physically and visually narrowing the roadway.

223. Sidewalk Grade Crossing—the portion of a highway-rail grade crossing or of a highway-light rail transit grade crossing where a sidewalk and railroad tracks or a sidewalk and light rail transit tracks cross at the same level, within which are included the tracks, sidewalk, and traffic control devices for sidewalk users traversing that area.

224. Sign—with regard to controlling traffic, any traffic control device that is intended to communicate specific information to road users through a word, symbol, and/or arrow legend. Signs do not include highway traffic signals, pavement markings, delineators, or channelization devices. Signs whose purpose is unrelated to traffic control are addressed in Section 1A.02.

225. Sign Assembly—a group of signs, located on the same support(s), that supplement one another in conveying information to road users.

226. Sign Illumination—either internal or external lighting that shows similar color by day or night. Street or highway lighting shall not be considered as meeting this definition.

227. Sign Legend—all word messages, logos, pictographs, and symbol and arrow designs that are intended to convey specific meanings. The border, if any, on a sign is not considered to be a part of the legend.

228. Sign Panel—a separate panel or piece of material containing a word, logo, pictograph, symbol, and/or arrow legend that is affixed to the face of a sign.

229. Signal—see Highway Traffic Signal.

230. Signal Backplate—a thin strip of material that extends outward from and parallel to a signal face on all sides of a signal housing to provide a background for improved visibility of the signal indications.

231. Signal Coordination—the establishment of timed relationships between adjacent traffic control signals.

232. Signal Dimming—a reduction of the light output from a signal indication, hybrid beacon, or rectangular rapid-flashing beacon indication, typically for nighttime conditions, to a value that is below the minimum specified intensity for daytime conditions. If a variety of intensity levels are used during daytime conditions and all of the various levels (including the lowest of the intensities) are above the minimum specified intensity for daytime conditions, this would not be considered to be signal dimming.

233. Signal Face—an assembly of one or more signal sections that is provided for controlling one or more traffic movements on a single approach.

234. Signal Head—an assembly of one or more signal faces that is provided for controlling traffic movements on one or more approaches.

235. Signal Housing—that part of a signal section that protects the light source and other required components.

236. Signal Indication—the illumination of a signal lens or equivalent device.

237. Signal Lens—that part of the signal section that redirects the light coming directly from the light source and its reflector, if any.

238. Signal Louver—a device that can be mounted inside a signal visor to restrict visibility of a signal indication from the side or to limit the visibility of the signal indication to a certain lane or lanes, or to a certain distance from the stop line.

239. Signal Phase—the right-of-way, yellow change, and red clearance intervals in a cycle that are assigned to an independent traffic movement or combination of movements.

240. Signal Section—the assembly of a signal housing, signal lens, if any, and light source with necessary components to be used for displaying one signal indication.

241. Signal Sequence (Sequence of Indications)—the order of appearance of signal indications during successive intervals of a signal cycle.

242. Signal System—two or more traffic control signals operating in signal coordination.

243. Signal Timing—the amount of time allocated for the display of a signal indication.

244. Signal Visor—that part of a signal section that directs the signal indication specifically to approaching traffic and reduces the effect of direct external light entering the signal lens.

245. Signing—individual signs or a group of signs, not necessarily on the same support(s), that supplement one another in conveying information to road users.

246. Simultaneous Preemption—notification of approaching rail traffic is forwarded to the highway traffic signal controller unit or assembly and railroad or light rail transit active warning devices at the same time.

247. Site Roadways Open to Public Travel—roadways and bikeways on sites of shopping centers, office parks, airports, schools, universities, sports arenas, recreational parks, and other similar business, governmental, and/or recreation facilities that are publicly or privately-owned but where the public is allowed to travel without full-time access restrictions. Two types of roadways are not included in this definition: (1) roadways where access is restricted at all times by gates and/or guards to residents, employees, or other specifically authorized persons; and (2) private highway-rail grade crossings. Site roadways open to public travel do not include parking areas (see definition in this Section), including the driving aisles (see definition in this Section) within those parking areas.

248. Special-Purpose Road—a low-volume, low-speed road that serves recreational areas or resource development activities.

249. Speed—speed is defined based on the following classifications:

- **(a) Average Speed—the summation of the instantaneous or spot-measured speeds at a specific location of vehicles divided by the number of vehicles observed.**
- **(b) Design Speed—a selected speed used to determine the various geometric design features of a roadway.**
- **(c) 85th-Percentile Speed—the speed at or below which 85 percent of the motor vehicles travel.**
- **(d) Operating Speed—a speed at which a typical vehicle or the overall traffic operates. Operating speed might be defined with speed values such as the average, pace, or 85th-percentile speeds.**
- **(e) Pace—the 10 mph speed range representing the speeds of the largest percentage of vehicles in the traffic stream.**

250. Speed Limit—the maximum (or minimum) speed applicable to a section of highway as established by law or regulation.

251. Speed Zone—a section of highway with a speed limit that is established by law or regulation, but which might be different from a legislatively-specified statutory speed limit.

252. Splitter Island—a median island used to separate opposing directions of traffic entering and exiting a roundabout.

253. Station Crossing—a pathway grade crossing that is associated with a station platform.

254. Statutory Speed Limit—a speed limit established by legislative action (such as Federal or State law) that typically is applicable for a particular class of highways with specified design, functional, jurisdictional, and/or location characteristics and that is not necessarily displayed on Speed Limit signs.

255. Steady (Steady Mode)—the continuous display of a signal indication for the duration of an interval, signal phase, or consecutive signal phases.

256. Stop Line—a solid white pavement marking line extending across approach lanes to indicate the point at which a stop is intended or required to be made.

257. Street—see Highway.

258. Supplemental Signal Face—a signal face that is not a primary signal face but which is provided for a given approach or separate turning movement to enhance visibility or conspicuity.

259. Swing Gate—a self-closing fence-type gate designated to swing open away from the track area and return to the closed position upon release.

260. Symbol—the approved design of a pictorial or graphical representation of a specific traffic control message for signs, pavement markings, traffic control signals, or other traffic control devices, as shown in the MUTCD.

261. Temporary Traffic Control Signal—see Highway Traffic Signal.

262. Temporary Traffic Control Zone—an area of a highway, pedestrian or bicycle facility where road user conditions are changed because of a work zone or incident by the use of temporary traffic control devices, flaggers, uniformed law enforcement officers, or other authorized personnel.

263. Theoretical Gore—a longitudinal point at the upstream end of a neutral area at an exit ramp or channelized turn lane where the channelizing lines that separate the ramp or channelized turn lane from the adjacent through lane(s) begin to diverge, or a longitudinal point at the downstream end of a neutral area at an entrance ramp or channelized entering lane where the channelizing lines that separate the ramp or channelized entering lane from the adjacent through lane(s) intersect each other.

264. Through Train—a train movement that continues without stopping or reversing direction throughout the entire length of the rail traffic detection circuit length approaching a highway-rail grade crossing.

265. Timed Exit Gate Operating Mode—a mode of operation where the exit gate descent at a grade crossing is based on a predetermined time interval.

266. Toll Booth—a shelter where a toll attendant is stationed to collect tolls or issue toll tickets. A toll booth is located adjacent to a toll lane and is typically set on a toll island.

267. Toll Collection—manual or electronic methods and elements used to collect a fee for use of a toll facility. Toll collection methods include:

(a) Electronic Toll Collection (ETC)—a cashless system for automated collection of tolls from moving or stopped vehicles through wireless technologies such as radio-frequency communication or optical scanning. ETC systems are classified as one of the following:

(1) systems that require users to have registered toll accounts, with the use of equipment inside or on the exterior of vehicles, such as a transponder or barcode decal, that communicates with or is detected by roadside or overhead receiving equipment, or with the use of license plate optical scanning, to automatically deduct the toll from the registered user account,

(2) systems that do not require users to have registered toll accounts because vehicle license plates are optically scanned and invoices for the toll amount are typically sent through postal mail to the address of the vehicle owner, or

(3) systems that allow electronic toll collection for both registered and non-registered toll accounts.

(b) Open-Road Tolling (ORT)—a system designed to allow electronic toll collection (ETC) from vehicles traveling at posted speeds. Open-road tolling might be used on toll roads or toll facilities in conjunction with toll plazas. Open-road tolling is also typically used on managed lanes and on toll facilities that only accept payment by ETC.

(c) Manual Toll Collection—a system of toll collection from stopped vehicles through acceptance of cash, toll tickets, tokens, or credit cards, and may involve issuance of receipts. Toll collection may be by a machine or toll booth attendant.

(1) Toll-Ticket System—a toll system in which the user of a toll road must stop to receive a ticket from a machine or toll booth attendant upon entering the toll facility. The ticket denotes the user's point of entry and, upon exiting the toll system, the user surrenders the ticket and is charged a toll based on the distance traveled between the points of entry and exit.

(2) Attended Lane (Manual Lane)—a toll lane adjacent to a toll booth occupied by a human toll collector who makes change, issues receipts, and performs other toll-related functions. Attended lanes at toll plazas typically require vehicles to stop to pay the toll.

(3) Exact Change Lane (Automatic Lane)—a non-attended toll lane that has a receptacle into which road users deposit coins totaling the exact amount of the toll. Exact Change lanes at toll plazas typically require vehicles to stop to pay the toll.

268. Toll Island—a raised island on which a toll booth or other toll collection and related equipment are located.

269. Toll Lane—an individual lane located within a toll plaza in which a toll payment is collected or, for toll-ticket systems, a toll ticket is issued.

270. Toll Plaza—the location at which tolls are collected consisting of a grouping of toll booths, toll islands, toll lanes, and, typically, a canopy. Toll plazas might be located on highway mainlines or on interchange ramps. A mainline toll plaza is sometimes referred to as a barrier toll plaza because it interrupts the traffic flow.

271. Toll Road (Facility)—a road or facility that is open to traffic only by payment of a user toll or fee.

272. Traffic—pedestrians, bicyclists, ridden or herded animals, vehicles, streetcars, and other conveyances either singularly or together while using for purposes of travel any highway or site roadway open to public travel.

273. Traffic Control Device—all signs, signals, markings, channelization devices, or other devices that use colors, shapes, symbols, words, sounds, and/or tactile information for the primary purpose of communicating a regulatory, warning, or guidance message to road users on a street, highway, pedestrian facility, bikeway, pathway, or site roadway open to public travel. Section 1A.02 contains information regarding items that are not traffic control devices.

274. Traffic Control Signal (Traffic Signal)—see Highway Traffic Signal.

275. Train—one or more locomotives coupled, with or without cars, that operates on rails or tracks and to which all other traffic must yield the right-of-way by law at highway-rail grade crossings.

276. **Transverse Markings—pavement markings that are generally placed perpendicular and across the flow of traffic such as shoulder markings; word, symbol, and arrow markings; stop lines; crosswalk lines; parking space markings; and others.**
277. **Traveled Way—the portion of the roadway for the movement of vehicles, exclusive of the shoulders, berms, sidewalks, and parking lanes.**
278. **Turn Bay—a lane for the exclusive use of turning vehicles that is formed on the approach to the location where the turn is to be made. In most cases where turn bays are provided, drivers who desire to turn must move out of a through lane into the newly-formed turn bay in order to turn. A through lane that becomes a turn lane is considered to be a lane drop rather than a turn bay.**
279. **Two-Stage Bicycle Turn Box—a designated area at an intersection intended to provide bicyclists a place to wait for traffic to clear before proceeding in a different direction of travel.**
280. **Uncontrolled Approach—an approach on which vehicles are not controlled by a traffic control signal, hybrid beacon, STOP sign, or YIELD sign.**
281. **Upstream—a term that refers to a location that is encountered by traffic prior to a downstream location as it flows in an "upstream to downstream" direction. For example, "the upstream end of a lane line separating the turn lane from a through lane on the approach to an intersection" is the end of the line that is furthest from the intersection.**
282. **Urban Street—a type of street normally characterized by relatively low speeds, wide ranges of traffic volumes, narrower lanes, frequent intersections and driveways, significant pedestrian traffic, and more businesses and houses.**
283. **Variable Message Sign—see Changeable Message Sign.**
284. **Vehicle—every device in, upon, or by which any person or property can be transported or drawn upon a highway, except trains and light rail transit operating in exclusive or semi-exclusive alignments. Light rail transit equipment operating in a mixed-use alignment, to which other traffic is not required to yield the right-of-way by law, is a vehicle.**
285. **Vibrotactile Pedestrian Device—an accessible pedestrian signal feature that communicates, by touch, information about pedestrian timing using a vibrating surface.**
286. **Visibility-Limited Signal Face or Visibility-Limited Signal Section—a type of signal face or signal section designed (or shielded, hooded, or louvered) to restrict the visibility of a signal indication from the side, to a certain lane or lanes, or to a certain distance from the stop line.**
287. **Walk Interval—an interval during which the WALKING PERSON (symbolizing WALK) signal indication is displayed.**
288. **Warning Light—a portable, powered, yellow, lens-directed, enclosed light that is used in a temporary traffic control zone in either a steady burn or a flashing mode.**
289. **Warning Sign—a sign that gives notice to road users of a situation that might not be readily apparent.**
290. **Warrant—a warrant describes a threshold condition based upon average or normal conditions that, if found to be satisfied as part of an engineering study, shall result in analysis of other traffic conditions or factors to determine whether a traffic control device or other improvement is justified. Warrants are not a substitute for engineering judgment. The fact that a warrant for a particular traffic control device is met is not conclusive justification for the installation of the device.**
291. **Wayside Horn System—a stationary horn (or a series of horns) located at a grade crossing that is used in conjunction with train-activated or light rail transit-activated warning systems to provide audible warning of approaching rail traffic to road users on the highway or pathway approaches to a grade crossing, either as a supplement or alternative to the sounding of a locomotive horn.**
292. **Worker—a person on foot whose duties place him or her within the right-of-way of a street, highway, or pathway, such as: construction and maintenance forces; survey crews; utility crews; responders to incidents within the right-of-way; and law enforcement personnel when directing traffic, investigating crashes, and handling lane closures, obstructed roadways, and disasters within the right-of-way.**
293. **Wrong-Way Arrow—a slender, elongated, white pavement marking arrow placed upstream from the ramp terminus to indicate the correct direction of traffic flow. Wrong-way arrows are intended primarily to warn wrong-way road users that they are going in the wrong direction.**

294. **Yellow Change Interval—the first interval following the green or flashing arrow interval during which the steady yellow signal indication is displayed.**

295. **Yield Line—a row of solid white isosceles triangles pointing toward approaching vehicles extending across approach lanes to indicate the point at which the yield is intended or required to be made.**

Section 1C.03 Meanings of Acronyms and Abbreviations Used in this Manual

Standard:

01 The following acronyms and abbreviations, when used in this Manual, shall have the following meanings:

1. **AADT—annual average daily traffic**
2. **AASHTO—American Association of State Highway and Transportation Officials**
3. **AC—alternating current**
4. **ADA—Americans with Disabilities Act**
5. **ADAS—Advanced Driver Assistance Systems**
6. **ADS—Automated Driving System**
7. **ADT—average daily traffic**
8. **AFAD—Automated Flagger Assistance Device**
9. **ANSI—American National Standards Institute**
10. **AREMA—American Railway Engineering and Maintenance-of-Way Association**
11. **AV—automated vehicle**
12. **cd/lx/m^2---candelas per lux per square meter**
13. **CFR—Code of Federal Regulations**
14. **CMS—changeable message sign**
15. **dBA—A-weighted decibels**
16. **DC—direct current**
17. **DDT—Dynamic Driving Task**
18. **EPA—Environmental Protection Agency**
19. **ETC—electronic toll collection**
20. **EV—electric vehicle**
21. **FHWA—Federal Highway Administration**
22. **FRA—Federal Railroad Administration**
23. **ft—foot or feet**
24. **FTA—Federal Transit Administration**
25. **HOV—high-occupancy vehicle**
26. **IEEE—Institute of Electrical and Electronics Engineers**
27. **IES—Illuminating Engineering Society**
28. **ILEV—inherently low-emission vehicle**
29. **in—inch(es)**
30. **ISEA—International Safety Equipment Association**
31. **ITE—Institute of Transportation Engineers**
32. **ITS—intelligent transportation systems**
33. **L—taper length**
34. **LED—light-emitting diode**
35. **LP—liquified petroleum**
36. **LRT—light rail transit**
37. **mi—mile(s)**
38. **MPH or mph—miles per hour**

39. **MUTCD—Manual on Uniform Traffic Control Devices for Streets and Highways**
40. **N—length of one line segment plus one gap of a broken line**
41. **NCEES—National Council of Examiners for Engineering and Surveying**
42. **NCHRP—National Cooperative Highway Research Program**
43. **ODD—Operational Design Domain**
44. **OPM—U.S. Office of Personnel Management**
45. **ORT—open-road tolling**
46. **PCMS—portable changeable message sign**
47. **PRT—perception-response time**
48. **RRFB—rectangular rapid-flashing beacon**
49. **RV—recreational vehicle**
50. **SAE—Society of Automotive Engineers**
51. **SHV—Specialized Hauling Vehicle**
52. **SPF—safety performance function**
53. **TA—Typical Application**
54. **TDD—telecommunication device for the deaf**
55. **TRB—Transportation Research Board**
56. **TTC—temporary traffic control**
57. **U.S.—United States**
58. **U.S.C.—United States Code**
59. **USDOT—United States Department of Transportation**
60. **UVC—Uniform Vehicle Code**
61. **VPH or vph—vehicles per hour**
62. **V2I—vehicle to infrastructure**
63. **& - And**

CHAPTER 1D. PROVISIONS APPLICABLE TO TRAFFIC CONTROL DEVICES IN GENERAL

Section 1D.01 Purpose and Principles of Traffic Control Devices

Support:

01 The purpose of traffic control devices, as well as the principles for their use, is to promote highway safety, inclusion and mobility of all road users, and efficiency by providing for the orderly movement of road users on streets, highways, bikeways, and site roadways open to public travel throughout the Nation. Section 1A.03 contains additional information on target road users.

02 This Manual contains the basic principles that govern the design and use of traffic control devices for all streets, highways, bikeways, and site roadways open to public travel (see definition in Section 1C.02) regardless of type or class or the public agency, official, or owner having jurisdiction. The text of this Manual specifies the restriction on the use of a device if it is intended for limited application or for a specific system. It is important that these principles be given primary consideration in the selection and application of each device.

Guidance:

03 To be effective, a traffic control device should:

- *A. Fulfill a need;*
- *B. Command attention;*
- *C. Convey a clear, simple meaning;*
- *D. Command respect from road users; and*
- *E. Give adequate time for proper response.*

04 Design, placement, operation, maintenance, and uniformity are aspects that should be carefully considered in order to maximize the ability of a traffic control device to be consistent with the five principles listed in Paragraph 3 of this Section. Vehicle speed and road-user types should be carefully considered as an element that governs the design, operation, placement, and location of various traffic control devices.

05 The proper use of traffic control devices should provide the road user with the information necessary to safely, efficiently, and lawfully use the streets, highways, pedestrian facilities, and bikeways.

Standard:

06 Traffic control devices used on site roadways open to public travel shall have the same shape, color, and meaning as those required by the MUTCD for use on public highways, except as provided otherwise elsewhere in this Manual. Sign size exceptions are noted in each Part as applicable.

Section 1D.02 Responsibility and Authority for Traffic Control Devices

Standard:

01 The responsibility for the design, placement, operation, maintenance, and uniformity of traffic control devices in compliance with the provisions of this Manual shall rest with the public agency or the official having jurisdiction, or, in the case of site roadways open to public travel, with the private owner or private official having jurisdiction.

02 All regulatory traffic control devices shall be supported by laws, ordinances, or regulations.

03 Traffic control devices, public announcements or notices, and other signs or messages within the highway right-of-way shall be placed only as authorized by a public authority or the official having jurisdiction, or, in the case of site roadways or private toll roads open to public travel, by the private owner or private official having jurisdiction, for the purpose of regulating, warning, or guiding traffic.

04 When the public agency or the official having jurisdiction over a street or highway or, in the case of site roadways open to public travel, the private owner or private official having jurisdiction, has granted proper authority, others such as contractors and public utility companies shall be allowed to install temporary traffic control devices in temporary traffic control zones. Such traffic control devices shall comply with the provisions of this Manual.

05 Signs and other devices that do not have any traffic control purpose that are placed within the highway right-of-way shall not be located where they will interfere with, or detract from, traffic control devices.

Wis. Stat. s. 349.07 provides department authority to declare connecting highways as "through highways." Local governments shall not place traffic signals, stop or yield signs on those connecting highways, except for temporary signs erected under Wis. Stat. s. 349.07.

Stop and Yield signs and traffic control signals which control traffic proceeding along a Connecting Highway shall not be placed without the approval of the Department.

Support:

The Department is responsible for the design, installation and maintenance of route sign assemblies and D1 and D2 series signs on Connecting Highways.

06 States are encouraged to adopt, through policy or legislation, the provisions of 23 CFR 750.108 that restrict outdoor advertising from resembling traffic control devices.

Section 1D.03 Engineering Study and Engineering Judgment

Support:

01 Definitions of professional engineer, engineering study, and engineering judgment are provided in Section 1C.02.

02 The application of engineering study and engineering judgment is a fundamental principle of the use of traffic control devices. It is for this reason that, in most cases, the selection of a particular device is not required by a Standard provision, but is determined by engineering study or engineering judgment. Many Standard provisions in this Manual specifically require, by explicit language in the individual provisions or by implication, the application of engineering study or engineering judgment in applying those Standards. Site-specific conditions might result in the determination that it is impossible or impracticable to comply with a Standard at that location. In such a case, a deviation from the requirement of a particular Standard at that location might be the only possibility. In such limited, specific cases, the deviation is allowed, provided that the agency or official having jurisdiction fully documents, through an engineering study, the engineering basis for the deviation.

Standard:

03 This Manual describes the application of traffic control devices, but shall not be a legal requirement for their installation.

Support:

04 The MUTCD does not mandate, and is not intending to imply, that an engineer must make the final decision whether to implement or execute the determination or advice of an engineer by installing or constructing the traffic control device to the engineer's specification in the field. Rather, the engineer, individual under supervision of an engineer, or other individual as duly authorized by State law to engage in the practice of engineering, develops an engineering-based solution that includes the specifications for selection and placement of traffic control devices, but the responsibility for a final decision to implement that solution rests with the agency having jurisdiction over the roadway, after consultation with and based on advice from the engineer.

Guidance:

05 The decision to use a particular device at a particular location should be made on the basis of either an engineering study or the application of engineering judgment by an engineer, someone under the direct supervision of an engineer, or other individual as duly authorized by State law to engage in the practice of engineering. Thus, while this Manual provides Standards, Guidance, and Options for design and application of traffic control devices, this Manual should not be considered a substitute for engineering judgment. Engineering judgment should be exercised in the selection and application of traffic control devices, as well as in the location and design of roads and streets that the devices complement.

06 Early in the processes of location and design of roads and streets, engineers should coordinate such location and design with the design and placement of the traffic control devices to be used with such roads and streets.

07 Jurisdictions, or owners of site roadways or private toll roads open to public travel, with responsibility for traffic control that do not have an engineer on their staff who is trained and/or experienced in traffic control devices should seek engineering assistance from others, such as the State transportation agency, their county, a nearby large city, or a traffic engineering consultant.

Support:

08 The provisions of this Manual are intended to be interpreted and applied by engineers or those under the supervision of an engineer. The construction of the provisions of this Manual, therefore, are informed by bases referenced in Paragraphs 9 and 10 of this Section.

09 The National Council of Examiners for Engineering and Surveying (NCEES) has defined the practice of engineering as "any service or creative work requiring engineering education, training, and experience in the

application of engineering principles and the interpretation of engineering data to engineering activities that potentially impact the health, safety, and welfare of the public." The practice of engineering is, therefore, subject to regulation in the public interest and is regulated by the State licensing boards in order to safeguard the health, safety, and welfare of the public. The NCEES has defined an engineer as "an individual who is qualified to practice engineering by reason of engineering education, training, and experience in the application of engineering principles and the interpretation of engineering data."

10 The U.S. Office of Personnel Management (OPM) has defined the professional knowledge of engineering as "the comprehensive, in-depth knowledge of mathematical, physical, and engineering sciences applicable to a specialty field of engineering that characterizes a full 4-year engineering program leading to a bachelor's degree, or the equivalent." The OPM has defined professional ability to apply engineering knowledge as "the ability to (a) apply fundamental and diversified professional engineering concepts, theories, and practices to achieve engineering objectives with versatility, judgment, and perception; (b) adapt and apply methods and techniques of related scientific disciplines; and (c) organize, analyze, interpret, and evaluate scientific data in the solution of engineering problems."

11 Requisite technical training in the application of the principles of the MUTCD might be available from the State's Local Technical Assistance Program (LTAP) for needed engineering guidance and assistance.

Section 1D.04 Design of Traffic Control Devices

Guidance:

01 Devices should be designed so that features such as size, shape, color, composition, lighting or retroreflection, and contrast are combined to draw attention to the devices; so that size, shape, color, and simplicity of message combine to produce a clear meaning; so that legibility and size combine with placement to provide adequate time for response; and so that uniformity, size, legibility, and reasonableness of the message combine to command respect.

Option:

02 Except for symbols and colors, minor modifications in the specific design elements of a device may be made based on an engineering study or engineering judgment, in accordance with Paragraph 3 of this Section, provided the essential appearance characteristics are preserved.

Guidance:

03 Aspects of the standard design of a traffic control device should not be modified unless there is a demonstrated need in unusual circumstances, based on an engineering study or engineering judgment.

Support:

04 An example of acceptably modifying the design of a device would be to modify the Combination Horizontal Alignment/Intersection (W1-10) sign to show intersecting side roads on both sides rather than on just one side of the major road within the curve.

Section 1D.05 Color Code

Support:

01 The following color code establishes general meanings for 11 colors of a total of 13 colors that have been identified as being appropriate for use in conveying traffic control information.

Standard:

02 The general meaning of the 13 colors shall be as follows:

- **A. Black—regulation**
- **B. Blue—road-user services guidance, tourist information, and evacuation route**
- **C. Brown—recreational and cultural interest area guidance**
- **D. Coral—reserved for future designation (see Paragraph 4 of this Section)**
- **E. Fluorescent Pink—incident management**
- **F. Fluorescent Yellow-Green—pedestrian warning, bicycle warning, playground warning, school bus warning, and school warning**
- **G. Green—indicated movements or actions permitted and direction guidance**
- **H. Light Blue—reserved for future designation (see Paragraph 4 of this Section)**
- **I. Orange—temporary traffic control**

J. Purple—restricted to use only by vehicles with registered electronic toll collection (ETC) accounts

K. Red—stop or prohibition

L. White—regulation

M. Yellow—warning

03 These colors shall be used only as prescribed for the specific devices or applications throughout this Manual.

Support:

04 The two colors for which general meanings have not yet been assigned are being reserved for future applications that will be determined only by the FHWA after consultation with the States, the engineering community, and the general public. The meanings described in this Section are of a general nature. More specific assignments of colors are given in the individual Parts of this Manual relating to each class of devices.

05 Tolerance limits for each color are contained in 23 CFR Part 655, Appendix to Subpart F and are available at the Federal Highway Administration's MUTCD Web site at http://mutcd.fhwa.dot.gov.

Section 1D.06 Public Domain, Copyrights, and Patents

Standard:

01 Traffic control device design or application provisions contained in this Manual shall be in the public domain. Traffic control devices contained in this Manual shall not be protected by a patent, trademark, or copyright, except for the Interstate Shield, 511 Travel Information pictograph, National Scenic Byway graphic, and any items under the stewardship of or owned by FHWA.

02 A traffic control device design or application shall not be eligible for official experimentation (see Section 1B.05) or interim approval (see Section 1B.07) unless it is in the public domain. Express abandonment of any and all forms of proprietary protection, such as patents, trademarks, or copyrights, related to the design and application of the traffic control device shall satisfy the requirement for the traffic control device to be in the public domain.

03 The requirement for the traffic control device to be in the public domain shall not apply to individual components used in the assembly or manufacture of the traffic control device.

Support:

04 The limitation on patented, trademarked, or copyrighted traffic control devices applies to the message that the device conveys to the road user. If a patent or other protection covers the device's communication to the road user by virtue of its appearance, audible message, or other aspects of the message conveyed (such as the order in which traffic control signal indications change from green to yellow and red), then the device is considered to be protected and not in the public domain. Such a device is precluded from inclusion in this Manual. The purpose of this limitation is to ensure uniformity of the messaging of individually approved traffic control devices. This limitation does not apply to other aspects of a device (such as internal controls, circuitry, electronics, mechanics, or housing) so long as the appearance, audible message, or other aspects of the message conveyed, including the manner of conveyance, remain freely reproducible by all without infringing on any proprietary rights or interests. This Manual does not prohibit such other aspects of a traffic control device that meet the legal requirements from being protected through patent, trademark, or copyright; and does not restrict components, parts, manufacturing processes, or similar aspects of traffic control devices from being patented or otherwise protected. Examples of acceptable protected traffic control device components or parts might include: sign sheeting or retroreflectivity technology, internal electronic components of traffic signal controllers, and breakaway sign support mechanisms.

05 Pictographs, as defined in Section 1C.02, are embedded in traffic control devices, but the pictographs themselves are not considered traffic control devices for the purposes of Paragraph 4 of this Section.

06 Business identification logos, as defined in Section 1C.02, are embedded in traffic control devices, but the logos themselves are not considered traffic control devices for the purposes of Paragraph 4 of this Section.

Section 1D.07 Advertising

Standard:

01 Traffic control devices or their supports shall not bear any advertising message or any other message that is not related to traffic control.

Support:

02 Acknowledgment signs (see Section 2H.13), Specific Service signs (see Chapter 2J), and Tourist-Oriented Directional signs (see Chapter 2K) are not considered advertising.

Section 1D.08 Abbreviations Used on Traffic Control Devices

Standard:

01 When the word messages shown in Table 1D-1 need to be abbreviated in connection with traffic control devices, the abbreviations shown in Table 1D-1 shall be used.

02 When the word messages shown in Table 1D-2 need to be abbreviated on a portable changeable message sign, the abbreviations shown in Table 1D-2 shall be used. Unless indicated by an asterisk, these abbreviations shall only be used on portable changeable message signs.

Guidance:

03 The abbreviations for the words listed in Table 1D-2 that also show a prompt word should not be used on a portable changeable message sign (or on a static sign if indicated in Table 1D-2 by an asterisk) unless the prompt word shown in Table 1D-2 either precedes or follows the abbreviation, as applicable.

Standard:

04 The abbreviations shown in Table 1D-3 shall not be used in connection with traffic control devices because of their potential to be misinterpreted by road users.

Guidance:

05 If Table 1D-1 or 1D-2 indicates that more than one abbreviation is allowed for a given word or phrase, the same abbreviation should be used throughout a single jurisdiction.

06 Except as otherwise provided in Table 1D-1 or 1D-2 or unless necessary to avoid confusion, periods, commas, apostrophes, question marks, ampersands, and other punctuation marks or characters that are not letters or numerals should not be used in any abbreviation.

Table 1D-1. Acceptable Abbreviations

General Abbreviations

Word Message	Standard Abbreviation
Afternoon / Evening	PM
Alternate	ALT
AM Radio	AM
Avenue	Ave, Av*
Bicycle(s)	BIKE, BIKES
Boulevard	Blvd*
Bridge	(See Table 1D-2)
CB Radio	CB
Center	Ctr**
Circle	Cir*
Civil Defense	CD
Compressed Natural Gas	CNG
Court	Ct*
Crossing (other than highway-rail)	X-ING
Drive	Dr*
East	E
Electric Vehicle	EV
Expressway	Expwy*
Feet	FT
FM Radio	FM
Freeway	Fwy*
Hazardous Material(s)	HAZMAT, HAZMATS
High Occupancy Vehicle(s)	HOV
Highway	Hwy*
Hospital	HOSP
Hour(s)	HR, HRS
Information	INFO
Inherently Low Emission Vehicle	ILEV
International	Intl
Interstate	(See Table 1D-2)
Junction / Intersection	JCT
Lane	(See Table 1D-2)
Liquified Petroleum Gas	LP-GAS
Maximum	MAX

Word Message	Standard Abbreviation
Mile(s)	MI
Miles per Hour	MPH
Minimum	MIN
Minute(s)	MIN, MINS
Morning / Late Night	AM
Mount	Mt**
Mountain	Mtn**
National	Natl**
North	N
Northeast	NE
Northwest	NW
Parkway	Pkwy*
Pedestrian(s)	PED, PEDS
Place	Pl*
Pounds	LBS
Road	Rd*
Saint	St**
South	S
Southeast	SE
Southwest	SW
State, county, or other non-US or non-Interstate numbered route	(See Table 1D-2)
Street	St*
Telephone	PHONE
Temporary	TEMP
Terrace	Ter*
Thruway	Thwy*
Ton(s)	T
Trail	Tr*
Turnpike	Tpk*
Two-Way Intersection, Two-Way Traffic	2-WAY
US Numbered Route	(See Table 1D-2)
West	W

Days of the Week

Day	Standard Abbreviation
Sunday	SUN
Monday	MON
Tuesday	TUES***
Wednesday	WED

Day	Standard Abbreviation
Thursday	THURS***
Friday	FRI
Saturday	SAT

* Abbreviation shall not be used for any application other than the name of a roadway. See Table 2D-3 for complete list of street name descriptors. Examples include: Bayshore Fwy, Cross County Hwy, Mid-County Pkwy

** Abbreviation shall not be used for any application other than as a descriptor or title within a proper name. Examples include: Vestal Ctr, Mt Hope, Pocono Mtn, Eldorado Natl Forest, St Louis

*** Tuesday and Thursday may be abbreviated on a Changeable Message Sign (CMS) to TUE and THU, respectively, when the number of Characters in a message to be displayed cannot be practically reduced through rewording to fit the number of characters supported by the CMS, such as might occur at times on a portable CMS.

Note: Abbreviations shown in upper- and lower-case lettering may be in all upper-case lettering when displayed on a changeable message sign with lower resolution that will not accommodate lower-case letter forms. See Chapter 2L of this Manual.

Table 1D-2. Abbreviations that Shall be Used Only for Temporary Messages on Portable Changeable Message Signs (Sheet 1 of 2)

Word Message	Standard Abbreviation	Prompt Word Preceding the Abbreviation	Prompt Word Following the Abbreviation	Example
Access	ACCS	—	Road	ACCS ROAD
Ahead	AHD	Fog	—	FOG AHD
Blocked	BLKD	Lane	—	2 LANES BLKD
Bridge	BR*	[Name]	—	BAY BR
Cannot	CANT	—	—	—
Center	CNTR	—	Lane	CNTR LANE, CNTR LN
Chemical	CHEM	—	Spill	CHEM SPILL
Condition	COND	Traffic	—	TRAFFIC COND
Congested	CONG	Traffic	—	TRAFFIC CONG AHD
Construction	CONST	—	Ahead	CONST AHEAD
Crossing	XING	—	—	PED XING
Do Not	DONT	—	—	—
Downtown	DWNTN	—	Traffic	DWNTN TRAFFIC
Eastbound	EAST	Route Number, Road Name	—	I-4 EAST
	E-BND	—	Lane, Traffic	E-BND LANE
Emergency	EMER	—	—	EMER VEHICLES
Entrance, Enter	ENT	—	—	ENT TO I-90
Exit	EX	Next	—	NEXT EX
Express	EXP	—	Lane	EXP LANE OPEN
Frontage	FRNTG	—	Road	FRNTG RD
Hazardous	HAZ	—	Driving	HAZ DRIVING
Highway-Rail Grade Crossing	RR XING	—	—	RR XING
Interstate	I-*	—	[Number]	I-80
It Is	ITS	—	—	—
Lane(s) (travel lanes of a highway)	LN, LNS	Right, Left, Center	—	LEFT LN ONLY 2 RIGHT LNS
Left	LFT	Keep, Next	—	NEXT LFT
	LFT	—	Lane	LFT LANE
Local	LOC	—	Traffic	LOC TRAFFIC ONLY
Lower	LWR	—	Level	LWR LEVEL
Maintenance	MAINT	—	—	ROAD MAINT
Major	MAJ	—	Crash	MAJ CRASH
Minor	MNR	—	Crash	MNR CRASH
Normal	NORM	—	—	—
Northbound	NORTH	Route Number, Road Name	—	US 1 NORTH
	N-BND	—	Lane, Traffic	N-BND TRAFFIC
Oversized	OVRSZ	—	Load	OVRSZ LOAD
Parking	PKING	—	—	—
Pavement	PVMT	Icy	—	ICY PVMT
Prepare	PREP	—	To Stop	PREP TO STOP
Quality	QLTY	Air	—	AIR QLTY
Right	RT	Keep, Next	—	KEEP RT
	RT	—	Lane	RT LANE
Road Work	RD WK	—	Ahead, [Distance]	RD WK 1 MILE
Route	RTE	Best	—	BEST RTE
Service	SERV	—	—	SERV AREA OPEN
Shoulder	SHLDR	—	—	SHLDR CLOSED

Table 1D-2. Abbreviations that Shall be Used Only for Temporary Messages on Portable Changeable Message Signs (Sheet 2 of 2)

Word Message	Standard Abbreviation	Prompt Word Preceding the Abbreviation	Prompt Word Following the Abbreviation	Example
Slippery	SLIP	—	—	—
Southbound	SOUTH	Route Number, Road Name	—	CA 1 SOUTH
	S-BND	—	Lane, Traffic	S-BND TRAFFIC
Speed	SPD	—	—	SPD LIMIT
State, County, or other non-U.S. or non-Interstate numbered route	[Route Abbreviation determined by highway agency]*	—	[Number]**	NY 7, CR 43
Tires With Lugs	LUGS	—	—	—
Traffic	TRAF	—	—	—
Travelers	TRVLRS	—	—	—
Two-Wheeled Vehicles	CYCLES	—	—	—
Upper	UPR	—	Level	UPR LEVEL
U.S. Numbered Route	US*	—	[Number]**	US 202
Vehicle(s)	VEH, VEHS	—	—	—
Warning	WARN	—	—	—
Westbound	WEST	Route Number, Road Name	—	IL 53 WEST
	W-BND	—	Lane, Traffic	W-BND LANES
Will Not	WONT	—	—	—

* Abbreviation, when accompanied by the prompt word, may be used on traffic control devices other than portable message signs. See Table 1D-1 for uses and format.

** A space and no hyphen shall be placed between the abbreviation and the number of the route.

Note: See Chapter 2L of this Manual for additional information on changeable message signs.

Table 1D-3. Unacceptable Abbreviations

Abbreviation	Intended Word	Common Misinterpretation
ACC	Accident	Access (Road)
CLRS	Clears	Colors
DLY	Delay	Daily
FDR	Feeder	Federal
L	Left	Lane (Merge)
LT	Light (Traffic)	Left
PARK	Parking	Park
POLL	Pollution (Index)	Poll
RED	Reduce	Red
STAD	Stadium	Standard
WRNG	Warning	Wrong

Section 1D.09 Placement and Operation of Traffic Control Devices

Standard:

01 Before any highway, site roadway open to public travel (see definition in Section 1C.02), detour, or temporary route is opened to public travel, all traffic control devices necessary for safe operation shall be in place.

Option:

02 Temporary traffic control devices, as provided for in Part 6 of this Manual, may be used in place of permanent devices that have yet to be installed for safe operation.

Guidance:

03 Placement of a traffic control device should be within the road user's view so that adequate visibility is provided. To aid in conveying the proper meaning, the traffic control device should be appropriately positioned with respect to the location, object, or situation to which it applies. The location and legibility of the traffic control device should be such that a road user has adequate time to make the proper response in both day and night conditions.

04 Traffic control devices should be placed and operated in a uniform and consistent manner as part of maintaining uniformity in traffic control.

Support:

05 Inconsistent placement or use of a device can result in disrespect for the device at locations where the device is needed and appropriate.

Guidance:

06 Unnecessary traffic control devices should be removed. The fact that a device is in good physical condition should not be a basis for deferring needed removal or change.

Support:

07 Section 2A.02 contains information on excessive use of signs and other considerations that can reduce their effectiveness and the effectiveness of other traffic control devices.

Section 1D.10 Maintenance of Traffic Control Devices

Guidance:

01 Functional maintenance of traffic control devices should be used to determine if certain devices need to be changed to meet current traffic conditions.

02 Physical maintenance of traffic control devices should be performed to retain the legibility and visibility of the device, and to retain the proper functioning of the device.

Support:

03 Clean, legible, properly-mounted devices in good working condition command the respect of road users.

Section 1D.11 Crashworthiness of Traffic Control Devices and Other Roadside Appurtenances

Standard:

01 In accordance with various Sections of this Manual, certain traffic control devices and their supports, and/or related appurtenances shall be crashworthy (see definition in Section 1C.02). Crashworthiness provisions in this Manual shall apply to all streets, highways, and site roadways open to public travel.

Support:

02 Roadside appurtenances include permanent and portable sign supports, other permanent or temporary traffic control devices, and other roadside fixtures that are not traffic control devices, such as longitudinal barriers, bridge railings, and crash cushions, within the clear zone. Crashworthiness of a device or appurtenance is determined by nationally established standards such as the "Manual for Assessing Safety Hardware" (MASH), 2016, AASHTO. Information on the FHWA's policy on crashworthiness of devices on the National Highway System and other roadways is available at the FHWA Office of Safety Web site at https://safety.fhwa.dot.gov/roadway_dept/countermeasures/reduce_crash_severity/policy_memo_guidance.cfm.

CHAPTER 2C. WARNING SIGNS AND OBJECT MARKERS

GENERAL

Section 2C.01 Application of Warning Signs

Standard:

01 The use of warning signs shall be based on an engineering study or on engineering judgment.

02 Warning signs shall be retroreflective or illuminated (see Section 2A.21).

Guidance:

03 The use of warning signs should be kept to a minimum as the unnecessary use of warning signs tends to breed disrespect for all signs. In situations where the condition or activity is seasonal or temporary, the warning sign should be removed or covered when the condition or activity does not exist.

Section 2C.02 Design of Warning Signs

Standard:

01 Except as provided in Paragraph 2 of this Section or unless specifically designated otherwise, all warning signs shall be diamond-shaped (square with one diagonal vertical) with a black legend and border on a yellow background. Warning signs shall be designed in accordance with the sizes, shapes, colors, and legends contained in the "Standard Highway Signs" publication (see Section 1A.05).

Option:

02 A warning sign that is larger than the size shown in the Oversized column in Table 2C-1 for that particular sign may be diamond-shaped or may be rectangular or square in shape.

Support:

03 The use of a shape other than diamond-shaped is typical for overhead installations.

04 Section 2A.05 contains information on allowable methods to accommodate a diamond-shaped warning sign where the lateral space available in which to install a diamond-shaped warning sign is constrained, such as in urban locations, when mounting on a narrow median barrier or adjacent to a retaining wall, including the display of the standard legend in a vertically oriented rectangle.

05 The use of LEDs in the border and legend of warning signs is described in Section 2A.12.

Option:

06 Except for symbols on warning signs, minor modifications may be made to the design provided that the essential appearance characteristics are met. Modifications may be made to the symbols shown on combined horizontal alignment/intersection signs (see Section 2C.09) and intersection warning signs (see Section 2C.41) in order to approximate the geometric configuration of the intersecting roadway(s).

07 Word message warning signs other than those provided in this Manual may be developed and installed by State and local highway agencies for conditions otherwise not addressed by standard signs (see Section 2A.04).

08 Warning signs regarding conditions associated with pedestrians, bicyclists, and playgrounds and their related plaques may have a black legend and border on a yellow or fluorescent yellow-green background.

Standard:

09 Warning signs regarding conditions associated with school buses and schools and their related supplemental plaques shall have a black legend and border on a fluorescent yellow-green background (see Section 7B.01).

Option:

10 Consistent with the provisions of Section 4S.03, a Warning Beacon may be used in combination with a standard warning sign.

Section 2C.03 Size of Warning Signs and Plaques

Standard:

01 Except as provided in Section 2A.07, the sizes for warning signs shall be as shown in Table 2C-1.

Support:

02 Section 2A.07 contains information regarding the applicability of the various columns in Table 2C-1.

Standard:

03 Except as provided in Paragraph 5 of this Section, the minimum size for all diamond-shaped warning signs facing traffic on a multi-lane conventional road where the posted speed limit is higher than 35 mph shall be 36 x 36 inches.

Table 2C-1. Warning Sign and Plaque Sizes (Sheet 1 of 4)

Sign or Plaque	Sign Designation	Section	Conventional Road		Expressway	Freeway	Minimum	Oversized
			Single Lane	Multi-Lane				
Horizontal Alignment	W1-1,2,3,4,5	2C.07	30 x 30*	36 x 36	36 x 36	36 x 36	–	48 x 48
One-Direction Large Arrow	W1-6	2C.10	48 x 24	48 x 24	60 x 30	60 x 30	–	60 x 30
Two-Direction Large Arrow	W1-7	2C.43	48 x 24	48 x 24	–	–	–	60 x 30
Chevron Alignment	W1-8	2C.08	18 x 24	18 x 24	30 x 36	36 x 48	–	24 x 30
Combination Horizontal Alignment/Intersection	W1-10,10a,10b, 10c,10d,10e	2C.09	36 x 36	36 x 36	36 x 36	48 x 48	–	–
Hairpin Curve	W1-11	2C.07	30 x 30	30 x 30	36 x 36	48 x 48	–	48 x 48
Truck Rollover	W1-13	2C.11	36 x 36	36 x 36	36 x 36	48 x 48	–	48 x 48
270-degree Curve	W1-15	2C.07	30 x 30	30 x 30	36 x 36	48 x 48	–	48 x 48
Intersection Warning	W2-1,2,3,3a, 4,5,6,7,8	2C.41	30 x 30	30 x 30	36 x 36	–	24 x 24	48 x 48
Traffic Entering When Flashing	W2-10	2C.42	36 x 36	36 x 36	48 x 48	–	–	–
Traffic Approaching When Flashing	W2-11	2C.42	36 x 36	36 x 36	48 x 48	–	–	–
Stop, Yield, Signal Ahead	W3-1,2,3	2C.35	30 x 30	30 x 30	48 x 48	48 x 48	30 x 30	–
Be Prepared to Stop	W3-4	2C.35	36 x 36	36 x 36	48 x 48	48 x 48	30 x 30	–
Reduced Speed Limit Ahead	W3-5	2C.40	36 x 36	36 x 36	48 x 48	48 x 48	–	–
XX MPH Speed Zone Ahead	W3-5a	2C.40	36 x 36	36 x 36	48 x 48	48 x 48	–	–
Variable Speed Zone Ahead	W3-5b	2C.40	36 x 36	36 x 36	48 x 48	48 x 48	–	–
XX MPH Truck Speed Zone Ahead	W3-5c	2C.40	36 x 36	36 x 36	48 x 48	48 x 48	–	–
Draw Bridge	W3-6	2C.36	36 x 36	36 x 36	48 x 48	–	–	60 x 60
Ramp Meter Ahead	W3-7	2C.37	36 x 36	36 x 36	–	–	–	–
Ramp Metered When Flashing	W3-8	2C.37	36 x 36	36 x 36	–	–	–	–
Merge	W4-1	2C.45	36 x 36	36 x 36	48 x 48	48 x 48	30 x 30*	–
Lane Ends	W4-2	2C.47	36 x 36	36 x 36	48 x 48	48 x 48	30 x 30*	–
Added Lane	W4-3	2C.46	36 x 36	36 x 36	48 x 48	48 x 48	30 x 30*	–
Cross Traffic Does Not Stop (plaque)	W4-4P	2C.66	24 x 12	24 x 12	36 x 18	–	–	48 x 24
Traffic From Left (Right) Does Not Stop (plaque)	W4-4aP	2C.66	24 x 12	24 x 12	36 x 18	–	–	48 x 24
Oncoming Traffic Does Not Stop (plaque)	W4-4bP	2C.66	24 x 12	24 x 12	36 x 18	–	–	48 x 24
Entering Roadway Merge	W4-5	2C.45	36 x 36	36 x 36	48 x 48	48 x 48	–	–
No Merge Area (plaque)	W4-5aP	2C.45	18 x 24	18 x 24	24 x 30	24 x 30	–	–
Entering Roadway Added Lane	W4-6	2C.46	36 x 36	36 x 36	48 x 48	48 x 48	–	–
Heavy Merge from Right (Left)	W4-7	2C.49	36 x 36	36 x 36	48 x 48	48 x 48	–	
Single Lane Transition	W4-8	2C.48	36 x 36	36 x 36	36 x 36	48 x 48	–	48 x 48
Road Narrows	W5-1	2C.17	36 x 36	36 x 36	48 x 48	48 x 48	30 x 30*	–
Narrow Bridge	W5-2	2C.18	36 x 36	36 x 36	48 x 48	48 x 48	30 x 30*	–
Narrow Underpass	W5-2a	2C.18	36 x 36	36 x 36	48 x 48	48 x 48	30 x 30*	
One Lane Bridge	W5-3	2C.19	36 x 36	36 x 36	48 x 48	48 x 48	30 x 30*	–
One Lane Underpass	W5-3a	2C.19	36 x 36	36 x 36	48 x 48	48 x 48	30 x 30*	
Divided Highway	W6-1	2C.20	36 x 36	36 x 36	48 x 48	48 x 48	–	–
Divided Highway Ends	W6-2	2C.21	36 x 36	36 x 36	48 x 48	48 x 48	–	–
Two-Way Traffic	W6-3	2C.51	36 x 36	36 x 36	48 x 48	48 x 48	–	–
Two-Way Traffic (3-Lane)	W6-5	2C.52	36 x 36	36 x 36	48 x 48	–	–	–
Two-Way Traffic (3-Lane)	W6-5a	2C.52	36 x 36	36 x 36	48 x 48	–	–	–
Hill	W7-1	2C.14	30 x 30*	36 x 36	36 x 36	36 x 36	24 x 24*	48 x 48
Hill with Grade	W7-1a	2C.14	30 x 30*	36 x 36	36 x 36	36 x 36	24 x 24*	48 x 48

Table 2C-1. Warning Sign and Plaque Sizes (Sheet 2 of 4)

Sign or Plaque	Sign Designation	Section	Conventional Road		Expressway	Freeway	Minimum	Oversized
			Single Lane	Multi-Lane				
Use Low Gear (plaque)	W7-2P	2C.64	24 x 18	24 x 18	–	–	–	–
Trucks Use Lower Gear (plaque)	W7-2bP	2C.64	24 x 18	24 x 18	–	–	–	–
XX% Grade (plaque)	W7-3P	2C.64	24 x 18	24 x 18	–	–	–	–
Next XX Miles (plaque)	W7-3aP	2C.61	24 x 18	24 x 18	–	–	–	–
XX% Grade, XX Miles (plaque)	W7-3bP	2C.64	24 x 18	24 x 18	–	–	–	–
Runaway Truck Ramp XX Miles	W7-4	2C.15	84 x 48	84 x 48	120 x 72	120 x 72	–	–
Runaway Truck Ramp Entrance Direction	W7-4b	2C.15	84 x 54	84 x 54	120 x 78	120 x 78	–	–
Truck Escape Ramp	W7-4c	2C.15	78 x 60	78 x 60	78 x 60	78 x 60	–	–
Sand, Gravel, Paved (plaques)	W7-4dP, 4eP,4fP	2C.15	24 x 12	24 x 12	24 x 12	24 x 12	–	–
Hill Blocks View	W7-6	2C.16	30 x 30*	36 x 36	36 x 36	–	–	48 x 48
Bump or Dip	W8-1,2	2C.26	30 x 30*	36 x 36	36 x 36	48 x 48	24 x 24*	48 x 48
Pavement Ends	W8-3	2C.28	36 x 36	36 x 36	48 x 48	–	30 x 30*	–
Soft Shoulder	W8-4	2C.29	36 x 36	36 x 36	48 x 48	48 x 48	24 x 24*	48 x 48
Slippery When Wet	W8-5	2C.30	30 x 30*	36 x 36	36 x 36	48 x 48	24 x 24*	48 x 48
Road Condition (plaques)	W8-5P,5bP,5cP	2C.30	24 x 18	24 x 18	30 x 24	36 x 30	–	36 x 30
Ice (plaque)	W8-5aP	2C.30	24 x 12	24 x 12	30 x 18	30 x 18	–	–
Truck Crossing	W8-6	2C.54	36 x 36	36 x 36	36 x 36	48 x 48	24 x 24*	48 x 48
Loose Gravel	W8-7	2C.30	36 x 36	36 x 36	36 x 36	–	24 x 24*	48 x 48
Rough Road	W8-8	2C.30	36 x 36	36 x 36	36 x 36	48 x 48	24 x 24*	48 x 48
Low Shoulder	W8-9	2C.29	36 x 36	36 x 36	36 x 36	48 x 48	24 x 24*	48 x 48
Uneven Lanes	W8-11	2C.30	36 x 36	36 x 36	36 x 36	48 x 48	–	48 x 48
No Center Line	W8-12	2C.32	36 x 36	36 x 36	36 x 36	48 x 48	–	–
Bridge Ices Before Road	W8-13	2C.30	36 x 36	36 x 36	36 x 36	48 x 48	24 x 24*	48 x 48
Fallen Rocks	W8-14	2C.30	30 x 30*	36 x 36	36 x 36	48 x 48	24 x 24*	48 x 48
Grooved Pavement	W8-15	2C.31	30 x 30*	36 x 36	36 x 36	48 x 48	24 x 24*	48 x 48
Motorcycle (plaque)	W8-15aP	2C.31	24 x 18	24 x 18	30 x 24	36 x 30	–	36 x 30
Metal Bridge Deck	W8-16	2C.31	30 x 30*	36 x 36	36 x 36	48 x 48	24 x 24*	48 x 48
Shoulder Drop-Off	W8-17	2C.29	30 x 30*	36 x 36	36 x 36	48 x 48	24 x 24*	48 x 48
Shoulder Drop-Off (plaque)	W8-17P	2C.29	24 x 18	24 x 18	30 x 24	36 x 30	–	36 x 30
Road May Flood	W8-18	2C.34	36 x 36	36 x 36	36 x 36	48 x 48	24 x 24*	48 x 48
Depth Gauge	W8-19	2C.34	12 x 72	12 x 72	–	–	–	–
Gusty Winds Area	W8-21	2C.34	36 x 36	36 x 36	36 x 36	48 x 48	24 x 24*	48 x 48
Fog Area	W8-22	2C.34	36 x 36	36 x 36	36 x 36	48 x 48	24 x 24*	48 x 48
No Shoulder	W8-23	2C.29	36 x 36	36 x 36	36 x 36	48 x 48	24 x 24*	48 x 48
Shoulder Ends	W8-25	2C.29	30 x 30*	36 x 36	36 x 36	48 x 48	24 x 24*	48 x 48
Road Ends	W8-26	2C.24	30 x 30	36 x 36	–	–	–	–
Street Ends	W8-26a	2C.24	30 x 30	36 x 36	–	–	–	–
Right (Left) Lane Ends	W9-1	2C.47	36 x 36	36 x 36	36 x 36	48 x 48	30 x 30*	48 x 48
Lanes Merge	W9-4	2C.48	36 x 36	36 x 36	36 x 36	48 x 48	30 x 30*	48 x 48
Right (Left) Lane for Exit Only	W9-7	2C.50	60 x 36	60 x 36	96 x 60	132 x 72	–	–
Bicycle	W11-1	2C.54	30 x 30	30 x 30	36 x 36	–	–	48 x 48
Pedestrian	W11-2	2C.55	30 x 30*	36 x 36	36 x 36	–	–	48 x 48
Large Animals	W11-3,4,16,17, 18,19,20,21,22	2C.55	30 x 30*	36 x 36	36 x 36	–	24 x 24*	48 x 48
Farm Vehicle	W11-5	2C.54	30 x 30*	36 x 36	36 x 36	–	24 x 24*	48 x 48
Snowmobile	W11-6	2C.55	30 x 30*	36 x 36	36 x 36	–	24 x 24*	48 x 48
Equestrian	W11-7	2C.55	30 x 30*	36 x 36	36 x 36	–	24 x 24*	48 x 48

Table 2C-1. Warning Sign and Plaque Sizes (Sheet 3 of 4)

Sign or Plaque	Sign Designation	Section	Conventional Road		Expressway	Freeway	Minimum	Oversized
			Single Lane	Multi-Lane				
Emergency Vehicle	W11-8	2C.54	30 x 30*	36 x 36	36 x 36	–	24 x 24*	48 x 48
Handicapped	W11-9	2C.55	30 x 30*	36 x 36	36 x 36	–	–	48 x 48
Truck	W11-10	2C.54	30 x 30*	36 x 36	36 x 36	–	24 x 24*	48 x 48
Golf Cart	W11-11	2C.54	30 x 30*	36 x 36	36 x 36	–	24 x 24*	48 x 48
Emergency Signal Ahead (plaque)	W11-12P	2C.54	36 x 30	36 x 30	36 x 30	–	–	–
Horse-Drawn Vehicle	W11-14	2C.54	30 x 30*	36 x 36	36 x 36	–	24 x 24*	48 x 48
Trail Crossing	W11-15	2C.54	30 x 30*	36 x 36	36 x 36	–	24 x 24*	48 x 48
Trail Crossing	W11-15a	2C.54	30 x 30*	36 x 36	36 x 36	–	24 x 24*	48 x 48
Trail Crossing (plaque)	W11-15P	2C.54	24 x 18	24 x 18	30 x 24	–	–	36 x 30
Double Arrow	W12-1	2C.23	30 x 30*	36 x 36	36 x 36	–	–	–
Low Clearance Advance	W12-2	2C.25	36 x 36	36 x 36	48 x 48	48 x 48	30 x 30*	–
Low Clearance Overhead	W12-2a	2C.25	84 x 24	84 x 24	84 x 24	84 x 24	–	–
Low Clearance - Lane Overhead	W12-2b	2C.25	102 x 24	102 x 24	102 x 24	102 x 24	–	–
Advisory Speed (plaque)	W13-1P	2C.59	18 x 18	18 x 18	24 x 24	30 x 30	–	30 x 30
Advisory Speed Confirmation (plaque)	W13-1aP	2C.59	48 x 15	48 x 15	60 x 18	60 x 18	48 x 15	72 x 24
Advisory Exit or Ramp Speed	W13-2,3	2C.12	24 x 30	24 x 30	36 x 48	36 x 48	–	48 x 60
Combination Horizontal Alignment/Advisory Exit or Ramp Speed Loop	W13-6,7,8,9	2C.12	24 x 42	24 x 42	36 x 66	36 x 66	–	48 x 84
Combination Horizontal Alignment/Advisory Exit or Ramp Speed Turn	W13-10,11	2C.12	24 x 36	24 x 36	36 x 54	36 x 54	–	48 x 72
Combination Horizontal Alignment/Advisory Exit or Ramp Speed - Truck Rollover	W13-12,13	2C.12	24 x 42	24 x 42	36 x 66	36 x 66	–	48 x 84
Vehicle Speed Feedback Sign	W13-20	2C.13	24 x 30	30 x 36	36 x 48	48 x 60	–	–
Vehicle Speed Feedback (plaque)	W13-20aP	2C.13	24 x 18	30 x 24	36 x 30	48 x 36	–	–
Dead End, No Outlet	W14-1,2	2C.24	30 x 30*	36 x 36	36 x 36	–	24 x 24*	48 x 48
Dead End, No Outlet (with arrow)	W14-1a,2a	2C.24	36 x 9	36 x 9	–	–	–	–
No Passing Zone	W14-3	2C.53	48 x 48 x 36	48 x 48 x 36	64 x 64 x 48	64 x 64 x 48	40 x 40 x 30	64 x 64 x 48
Playground	W15-1	2C.56	30 x 30*	36 x 36	36 x 36	–	24 x 24*	48 x 48
In Road (plaque)	W16-1P	2C.67	18 x 12	18 x 12	24 x 18	–	–	24 x 18
In Street (plaque)	W16-1aP	2C.67	18 x 12	18 x 12	24 x 18	–	–	24 x 18
XX Feet (2-line plaque)	W16-2P	2C.61	24 x 18	24 x 18	30 x 24	30 x 24	–	30 x 24
XX Ft (1-line plaque)	W16-2aP	2C.61	24 x 12	24 x 12	–	–	–	30 x 18
XX Miles (2-line plaque)	W16-3P	2C.61	30 x 24	30 x 24	–	–	–	–
XX Miles (1-line plaque)	W16-3aP	2C.61	30 x 12	30 x 12	–	–	–	–
Next XX Feet (plaque)	W16-4P	2C.61	30 x 24	30 x 24	–	–	–	–
Supplemental Arrow (plaque)	W16-5P,6P	2C.62	21 x 15	21 x 15	–	–	–	30 x 21
Diagonal Downward Arrow (plaque)	W16-7P	2C.63	21 x 15	21 x 15	–	–	–	30 x 21
Dual Downward Diagonal Arrow (plaque)	W16-7aP	2C.63	21 x 15	21 x 15	–	–	–	30 x 21
Advance Street Name (1-line plaque)	W16-8P	2C.65	Varies x 8	Varies x 8	–	–	–	–
Advance Street Name (2-line plaque)	W16-8aP	2C.65	Varies x 15	Varies x 15	–	–	–	–
Ahead (plaque)	W16-9P	2C.55	24 x 12	24 x 12	30 x 18	–	–	30 x 18
Photo Enforced (symbol plaque)	W16-10P	2C.69	24 x 12	24 x 12	36 x 18	–	–	48 x 24
Photo Enforced (plaque)	W16-10aP	2C.69	24 x 18	24 x 18	36 x 30	–	–	48 x 36

Table 2C-1. Warning Sign and Plaque Sizes (Sheet 4 of 4)

Sign or Plaque	Sign Designation	Section	Conventional Road		Expressway	Freeway	Minimum	Oversized
			Single Lane	Multi-Lane				
Traffic Circle (plaque)	W16-12P	2C.41	24 x 18	24 x 18	–	–	–	–
Roundabout (plaque)	W16-12aP	2C.41	24 x 12	24 x 12	–	–	–	–
When Flashing (plaque)	W16-13P	2C.55	24 x 18	24 x 18	–	–	–	–
New (plaque)	W16-15P	2C.60	24 x 12	24 x 12	–	–	–	–
Notice (plaque)	W16-18P	2A.11	24 x 12	24 x 12	–	–	–	–
Except Bicycles (plaque)	W16-20P	2C.68	24 x 12	24 x 12	–	–	–	–
Speed Hump	W17-1	2C.27	30 x 30*	36 x 36	–	–	24 x 24*	48 x 48
No Traffic Signs	W18-1	2C.33	30 x 30*	36 x 36	–	–	24 x 24*	36 x 36
Freeway Ends XX Miles	W19-1	2C.22	–	–	–	144 x 48	–	–
Expressway Ends XX Miles	W19-2	2C.22	–	–	144 x 48	–	–	–
Freeway Ends	W19-3	2C.22	–	–	–	48 x 48	–	–
Expressway Ends	W19-4	2C.22	–	–	48 x 48	–	–	–
All Traffic Must Exit	W19-5	2C.22	–	–	90 x 48	90 x 48	–	–
New Traffic Pattern Ahead	W23-2	2C.38	36 x 36	36 x 36	–	–	–	–
New Signal Operation Ahead	W23-2a	2C.38	36 x 36	36 x 36	48 x 48	48 x 48	–	–
Oncoming Traffic Has (May Have) Extended Green	W25-1,2	2C.44	24 x 30	24 x 30	–	–	–	–
Watch for Stopped Traffic	W26-1	2C.39	36 x 36	36 x 36	48 x 48	48 x 48	–	–

04 The minimum size for supplemental warning plaques that are not included in Table 2C-1 shall be as shown in Table 2C-2.

Table 2C-2. Minimum Size of Supplemental Warning Plaques

Size of Warning Sign	Size of Supplemental Plaque			
	Rectangular			Square
	1 Line	2 Lines	Arrow	
24 x 24 30 x 30	24 x 12	24 x 18	21 x 15	18 x 18
36 x 36 48 x 48	30 x 18	30 x 24	30 x 21	24 x 24

Notes:
1. Larger supplemental plaques may be used when appropriate
2. Dimensions are shown as width x height, in inches

Option:

05 If a diamond-shaped warning sign is placed on the left-hand side of a multi-lane roadway to supplement the installation of the same warning sign on the right-hand side of the roadway, the minimum size identified in the Single Lane column in Table 2C-1 may be used.

06 Signs and plaques larger than those shown in Tables 2C-1 and 2C-2 may be used (see Section 2A.11).

Guidance:

07 The minimum size for all diamond-shaped warning signs facing traffic on exit and entrance ramps at major interchanges connecting an Expressway or Freeway with an Expressway or Freeway (see Section 2E.11) should be the size identified in Table 2C-1 for the mainline roadway classification (Expressway or Freeway). If a minimum size is not provided in the Freeway Column, the Expressway size should be used. If a minimum size is not provided in the Freeway or the Expressway Column, the Oversized size should be used.

08 The minimum size for all diamond-shaped warning signs facing traffic on exit and entrance ramps at all other interchanges (see Section 2E.11) should be 36 x 36 inches.

09 The typical size of warning signs used on low-volume rural roads with operating speeds of 30 mph or less should be in accordance with the minimum column of Table 2C-1.

Section 2C.04 Placement of Warning Signs

Support:

01 Information on the placement of warning signs is contained in Sections 2A.13 through 2A.18.

02 The time needed for detection, recognition, decision, and reaction is called the Perception-Response Time (PRT). Table 2C-3 is provided as an aid for determining warning sign location. The distances shown in Table 2C-3 can be adjusted for roadway features, other signing, and to improve visibility.

Guidance:

03 Warning signs should be placed so that they provide an adequate PRT. The distances contained in Table 2C-3 should be applied with engineering judgment.

04 Minimum spacing between warning signs with different messages should be based on the estimated PRT for driver comprehension of and reaction to the second sign.

05 The effectiveness of the placement of warning signs should be periodically evaluated under both day and night conditions.

Table 2C-3. Guidelines for Advance Placement of Warning Signs

Posted or 85th-Percentile Speed	Advance Placement Distance[1]									
	Condition A: Speed reduction and lane changing in heavy traffic[2]	Condition B: Deceleration to the listed advisory speed (mph) for the condition								
		0[3]	10[4]	20[4]	30[4]	40[4]	50[4]	60[4]	70[4]	80[4]
20 mph	225 ft	115 ft	N/A[5]	–	–	–	–	–	–	–
25 mph	325 ft	155 ft	N/A[5]	N/A[5]	–	–	–	–	–	–
30 mph	460 ft	200 ft	N/A[5]	N/A[5]	–	–	–	–	–	–
35 mph	565 ft	250 ft	N/A[5]	N/A[5]	N/A[5]	–	–	–	–	–
40 mph	670 ft	305 ft	100 ft[6]	100 ft[6]	N/A[5]	–	–	–	–	–
45 mph	775 ft	360 ft	125 ft	100 ft[6]	100 ft[6]	N/A[5]	–	–	–	–
50 mph	885 ft	425 ft	200 ft	175 ft	125 ft	100 ft[6]	–	–	–	–
55 mph	990 ft	495 ft	275 ft	225 ft	200 ft	125 ft	N/A[5]	–	–	–
60 mph	1,100 ft	570 ft	350 ft	325 ft	275 ft	200 ft	100 ft[6]	–	–	–
65 mph	1,200 ft	645 ft	450 ft	400 ft	350 ft	275 ft	200 ft	100 ft[6]	–	–
70 mph	1,250 ft	730 ft	525 ft	500 ft	450 ft	375 ft	275 ft	150 ft	–	–
75 mph	1,350 ft	820 ft	625 ft	600 ft	550 ft	475 ft	375 ft	250 ft	100 ft[6]	–
80 mph	1,475 ft	910 ft	725 ft	700 ft	625 ft	550 ft	450 ft	350 ft	200 ft	–
85 mph	1,600 ft	1,010 ft	825 ft	800 ft	750 ft	675 ft	575 ft	450 ft	300 ft	150 ft

[1] The distances are adjusted for a sign legibility distance of 180 feet for Condition A. The distances for Condition B (with the exception of the potential stop condition) have been adjusted for a sign legibility distance of 250 feet, which is appropriate for an alignment warning symbol sign. For Conditions A and B, warning signs with less than 6-inch legend or more than four words, a minimum of 100 feet should be added to the advance placement distance to provide adequate legibility of the warning sign.

[2] Typical conditions are locations where the road user must use extra time to adjust speed and change lanes in heavy traffic because of a complex driving situation. Typical signs are Merge and Lane Ends. The distances are determined by providing the driver a PRT of 14.0 to 14.5 seconds for vehicle maneuvers (2018 AASHTO Policy, Table 3-3, Decision Sight Distance, Avoidance Maneuver E) and adjusted for a legibility distance of 180 feet for the appropriate sign.

[3] Typical condition is the warning of a potential stop situation. Typical signs are Stop Ahead, Yield Ahead, Signal Ahead, and Intersection Warning signs. The distances are based on the 2018 AASHTO Policy, Table 3-1, Stopping Sight Distance, providing a PRT of 2.5 seconds, a deceleration rate of 11.2 feet/second^2.

[4] Typical conditions are locations where the road user must decrease speed to maneuver through the warned condition. Typical signs are Turn, Curve, Reverse Turn, or Reverse Curve. The distance is determined by providing a 2.5 second PRT, a vehicle deceleration rate of 10 feet/second^2, and adjusted for a sign legibility distance of 250 feet.

[5] No suggested distances are provided for these speeds, as the placement location is dependent on site conditions and other signing. An alignment warning sign may be placed anywhere from the point of curvature up to 100 feet in advance of the curve. However, the alignment warning sign should be installed in advance of the curve and at least 100 feet from any other signs.

[6] The minimum advance placement distance is listed as 100 feet to provide adequate spacing between signs.

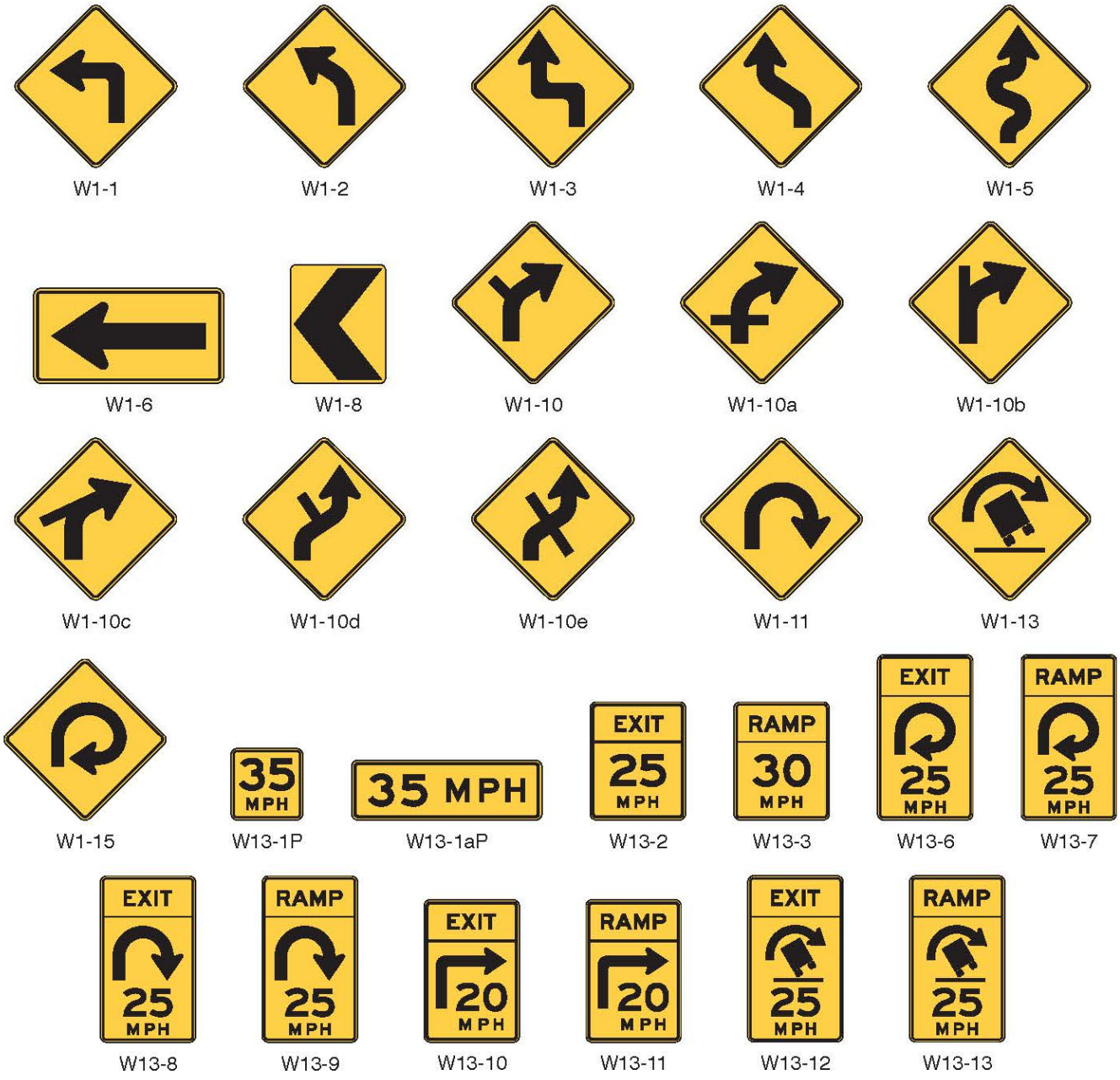
Note: Warning signs that advise road users about conditions that are not related to a specific location, such as Deer Crossing or SOFT SHOULDER, can be installed in an appropriate location, based on engineering judgment.

Section 2C.05 Horizontal Alignment Warning Signs – General

Support:

01 A variety of horizontal alignment warning signs (see Figure 2C-1), pavement markings (see Chapter 3B), and delineation (see Chapter 3G) can be used to advise motorists of a change in the roadway alignment. Uniform application of these traffic control devices with respect to the amount of change in the roadway alignment conveys a consistent message establishing driver expectancy and promoting effective roadway operations. The design and application of horizontal alignment warning signs to meet those requirements are addressed in Sections 2C.05 through 2C.12.

Figure 2C-1. Horizontal Alignment Signs and Plaques



Note: Turn arrows and reverse turn arrows may be substituted for the curve arrows and reverse curve arrows on the W1-10 series signs where appropriate.

02 The following list identifies treatments that might be used in advance of or within a change in horizontal alignment:

A. Horizontal alignment (Turn (W1-1), Curve (W1-2, W1-10 series, W1-11, W1-13, W1-15), Reverse Turn (W1-3), Reverse Curve (W1-4), Winding Road (W1-5), Exit Speed (W13-2), Ramp Speed (W13-3), and Combination Horizontal Alignment (Advisory Exit or Ramp Speed W13-6 through W13-11)) signs (see Sections 2C.07, 2C.09, and 2C.12)

B. Advisory Speed (W13-1P) plaque (see Section 2C.59)

C. Chevron Alignment (W1-8) signs (see Section 2C.08)

D. Delineators (see Chapter 3G)

E. One Direction Large Arrow (W1-6) sign (see Section 2C.10)

F. Raised Retroreflective Pavement Markers (see Sections 3B.15 through 3B.17)

G. Sign or marking conspicuity enhancements (see Section 2A.11)

H. Wide edge lines (see Section 3A.04)

I. Pavement word, symbol and arrow markings (symbol or words) (see Sections 3B.20 through 3B.22)

J. Rumble strips (see Chapter 3K)

K. Vehicle Speed Feedback Sign (see Section 2C.13)

L. Speed reduction markings (see Section 3B.28)

03 In addition, considerations other than traffic control devices, such as improved surface friction (high friction surface treatments), pavement edge treatments, lighting improvements, increased superelevation, and rumble strips, might be used in advance of or within a change in horizontal alignment.

Guidance:

04 Except as provided in Section 2C.06, the selection of traffic control devices used to warn road users of a change in horizontal alignment or to provide guidance in navigating the change in horizontal alignment should be based on consideration of one or more of the following factors:

A. The speed of traffic on the approach to the change in horizontal alignment

B. The recommended advisory speed for the change in horizontal alignment

C. The difference between the speed limit and the advisory speed, or the speed differential for the change in horizontal alignment

D. Daily traffic volumes on the roadway

E. The typical mix of vehicle types on the roadway

F. Sight distance throughout the change in horizontal alignment

G. Other types of traffic control devices that are used in advance of and within the change in horizontal alignment on the same roadway segment

H. The crash history of the change in horizontal alignment

I. The presence of driveways or intersections within the curve radius

Section 2C.06 Device Selection for Changes in Horizontal Alignment

Standard:

01 The criteria shown in Chart A of Table 2C-4 shall be used to determine the need for devices for changes in horizontal alignment. If the use of a device or devices is indicated by Chart A of Table 2C-4, then Chart B of Table 2C-4 shall be used to specify the type(s) of devices to be used in advance of, and/or along, a horizontal curve, except as provided in Paragraphs 3, 5, and 6 of this Section. The speed differential in Chart B of Table 2C-4 shall be the difference between the horizontal curve's advisory speed and the roadway's posted speed limit, statutory speed limit, or the 85th percentile speed on the approach to the curve. (See Section 2C.59 for the use of the Advisory Speed Plaque.)

Support:

02 Chart A of Table 2C-4 represents existing AADT, type of roadway, and whether or not there are existing markings.

Option:

03 Additional or supplemental devices may be used for a change in horizontal alignment on the basis of engineering judgment.

Table 2C-4. Application of Traffic Control Devices for Changes in Horizontal Alignment

A - Determination of the Need for Devices for Changes in Horizontal Alignment[1]

Roadway Type	AADT			
	Less than 1,000	1,000-2,999	3,000-3,999	Greater than 3,999
Freeways and Expressways	Required	Required	Required	Required
Arterial or Collector without Pavement Markings	Optional	Recommended	Required	Required
Arterial or Collector with Pavement Markings[2]	Optional	Recommended	Recommended	Required
All other roadways	Optional	Optional	Optional	Optional

[1] If devices are determined to be needed, the selection of the device(s) is based on Chart B below.

[2] An arterial or collector is considered to have pavement markings when either a center line, edge lines, or both are present.

B - Selection of Devices for Changes in Horizontal Alignment

Speed Differential[3]	Devices for Change in Horizontal Alignment[3,6]
5 mph	Pavement markings or advance horizontal alignment warning sign on paved roadways. Advance horizontal alignment warning sign on unpaved roadways.[4]
10 mph	Advance horizontal alignment warning sign
15 mph	Delineators[5] and advance horizontal alignment warning sign
20 mph or more	Chevrons[5] and advance horizontal alignment warning sign

[3] The provisions for the use of Horizontal Alignment warning signs and devices are contained in Section 2C.06. The need for devices is determined by Chart A above.

[4] A roadway is considered to have pavement markings when either a center line, edge lines, or both are present.

[5] Section 2C.10 contains information about the use of a One-Direction Large Arrow (W1-6) sign in place of or to supplement delineators and chevrons.

[6] See Section 2C.59 for the use of the Advisory Speed Plaque.

04 Devices for changes in horizontal alignment may be omitted when the speed limit on the approach to an alignment change is 20 mph or less.

05 Devices for changes in horizontal alignment may be omitted on urban streets with an AADT of 1,000 vehicles per day or less.

Support:

06 For purposes of selecting traffic control devices for changes in horizontal alignment, an arterial or collector is considered to have pavement markings when either a center line, edge lines, or both are present. Warrants for center lines and edge lines are provided in Sections 3B.02 and 3B.10, respectively.

Section 2C.07 Horizontal Alignment Signs (W1-1 through W1-5, W1-11, and W1-15)

Standard:

01 If Table 2C-4 indicates that a horizontal alignment sign (see Figure 2C-1) is required, recommended, or allowed, the sign installed in advance of the curve shall be a Curve (W1-2) sign unless a different sign is recommended or allowed by the provisions of this Section.

Guidance:

02 A Turn (W1-1) sign should be used instead of a Curve (W1-2) sign in advance of a horizontal curve that has an advisory speed of 30 mph or less.

Standard:

03 Where there are two changes in roadway alignment in opposite directions that are separated by a tangent distance of less than 600 feet, the Reverse Turn (W1-3) sign shall be used instead of multiple Turn (W1-1) signs or the Reverse Curve (W1-4) sign should be used instead of multiple Curve (W1-2) signs.

Guidance:

When an Advisory Speed Plaque (W13-1P) is used to supplement a Reverse Turn (W1-3) or Reverse Curve (W1-4) sign, it should display the advisory speed of whichever curve or turn has the lower advisory speed.

Support:

04 Figure 2C-2 provides examples of warning signs used for turns and curves.

Standard:

05 A Winding Road (W1-5) sign shall be used instead of multiple Turn (W1-1) or Curve (W1-2) signs where there are three or more changes in roadway alignment each separated by a tangent distance of less than 600 feet.

Option:

06 A NEXT XX MILES (W7-3aP) supplemental distance plaque (see Section 2C.61) may be installed below the Winding Road sign where continuous roadway curves exist for a specific distance.

Figure 2C-2. Examples of Warning Signs for Changes in Horizontal Alignment (Sheet 1 of 2)

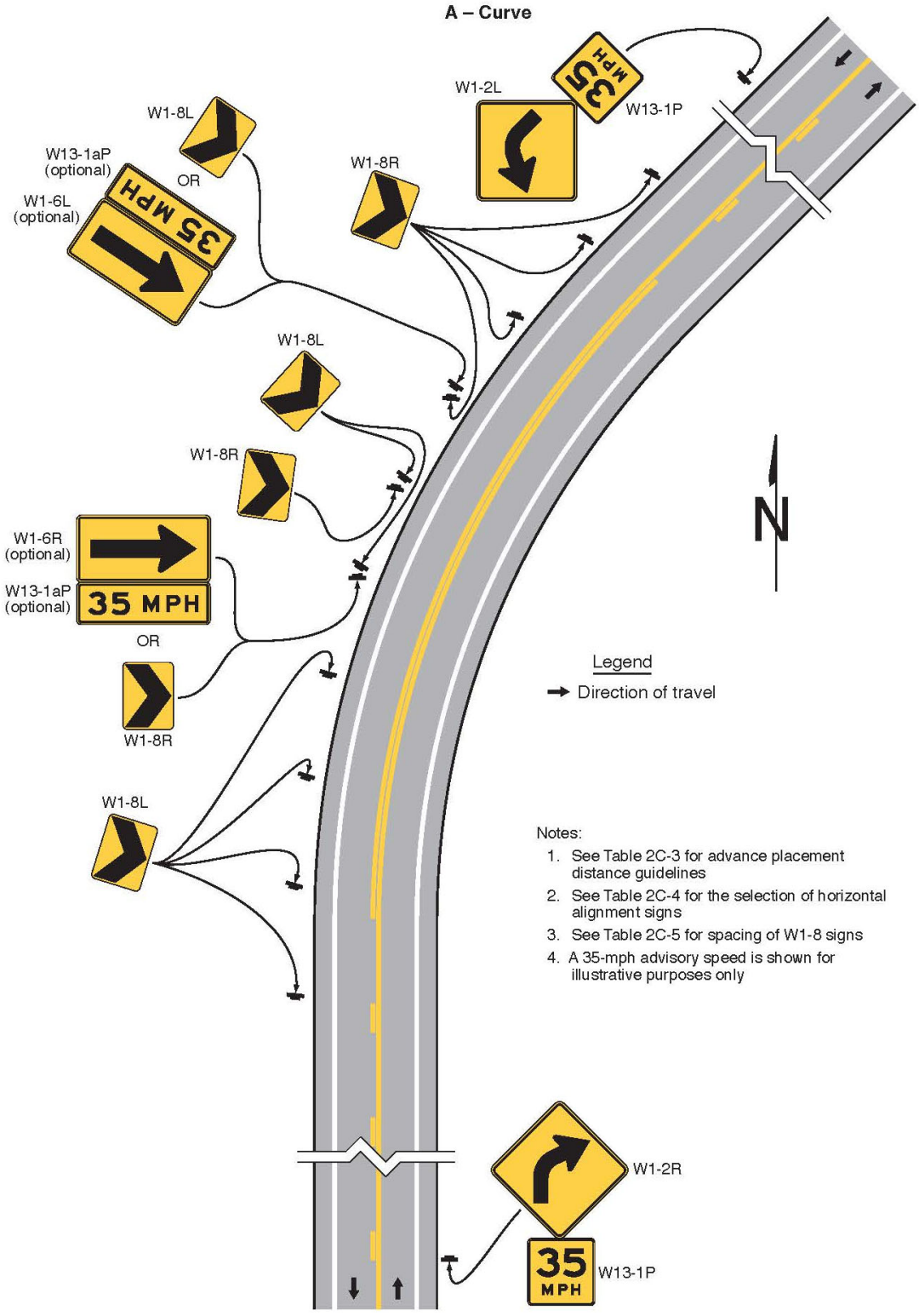
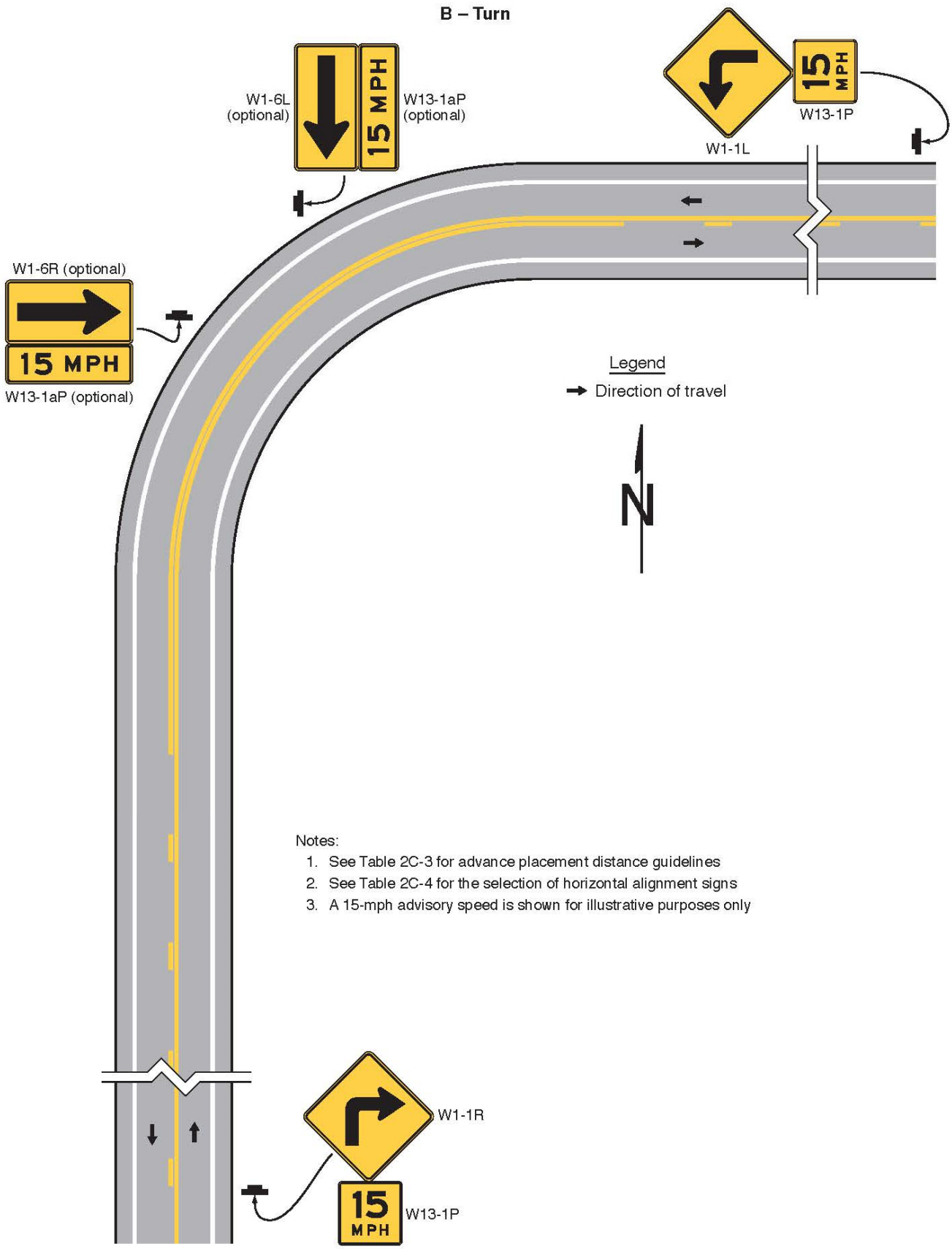


Figure 2C-2. Examples of Warning Signs for Changes in Horizontal Alignment (Sheet 2 of 2)



07 If the curve has a change in horizontal alignment of 135 degrees or more, the Hairpin Curve (W1-11) sign may be used instead of a Turn or Curve sign.

08 If the curve has a change of direction of approximately 270 degrees, such as on a cloverleaf interchange ramp, the 270-degree Loop (W1-15) sign may be used instead of a Turn or Curve sign.

Guidance:

09 When the Hairpin Curve sign or the 270-degree Loop sign is installed, either a One-Direction Large Arrow (W1-6) sign or Chevron Alignment (W1-8) signs should be installed on the outside of the turn or curve.

Section 2C.08 Chevron Alignment Sign (W1-8)

Standard:

01 The use of the Chevron Alignment (W1-8) sign (see Figures 2C-1 and 2C-2) to provide additional emphasis and guidance for a change in horizontal alignment shall be in accordance with the information shown in Table 2C-4.

Option:

02 Chevron Alignment signs may be used instead of or in addition to standard delineators.

Standard:

03 The Chevron Alignment sign shall be a vertical rectangle. No border shall be used on the Chevron Alignment sign.

04 If used, Chevron Alignment signs shall be installed on the outside of a turn or curve, in line with and at approximately a right angle to approaching traffic. Chevron Alignment signs shall be installed at a minimum height of 4 feet, measured vertically from the bottom of the sign to the elevation of the near edge of the traveled way.

Table 2C-5. Typical Spacing of Chevron Alignment Signs on Horizontal Curves

Advisory Speed	Curve Radius	Sign Spacing
15 mph or less	Less than 200 feet	40 feet
20 to 30 mph	200 to 400 feet	80 feet
35 to 45 mph	401 to 700 feet	120 feet
50 to 60 mph	701 to 1,250 feet	160 feet
More than 60 mph	More than 1,250 feet	200 feet

Note: The relationship between the curve radius and the advisory speed shown in this table should not be used to determine the advisory speed.

Guidance:

05 The approximate spacing of Chevron Alignment signs on the turn or curve measured from the point of curvature (PC) should be as shown in Table 2C-5.

06 The Chevron Alignment signs should be visible for a sufficient distance to provide the road user with adequate time to react to the change in alignment.

Option:

07 LEDs may be used to enhance the conspicuity of Chevron Alignment signs (see Section 2A.12).

Standard:

08 The LEDs used in the Chevron Alignment sign shall consist of yellow LEDs outlining the chevron symbol.

09 Chevron Alignment signs shall not be placed on the far side of a T-intersection facing traffic on the stem approach to warn drivers that a through movement is not physically possible, as this is the function of a Two-Direction (or One-Direction) Large Arrow sign.

10 Chevron Alignment signs shall not be used to mark obstructions within or adjacent to the roadway, including the beginning of guardrails or barriers, as this is the function of an object marker (see Section 2C.70).

11 Chevron Alignment signs directing traffic to the right shall not be used in the central island of a roundabout or a neighborhood traffic circle.

Section 2C.09 Combination Horizontal Alignment/Intersection Signs (W1-10 Series)

Option:

01 The Turn (W1-1) sign, the Curve (W1-2) sign, and the Reverse Curve (W1-4) sign may be combined with the Cross Road (W2-1) sign or the Side Road (W2-2 or W2-3) sign to create a combination Horizontal Alignment/Intersection (W1-10 series) sign (see Figure 2C-1) that depicts the condition where an intersection occurs within or immediately adjacent to a turn or curve.

Support:

02 Section 2C.65 contains information about the use of an advance street name plaque to identify an intersecting road.

Guidance:

03 Elements of the combination Horizontal Alignment/Intersection sign related to horizontal alignment should comply with the provisions of Section 2C.07, and elements related to intersection configuration should comply with the provisions of Section 2C.41. The symbol design should approximate the configuration of the intersecting roadway(s). No more than one Cross Road or two Side Road symbols should be displayed on any one combination Horizontal Alignment/Intersection sign.

Standard:

04 The use of the combination Horizontal Alignment/Intersection sign shall be in accordance with the provisions of Section 2C.07 for the appropriate Turn or Curve sign .

Section 2C.10 One-Direction Large Arrow Sign (W1-6)

Option:

01 A One-Direction Large Arrow (W1-6) sign may be used to supplement a Turn (W1-1) or Reverse Turn (W1-3) sign (see Figure 2C-2) to emphasize the abrupt curvature.

02 A One-Direction Large Arrow (W1-6) sign (see Figure 2C-1) may be used either as a supplement or alternative to Chevron Alignment signs or delineators in order to delineate a change in horizontal alignment (see Figure 2C-2) when:

A. Site conditions limit the number of delineators or Chevron Alignment signs that are visible, or
B. The number of delineators or Chevron Alignment signs that can be installed within the change in horizontal alignment is less than the number determined by the spacing specified in Sections 2C.08 or 3G.04.

Standard:

03 The One-Direction Large Arrow sign shall be a horizontal rectangle with an arrow pointing to the left or right.

04 If used, the One-Direction Large Arrow sign shall be installed on the outside of a turn or curve in line with and at approximately a right angle to approaching traffic.

05 The One-Direction Large Arrow sign shall not be used where there is no alignment change in the direction of travel, such as at the beginnings and ends of medians or at center piers.

06 The One-Direction Large Arrow sign directing traffic to the right shall not be used in the central island of a roundabout or a neighborhood traffic circle.

Guidance:

07 The One-Direction Large Arrow sign should be visible for a sufficient distance to provide the road user with adequate time to react to the change in alignment.

Section 2C.11 Truck Rollover Sign (W1-13)

Option:

01 A Truck Rollover (W1-13) sign (see Figure 2C-1) may be used as a supplement to a horizontal alignment warning sign to warn drivers of vehicles with a high center of gravity, such as trucks, tankers, and recreational vehicles, of a curve or turn where there are:

A. Past incidents of truck rollovers at the specific location,
B. High volumes of trucks, or
C. A speed differential (see Section 2C.06) that might pose a greater risk for vehicles with high centers of gravity.

Guidance:

02 Where engineering judgment determines the need for the installation of a Truck Rollover (W1-13) sign, it should be located downstream of the horizontal alignment warning sign in advance of the curve.

Standard:

03 If a Truck Rollover (W1-13) sign is used, it shall be accompanied by an Advisory Speed (W13-1P) plaque indicating the recommended speed for vehicles with a higher center of gravity.

Option:

04 The Truck Rollover sign may include conspicuity enhancements, or may be a blank-out sign, activated by the detection of an approaching vehicle with a high center of gravity that is traveling in excess of the recommended speed for the condition.

Support:

05 The curved arrow on the Truck Rollover sign shows the direction of roadway curvature. The truck tips in the opposite direction.

Section 2C.12 Advisory Exit and Ramp Speed Signs (W13-2 and W13-3) and Combination Horizontal Alignment/Advisory Exit and Ramp Speed Signs (W13-6 through W13-13)

Standard:

01 Where an advisory speed is posted in advance of a freeway or expressway exit, the Advisory Exit Speed (W13-2) sign (see Figure 2C-1) shall be used.

02 Where an advisory speed is posted in advance of a conventional road ramp or to another roadway or roadside facility, the Advisory Ramp Speed (W13-3) sign (see Figure 2C-1) shall be used.

03 An Advisory Exit Speed or Advisory Ramp Speed sign shall be used when the difference between the mainline roadway speed limit and the exit or ramp advisory speed in the vicinity of the departure is 20 mph or greater.

Support:

In Wisconsin, safety rest areas, Safety and Weight Enforcement Facilities (SWEFs), scenic overlooks, waysides and Wisconsin welcome centers are examples of roadside facilities.

Guidance:

04 An Advisory Exit Speed or Advisory Ramp Speed sign should be used when the difference between the mainline roadway speed limit and the exit or ramp advisory speed in the vicinity of the departure is 15 mph.

Option:

05 An Advisory Exit Speed or Advisory Ramp Speed sign may be used based on engineering judgment when the difference between the mainline roadway speed limit and the exit or ramp advisory speed in the vicinity of the departure is 10 mph or less.

06 The Combination Horizontal Alignment/Advisory Exit Speed (W13-6, W13-8, and W13-10) signs (see Figure 2C-1) may be used in lieu of the Advisory Exit Speed (W13-2) sign, and the combination Horizontal Alignment/Advisory Ramp Speed (W13-7, W13-9, and W13-11) signs (see Figure 2C-1) may be used in lieu of the Advisory Ramp Speed (W13-3) sign.

Standard:

When used on ramps that are comprised of compound curves or turns (the curve or turn with multiple radii being all in one direction), the Combination Horizontal Alignment/Advisory Exit Speed (W13-6, W13-8, and W13-10) sign or the Combination Horizontal Alignment/Advisory Ramp Speed (W13-7, W13-9, and W13-11) sign shall show the advisory speed of whichever curve or turn has the lower advisory speed.

Option:

07 The Combination Truck Rollover/Advisory Exit Speed and Truck Rollover/Advisory Ramp Speed (W13-12 and W13-13) signs (see Figure 2C-1) may be used in lieu of the W13-2 and W13-3 signs respectively if the tip over condition is in the vicinity of the gore.

Standard:

08 Roadway geometrics represented on the Combination Horizontal Alignment/Advisory Exit and Combination Horizontal Alignment/Advisory Ramp Speed signs (see Figure 2C-1) shall be limited to the standard signs shown in this Manual.

Guidance:

09 If used, the Advisory Exit Speed sign or the Combination Horizontal Alignment/Advisory Exit Speed sign should be installed along the deceleration lane. The Advisory Exit Speed or the Combination Horizontal Alignment/Advisory Exit Speed signs should be visible in time for the road user to decelerate and make an exiting maneuver.

10 Regulatory Speed Limit signs (see Section 2B.21) should not be located in the vicinity of exit ramps or deceleration lanes, particularly where they will conflict with the advisory speed displayed on the Advisory Exit or Ramp Speed signs.

Support:

11 Section 2C.06 contains provisions for the determination of the displayed advisory speed.

12 Table 2C-3 lists recommended advance sign placement distances for deceleration to various advisory speeds.

Option:

13 Where there is a need to remind road users of the recommended advisory speed, a horizontal alignment warning sign with an advisory speed plaque displaying the same advisory speed may be installed at a downstream location along the ramp.

Guidance:

14 If the ramp curvature changes to the extent that it warrants a lower advisory speed, a horizontal alignment warning sign with the new advisory speed should be displayed in advance of the change in curvature.

Option:

15 The One-Direction Large Arrow (W1-6) sign may be installed beyond the exit gore on the outside of the curve to provide additional warning of an immediate change in curvature. When used in conjunction with the exit speed, the One-Direction Large Arrow (W1-6) sign may be supplemented with a Confirmation Advisory Speed (W13-1aP) plaque (see Figure 2C-1) when the plaque is not used with the Exit Gore (E5-1 series) sign.

Guidance:

16 The horizontal alignment symbol displayed on the Combination Horizontal Alignment/Advisory Exit and Ramp Speed signs should be consistent with the horizontal geometry of the ramp.

Support:

17 Examples of advisory speed signing for exit ramps are shown in Figure 2C-3.

Figure 2C-3. Examples of Exit Ramp Advisory Speed and Other Warning Signs (Sheet 1 of 5)

A – Loop ramp with constant controlling curvature along ramp proper

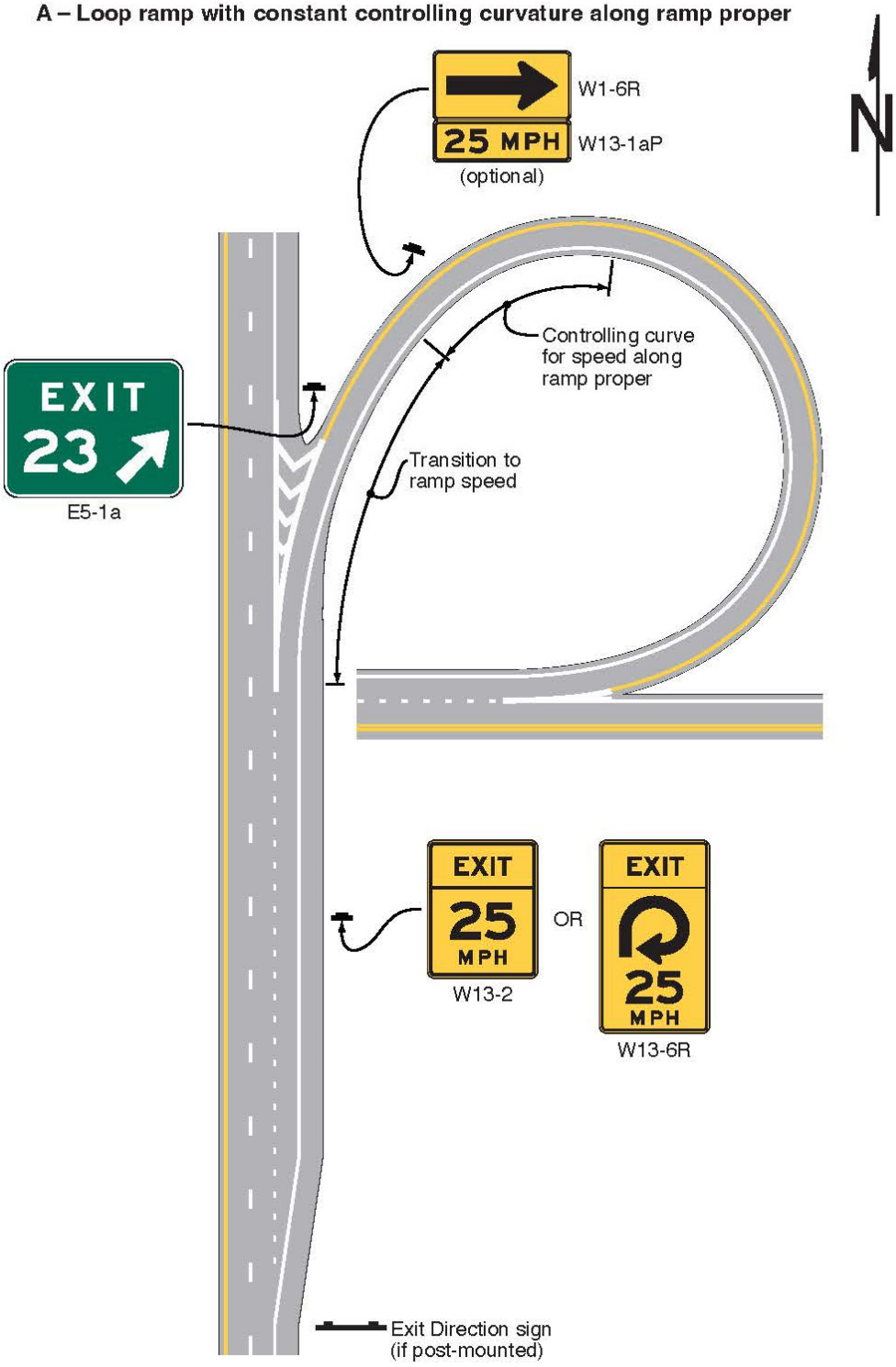


Figure 2C-3. Examples of Exit Ramp Advisory Speed and Other Warning Signs (Sheet 2 of 5)

B – Loop ramp with downstream limiting curvature

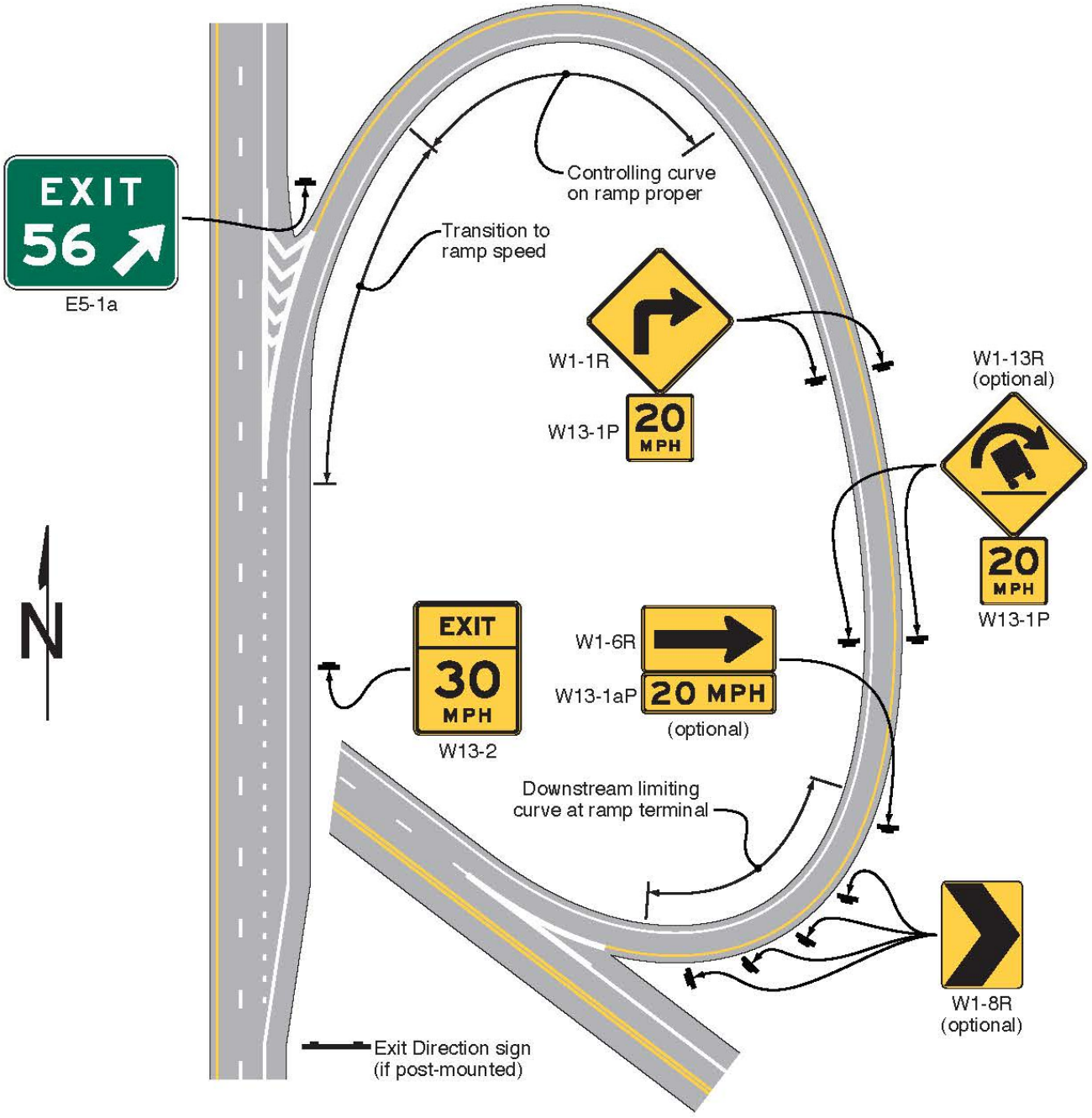


Figure 2C-3. Examples of Exit Ramp Advisory Speed and Other Warning Signs (Sheet 3 of 5)

C – Directional ramp

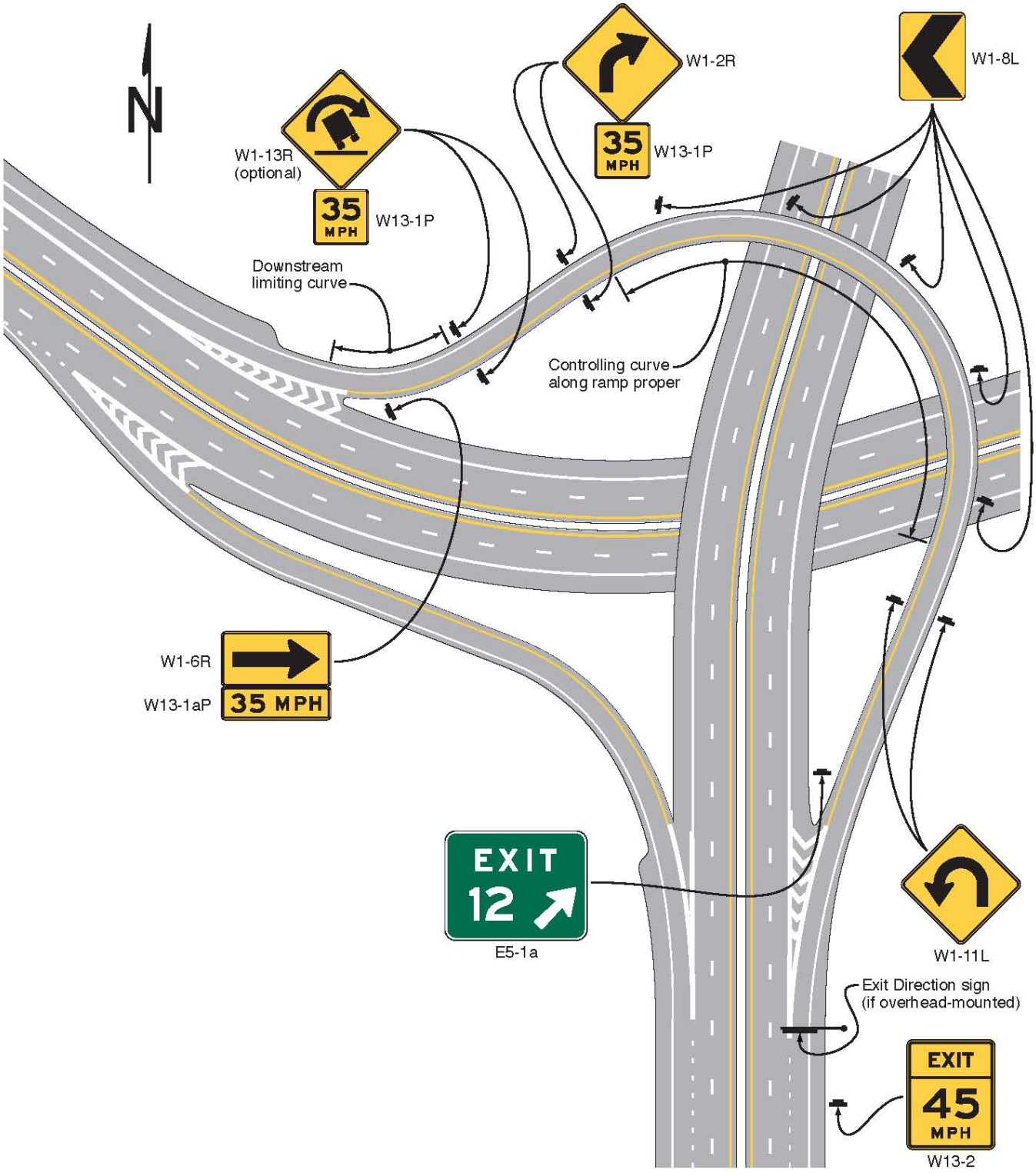


Figure 2C-3. Examples of Exit Ramp Advisory Speed and Other Warning Signs (Sheet 4 of 5)

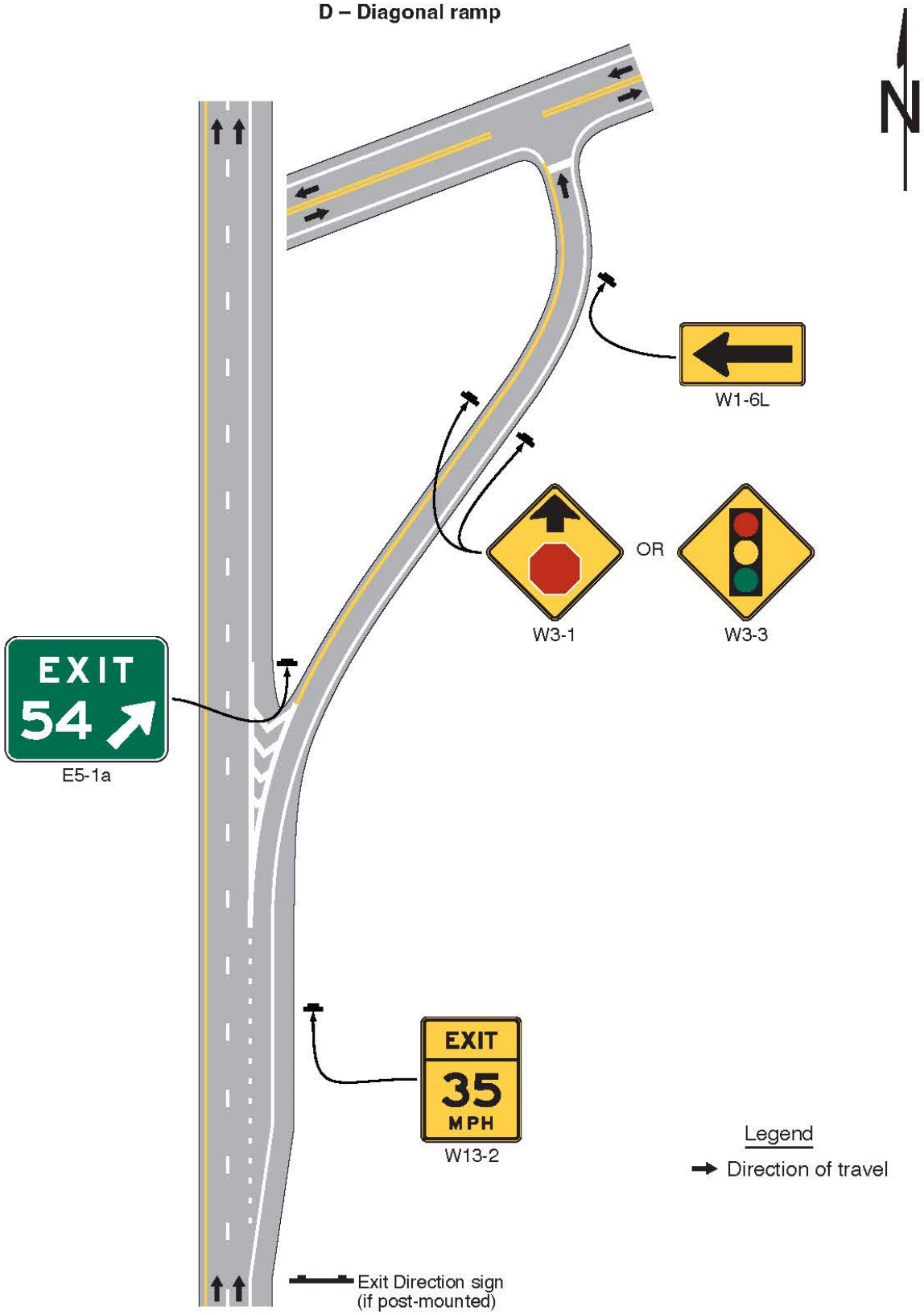
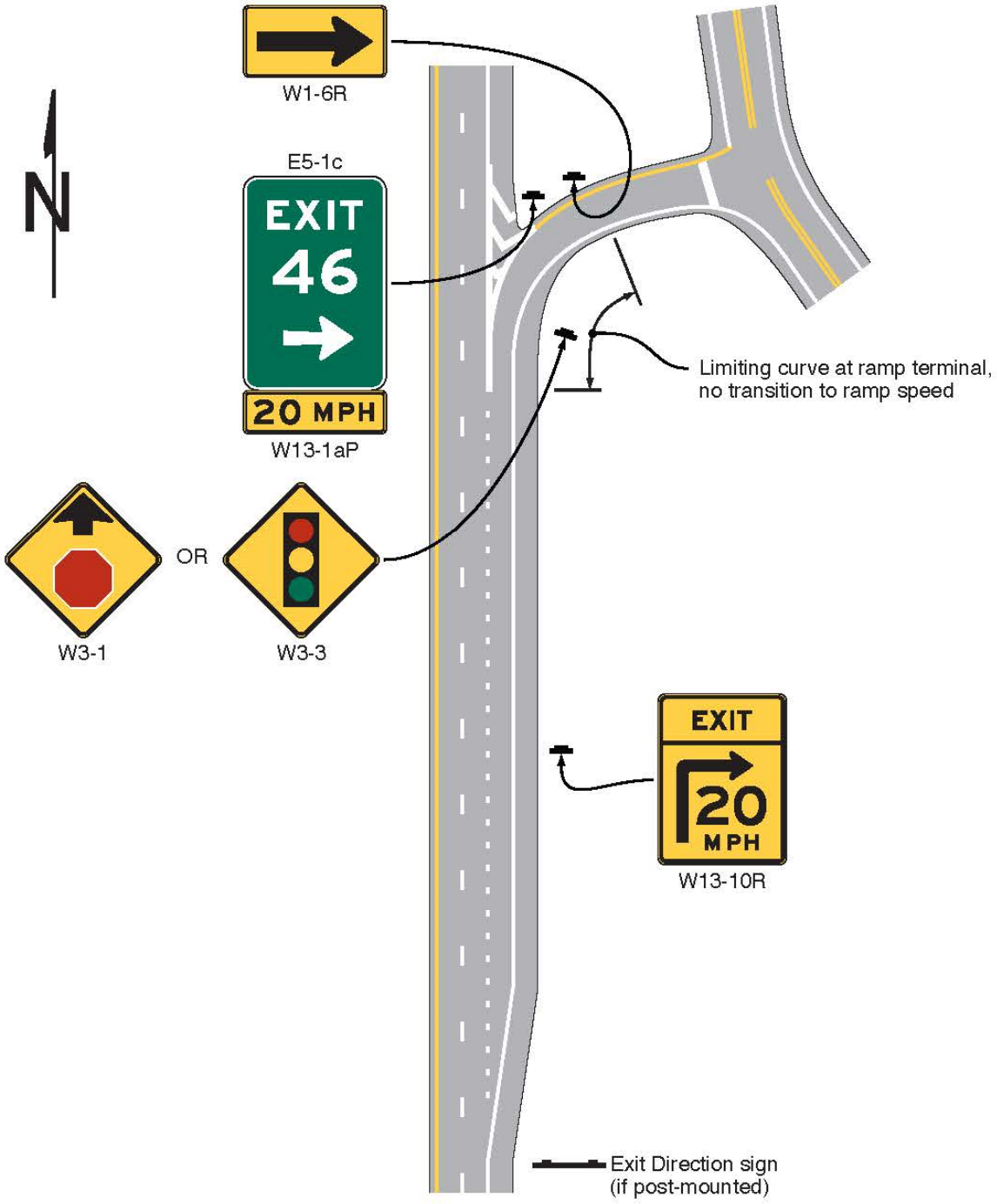


Figure 2C-3. Examples of Exit Ramp Advisory Speed and Other Warning Signs (Sheet 5 of 5)

E – Short ramp length with limiting curve near ramp terminal



Section 2C.13 Vehicle Speed Feedback Sign and Plaque (W13-20 and W13-20aP)

Support:

01 Vehicle Speed Feedback (W13-20) signs or (W13-20aP) plaques (see Figure 2C-4) that display the speed of an approaching vehicle to the vehicle operator are sometimes used to provide warning to drivers of their speed in relation to either a speed limit (R2-1) sign or a horizontal alignment warning sign assembly with a posted advisory speed.

Figure 2C-4. Vehicle Speed Feedback Sign and Plaque

W13-20 W13-20aP

Standard:

02 The Vehicle Speed Feedback (W13-20aP) plaque shall only be mounted below a Speed Limit (R2-1) sign (see Section 2B.21) to display the speed of an approaching vehicle in relation to the posted speed.

03 The Vehicle Speed Feedback (W13-20) sign shall only be an independent installation near the point of curvature of a horizontal curve (see Section 2C.06) to supplement the advisory speed that is displayed with the horizontal alignment warning sign.

04 The legend YOUR SPEED shall be a black legend on a yellow retroreflective background, except as provided in Sections 6H.01 and 7B.01. The changeable legend displaying the speed of the approaching vehicle shall be a yellow luminous legend on a black opaque background. The vehicle speed displayed on the changeable portion of the sign shall be displayed as an integer. The Vehicle Speed Feedback sign and plaque shall not flash (e.g., red and blue lights, white light)**, strobe, change color,** use alternative messages (e.g., "SLOW DOWN", "TOO FAST"), **or use other animated elements** (e.g., graphics/faces) **integrated into the changeable legend display. When no vehicles are approaching, the changeable display shall not display a legend.**

Guidance:

05 The changeable portion of the Vehicle Speed Feedback legend should be approximately the same height, width, and stroke of those on the Speed Limit sign it supplements or is mounted below.

06 When a W13-20aP plaque is used with a Speed Limit sign it should be approximately the same width as the Speed Limit sign it is mounted below.

Support:

It is not the purpose of a traffic control device to provide positive or negative reinforcement of a road user' s behavior. Rather, traffic control devices are intended to provide a clear and simple message conveying a regulation, warning, or guidance to the road user. In accordance with Section 1D.02, to be effective, a traffic control device should meet five basic principles: fulfill a need; command attention; convey a clear, simple meaning; command respect from road users; and give adequate time for proper response. A vehicle speed feedback sign that displays the speed of a vehicle to the driver is only intended to convey the speed to provide the road user a clear indication of their speed of travel as compared to the regulatory speed limit or advisory speed associated with that segment of the roadway. A pictorial representation of a facial expression, messages such as "SLOW DOWN" or strobe lights mimicking law enforcement do not convey a traffic control related message; they are vague in nature and do not command respect for such a device.

VERTICAL GRADE WARNING SIGNS AND PLAQUES

Section 2C.14 Hill Signs (W7-1 and W7-1a)

Guidance:

01 The Hill (W7-1) sign (see Figure 2C-5) should be used in advance of a downgrade where the length, percent of grade, horizontal curvature, and/or other physical features require special precautions on the part of road users.

02 The Hill sign and supplemental grade (W7-3P) plaque (see Figure 2C-5 and Section 2C.64) used in combination, or the W7-1a sign used alone, should be installed in advance of downgrades for the following conditions:

A. 5% grade that is more than 3,000 feet in length,

B. 6% grade that is more than 2,000 feet in length,

C. 7% grade that is more than 1,000 feet in length,

D. 8% grade that is more than 750 feet in length, or

E. 9% grade that is more than 500 feet in length.

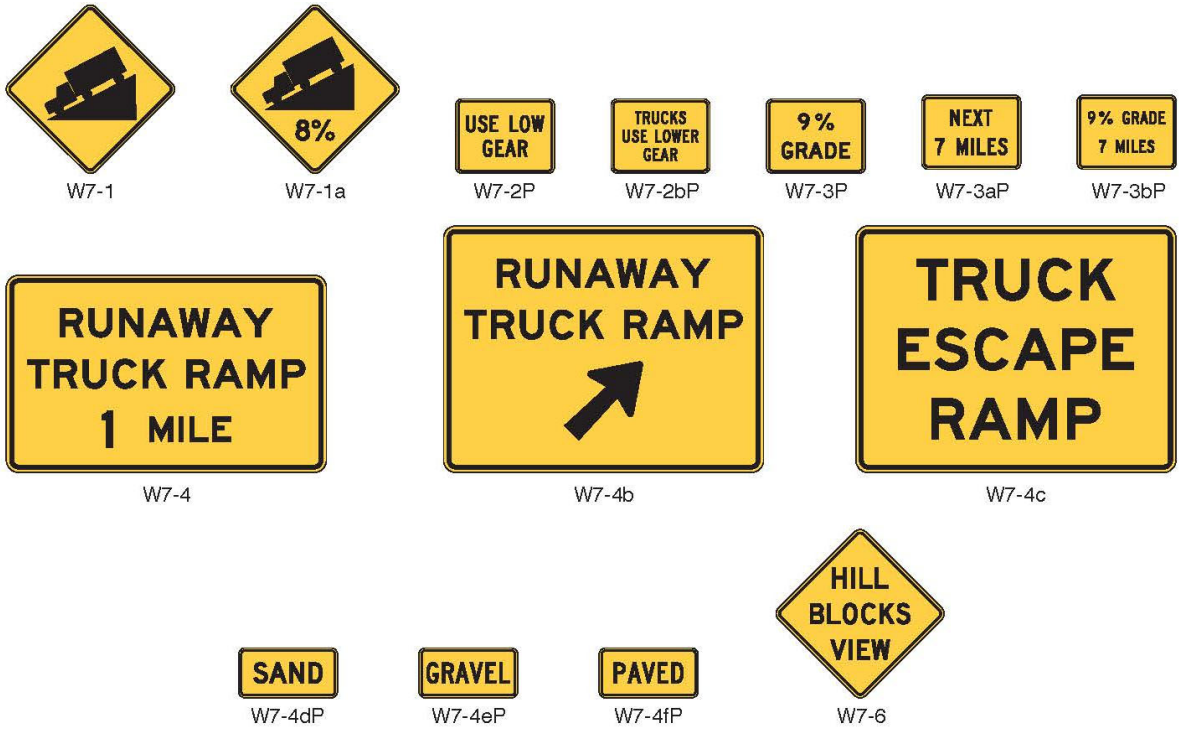
03 These signs should also be installed for steeper grades or where crash experience and field observations indicate a need.

04 Supplemental plaques (see Sections 2C.57 and 2C.64) and larger signs should be used for emphasis or where special hill characteristics exist. On longer grades, the use of the Hill sign with a distance (W7-3aP) plaque or the combination distance/grade (W7-3bP) plaque (see Figure 2C-5) at periodic intervals of approximately 1-mile spacing should be considered.

Option:

05 A USE LOW GEAR (W7-2P) or TRUCKS USE LOWER GEAR (W7-2bP) supplemental plaque (see Figure 2C-5) may be used to indicate a situation where downshifting as well as braking might be advisable.

Figure 2C-5. Vertical Grade Signs and Plaques



Section 2C.15 Truck Escape Ramp Signs (W7-4 Series)

Guidance:

01 Where applicable, truck escape (or runaway truck) ramp advance warning signs (see Figure 2C-5) should be located approximately 1 mile and approximately ½ mile in advance of the grade, and of the escape ramp. An additional W7-4b or W7-4c sign should be placed at the gore.

02 A RUNAWAY VEHICLES ONLY (R4-10) sign (see Section 2B.41) should be installed near the escape ramp entrance to discourage other road users from entering the ramp. No Parking (R8-3) signs should be placed near the ramp entrance.

Standard:

03 When truck escape ramps are installed, at least one of the W7-4 series signs shall be used.

Option:

04 A SAND (W7-4dP), GRAVEL (W7-4eP), or PAVED (W7-4fP) supplemental plaque (see Figure 2C-5) may be used to describe the ramp surface. State and local highway agencies may develop appropriate word message signs for the specific situation.

Section 2C.16 HILL BLOCKS VIEW Sign (W7-6)

Option:

01 A HILL BLOCKS VIEW (W7-6) sign (see Figure 2C-5) may be used on the approach to a crest vertical curve where the vertical curvature provides inadequate stopping sight distance at the posted speed limit.

Guidance:

02 *When a vertical curve results in a sight distance obstruction to a specific condition beyond the crest of the vertical curve, the warning sign for the specific condition beyond the vertical crest should be used rather than the HILL BLOCKS VIEW sign.*

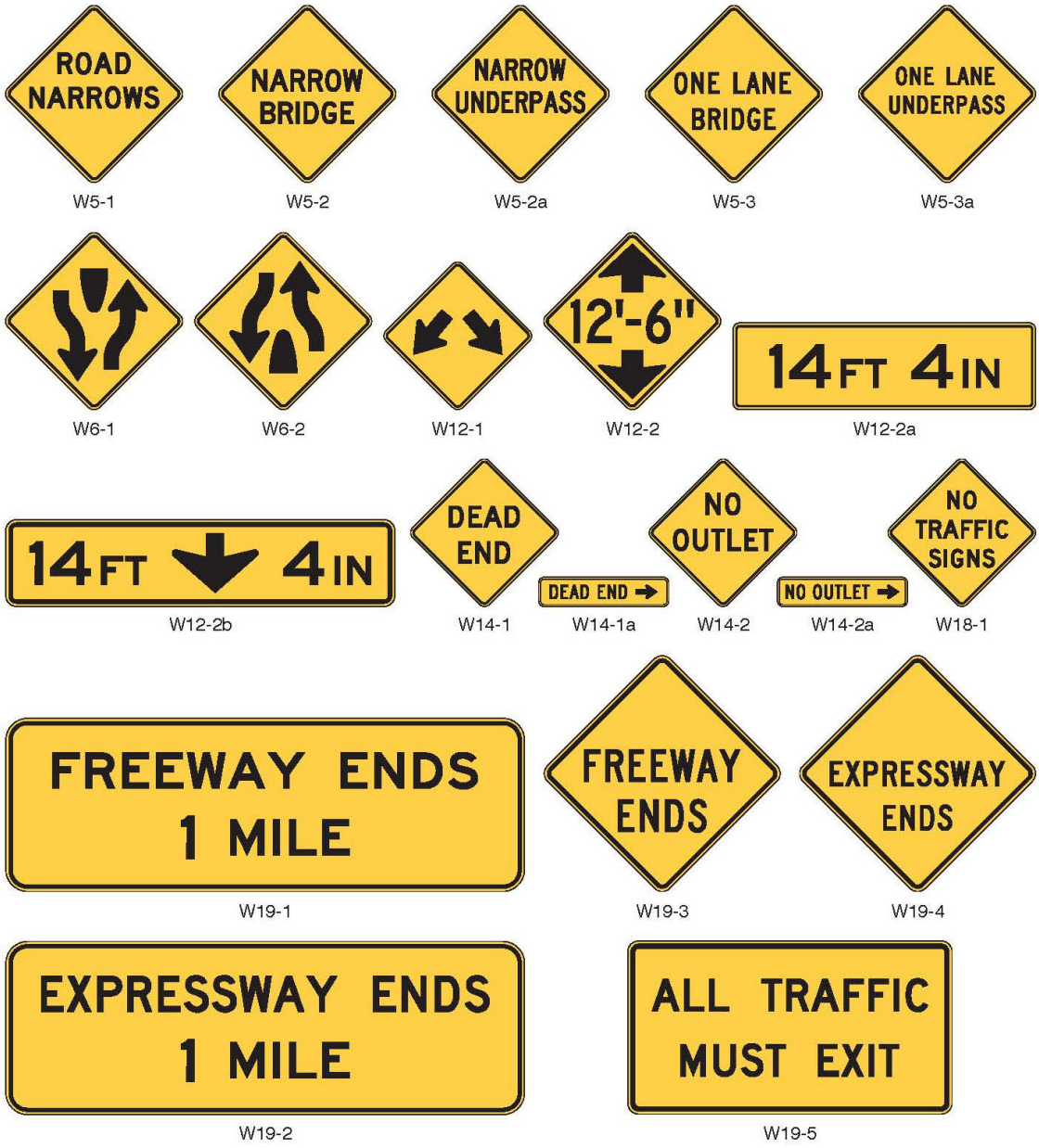
03 When a HILL BLOCKS VIEW sign is used, it should be supplemented by an Advisory Speed (W13-1P) plaque (see Figure 2C-1) indicating the recommended speed for traveling over the hillcrest based on available stopping sight distance.

Section 2C.17 ROAD NARROWS Sign (W5-1)

Guidance:

01 Except as provided in Paragraph 2 of this Section, a ROAD NARROWS (W5-1) sign (see Figure 2C-6) should be used in advance of a transition on two-lane roads where the pavement width is reduced abruptly to a width such that vehicles traveling in opposite directions cannot simultaneously travel through the narrow portion of the roadway without reducing speed.

Figure 2C-6. Miscellaneous Warning Signs



Option:

02 The ROAD NARROWS (W5-1) sign may be omitted on low-volume local streets that have speed limits of 30 mph or less.

03 Additional emphasis may be provided by the use of object markers and delineators (see Sections 2C.70 through 2C.73 and Chapter 3G). The Advisory Speed (W13-1P) plaque (see Figure 2C-1 and Section 2C.59) may be used to indicate the recommended speed.

Section 2C.18 NARROW BRIDGE and NARROW UNDERPASS Signs (W5-2 and W5-2a)

Standard:

01 A NARROW BRIDGE (W5-2) sign (see Figure 2C-6) shall be used in advance of any bridge or culvert having a two-way roadway horizontal clearance of 16 to 18 feet, or any bridge or culvert having a roadway horizontal clearance less than the width of the approach travel lanes. Where these conditions exist for an underpass, a NARROW UNDERPASS (W5-2a) sign (see Figure 2C-6) shall be used.

Guidance:

02 Additional emphasis should be provided by the use of object markers, delineators, and/or pavement markings.

Support:

See Section 2C.72 for information regarding the use of object markers at locations utilizing the NARROW BRIDGE or NARROW UNDERPASS sign.

Option:

03 A NARROW BRIDGE sign may be used in advance of a bridge or culvert on which the approach shoulders are narrowed or eliminated. Where these conditions exist for an underpass, a NARROW UNDERPASS sign may be used.

04 The NARROW BRIDGE or NARROW UNDERPASS sign may be omitted on low-volume rural roads where there is adequate sight distance to the bridge, culvert, or underpass on both approaches.

Section 2C.19 ONE LANE BRIDGE and ONE LANE UNDERPASS Signs (W5-3 and W5-3a)

Guidance:

01 A ONE LANE BRIDGE (W5-3) sign (see Figure 2C-6) should be used on two-way roadways in advance of any bridge or culvert:

A. Having a roadway horizontal clearance of less than 16 feet, or

B. Having a roadway horizontal clearance of less than 18 feet when commercial vehicles constitute a high proportion of the traffic, or

C. Having a roadway horizontal clearance of 18 feet or less where the sight distance on the approach is less than that shown in Condition A of Table 2C-3.

02 Where these conditions exist for an underpass, a ONE LANE UNDERPASS (W5-3a) sign (see Figure 2C-6) should be used.

03 Additional emphasis should be provided by the use of object markers, delineators, and/or pavement markings.

Option:

04 The ONE LANE BRIDGE or ONE LANE UNDERPASS sign may be omitted on low-volume rural roads where there is adequate sight distance to the bridge, culvert, or underpass on both approaches.

05 STOP (R1-1) or YIELD (R1-2) signs (see Sections 2B.04 and 2B.05) and related pavement markings (see Sections 3B.21 and 3B.22) may be used when conditions A, B, or C in Paragraph 1 of this Section apply.

Section 2C.20 Divided Highway Sign (W6-1)

Guidance:

01 A Divided Highway (W6-1) sign (see Figure 2C-6) should be used on the approaches to a section of highway (not an intersection or junction) where the opposing flows of traffic are separated by a median or other physical barrier.

Standard:

02 The Divided Highway (W6-1) sign shall not be used instead of a Keep Right (R4-7 series) sign on the approach end of a median island.

Section 2C.21 Divided Highway Ends Sign (W6-2)

Guidance:

01 A Divided Highway Ends (W6-2) sign (see Figure 2C-6) should be used in advance of the end of a section of physically divided highway (not an intersection or junction) as a warning of two-way traffic ahead.

02 The Two-Way Traffic (W6-3) sign (see Section 2C.51) should be used to give warning and notice of the transition to a two-lane, two-way section.

Section 2C.22 Freeway or Expressway Ends Signs (W19 Series)

Option:

01 A FREEWAY ENDS XX MILES (W19-1) sign or a FREEWAY ENDS (W19-3) sign (see Figure 2C-6) may be used in advance of the end of a freeway.

02 An EXPRESSWAY ENDS XX MILES (W19-2) sign or an EXPRESSWAY ENDS (W19-4) sign (see Figure 2C-6) may be used in advance of the end of an expressway.

03 The rectangular W19-1 and W19-2 signs may be post-mounted or may be mounted overhead for increased emphasis.

Guidance:

04 If the reason that the freeway is ending is that the next portion of the freeway is not yet constructed and as a result all traffic must use an exit ramp to leave the freeway, an ALL TRAFFIC MUST EXIT (W19-5) sign (see Figure 2C-6) should be used in addition to the Freeway Ends signs in advance of the downstream end of the freeway.

Section 2C.23 Double Arrow Sign (W12-1)

Option:

01 The Double Arrow (W12-1) sign (see Figure 2C-6) may be used to advise road users that traffic is permitted to pass on either side of an island, obstruction, or gore in the roadway. Traffic separated by this sign may either rejoin or change directions.

Standard:

The minimum height of the Double Arrow (W12-1) sign measured vertically from the bottom of the sign to the elevation of the near edge of the traveled way shall be 2 feet.

Guidance:

02 If used on an island, the Double Arrow sign should be mounted near the approach end.

03 If used in front of a pier or obstruction, the Double Arrow sign should be mounted on the face of, or just in front of, the pier or obstruction. Where stripe markings are used on the pier or obstruction, they should be discontinued to leave a 3-inch space around the outside of the Double Arrow sign.

Section 2C.24 DEAD END, NO OUTLET, and ROAD ENDS Signs (W14-1, W14-1a, W14-2, W14-2a, W8-26, and W8-26a)

Option:

01 The DEAD END (W14-1) sign (see Figure 2C-6) may be used at the entrance to a single road or street that terminates without intersecting another street. The NO OUTLET (W14-2) sign (see Figure 2C-6) may be used at the entrance to a road or road network from which there is no other exit.

02 DEAD END (W14-1a) or NO OUTLET (W14-2a) signs (see Figure 2C-6) may be used in combination with Street Name (D3-1) signs (see Section 2D.45) to warn turning traffic that the cross street ends in the direction indicated by the arrow.

03 At locations where the cross street does not have a name, a W14-1a or W14-2a sign may be used alone in place of a street name sign.

Guidance:

04 When the W14-1 or W14-2 sign is used, the sign should be posted as near as practicable to the entry point or at a sufficient advance distance to permit the road user to avoid the dead end or no outlet condition by turning at the nearest intersecting street.

Standard:

05 The DEAD END (W14-1a) or NO OUTLET (W14-2a) sign shall not be used instead of the W14-1 or W14-2 signs where traffic can proceed straight through the intersection into the dead end street or no outlet area.

Option:

06 The ROAD ENDS XX FT (W8-26) or STREET ENDS XX FT (W8-26a) sign (see Figure 2C-11) may be used on the approach to the end of a conventional road or street where the terminus is not apparent.

Support:

07 Information about the use of Type 4 object markers to mark the end of the road or street is contained in Section 2C.73.

Standard:

08 The W8-26 and W8-26a signs shall not be used in place of a W14-1 or W14-2 sign at the entrance to such a road or street.

Support:

09 Section 2C.22 contains information on signs for use on the approach to the end of a freeway or expressway.

Section 2C.25 Low Clearance Signs (W12-2, W12-2a, and W12-2b)

Standard:

01 The Low Clearance Advance (W12-2) sign (see Figure 2C-6) shall be used to warn road users of vertical clearances less than 14 feet 6 inches, or vertical clearances less than 12 inches above the statutory maximum vehicle height, whichever is greater.

Option:

Frequently hit structures with clearances at 14’ - 6” and above may be signed.

Guidance:

02 The actual clearance should be displayed on the Low Clearance (W12-2, W12-2a, and W12-2b) sign to the nearest 1 inch not exceeding the actual clearance. However, in areas that experience changes in temperature causing frost action, a reduction, not exceeding 3 inches, should be used for this condition.

03 Clearances should be evaluated periodically to determine if additional low clearance signing is necessary, particularly when resurfacing operations have occurred, on routes onto which over-height vehicles are normally directed under the permit process, and structures that are susceptible to catastrophic failure when struck by over-height vehicles.

Standard:

04 The W12-2 sign with a supplemental distance plaque shall also be placed at the nearest intersecting road or wide point in the road at which a vehicle can detour or turn around.

Guidance:

05 Where there is a need to warn of a low clearance on an intersecting road or off a freeway or expressway exit, a rectangular warning sign with an appropriate word legend should be used rather than a W12-2 sign.

Option:

06 The Low Clearance Overhead (W12-2a or W12-2b) sign (see Figure 2C-6) may be installed on the structure to supplement the advance warning sign.

07 In cases where physical conditions on a structure limit the width such that the W12-2a or W12-2b signs are physically unable to fit, a W12-2 sign may be installed overhead on the structure or post-mounted in front of the structure, in addition to the required W12-2 sign at the advance location.

Guidance:

08 In the case of an arch, or other structure under which the clearance varies greatly, two or more Low Clearance Overhead (W12-2a or 12-2b) signs should be installed on the structure itself to give information as to the clearances over the low clearance portions of the roadway.

Standard:

09 If used, the Low Clearance Overhead (W12-2b) sign shall be placed over a lane or shoulder to indicate the portion of the structure with low clearance if the posted clearance does not apply to the entire structure.

Guidance:

10 The clearance shown on the Low Clearance Advance sign should match the clearance on the W12-2a or W12-2b sign or, if there are multiple W12-2b signs, should match the lowest clearance.

Option:

Structures on Oversize-Overweight (OSOW) freight network routes with clearances at 14’-6” or greater may be signed.

Section 2C.26 BUMP and DIP Signs (W8-1 and W8-2)

Guidance:

01 BUMP (W8-1) and DIP (W8-2) signs (see Figure 2C-7) should be used in advance of a sharp rise or depression in the profile of the road.

Option:

A BUMP or DIP sign with a diagonal downward-pointing arrow (W16-7P) plaque may be used at the location of a sharp rise or depression in the profile of the road.

When a BUMP or DIP sign with diagonal downward-pointing arrow plaque is used at the location of a sharp rise or depression in the profile of the road, a BUMP or DIP sign (see Figure 2C-7) supplemented with an AHEAD plaque may be used instead of a BUMP or DIP sign discussed in Paragraph 1 of this Section.

02 These signs may be supplemented with an Advisory Speed plaque (see Figure 2C-1 and Section 2C.59).

Guidance:

03 The DIP sign should not be used in advance of a short stretch of depressed alignment that might momentarily hide a vehicle.

04 A short stretch of depressed alignment that might momentarily hide a vehicle should be treated as a no-passing zone when center line striping is provided on a two-lane or three-lane road (see Section 3B.03).

Option:

A series of bumps or dips or a combination of bumps and dips may be signed with a Rough Road (W8-8) sign in lieu of bump and dip signs.

Section 2C.27 SPEED HUMP Sign (W17-1)

Guidance:

01 The SPEED HUMP (W17-1) sign (see Figure 2C-7) should be used in advance of a vertical deflection in the roadway that is designed to limit the speed of traffic.

02 If used, the SPEED HUMP sign should be supplemented by an Advisory Speed plaque (see Figure 2C-1 and Section 2C.59).

Option:

03 If a series of speed humps exists in close proximity, an Advisory Speed plaque may be eliminated on all but the first SPEED HUMP sign in the series.

04 The legend SPEED BUMP may be used instead of the legend SPEED HUMP on the W17-1 sign.

Support:

05 Speed humps generally provide more gradual vertical deflection than speed bumps. Speed bumps limit the speed of traffic more severely than speed humps. Other forms of speed humps include speed tables and raised crosswalks or intersections. However, these differences in engineering terminology are not well known by the public, so for signing purposes these terms are interchangeable.

06 Sections 3B.29 and 3B.30 contain information about the use of markings at and in advance of speed humps.

Section 2C.28 PAVEMENT ENDS Sign (W8-3)

Guidance:

01 A PAVEMENT ENDS (W8-3) sign (see Figure 2C-7) should be used where a paved surface changes to either a gravel treated surface or an earth road surface.

Option:

02 An Advisory Speed plaque (see Figure 2C-1 and Section 2C.59) may be used when the change in roadway condition requires a reduced speed.

Section 2C.29 Shoulder Signs (W8-4, W8-9, W8-17, W8-23, and W8-25)

Option:

01 The SOFT SHOULDER (W8-4) sign (see Figure 2C-7) may be used to warn of a soft shoulder condition.

02 The LOW SHOULDER (W8-9) sign (see Figure 2C-7) may be used to warn of a shoulder condition where there is an elevation difference of 3 inches or less between the shoulder and the travel lane.

Guidance:

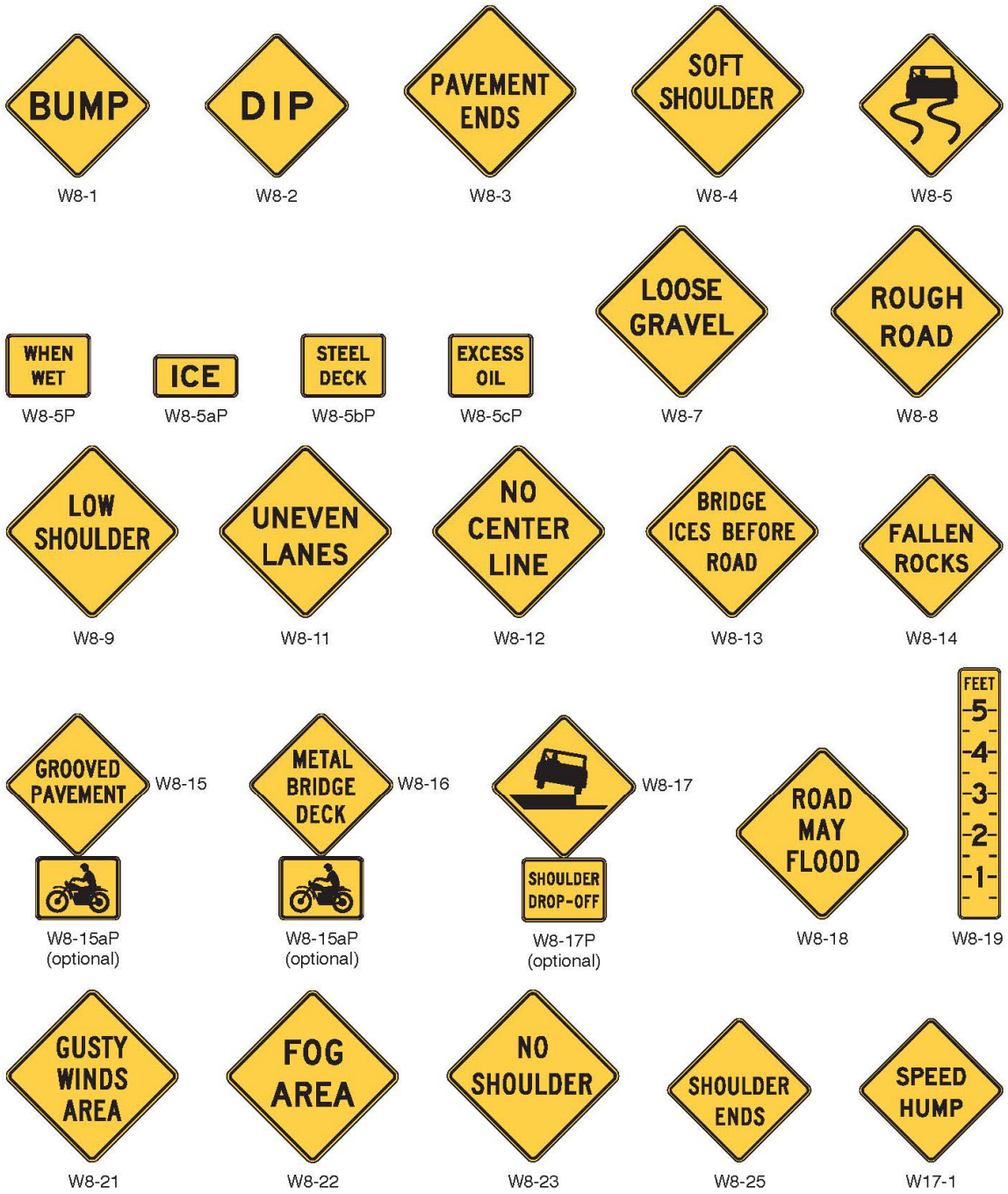
03 The Shoulder Drop Off (W8-17) sign (see Figure 2C-7) should be used where an unprotected shoulder drop-off, adjacent to the travel lane, exceeds 3 inches in depth for a significant continuous length along the roadway, based on engineering judgment.

Option:

04 A SHOULDER DROP-OFF (W8-17P) supplemental plaque (see Figure 2C-7) may be mounted below the W8-17 sign.

05 The NO SHOULDER (W8-23) sign (see Figure 2C-7) may be used to warn road users that a shoulder does not exist along a portion of the roadway.

Figure 2C-7. Roadway and Weather Condition Signs and Plaques



06 The SHOULDER ENDS (W8-25) sign (see Figure 2C-7) may be used to warn road users that a shoulder is ending.

Guidance:

07 Additional shoulder signs should be placed at appropriate intervals along the road where the condition continually exists.

When shoulder signs are used, a shoulder sign should be placed in advance of the condition per Table 2C-3.

Section 2C.30 Surface Condition Signs (W8-5, W8-7, W8-8, W8-11, W8-13, and W8-14)

Option:

01 The Slippery When Wet (W8-5) sign (see Figure 2C-7) may be used to warn of unexpected slippery conditions. Supplemental plaques (see Figure 2C-7) with legends such as ICE, WHEN WET, STEEL DECK, or EXCESS OIL may be used with the W8-5 sign to indicate the reason that the slippery conditions might be present.

02 The LOOSE GRAVEL (W8-7) sign (see Figure 2C-7) may be used to warn of loose gravel on the roadway surface.

03 The ROUGH ROAD (W8-8) sign (see Figure 2C-7) may be used to warn of a rough roadway surface.

04 An UNEVEN LANES (W8-11) sign (see Figure 2C-7) may be used to warn of a difference in elevation between travel lanes.

05 The BRIDGE ICES BEFORE ROAD (W8-13) sign (see Figure 2C-7) may be used in advance of bridges to advise bridge users of winter weather conditions. The BRIDGE ICES BEFORE ROAD sign may be removed or covered during seasons of the year when its message is not relevant.

06 The FALLEN ROCKS (W8-14) sign (see Figure 2C-7) may be used in advance of an area that is adjacent to a hillside, mountain, or cliff where rocks frequently fall onto the roadway.

Guidance

07 When used, Surface Condition signs should be placed in advance of the beginning of the affected section (see Table 2C-3), and additional signs should be placed at appropriate intervals along the road where the condition exists.

Section 2C.31 Warning Signs and Plaque for Motorcyclists (W8-15, W8-15aP, and W8-16)

Support:

01 The signs and plaques described in this Section are intended to give motorcyclists advance notice of surface conditions that might adversely affect their ability to maintain control of their motorcycle under wet or dry conditions. The use of some of the advance surface condition warning signs described in Section 2C.30, such as Slippery When Wet, LOOSE GRAVEL, or ROUGH ROAD, can also be helpful to motorcyclists if those conditions exist.

Option:

02 If a portion of a street or highway features a roadway pavement surface that is grooved or textured instead of smooth, such as a grooved skid resistance treatment for a horizontal curve or a brick pavement surface, a GROOVED PAVEMENT (W8-15) sign (see Figure 2C-7) may be used to provide advance warning of this condition to motorcyclists, bicyclists, and other road users. Alternate legends such as TEXTURED PAVEMENT or BRICK PAVEMENT may also be used on the W8-15 sign.

03 If a bridge or a portion of a bridge includes a metal or grated surface, a METAL BRIDGE DECK (W8-16) sign (see Figure 2C-7) may be used to provide advance warning of this condition to motorcyclists, bicyclists, and other road users.

04 A Motorcycle (W8-15aP) plaque (see Figure 2C-7) may be mounted below or above a W8-15 or W8-16 sign if the warning is intended to be directed primarily to motorcyclists.

Section 2C.32 NO CENTER LINE Sign (W8-12)

Option:

01 The NO CENTER LINE (W8-12) sign (see Figure 2C-7) may be used to warn of a roadway without center line pavement markings.

Section 2C.33 NO TRAFFIC SIGNS Sign (W18-1)

Option:

01 The NO TRAFFIC SIGNS (W18-1) sign (see Figure 2C-6) may be used only on low-volume rural roads to advise road users that no signs are installed along the distance of the road. The sign may be installed at the point

where road users would enter the low volume road or where, based on engineering judgment, the road user might need this information.

02 A W7-3aP (see Figure 2C-5), W16-2P (see Figure 2C-16), or W16-9P (see Figure 2C-16) supplemental plaque with the legend NEXT XX MILES, XX FEET, or AHEAD may be installed below the W18-1 sign when appropriate.

Section 2C.34 Weather Condition Signs (W8-18, W8-19, W8-21, and W8-22)

Option:

01 The ROAD MAY FLOOD (W8-18) sign (see Figure 2C-7) may be used to warn road users that a section of roadway is subject to frequent flooding**.** A Depth Gauge (W8-19) sign (see Figure 2C-7) may also be installed within a roadway section that frequently floods.

Guidance:

02 If used, the Depth Gauge sign should be in addition to the ROAD MAY FLOOD sign and should be mounted at the appropriate height to indicate the depth of the water at the deepest point on the roadway.

Option:

03 The GUSTY WINDS AREA (W8-21) sign (see Figure 2C-7) may be used to warn road users that wind gusts frequently occur along a section of highway that are strong enough to impact the stability of trucks, recreational vehicles, and other vehicles with high centers of gravity**.** A NEXT XX MILES (W7-3aP) supplemental plaque (see Figure 2C-5) may be mounted below the W8-21 sign to inform road users of the length of roadway that frequently experiences strong wind gusts.

04 The FOG AREA (W8-22) sign (see Figure 2C-7) may be used to warn road users that foggy conditions frequently reduce visibility along a section of highway**.** A NEXT XX MILES (W7-3aP) supplemental plaque (see Figure 2C-5) may be mounted below the W8-22 sign to inform road users of the length of roadway that frequently experiences foggy conditions.

Support:

05 Chapter 2L contains provisions for the use of blank-out or changeable message signs that can be activated by detection of the applicable condition.

Section 2C.35 Advance Traffic Control Signs (W3-1, W3-2, W3-3, and W3-4)

Standard:

01 The Stop Ahead (W3-1), Yield Ahead (W3-2), and Signal Ahead (W3-3) Advance Traffic Control signs (see Figure 2C-8) shall be installed on an approach to a primary traffic control device that is not visible for a sufficient distance to permit the road user to respond to the device (see Table 2C-3). The visibility criteria for a traffic control signal shall be based on having a continuous view of at least two signal faces for the distance specified in Table 4D-2.

Guidance:

A Stop Ahead (W3-1) sign should be erected in advance of any Stop sign that controls traffic entering a State Trunk Highway having a posted speed limit of 45 mph or greater on the approach regardless of visibility distance.

Standard:

A Stop Ahead (W3-1) sign shall be erected by the County in advance of any Stop sign that controls traffic entering a State Trunk Highway from a County Trunk Highway with a posted speed limit of 45 mph or greater on the approach regardless of visibility distance.

Guidance:

A Signal Ahead (W3-3) sign should be erected in advance of all traffic control signals having a posted speed limit of 45 mph or greater on the approach.

Option:

A Signal Ahead sign may be omitted from intersections which have an upstream signal spaced a ¼ mile or less.

Guidance:

02 Where intermittent obstructions occur, engineering judgment should determine the treatment to be implemented.

Support:

03 Figure 2A-4 shows examples of the typical placement of an Advance Traffic Control sign.

04 Permanent obstructions causing the limited visibility might include roadway alignment or structures. Intermittent obstructions might include foliage or parked vehicles.

Option:

05 An Advance Traffic Control sign may be used for additional emphasis of the primary traffic control device, even when the visibility distance to the device is satisfactory.

Support:

06 Section 2C.65 contains information about the use of an advance street name plaque to identify an intersecting road.

Option:

07 A BE PREPARED TO STOP (W3-4) sign (see Figure 2C-8) may be used to warn of stopped traffic caused by a traffic control signal.

08 A Warning Beacon (see Section 4S.03) or yellow LEDs within the border of the sign may be used with an Advance Traffic Control or BE PREPARED TO STOP sign.

Standard:

09 When a BE PREPARED TO STOP sign is used in advance of a traffic control signal, it shall be used in addition to a Signal Ahead sign and shall be placed downstream from the Signal Ahead sign.

Guidance:

10 When a Warning Beacon is interconnected with a traffic control signal or queue detection system, the BE PREPARED TO STOP sign should be supplemented with a WHEN FLASHING (W16-13P) plaque (see Figure 2C-16).

Figure 2C-8. Advance Traffic Control Signs

W3-1 W3-2 W3-3 W3-4 W3-6 W3-7 W3-8 W23-2 W23-2a W26-1

Support:

11 Section 2C.45 contains information regarding the use of a NO MERGE AREA (W4-5aP) supplemental plaque in conjunction with a Yield Ahead sign.

Section 2C.36 DRAW BRIDGE Sign (W3-6)

Standard:

01 A DRAW BRIDGE (W3-6) sign (see Figure 2C-8) shall be used in advance of movable bridge signals and gates (see Section 4Q.02) to give warning to road users.

Section 2C.37 Advance Ramp Control Signal Signs (W3-7 and W3-8)

Option:

01 A RAMP METER AHEAD (W3-7) sign (see Figure 2C-8) may be used to warn road users that a freeway entrance ramp is metered and that they will encounter a ramp control signal (see Chapter 4P).

Guidance:

02 When the ramp control signals are operated only during certain periods of the day, a RAMP METERED WHEN FLASHING (W3-8) sign (see Figure 2C-8) should be installed in advance of the ramp control signal near the entrance to the ramp, or on the arterial on the approach to the ramp, to alert road users to the presence and operation of ramp meters.

Standard:

03 The RAMP METERED WHEN FLASHING sign shall be supplemented with a Warning Beacon (see Section 4S.03) that flashes when the ramp control signal is in operation.

Section 2C.38 NEW TRAFFIC PATTERN and NEW SIGNAL OPERATION AHEAD Signs (W23-2 and W23-2a)

Option:

01 A NEW TRAFFIC PATTERN AHEAD (W23-2) sign (see Figure 2C-8) may be used on the approach to an intersection or along a section of roadway to provide advance warning of a change in traffic patterns, such as revised lane usage or roadway geometry.

02 A NEW SIGNAL OPERATION AHEAD (W23-2a) sign (see Figure 2C-8) may be used on the approach to a signalized intersection to provide advance warning of a change in signal phasing.

Guidance:

03 The NEW TRAFFIC PATTERN or NEW SIGNAL OPERATION AHEAD sign should be removed when the traffic pattern returns to normal, when the changed pattern is no longer considered to be new, or within 12 months.

Section 2C.39 WATCH FOR STOPPED TRAFFIC Sign (W26-1)

Option:

01 The WATCH FOR STOPPED TRAFFIC (W26-1) sign (see Figure 2C-8) may be used to warn road users of the possibility of vehicles stopping abruptly in the travel lane due to recurring congested conditions.

Section 2C.40 Reduced Speed Limit Ahead and Speed Zone Signs (W3-5, W3-5a, W3-5b, and W3-5c)

Guidance:

01 A Reduced Speed Limit Ahead (W3-5 or W3-5a) or Truck Speed Zone Ahead (W3-5c) sign (see Figure 2C-9) should be used to inform road users of a reduced speed zone where the speed limit is being reduced by more than 10 mph, or where engineering judgment indicates the need for advance notice to comply with the posted speed limit ahead.

A reduced speed limit ahead sign (W3-5 or W3-5a) should be used to inform road users of a reduced speed zone where the regulatory speed limit is being reduced from 55 mph or greater.

02 A VARIABLE SPEED ZONE AHEAD (W3-5b) sign (see Figure 2C-9) should be used to inform road users of a zone where the speed limit is varied by time of day or as conditions change.

Standard:

03 If used, Reduced Speed Limit, Variable Speed Zone, or Truck Speed Zone Ahead signs shall be followed by a Speed Limit (R2-1) sign (see Figure 2B-3), with the Trucks (R2-2P) plaque (see Figure 2B-3) if applicable, installed at the beginning of the zone where the speed limit applies.

04 The speed limit displayed on the W3-5, W3-5a, and W3-5c signs shall be identical to the speed limit displayed on the subsequent Speed Limit sign.

Figure 2C-9. Reduced Speed Limit Ahead and Speed Zone Signs

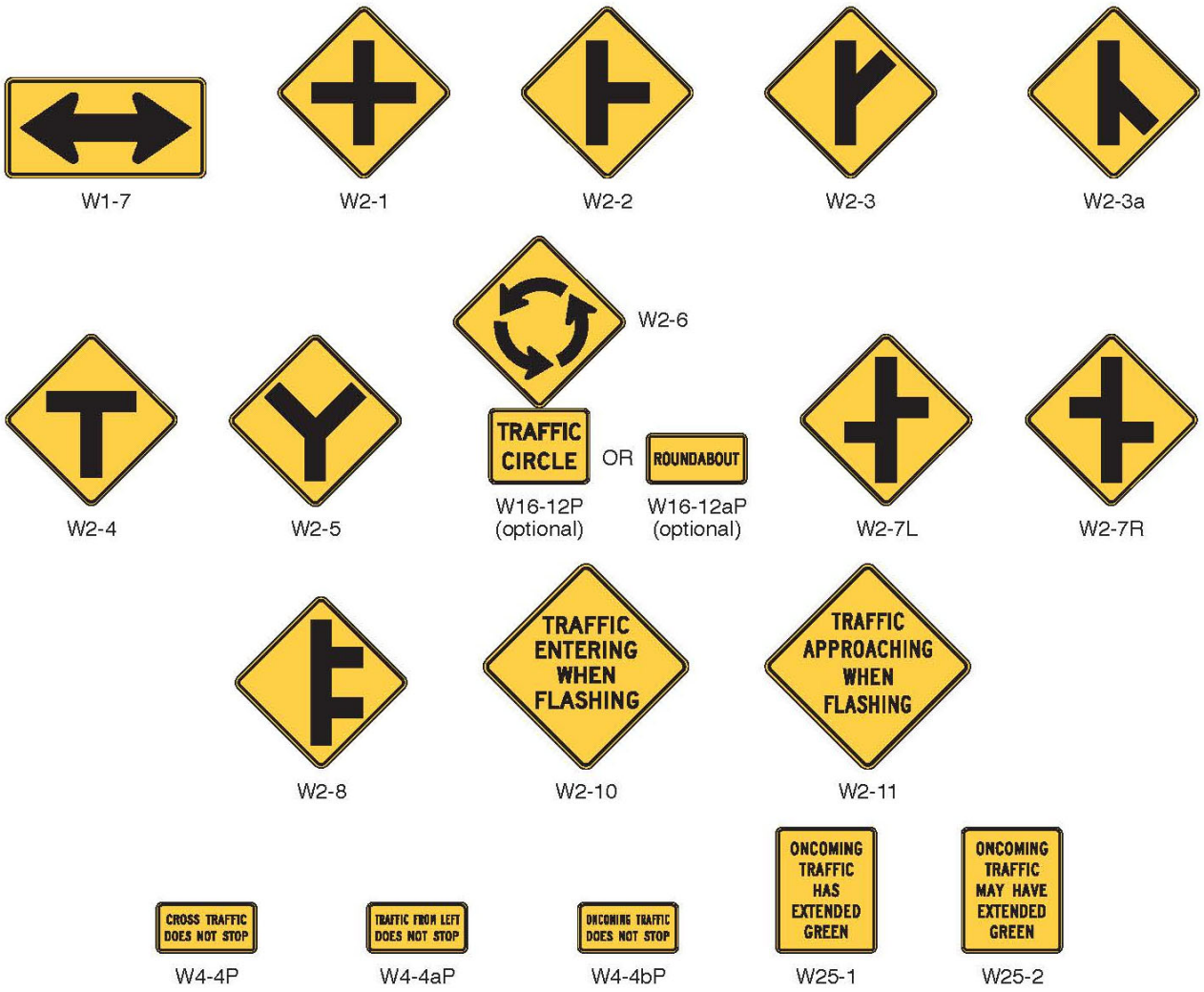
W3-5 W3-5a W3-5b W3-5c

Section 2C.41 Intersection Warning Signs (W2-1 through W2-8)

Option:

01 A Cross Road (W2-1), Side Road (W2-2, W2-3, or W2-3a), T-Intersection (W2-4), or Y-Intersection (W2-5) sign (see Figure 2C-10) may be used in advance of an intersection to indicate the presence of an intersection and the possibility of turning or entering traffic.

Figure 2C-10. Intersection Warning Signs and Plaques



Guidance:

An intersection warning sign should be used where intersection sight distance is insufficient for traffic on the cross or side street to identify traffic approaching on the through highway.

Support:

Placement of an intersection warning sign on one approach of a through highway at an intersection does not itself convey a requirement for the same warning sign to be posted on the approach in the opposite direction.

Guidance:

An intersection warning sign should be used on an approach to an intersection with a demonstrated safety concern, as documented by engineering study.

02 The Circular Intersection (W2-6) sign (see Figure 2C-10) may be installed in advance of a circular intersection (see Figures 2B-21 through 2B-23).

Guidance:

03 If an approach to a circular intersection has a statutory or posted speed limit of 40 mph or higher, the Circular Intersection (W2-6) sign should be installed in advance of the circular intersection.

Option:

04 An educational plaque (see Figure 2C-10) with a legend such as TRAFFIC CIRCLE (W16-12P) or ROUNDABOUT (W16-12aP) may be mounted below a Circular Intersection sign.

Support:

05 Section 2C.65 contains information about the use of an advance street name plaque to identify an intersecting road.

Guidance:

06 The Intersection Warning sign should illustrate and depict the general configuration of the intersecting roadway, such as a cross road, side road, T-intersection, or Y-intersection.

07 Intersection Warning signs, other than the Circular Intersection (W2-6) sign, the T-intersection (W2-4) sign, and the Grade Crossing and Intersection Advance Warning (W10-2, W10-3, W10-4, W10-11, and W10-12) signs (see Figure 8B-4) should not be used on approaches controlled by STOP signs, YIELD signs, or signals.

08 If an Intersection Warning sign is used where the side roads are not opposite of each other, the Offset Side Roads (W2-7) sign (see Figure 2C-10) should be used instead of the Cross Road sign.

09 If an Intersection Warning sign is used where two closely-spaced side roads are on the same side of the highway, the Double Side Roads (W2-8) sign (see Figure 2C-10) should be used instead of the Side Road sign.

10 No more than two side roads should be depicted on the same side of the highway on a W2-7 or W2-8 sign, and no more than three side roads should be depicted on a W2-7 or W2-8 sign.

Option:

11 When at least one side road is shown, the stem of an additional side road representing a significantly lower relative volume may be depicted using a line that is two-thirds the width of the through road based on engineering judgment.

Support:

12 Figure 2A-4 shows examples of the typical placement of an Intersection Warning sign.

Section 2C.42 Actuated Advance Intersection Signs (W2-10 and W2-11)

Support:

01 Actuated Advance Intersection signs are typically associated with restricted sight distance and gap selection at stop controlled intersections.

Option:

02 The TRAFFIC ENTERING WHEN FLASHING (W2-10) sign (see Figure 2C-10) may be used on the uncontrolled through roadway approach to a side or cross road stop controlled intersection to warn of entering traffic from the side or cross road.

03 The TRAFFIC APPROACHING WHEN FLASHING (W2-11) sign (see Figure 2C-10) may be used on the side road stop controlled approach to warn of traffic approaching on the uncontrolled through road.

Standard:

04 **When used, the TRAFFIC ENTERING WHEN FLASHING sign, and the TRAFFIC APPROACHING WHEN FLASHING sign shall be supplemented with a Warning Beacon (see Section 4S.03) that activates when a vehicle on a conflicting approach is detected.**

Section 2C.43 Two-Direction Large Arrow Sign (W1-7)

Standard:

01 The Two-Direction Large Arrow (W1-7) sign (see Figure 2C-10) shall be a horizontal rectangle.

02 If used, the Two-Direction Large arrow sign shall be installed on the far side of a T-intersection in line with, and at approximately a right angle to, traffic approaching from the stem of the T-intersection.

03 The Two-Direction Large Arrow sign shall not be used where there is no change in the direction of travel such as at the beginnings and ends of medians or at center piers.

Guidance:

04 The Two-Direction Large Arrow sign should be visible for a sufficient distance to provide the road user with adequate time to react to the intersection configuration.

Section 2C.44 Traffic Signal Oncoming Extended Green Signs (W25-1 and W25-2)

Standard:

01 At locations where either a W25-1 or a W25-2 sign is required based on the provisions in Section 4F.01, the W25-1 or W25-2 sign (see Figure 2C-10) shall be installed near the left-most signal face for the approach.

MERGING, TWO-WAY TRAFFIC, AND NO PASSING WARNING SIGNS AND PLAQUES

Section 2C.45 Merge Signs and Plaque (W4-1, W4-5, and W4-5aP)

Option:

01 A Merge (W4-1) sign (see Figure 2C-11) may be used to warn road users on the major roadway that merging movements might be encountered in advance of a point where lanes from two separate roadways converge as a single traffic lane and no turning conflict occurs.

02 A Merge sign may also be installed on the side of the entering roadway to warn road users on the entering roadway of the merge condition.

Guidance:

03 The Merge sign should be installed on the side of the major roadway where merging traffic will be encountered and in such a position as to not obstruct the road user's view of entering traffic.

Figure 2C-11. Merging and Passing Signs and Plaques

04 When a Merge sign is installed on a major roadway, the symbol should be oriented right or left as appropriate to depict the side from which the merge occurs, with the arrow representing the major roadway and the curved stem representing the entering roadway (see Figure 2C-11)

05 When a Merge sign is to be installed on an entering roadway that curves before merging with the major roadway, such as a ramp with a curving horizontal alignment as it approaches the major roadway, the Entering

Roadway Merge (W4-5) sign (see Figure 2C-11) should be used to better portray the actual geometric conditions to road users on the entering roadway.

06 Where two roadways of approximately equal importance converge and merging movements are required, a Merge sign should be placed on each roadway.

07 The Merge sign should not be used where two roadways converge and merging movements are not required.

Standard:

08 The Merge sign shall not be used in place of a Lane Ends (W4-2) sign (see Section 2C.47) where lanes of traffic moving on a single roadway must merge because of a reduction in the actual or usable pavement width.

Option:

09 An Entering Roadway Merge (W4-5) sign with a NO MERGE AREA (W4-5aP) supplemental plaque (see Figure 2C-11) mounted below it may be used to warn road users on an entering roadway that they will encounter an abrupt merging situation without an acceleration lane at the downstream end of the ramp.

10 A Merge (W4-1) sign with a NO MERGE AREA (W4-5aP) supplemental plaque mounted below it may be used to warn road users on the major roadway that traffic on an entering roadway will encounter an abrupt merging situation without an acceleration lane at the downstream end of the ramp.

11 For a yield-controlled channelized right-turn movement onto a roadway without an acceleration lane, a NO MERGE AREA (W4-5aP) supplemental plaque may be mounted below a Yield Ahead (W3-2) sign and/or below a YIELD (R1-2) sign when engineering judgment indicates that road users would expect an acceleration lane to be present.

Support:

12 Examples of the use of Merge (W4-1) signs are shown in Drawing A in Figure 2C-12.

Section 2C.46 Added Lane Signs (W4-3 and W4-6)

Guidance:

01 The Added Lane (W4-3) sign (see Figure 2C-11) should be installed in advance of a point where two roadways converge and merging movements are not required. When possible, the Added Lane sign should be placed such that it is visible from both roadways; if this is not possible, an Added Lane sign should be placed on the side of each roadway.

02 When an Added Lane (W4-3) sign is installed on a major roadway, the symbol should be oriented right or left as appropriate to depict the side from which the entering roadway converges, with the straight arrow representing the major roadway and the curved arrow representing the entering roadway. The sign should be located on the side of the major roadway from which the entering roadway converges.

03 When an Added Lane sign is to be installed on a roadway that curves before converging with another roadway that has a tangent alignment at the point of convergence, the Entering Roadway Added Lane (W4-6) sign (see Figure 2C-11) should be used to better portray the actual geometric conditions to road users on the curving roadway.

Support:

04 Examples of the use of Added Lane (W4-3) and Entering Roadway Added Lane (W4-6) signs are shown in Drawing B in Figure 2C-12.

Section 2C.47 Lane Ends Signs (W4-2 and W9-1)

Support:

01 The Lane Ends (W4-2) and RIGHT (LEFT) LANE ENDS (W9-1) signs (see Figure 2C-11) are used to warn of the reduction in the number of traffic lanes in the direction of travel.

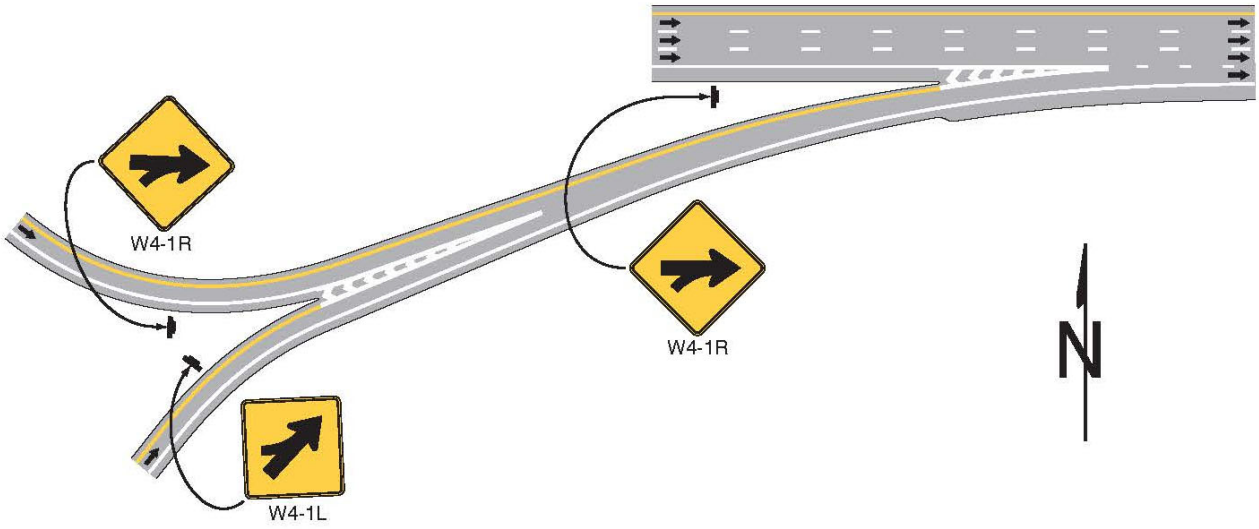
02 The sequence of the W4-2 and W9-1 signs is illustrated in Figure 2C-13.

Guidance:

03 The Lane Ends (W4-2) sign should be installed at the advance placement distance in accordance with Table 2C-3.

Figure 2C-12. Examples of Merge and Added Lane Sign Placement for Entering and Converging Roadways

A – Example for converging and entering roadways



B – Examples for an added lane

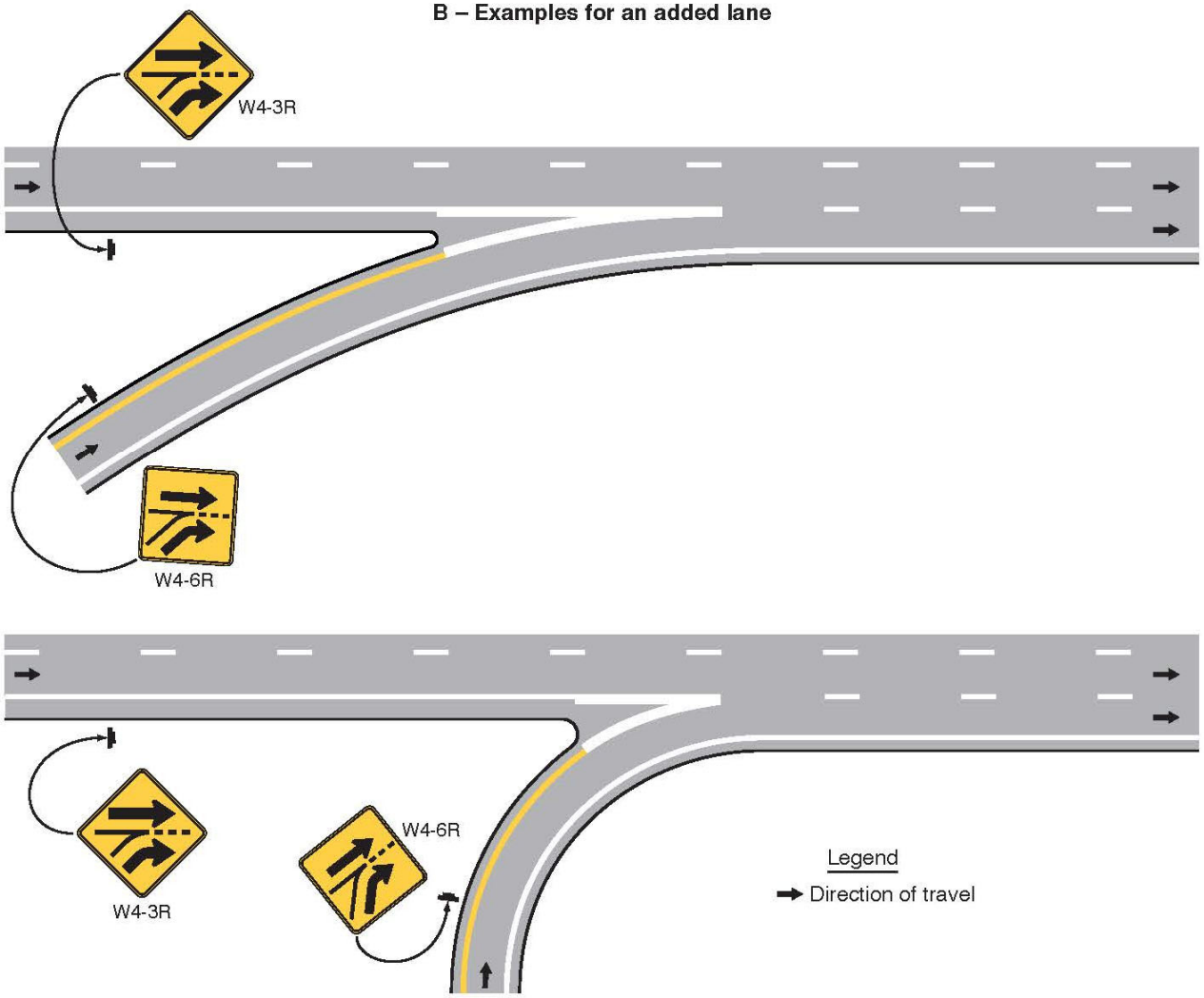


Figure 2C-13. Example Sequences for Lane Ends and Lane Merge Signs (Sheet 1 of 5)

A – Freeway or expressway - lane ends

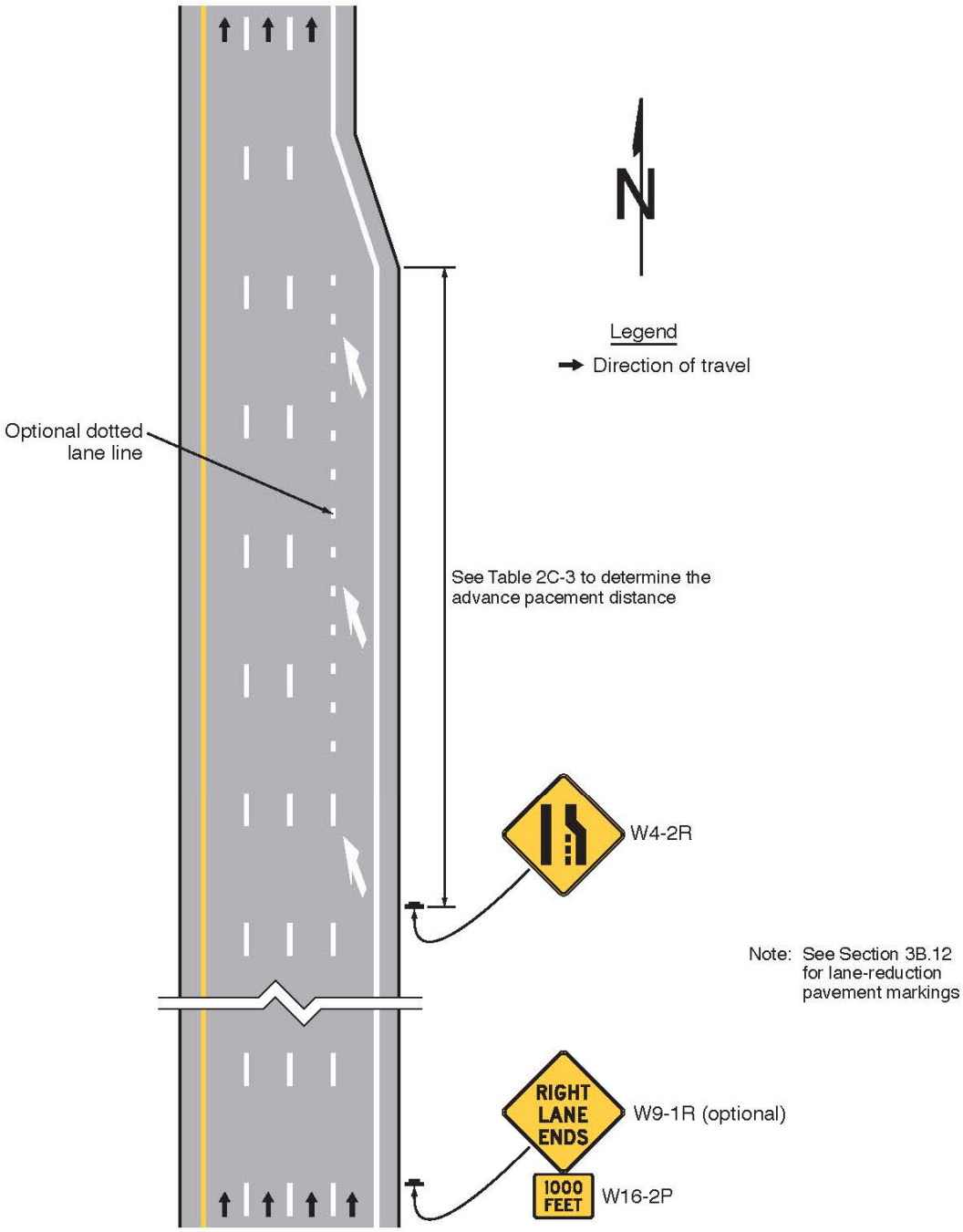
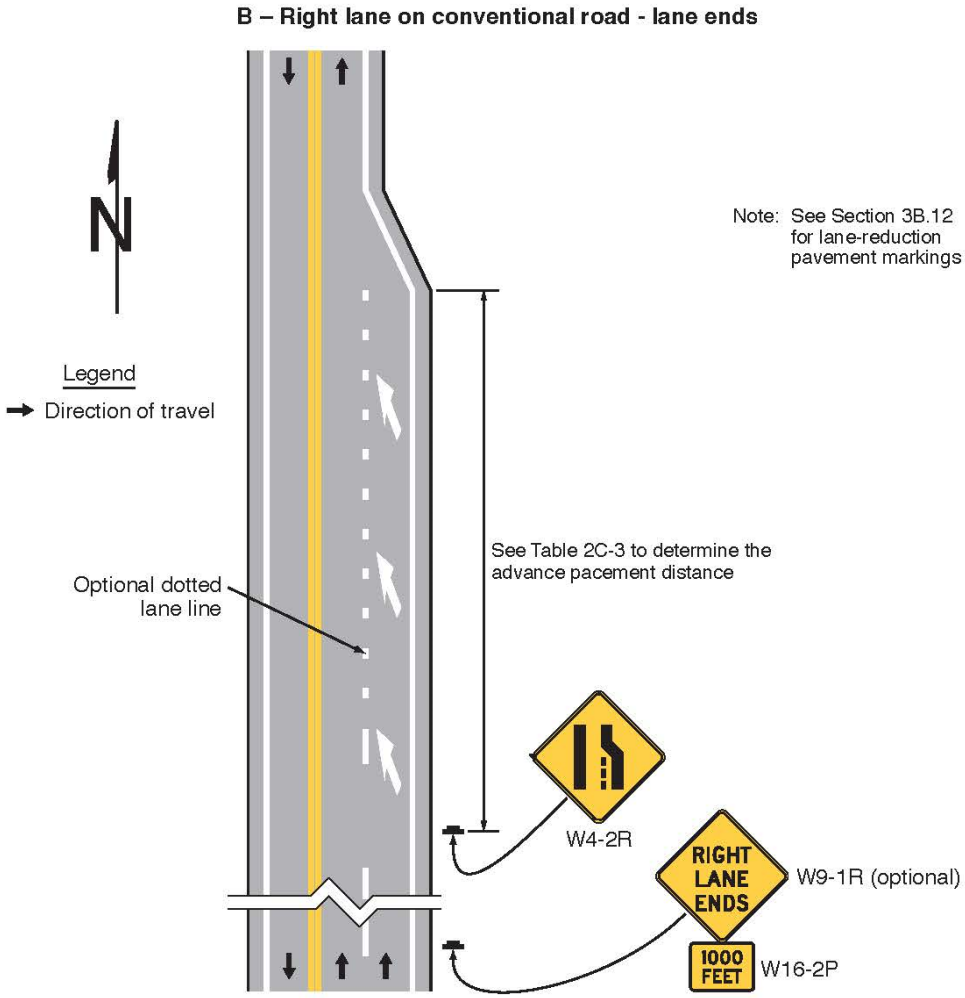


Figure 2C-13. Example Sequences for Lane Ends and Lane Merge Signs (Sheet 2 of 5)



Option:

04 A RIGHT (LEFT) LANE ENDS (W9-1) sign may be installed in advance of the Lane Ends sign to provide additional warning that a lane is ending and that a merging maneuver will be required.

Guidance:

05 If a W9-1 sign is installed, a Distance (W16-2P series or W16-3P series) plaque (see Figure 2C-16) should be installed below the W9-1 sign.

06 On one-way streets or on divided highways where the left-hand lane is ending and the width of the median will permit, the W9-1 and W4-2 signs should be placed facing approaching traffic on the left-hand side or median.

Option:

07 Where a lane ends a distance beyond the intersection that is less than the advance placement distance indicated in Table 2C-3, the W4-2 sign may be located at the far side of the intersection (see Sheet 4 of Figure 2C-13).

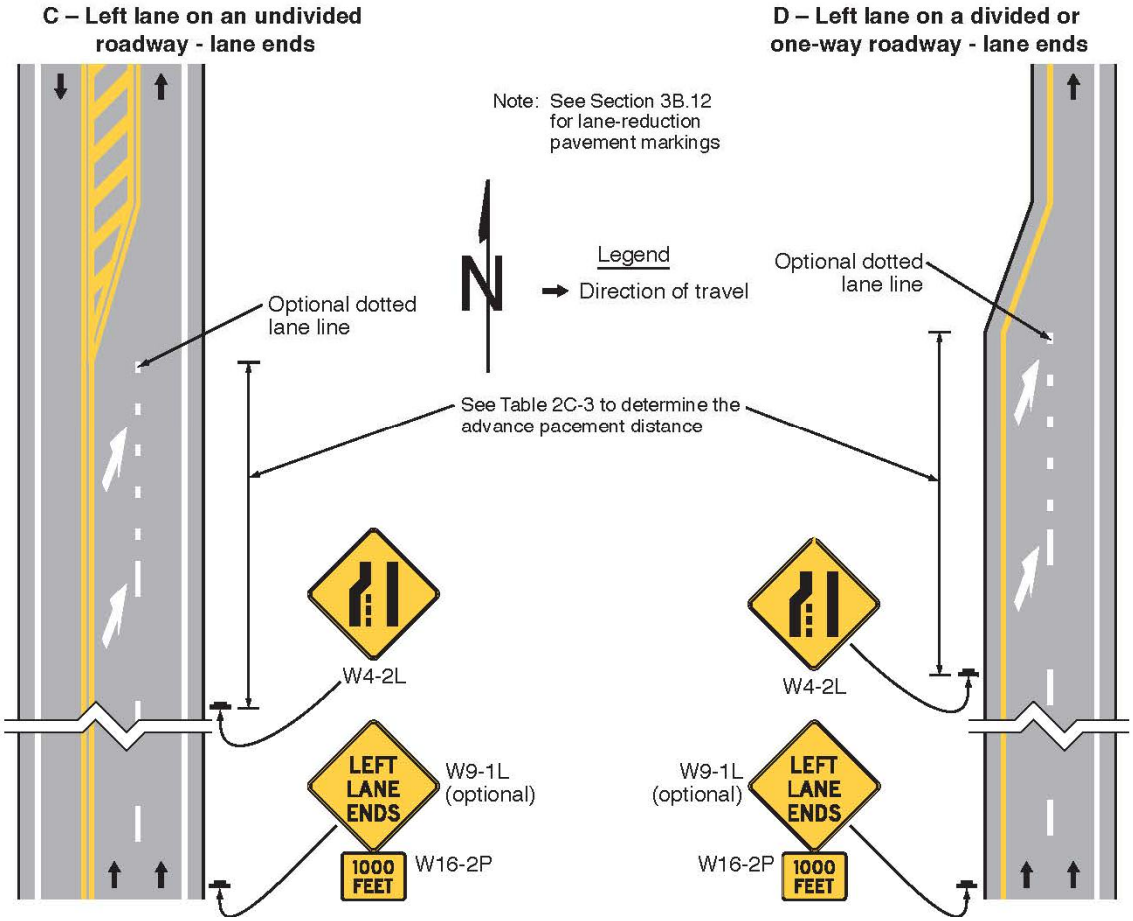
Guidance:

08 When the W4-2 sign is located at the far side of the intersection in accordance with Paragraph 7 of this Section, the W9-1 sign should be placed upstream of the intersection with the appropriate distance plaque.

Support:

09 Section 3B.12 contains information regarding the use of pavement markings in conjunction with a lane reduction.

Figure 2C-13. Example Sequences for Lane Ends and Lane Merge Signs (Sheet 3 of 5)



Guidance:

10 Lane Ends signs should not be installed in advance of the downstream end of an acceleration lane.

Standard:

11 The W4-2 and W9-1 signs shall not be used in dropped lane situations. In dropped lane situations on conventional roads at intersections, regulatory signs (see Section 2B.28) shall be used to inform road users that a through lane becomes a mandatory turn lane.

Section 2C.48 Lanes Merge Signs (W9-4 and W4-8)

Support:

01 The LANES MERGE (W9-4) and Single-Lane Transition (W4-8) signs (see Figure 2C-11) are used to warn of a merge of two lanes to one in the same direction of travel with a merging maneuver required for each lane (see Sheet 5 of Figure 2C-13). This type of merge is for a geometric condition where both approach lanes merge into a single lane, not where one lane merges into the other. Section 6H.08 contains information about the use of the late merge sign.

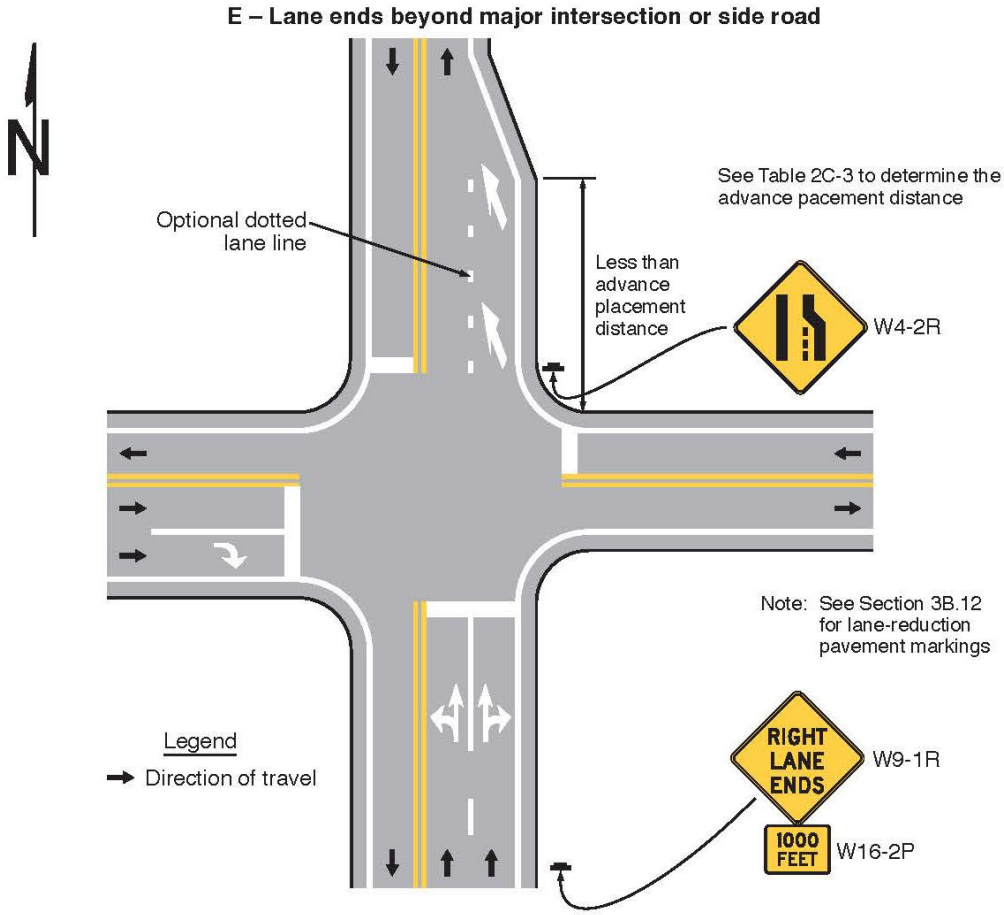
Guidance:

02 The Single-Lane Transition (W4-8) sign should be located at the advance placement distance in accordance with Table 2C-3.

Option:

03 The Lanes Merge (W9-4) sign may be used in advance of the W4-8 sign to provide additional warning that both lanes form a single lane and that a merging maneuver is needed for the traffic in each lane.

Figure 2C-13. Example Sequences for Lane Ends and Lane Merge Signs (Sheet 4 of 5)



Section 2C.49 HEAVY MERGE FROM LEFT (RIGHT) Sign (W4-7)

Option:

01 The HEAVY MERGE FROM LEFT (RIGHT) (W4-7) sign (see Figure 2C-11) may be used to supplement a W4-1 sign at multilane approaches to congested areas to inform road users that it is desirable for through traffic to move out of a lane that will be occupied by a high volume of entering traffic. If used, the W4-7 sign may be supplemented with a W16-2P series or W16-3P series plaque (see Section 2C.61).

Standard:

02 If used, the W4-7 sign shall be installed at a location upstream from the location of the W4-1 sign.

Section 2C.50 RIGHT (LEFT) LANE FOR EXIT ONLY Sign (W9-7)

Option:

01 The RIGHT (LEFT) LANE FOR EXIT ONLY (W9-7) sign (see Figure 2C-11) may be used to provide advance warning to road users that traffic in the right-hand (left-hand) lane of a roadway will be required to depart the roadway at the next exit.

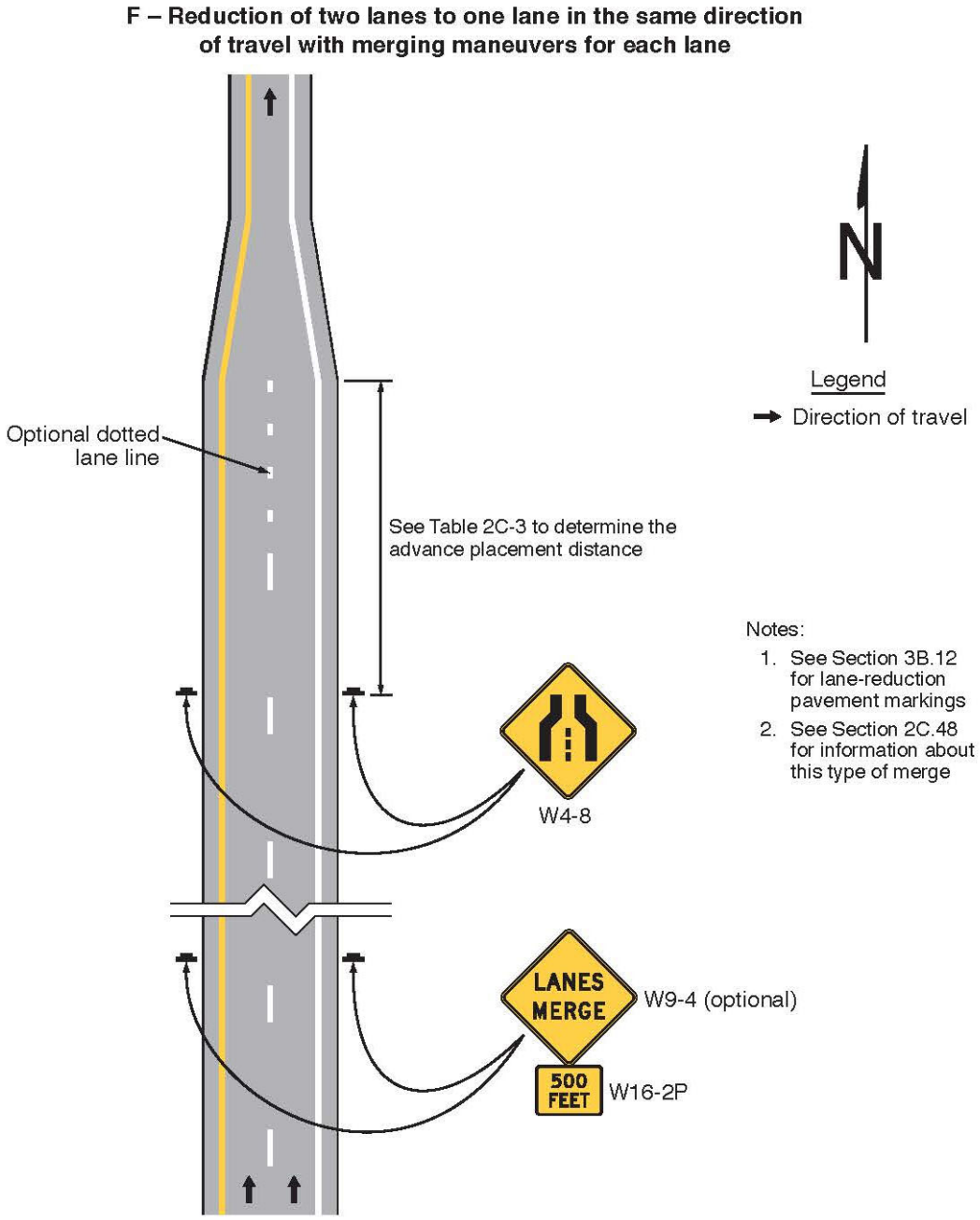
Guidance:

02 If used, the W9-7 sign should be installed upstream from the first overhead guide sign that contains an EXIT ONLY sign panel or upstream from the first RIGHT (LEFT) LANE MUST EXIT (R3-33) regulatory sign, if used, whichever is farther upstream from the exit.

Option:

03 A legend or plaque displaying the distance may be added to the W9-7 sign where the distance along the dropped lane between the sign and the exit ramp is greater than 1 mile.

Figure 2C-13. Example Sequences for Lane Ends and Lane Merge Signs (Sheet 5 of 5)



Support:

04 Section 2B.31 contains information regarding a regulatory sign that can be used for lane drops at grade-separated interchanges.

Section 2C.51 Two-Way Traffic Sign (W6-3)

Guidance:

01 A Two-Way Traffic (W6-3) sign (see Figure 2C-11) should be used to warn road users of a transition from a multi-lane divided section of roadway to a two-lane, two-way section of roadway.

02 A Two-Way Traffic (W6-3) sign with an AHEAD (W16-9P) plaque (see Figure 2C-16) should be used to warn road users of a transition from a one-way street to a two-lane, two-way section of roadway (see Figure 2B-18).

Option:

03 The Two-Way Traffic sign may be used at intervals along a two-lane, two-way roadway and may be used to supplement the Divided Highway (Road) Ends (W6-2) sign discussed in Section 2C.21.

Support:

04 Section 6H.17 contains information on a Narrow Two-Way Traffic (W6-4) sign for use in temporary traffic control situations.

Section 2C.52 Two-Way Traffic on a Three-Lane Roadway Signs (W6-5 and W6-5a)

Option:

01 The Two-Way Traffic on a Three-Lane Roadway (W6-5 and W6-5a) signs (see Figure 2C-11) may be installed along three-lane roadways with two lanes in one direction and one in the opposing direction.

Section 2C.53 NO PASSING ZONE Sign (W14-3)

Standard:

01 The NO PASSING ZONE (W14-3) sign (see Figure 2C-11) shall be a pennant-shaped isosceles triangle with its longer axis horizontal and pointing to the right. When used, the NO PASSING ZONE sign shall be installed on the left-hand side of the roadway at the beginning of no-passing zones identified by pavement markings or DO NOT PASS signs or both (see Sections 2B.36 and 3B.03).

MISCELLANEOUS WARNING SIGNS AND PLAQUES

Section 2C.54 Vehicular Traffic Warning Signs (W8-6, W11-1, W11-5, W11-8, W11-10, W11-11, W11-12P, W11-14, W11-15, and W11-15a)

Option:

01 Vehicular Traffic Warning (W8-6, W11-1, W11-5, W11-8, W11-10, W11-11, W11-12P, W11-14, W11-15, and W11-15a) signs (see Figure 2C-14) may be used to alert road users to locations where unexpected entries into the roadway by trucks, bicycles, farm vehicles, emergency vehicles, golf carts, horse-drawn vehicles, or other vehicles might occur. The TRUCK CROSSING (W8-6) word message sign may be used as an alternate to the Truck (W11-10) symbol sign.

Support:

02 These locations might be relatively confined or might occur randomly over a segment of roadway.

Guidance:

03 Vehicular Traffic Warning signs should be used only at locations where the road user's sight distance is restricted, or the condition, activity, or entering traffic would be unexpected.

04 If the condition or activity is seasonal or temporary, the Vehicular Traffic Warning sign should be removed or covered when the condition or activity does not exist.

Option:

05 The Trail Crossing (W11-15) sign may be used where both bicyclists and pedestrians might be crossing the roadway, such as at an intersection with a shared-use path. A TRAIL X-ING (W11-15P) supplemental plaque (see Figure 2C-14) may be mounted below the W11-15 sign. The TRAIL CROSSING (W11-15a) sign may be used to warn of shared-use path crossings where pedestrians, bicyclists, and other user groups might be crossing the roadway.

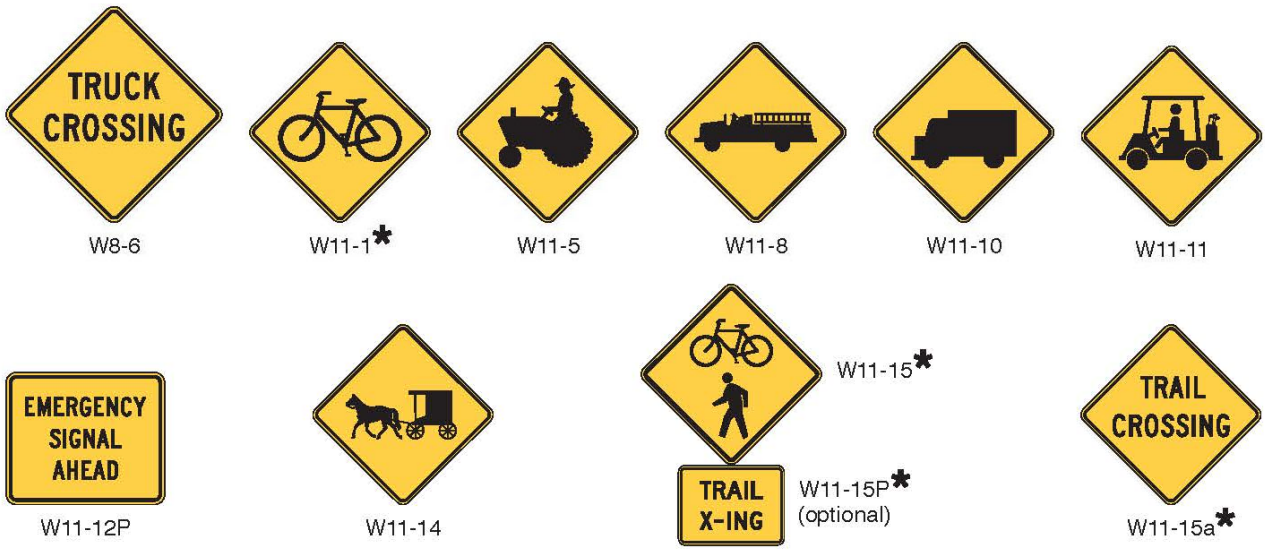
06 The W11-1, W11-15, and W11-15a signs and their related supplemental plaques may have a fluorescent yellow-green background with a black legend and border.

07 Supplemental plaques (see Figure 2C-16 and Section 2C.57) with legends such as AHEAD, XX FEET, NEXT XX MILES, IN STREET, or IN ROAD may be mounted below Vehicular Traffic Warning signs to provide advance notice to road users of unexpected entries.

Standard:

08 If used in advance of a trail crossing, a W11-15 or W11-15a sign shall be supplemented with an AHEAD plaque to inform road users that they are approaching a point where crossing activity might occur.

Figure 2C-14. Vehicular Traffic Warning Signs and Plaques



Standard:

09 If a post-mounted W11-1, W11-11, W11-15, or W11-15a sign is placed at the location of the crossing point where golf carts, pedestrians, bicyclists, or other shared-use path users might be crossing the roadway, a diagonal downward-pointing arrow (W16-7P) plaque (see Figure 2C-16 and Section 2C.63) shall be mounted below the sign. If the W11-1, W11-11, W11-15, or W11-15a sign is mounted overhead, the W16-7P supplemental plaque shall not be used.

10 A Vehicular Traffic Warning sign assembly shall not be installed on an approach controlled by a STOP or a YIELD sign, except as provided in Paragraphs 11 and 12 of this Section.

Option:

11 The Vehicular Traffic Warning sign assembly may be installed on an approach to a circular intersection controlled by a YIELD sign where the crosswalk is at least 20 feet in advance of the yield point at the entrance to the circulatory roadway.

12 At a signalized or stop-controlled intersection the Vehicular Traffic Warning sign assembly may be installed on an approach to a channelized right-turn lane controlled by a YIELD sign where the crosswalk is at least 20 feet in advance of the yield point.

13 The crossing location identified by a W11-1, W11-11, W11-15, or W11-15a sign may be defined with crosswalk markings (see Chapter 3C).

Standard:

14 The Emergency Vehicle (W11-8) sign (see Figure 2C-14) with the EMERGENCY SIGNAL AHEAD (W11-12P) supplemental plaque (see Figure 2C-14) shall be placed in advance of all emergency-vehicle traffic control signals (see Chapter 4M).

Option:

15 The Emergency Vehicle (W11-8) sign, or a word message sign indicating the type of emergency vehicle (such as rescue squad), may be used in advance of the emergency-vehicle station when no emergency-vehicle traffic control signal is present.

16 A Warning Beacon (see Section 4S.03) may be used with any Vehicular Traffic Warning sign to indicate specific periods when the condition or activity is present or is likely to be present, or to provide enhanced sign conspicuity.

17 A supplemental WHEN FLASHING (W16-13P) plaque (see Figure 2C-16) may be used with any Vehicular Traffic Warning sign that is supplemented with a Warning Beacon to indicate specific periods when the condition or activity is present or is likely to be present.

Section 2C.55 Non-Vehicular Warning Signs (W11-2, W11-3, W11-4, W11-6, W11-7, W11-9, and W11-16 through W11-22)

Option:

01 REMOVED

Post-mounted W11-3, W11-4, and W11-16 through W11-22 signs (see Figure 2C-15) may be used to alert road users in advance of locations where unexpected entries into the roadway by animals might occur.

Standard:

Non-Vehicular Warning (W11-2, W11-6, W11-7 and W11-9) signs (see Figure 2C-15) shall be used to alert road users in advance of locations ~~where the posted speed is 45 mph or greater,~~ where unexpected entries into the roadway might occur or where shared use of the roadway by pedestrians, snowmobilers, or equestrians might occur when the posted speed is 45 mph or greater.

Option:

Non-Vehicular Warning (W11-2, W11-6, W11-7 and W11-9) signs (see Figure 2C-15) may be used to alert road users in advance of locations ~~where the posted speed is 40 mph or less,~~ where unexpected entries into the roadway might occur or where shared use of the roadway by pedestrians, snowmobilers, or equestrians might occur when the posted speed is 40 mph or less.

Support:

02 These conflicts might be relatively confined, or might occur randomly over a segment of roadway.

Standard:

03 If used in advance of a pedestrian, snowmobile, or equestrian crossing, the W11-2, W11-6, W11-7, and W11-9 signs shall be supplemented with plaques (see Figure 2C-16 and Section 2C.61) with the legend AHEAD to inform road users that they are approaching a point where crossing activity might occur.

04 If a post-mounted W11-2, W11-6, W11-7, or W11-9 sign is placed at the location of the crossing point where pedestrians, snowmobilers, or equestrians might be crossing the roadway, a diagonal downward-pointing arrow (W16-7P) plaque (see Figure 2C-16 and Section 2C.63) shall be mounted below the sign. If the W11-2, W11-6, W11-7, or W11-9 sign is mounted overhead, the W16-7P plaque shall not be used.

~~**REMOVED**~~

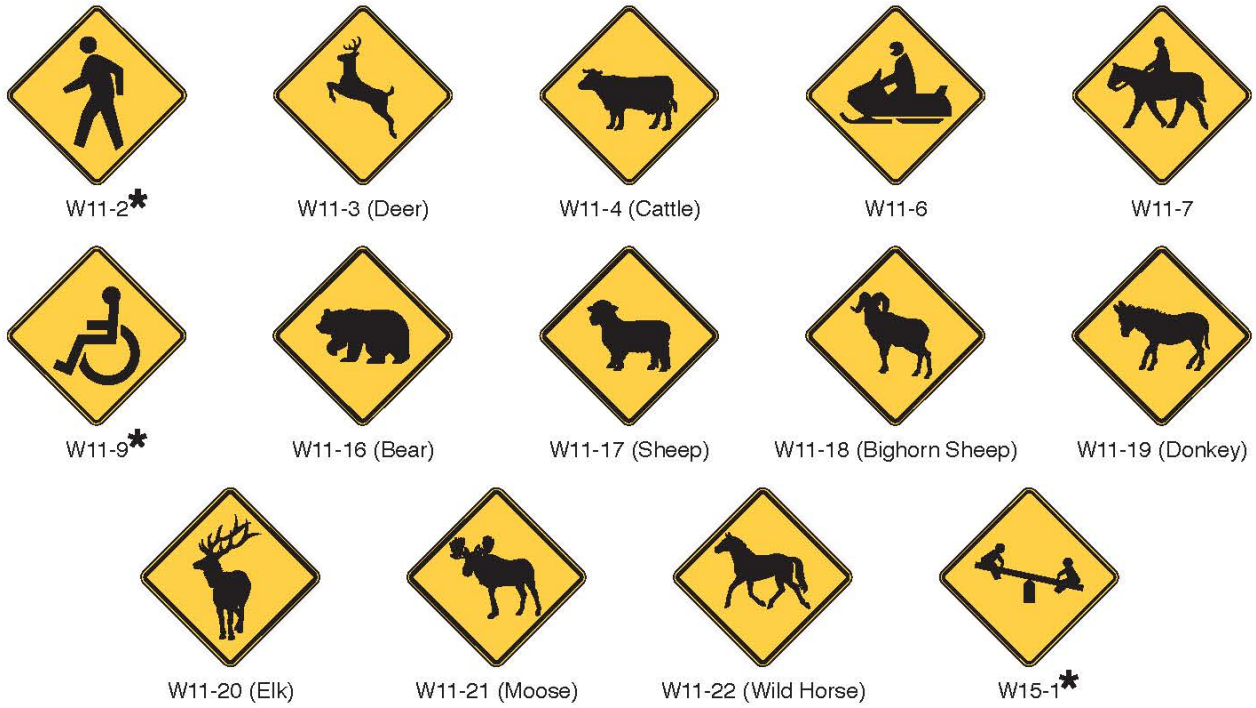
~~**A post-mounted W11-2, W11-6, W11-7, or W11-9 sign shall be placed at the location of the crossing point where pedestrians, snowmobilers, or equestrians might be crossing the roadway. A diagonal downward-pointing arrow (W16-7P) plaque (see Figure 2C-16 and Section 2C.63) shall be mounted below the sign. If the W11-2, W11-6, W11-7, or W11-9 sign is mounted overhead, the W16-7P plaque shall not be used.**~~

05 A Non-Vehicular Warning sign assembly shall not be installed on an approach controlled by a STOP or a YIELD sign, except as provided in Paragraphs 6 and 7 of this Section.

Option:

06 The Non-Vehicular Warning sign assembly may be installed on an approach to a circular intersection controlled by a YIELD sign where the crosswalk is at least 20 feet in advance of the yield point at the entrance to a circulatory roadway.

Figure 2C-15. Non-Vehicular Warning Signs



* A fluorescent yellow-green background color may be used for this sign or plaque.

07 At a signalized or stop-controlled intersection the Non-Vehicular Warning sign assembly may be installed on an approach to a channelized right-turn lane controlled by a YIELD sign where the crosswalk is at least 20 feet in advance of the yield point.

08 A Pedestrian Crossing (W11-2) sign may be placed overhead or may be post-mounted with a diagonal downward-pointing arrow (W16-7P) plaque at the crosswalk location where Yield Here To (Stop Here For) Pedestrians signs (see Section 2B.19) have been installed in advance of the crosswalk.

Standard:

09 If a W11-2 sign has been post-mounted at the crosswalk location where a Yield Here To (Stop Here For) Pedestrians sign is used on the approach, the Yield Here To (Stop Here For) Pedestrians sign shall not be placed on the same post as the W11-2 sign.

Option:

10 An advance Pedestrian Crossing (W11-2) sign with an AHEAD or a distance supplemental plaque may be used in conjunction with a Yield Here To (Stop Here For) Pedestrians sign on the approach to the same crosswalk.

11 The crossing location identified by a W11-2, W11-6, W11-7, or W11-9 sign may be defined with crosswalk markings (see Chapter 3C).

12 The W11-2 and W11-9 signs and their related supplemental plaques may have a fluorescent yellow-green background with a black legend and border.

Guidance:

13 When a fluorescent yellow-green background is used, a systematic approach featuring one background color within a zone or area should be used. The mixing of standard yellow and fluorescent yellow-green backgrounds within a selected site area should be avoided.

Option:

14 A Warning Beacon (see Section 4S.03) may be used with any Non-Vehicular Warning sign to indicate specific periods when the condition or activity is present or is likely to be present, or to provide enhanced sign conspicuity.

15 A supplemental WHEN FLASHING (W16-13P) plaque (see Figure 2C-16) may be used with any Non-Vehicular Warning sign that is supplemented with a Warning Beacon to indicate specific periods when the condition or activity is present or is likely to be present.

Section 2C.56 Playground Sign (W15-1)

Option:

01 The Playground (W15-1) sign (see Figure 2C-15) may be used to give advance warning of a designated children's playground that is located adjacent to the road.

02 The Playground sign may have a fluorescent yellow-green background with a black legend and border.

Guidance:

03 If the access to the playground area requires a roadway crossing, the application of crosswalk pavement markings (see Chapter 3C) and Non-Vehicular Warning signs (see Section 2C.55) should be considered.

SUPPLEMENTAL WARNING PLAQUES

Section 2C.57 Use of Supplemental Warning Plaques

Option:

01 A supplemental warning plaque (see Figure 2C-16) may be displayed with a warning or regulatory sign when engineering judgment indicates that road users require additional warning information beyond that contained in the main message of the warning or regulatory sign.

Standard:

02 Supplemental warning plaques shall be used only in combination with and installed on the same post(s) as warning or regulatory signs. They shall not be mounted alone or displayed alone.

03 Unless otherwise provided in this Manual for a particular plaque, supplemental warning plaques shall be mounted below the sign they supplement.

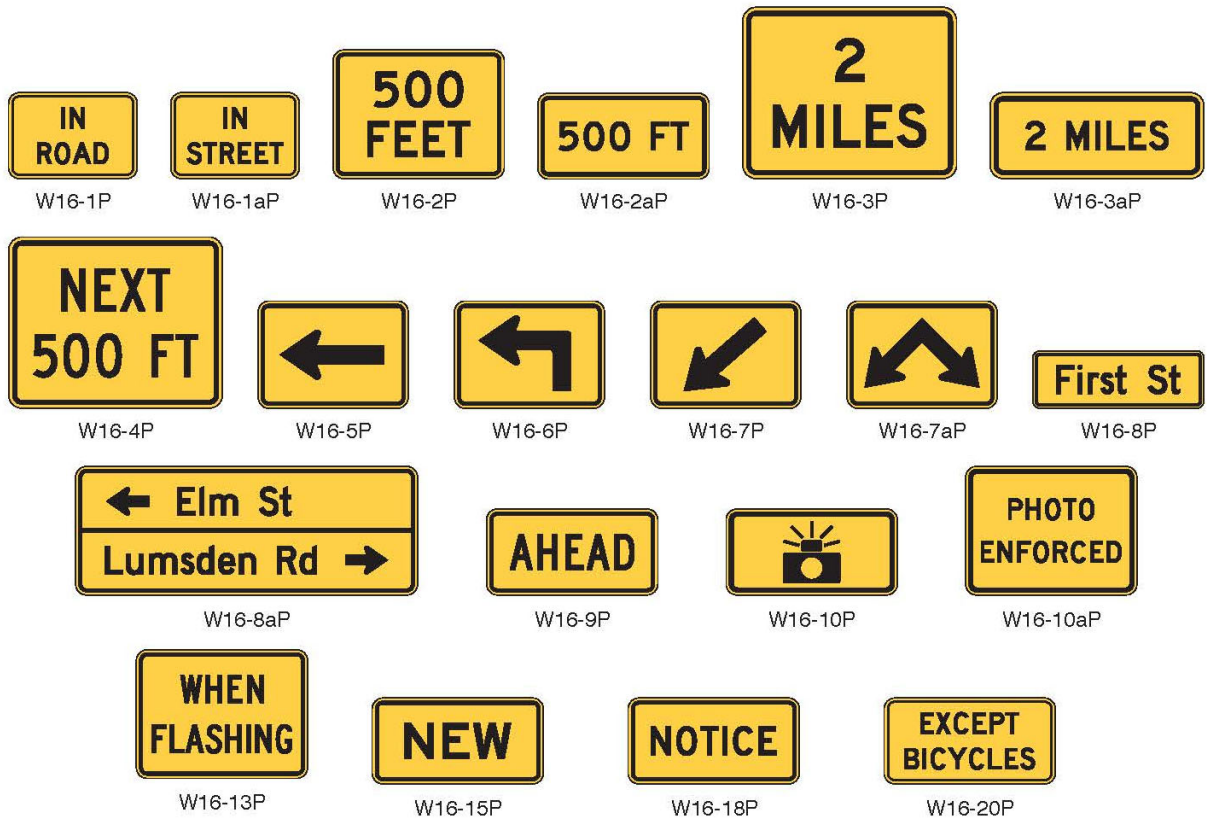
Section 2C.58 Design of Supplemental Warning Plaques

Standard:

01 A supplemental warning plaque used with a warning sign shall have the same legend, border, and background color as the warning sign with which it is displayed. A supplemental warning plaque used with a regulatory sign shall have a black legend and border on a yellow background.

02 Supplemental warning plaques shall be square or rectangular.

Figure 2C-16. Supplemental Warning Plaques



Note: The background color (yellow or fluorescent yellow-green) shall match the color of the warning sign that it supplements.

Section 2C.59 Advisory Speed Plaque (W13-1P) and Confirmation Advisory Speed Plaque (W13-1aP)

Option:

01 The Advisory Speed (W13-1P) plaque (see Figure 2C-1) may be used to supplement an advance warning sign to indicate the advisory speed for a condition.

02 The Confirmation Advisory Speed (W13-1aP) plaque (see Figure 2C-1) may be used to supplement a One-Direction Large Arrow (W1-6) sign on the outside of a turn or curve in line with and at approximately a right angle to approaching traffic.

Standard:

03 The use of the Advisory Speed and Confirmation Advisory Speed plaques for horizontal curves shall be in accordance with Section 2C.06 and Table 2C-6. The speed differential in Table 2C-6 shall be the difference between the advisory speed for the horizontal curve and the posted speed limit, statutory speed limit, or the 85th percentile speed on the approach to the curve. The Advisory Speed plaque shall also be used where an engineering study indicates a need to advise road users of the advisory speed for other roadway conditions.

Table 2C-6. Use of Advisory Speed Plaque for Horizontal Alignment Changes

Speed Differential	Use of Advisory Speed Plaque (W13-1P)[1]
5 mph	Optional
10 mph	Recommended
15 mph or more	Required

[1] See Section 2C.59

04 The speed displayed on the Advisory Speed and Confirmation Advisory Speed plaques shall be a multiple of 5 mph.

05 Except in emergencies or when the condition is temporary, an Advisory Speed or Confirmation Advisory Speed plaque shall not be installed until the advisory speed has been determined by an engineering study.

06 The Advisory Speed plaque shall only be used to supplement an advance warning sign. The Advisory Speed plaque or the Confirmation Advisory Speed plaque shall not be installed as a separate sign installation.

Guidance:

07 The Advisory Speed plaque, if used with a sign that is also supplemented with another plaque, such as an Advance Street Name plaque (see Section 2C.65), should be mounted immediately below the primary warning sign with any other plaque mounted below the Advisory Speed plaque.

Standard:

08 The Confirmation Advisory Speed plaque shall only be used to supplement a One-Direction Large Arrow (W1-6) sign (see Section 2C.10) or an Exit Gore (E5-1 series) sign (see Section 2E.26) and shall not be installed as a separate sign installation.

09 The advisory speed shall be determined by an engineering study that follows established engineering practices.

Guidance:

10 The advisory speed should be determined based on free-flowing traffic conditions.

11 Because changes in conditions, such as roadway geometrics, surface characteristics, or sight distance, might affect the advisory speed, each location should be evaluated periodically or when conditions change.

Support:

12 The 2nd Edition of the "Traffic Control Devices Handbook," 2013, Institute of Transportation Engineers contains engineering practices for the determination of the recommended advisory speed for a horizontal curve including the following:

A. Compass method
B. Safety-based method
C. Accelerometer method
D. Design equation method
E. Ball-bank method using the following criteria:
    1. 16 degrees of ball-bank for speeds of 20 mph or less
    2. 14 degrees of ball-bank for speeds of 25 to 30 mph
    3. 12 degrees of ball-bank for speeds of 35 mph and higher

13 The 16, 14, and 12 degrees of ball-bank criteria are comparable to the current AASHTO horizontal curve design guidance. Research has shown that drivers often exceed existing posted advisory curve speeds by 7 to 10 mph.

Section 2C.60 NEW Plaque (W16-15P)

Option:

01 A NEW (W16-15P) plaque (see Figure 2C-16) may be mounted above a regulatory sign when a new regulation takes effect in order to alert road users to the new traffic regulation. A NEW plaque may also be mounted above an advance warning sign (such as a Signal Ahead sign for a newly-installed traffic control signal) for a warning of a new traffic condition.

Guidance:

02 The NEW plaque should be removed no later than 12 months after it was installed.

Section 2C.61 Distance Plaques (W16-2 Series, W16-3 Series, W16-4P, and W7-3aP)

Option:

01 The Distance Ahead (W16-2 series and W16-3 series) plaques (see Figure 2C-16) may be used to inform the road user of the distance to the condition indicated by the warning sign.

02 The Next Distance (W7-3aP and W16-4P) plaques (see Figures 2C-5 and 2C-16) may be used to inform road users of the length of roadway over which the condition indicated by the warning sign exists.

Section 2C.62 Supplemental Arrow Plaques (W16-5P and W16-6P)

Guidance:

01 If the condition indicated by a warning sign is located on an intersecting road and the distance between the intersection and condition is not sufficient to provide adequate advance placement of the warning sign, a Supplemental Arrow (W16-5P or W16-6P) plaque (see Figure 2C-16) should be used below the warning sign.

Standard:

02 Supplemental Arrow plaques shall have the same legend design as the Advance Turn Arrow and Directional Arrow auxiliary signs (see Sections 2D.26 and 2D.28) except that they shall have a black legend and border on a yellow or fluorescent yellow-green background, as appropriate.

Section 2C.63 Diagonal Downward-Pointing Arrow Plaques (W16-7P and W16-7aP)

Support:

01 Diagonal downward-pointing arrow (W16-7P and W16-7aP) plaques (see Figure 2C-16) are used with certain Vehicular Traffic Warning signs (see Section 2C.54) and certain Non-Vehicular Warning signs (see Section 2C.55), and School Crossing signs (see Section 7B.03) to indicate the specific location of a crossing point.

02 The W16-7P plaque contains a single arrow pointing diagonally down to the right or left, toward the roadway, depending on which side of the roadway it is located.

Option:

03 A W16-7aP plaque may be used with a single crossing sign located on a narrow median separating two roadways with traffic in the same direction where the crossing traverses both roadways.

Section 2C.64 Hill-Related Plaques (W7-2 Series and W7-3 Series)

Guidance:

01 Hill-Related (W7-2 series and W7-3 series) plaques (see Figure 2C-5) or other appropriate legends and larger signs should be used for emphasis or where special hill characteristics exist.

02 On longer grades, the use of a distance (W7-3aP or W7-3bP) plaque (see Figure 2C-5) at periodic intervals of approximately 1-mile spacing should be considered.

Section 2C.65 Advance Street Name Plaques (W16-8P and W16-8aP)

Option:

01 An Advance Street Name (W16-8P or W16-8aP) plaque (see Figure 2C-16) may be used with any Intersection (W1-10 series, W2 series, W10-2, W10-3, or W10-4) or Advance Traffic Control (W3 series) sign to identify the name of the intersecting street.

Standard:

02 The lettering on Advance Street Name plaques shall be composed of a combination of lower-case letters with initial upper-case letters.

03 If two street names are used on the Advance Street Name plaque, a directional arrow pointing in the direction of the street shall be placed next to each street name. Arrows pointing to the left shall be placed to the left of the street name, and arrows pointing to the right shall be placed to the right of the street name.

Guidance:

04 If two street names are used on the Advance Street Name plaque, the street names and associated arrows should be displayed in the following order:

A. For a single intersection, the name of the street to the left should be displayed above the name of the street to the right; or

B. For two sequential intersections, such as where the plaque is used with an Offset Side Roads (W2-7) or a Double Side Road (W2-8) sign, the name of the first street encountered should be displayed above the name of the second street encountered, and the arrow associated with the second street encountered should be an advance arrow, such as the arrow shown on the W16-6P arrow plaque (see Figure 2C-16).

Section 2C.66 Traffic Does Not Stop Plaques (W4-4P Series)

Option:

01 The CROSS TRAFFIC DOES NOT STOP (W4-4P) plaque (see Figure 2C-10) may be used in combination with a STOP sign when engineering judgment indicates that conditions are present that are causing or could cause road users to misinterpret the intersection as an all-way stop.

02 The TRAFFIC FROM LEFT (RIGHT) DOES NOT STOP (W4-4aP) or ONCOMING TRAFFIC DOES NOT STOP (W4-4bP) plaque may be used when such messages more accurately describe the traffic controls established at the intersection.

Guidance:

03 The W4-4aP and W4-4bP plaques should be used at intersections where STOP signs control all but one approach to the intersection, unless the only non-stopped approach is from a one-way street.

Standard:

04 If a W4-4P series plaque is used, it shall be mounted below the STOP sign.

Support:

05 Section 9C.06 contains information for Bicycle Cross Traffic warning plaques that can be used below STOP signs on crossroads or driveways that intersect with bicycle facilities.

Section 2C.67 IN ROAD and IN STREET Plaques (W16-1P and W16-1aP)

Option:

01 In situations where there is a need to warn drivers to watch for other slower forms of transportation traveling along the highway, such as bicycles, pedestrians, golf carts, horse-drawn vehicles, or farm machinery, an IN ROAD (W16-1P) plaque or IN STREET (W16-1aP) plaque (see Figure 2C-16) may be used.

Standard:

02 The background color of the W16-1P or W16-1aP plaque shall match the background color of the warning sign with which it is displayed. If a W16-1P or W16-1aP plaque is used, it shall be mounted below either a Vehicular Traffic Warning sign (see Section 2C.54) or a Non-Vehicular Warning sign (see Section 2C.55), and shall not be mounted alone.

Support:

03 Section 9B.14 contains information about the use of a Bicycles Allowed Use of Full Lane (R9-20) sign to inform drivers of the presence of bicycles in the roadway or where bicyclists are expected or preferred to use the full lane.

Section 2C.68 EXCEPT BICYCLES Plaque (W16-20P)

Option:

01 Where it is desired to notify bicyclists that the conditions depicted by a warning sign are not applicable to bicycles, the EXCEPT BICYCLES (W16-20P) supplemental warning plaque (see Figure 2C-16) may be mounted below the warning sign.

Support:

02 Examples of warning signs with which an EXCEPT BICYCLES (W16-20P) plaque can be mounted include DEAD END (W14-1) or NO OUTLET (W14-2) signs.

Section 2C.69 Photo Enforced Plaques (W16-10P and W16-10aP)

Support:

Photo radar speed detection is not allowed in Wisconsin pursuant to Wis. State Statute 349.02.

Option:

01 A Photo Enforced (W16-10P) plaque or a PHOTO ENFORCED (W16-10aP) word message plaque (see Figure 2C-16) may be mounted below a warning sign to advise road users that the regulations associated with the condition being warned about (such as a traffic control signal or a toll plaza) are being enforced by photographic equipment.

OBJECT MARKERS

Section 2C.70 Object Marker Design and Placement Height

Support:

01 Types 1, 2, and 3 object markers are used to mark obstructions within or adjacent to the roadway. Type 4 object markers are used to mark the end of a roadway.

Standard:

02 When used, object markers (see Figure 2C-17) shall not have a border and shall consist of an arrangement of one or more of the following types:

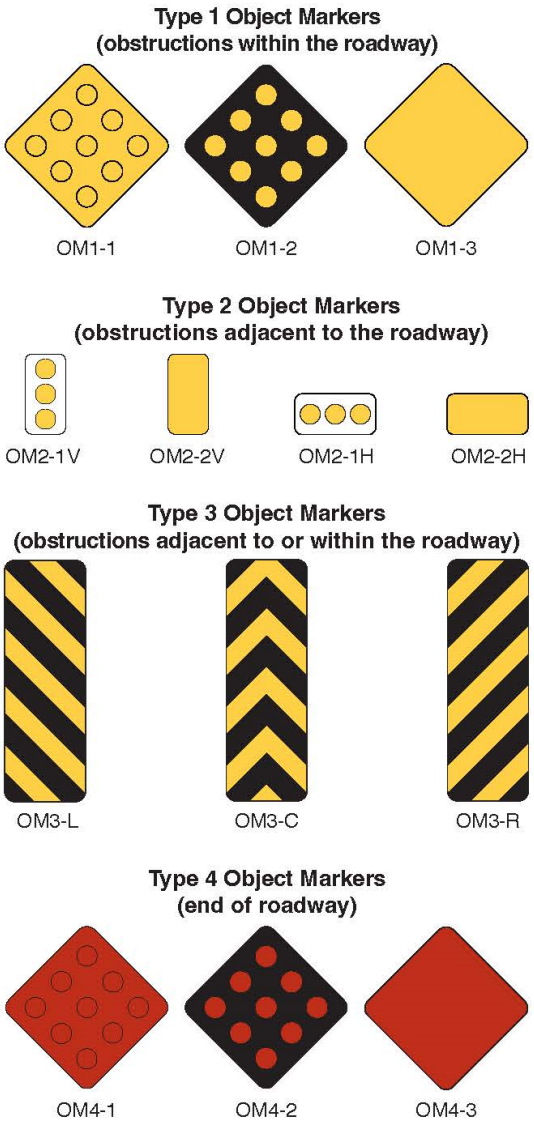
Type 1—a diamond-shaped sign, at least 18 inches on a side, consisting of either a yellow (OM1-1) or black (OM1-2) sign with nine yellow retroreflective devices, each with a minimum diameter of 3 inches, mounted symmetrically on the sign, or an all-yellow retroreflective sign (OM1-3).

Type 2—either a marker (OM2-1V or OM2-1H) consisting of three yellow retroreflective devices, each with a minimum diameter of 3 inches, arranged either horizontally or vertically on a white sign measuring at least 6 x 12 inches; or an all-yellow horizontal or vertical retroreflective sign (OM2-2V or OM2-2H), measuring at least 6 x 12 inches.

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

Type 4—a diamond-shaped sign, at least 18 inches on a side, consisting of either a red (OM4-1) or black (OM4-2) sign with nine red retroreflective devices, each with a minimum diameter of 3 inches, mounted symmetrically on the sign, or an all-red retroreflective sign (OM4-3).

Figure 2C-17. Object Markers



Support:

03 Type 3 object markers with stripes that begin at the upper right side and slope downward to the lower left side are designated as right object markers (OM3-R). Object markers with stripes that begin at the upper left side and slope downward to the lower right side are designated as left object markers (OM3-L). Object markers with chevron stripes that slope downward to both the lower left and lower right sides are designated as center object markers (OM3-C).

Guidance:

04 When used for marking obstructions within the roadway or obstructions that are 8 feet or less from the shoulder or curb, the minimum mounting height, measured from the bottom of the object marker to the elevation of the near edge of the traveled way, should be 4 feet.

05 When used to mark obstructions more than 8 feet from the shoulder or curb, the clearance from the ground to the bottom of the object marker should be at least 4 feet.

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

Option:

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

Support:

08 Section 9C.09 contains information regarding the use of object markers on shared-use paths.

Section 2C.71 Object Markers for Obstructions Within the Roadway

Standard:

01 Obstructions within the roadway shall be marked with a Type 1 or Type 3 object marker. In addition to markers on the face of the obstruction, warning of approach to the obstruction shall be given by appropriate pavement markings (see Section 3B.13).

Option:

02 To provide additional emphasis, a Type 1 or Type 3 object marker may be installed at or near the approach end of a median island.

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

Standard:

04 The alternating black and retroreflective yellow stripes (OM3-L, OM3-R) shall be sloped down at an angle of 45 degrees toward the side on which traffic is to pass the obstruction. If traffic can pass to either side of the obstruction, the alternating black and retroreflective yellow stripes (OM3-C) shall form chevrons that point upwards.

Option:

05 Appropriate signs (see Sections 2B.39 and 2C.23) directing traffic to one or both sides of the obstruction may be used instead of the object marker.

Section 2C.72 Object Markers for Obstructions Adjacent to the Roadway

Support:

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

Guidance:

On an approach to a bridge where the shoulder is narrowed, the convergence should be delineated with a minimum of two Object Markers Type 2 (OM2-2V) spaced at 100 feet or less, as determined by engineering judgment.

Option:

02 Type 2 or Type 3 object markers may be used to mark an obstruction adjacent to the roadway.

Guidance:

03 If a Type 2 or Type 3 object marker is used to mark an obstruction adjacent to the roadway, the edge of the object marker that is closest to the road user should be installed in line with the closest edge of the obstruction.

04 When a marker is applied to the approach ends of guardrail or crash cushion terminals it should have the appearance of a Type 3 object marker and should be directly affixed, without a substrate, to the approach end of the guardrail or crash cushion and generally conform to the size and shape of the approach end of the guardrail or crash cushion.

Standard:

05 Type 1 and Type 4 object markers shall not be used to mark obstructions adjacent to the roadway.

Guidance:

06 Standard warning signs in this Chapter should also be used where applicable.

Section 2C.73 Object Markers for Ends of Roadways

Support:

01 The Type 4 object marker is used to warn and alert road users of the end of a roadway in other than construction or maintenance areas.

Standard:

02 If an object marker is used to mark the end of a roadway, a Type 4 object marker (OM4-1 or OM4-3) shall be used.

Support:

The Type 4 Object Marker (OM4-2) is not used in Wisconsin.

Option:

03 The Type 4 object marker may be used in instances where there are no alternate vehicular paths.

04 Where conditions warrant, more than one marker, or a larger marker with or without a Type 3 Barricade (see Section 2B.75), may be used at the end of the roadway.

Standard:

05 The minimum mounting height, measured vertically from the bottom of a Type 4 object marker to the elevation of the near edge of the traveled way, shall be 4 feet.

Guidance:

06 Appropriate advance warning signs in this Chapter should be used.

PART 3
MARKINGS

CHAPTER 3A. GENERAL

CHAPTER 3B. PAVEMENT AND CURB MARKINGS

CHAPTER 3A. GENERAL

Section 3A.01 Standardization of Application

Support:

01 Markings are used to supplement other traffic control devices such as signs, signals, and other markings. In other instances, markings are used alone to effectively convey regulations, warnings, or guidance in ways not obtainable by the use of other devices.

02 Markings can take many forms including road surface markings, curb markings, delineators, colored pavements, and channelizing devices.

Standard:

03 Each standard marking shall be used only to convey the meaning prescribed for that marking in this Manual, including when used for applications not described in this Manual.

04 Except as provided in Chapter 3H, markings that must be visible at night shall be retroreflective unless the markings are adequately visible under street or highway lighting. All markings on Interstate highways shall be retroreflective.

05 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 practicable.

Option:

06 Until they can be removed or obliterated, markings that are no longer applicable for roadway conditions or restrictions may be temporarily masked with non-reflective, preformed tape that is approximately the same color as the pavement surface.

Section 3A.02 Materials

Guidance:

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

02 Consideration should be given to selecting pavement marking materials that will minimize tripping or loss of traction for road users, including pedestrians, bicyclists, and motorcyclists.

Option:

03 Marking systems that consist of clumps or droplets of material with visible open spaces of bare pavement between the material droplets, which can function in a manner that is similar to the marking systems that completely cover the pavement surface, may be used as pavement markings if they meet the other pavement marking requirements of the highway agency.

Section 3A.03 Colors

Standard:

01 Markings shall be yellow, white, red, blue, or purple. The colors for markings shall conform to the standard highway colors.

Option:

02 Black markings may be used in combination with the colors mentioned in Paragraph 1 of this Section to enhance the contrast with a light-colored pavement.

Standard:

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.**

04 When used, white markings for longitudinal lines shall delineate:

- **A. The separation of traffic flows in the same direction,**
- **B. The right-hand edge of the roadway, or**
- **C. Both the right-hand edge and left-hand edge of a reversible roadway.**

05 When used, red raised pavement markers or delineators shall delineate:

A. Truck escape ramps, or

B. One-way roadways, ramps, or travel lanes that shall not be entered or used in the direction from which the markers are visible.

06 When used, blue markings shall supplement white markings for parking spaces for persons with disabilities.

07 When used, purple markings shall be in accordance with the provisions of Chapter 3F to identify toll plaza approach lanes restricted to use only by vehicles with registered electronic toll collection accounts.

08 When pavement markings that simulate route signs are used (see Section 3B.22), the colors shall be the same as those that are used for the route signs (see Section 2D.11).

Support:

09 Provisions regarding colored pavements are contained in Chapter 3H.

Section 3A.04 Functions, Widths, and Patterns of Longitudinal Pavement Markings

Standard:

01 The general functions of longitudinal lines shall be as follows:

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.

D. A dotted lane line provides warning of a downstream change in lane function.

E. A dotted line used as a lane line or edge line extension guides vehicles through an intersection, a taper area, or an interchange ramp area.

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. The pavement surface shall be visible between the lines in the same way that it is visible outside the lines, except where contrast markings are used in combination with the double line (see Section 3A.03).

D. Broken line—normal width 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:

03 To be recognized as a double line rather than two separate, disassociated single lines, the discernible space separating the parallel lines of a double line should not exceed two times the line width of a single line.

Support:

04 The width of the line indicates the degree of emphasis.

05 Increasing edge line width from 4 inches to 6 inches has been shown to be a beneficial countermeasure to enhance safety at locations with a history of run-off-the-road crashes (see Section 3B.09). Wider normal lines with a 6-inch width instead of the minimum 4-inch width can be beneficial to both human drivers and driving automation systems (see Section 5B.02).

Guidance:

06 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 the need for delineation.

07 A dotted line used as a lane line (see Section 3B.07) should consist of 3-foot line segments and 9-foot gaps. A dotted line for line extensions within an intersection, taper area, or interchange ramp area (see Section 3B.11) should consist of 2-foot line segments and 2-foot to 6-foot gaps.

Support:

08 Section 5B.02 contains information on pavement marking considerations for driving automation systems.

Section 3A.05 Maintaining Minimum Pavement Marking Retroreflectivity

Standard:

01 Except as provided in Paragraph 5 of this Section, a method designed to maintain retroreflectivity at or above 50 mcd/m^2/lx under dry conditions shall be used for longitudinal markings on roadways with speed limits of 35 mph or greater.

Guidance:

02 Except as provided in Paragraph 5 of this Section, a method designed to maintain retroreflectivity at or above 100 mcd/m^2/lx under dry conditions should be used for longitudinal markings on roadways with speed limits of 70 mph or greater.

03 The method used to maintain retroreflectivity should be one or more of those described in "Methods for Maintaining Pavement Marking Retroreflectivity" (FHWA-SA-22-028), 2022 Edition, FHWA or developed from an engineering study based on the values in Paragraphs 1 and 2 of this Section.

Support:

04 Retroreflectivity levels for pavement markings are measured with an entrance angle of 88.76 degrees and an observation angle of 1.05 degrees. This geometry is also referred to as 30-meter geometry. The units of pavement marking retroreflectivity are reported in mcd/m^2/lx, which means millicandelas per square meter per lux.

Option:

05 The following markings may be excluded from the provisions established in Paragraphs 1 and 2 of this Section:

A. Markings where ambient illumination assures that the markings are adequately visible;
B. Markings on streets or highways that have an ADT of less than 6,000 vehicles per day;
C. Dotted extension lines that extend a longitudinal line through an intersection, major driveway, or interchange area (see Section 3B.11);
D. Curb markings;
E. Parking space markings; and
F. Shared-use path markings.

Support:

06 The provisions of this Section do not apply to non-longitudinal pavement markings including, but not limited to, the following:

A. Transverse markings;
B. Word, symbol, and arrow markings;
C. Crosswalk markings; and
D. Chevron, diagonal, and crosshatch markings.

07 Special circumstances will periodically cause pavement marking retroreflectivity to be below the minimum levels. These circumstances include, but are not limited to, the following:

A. Isolated locations of abnormal degradation;
B. Periods preceding imminent resurfacing or reconstruction;
C. Unanticipated events such as equipment breakdowns, material shortages, and contracting problems; and
D. Loss of retroreflectivity resulting from snow maintenance operations.

08 When such circumstances occur, compliance with Paragraphs 1 and 2 of this Section is still considered to be achieved if a reasonable course of action is taken to resume maintenance of minimum retroreflectivity in a timely manner according to the maintaining agency's method(s), policies, and procedures.

CHAPTER 3B. PAVEMENT AND CURB MARKINGS

Section 3B.01 Yellow Center Line Pavement Markings

Standard:

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

Option:

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

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

Standard:

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 width 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 width broken yellow line and the other is a normal width 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 width 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 Except where a reversible lane (see Section 3B.04) or a two-way left-turn lane (see Section 3B.05) is present, 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 normal width double solid yellow lines as shown in Figure 3B-2.

Support:

07 Section 3B.11 contains information for application of pavement markings through intersections or interchanges.

Guidance:

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

Option:

09 A curved transition may be used where a center line changes direction.

Support:

10 An example of a location where a curved transition can have value is a turn lane.

Figure 3B-1. Yellow Center Lines for Two-Lane, Two-Way Applications

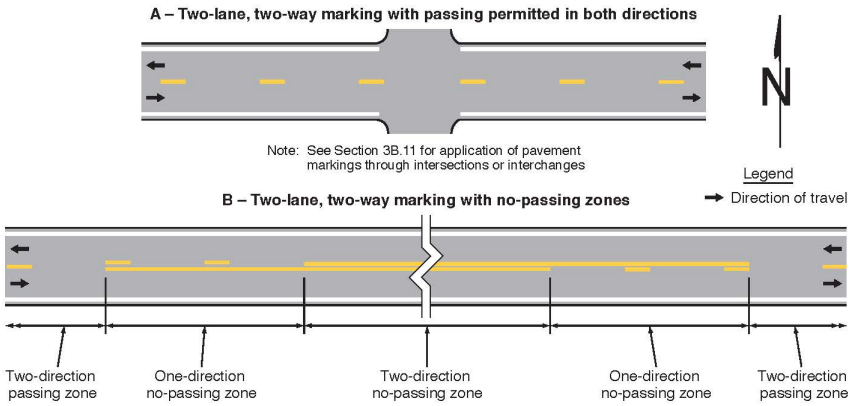


Figure 3B-2. Yellow Center Lines for Four-or-More Lane, Two-Way Applications

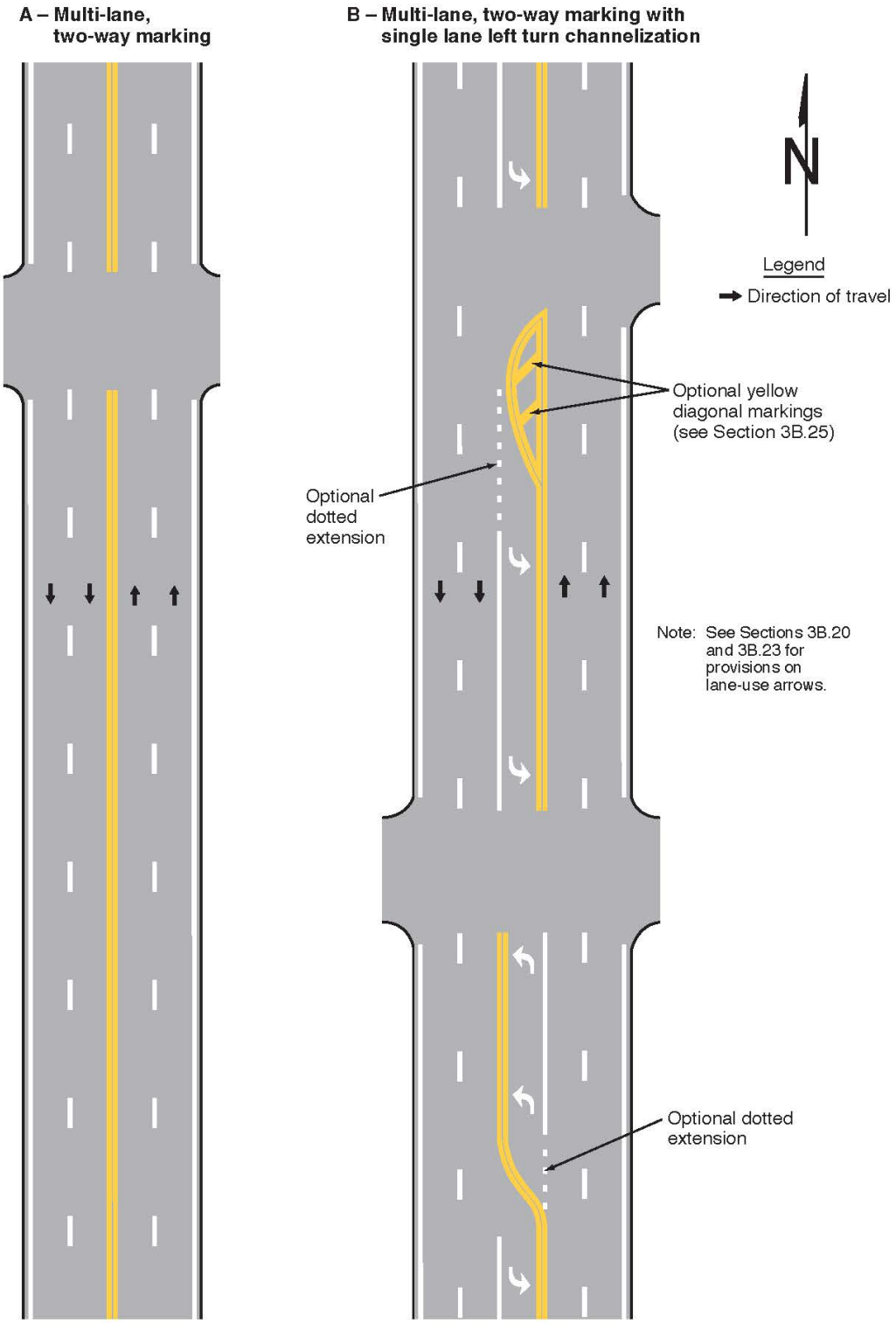
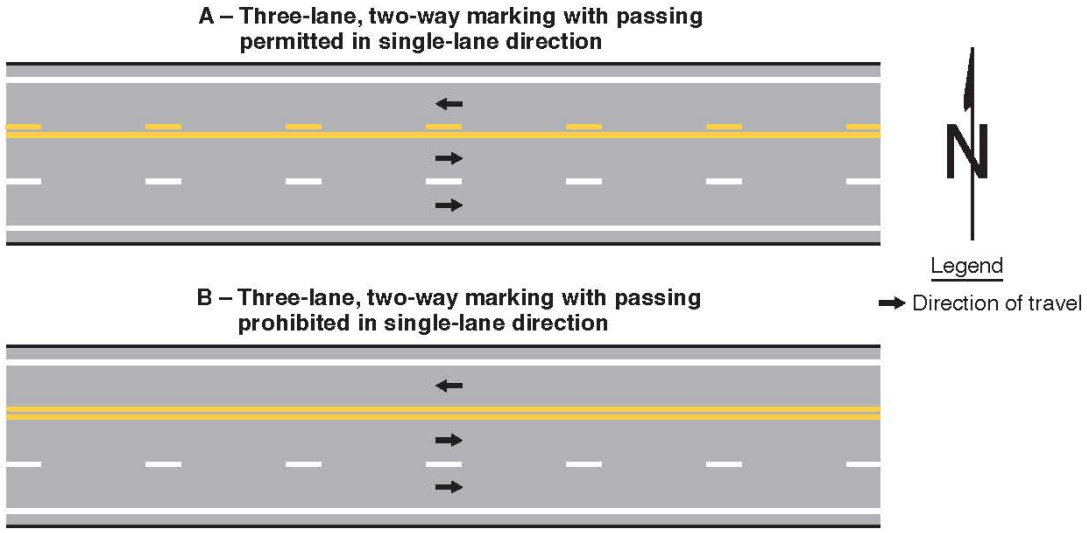


Figure 3B-3. Yellow Center Lines for Three-Lane, Two-Way Applications



Section 3B.02 Warrants for Yellow Center Lines

Standard:

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

Guidance:

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

03 Engineering judgment should be used in determining whether to place center line markings on traveled ways that are less than 16 feet wide because of the potential for traffic encroaching on the pavement edges, traffic being affected by parked vehicles, and traffic encroaching into the opposing traffic lane.

Option:

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

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

Section 3B.03 No-Passing Zone Pavement Markings

Standard:

01 No-passing zones shall be marked by either the one-direction no-passing zone pavement markings or the two-direction no-passing zone pavement markings described in Section 3B.01 and shown in Figures 3B-1 and 3B-3.

02 No-passing zone markings shall be used on:

- **A. Two-way roadways at lane-reduction transitions (see Section 3B.12),**
- **B. Approaches to obstructions that must be passed on the right (see Section 3B.13),**
- **C. Approaches to grade crossings (see Section 8C.02), and**
- **D. Approaches to crosswalks.**

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

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 speed limit.

Support:

05 The passing sight distance on a vertical curve is the distance at which an object 3.5 feet above the pavement surface can be seen from a point 3.5 feet above the pavement (see Figure 3B-4). Similarly, the passing sight distance on a horizontal curve is the distance measured along the center line (or right-hand lane line of a three-lane roadway) between two points 3.5 feet above the pavement on a line tangent to the embankment or other obstruction that cuts off the view on the inside of the curve (see Figure 3B-4).

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

85th-Percentile or 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

06 The upstream end of a no-passing zone at point “a” in Figure 3B-4 is that point where the sight distance first becomes less than that specified in Table 3B-1. The downstream end of the no-passing zone at point “b” in Figure 3B-4 is that point at which the sight distance again becomes greater than the minimum specified.

Guidance:

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

Support:

08 No-passing zone signs (see Sections 2B.36, 2B.37, and 2C.53) are sometimes used to emphasize the existence and extent of a no-passing zone.

Standard:

09 On three-lane roadways where the direction of travel in the center lane transitions from one direction to the other, a no-passing buffer zone, consisting of a flush median island (see Section 3J.03) at least 50 feet in length, shall be provided in the center lane as shown in Figure 3B-5. A lane-reduction transition (see Section 3B.12) shall be provided approaching each end of the buffer zone.

Section 3B.04 Yellow Pavement Markings for Reversible Lanes

Standard:

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

02 Signs (see Section 2B.34), lane-use control signals (see Chapter 4T), or both shall be used to supplement reversible lane pavement markings.

Support:

03 Section 3E.02 contains additional applications of pavement markings for counter-flow preferential lanes that also operate as reversible lanes.

Section 3B.05 Pavement Markings for Two-Way Left-Turn Lanes

Standard:

01 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 width broken yellow line and a normal width 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:

02 White two-way left-turn lane-use arrows should be used at or just downstream from the beginning of a two-way left-turn lane.

Figure 3B-4. Method of Locating and Determining the Limits of No-Passing Zones at Curves

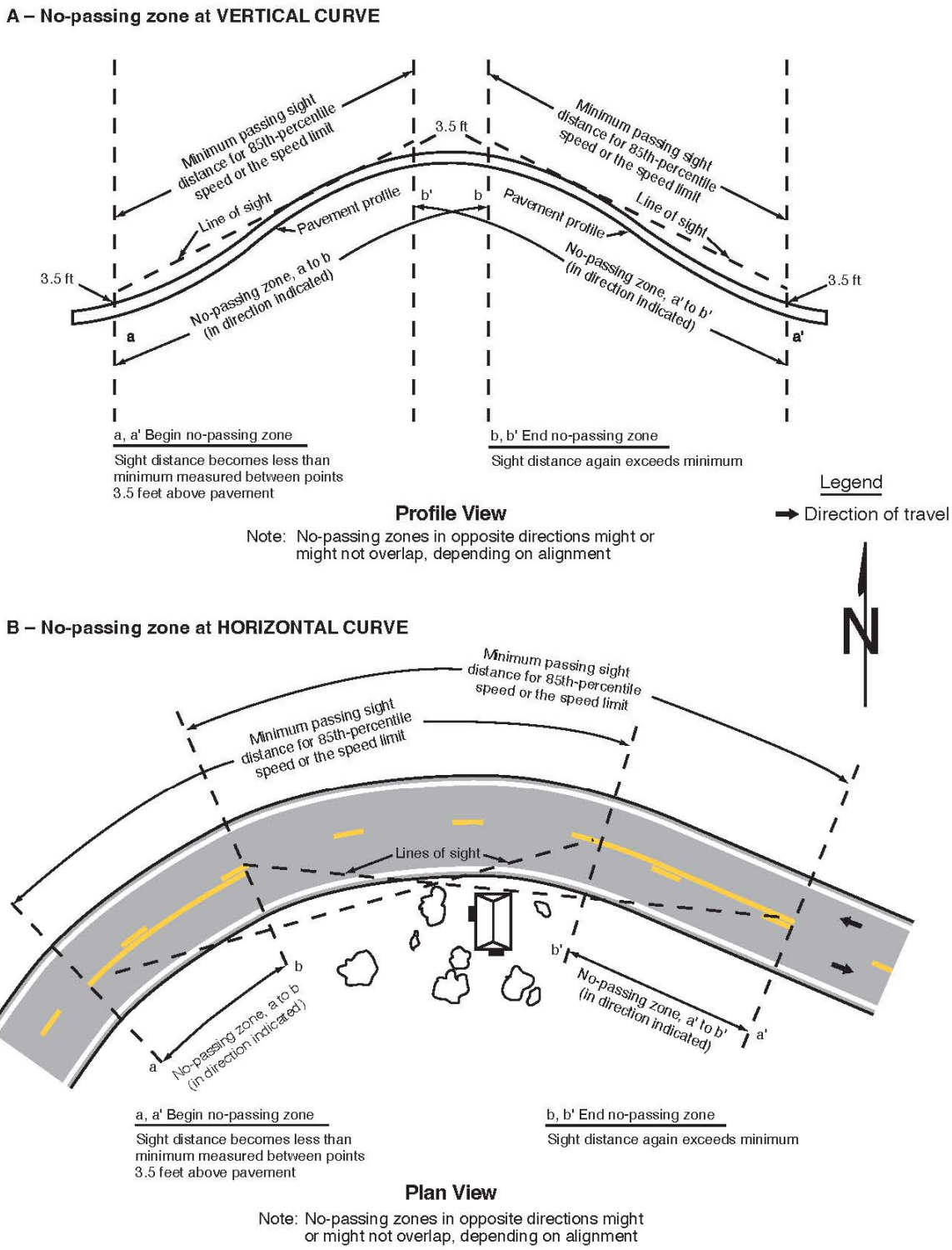


Figure 3B-5. Application of Three-Lane, Two-Way Markings for Changing the Direction of the Center Lane

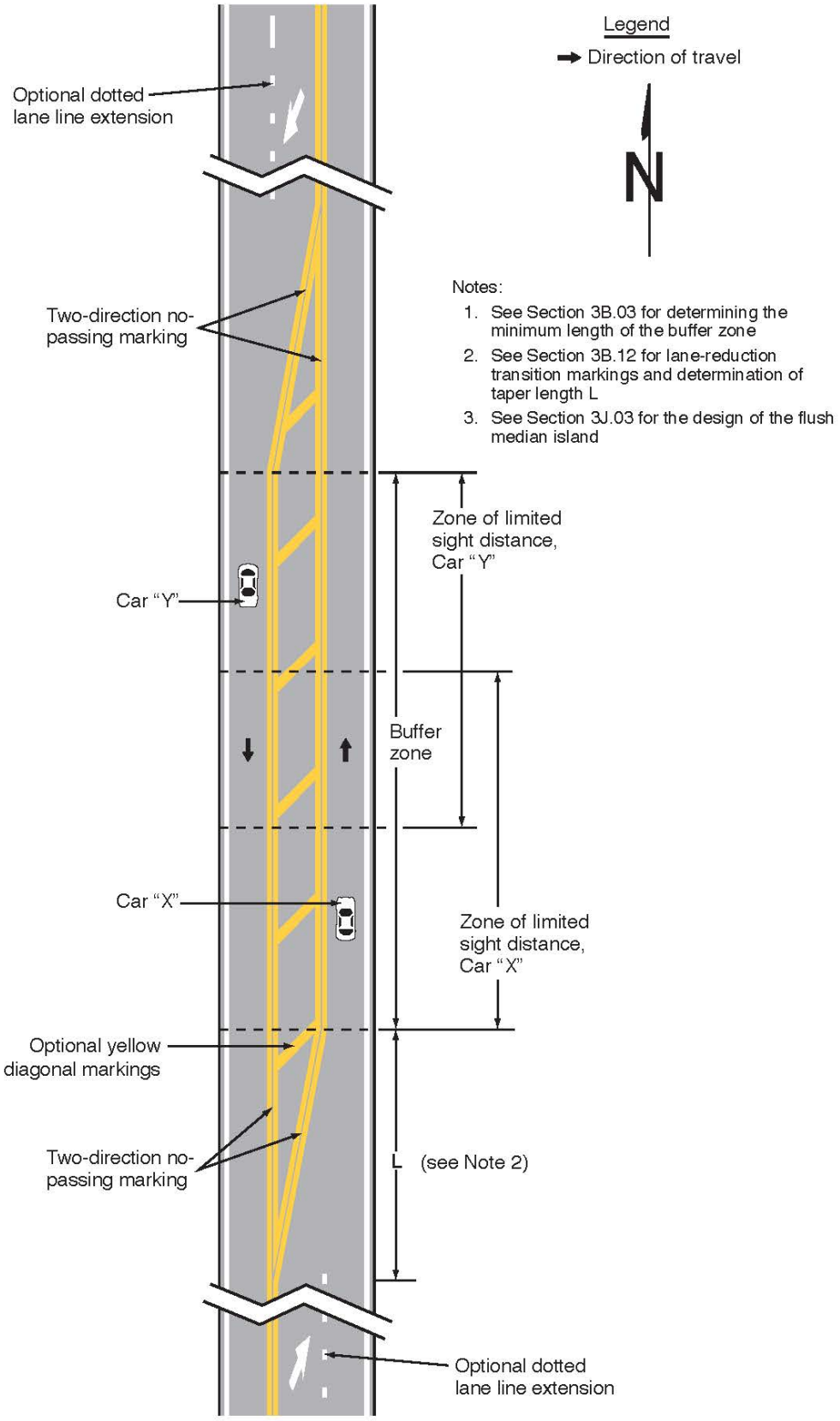
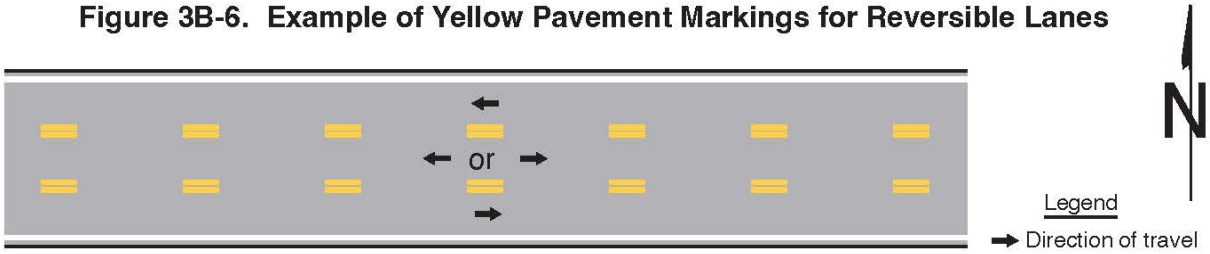


Figure 3B-6. Example of Yellow Pavement Markings for Reversible Lanes



Option:

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

Standard:

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

Guidance:

05 Signs should be used in conjunction with the two-way left-turn markings (see Section 2B.32).

06 Two-way left-turn lane markings should not extend to intersections (see definition in Section 1C.02).

Option:

07 Two-way left-turn lanes may be transitioned to mandatory left-turn lanes as shown in Figure 3B-7 or painted median islands where they approach an intersection.

Support:

08 Section 8A.06 contains guidance information for discontinuing a two-way left-turn lane in the immediate vicinity of a highway-rail or highway-LRT grade crossing.

Section 3B.06 White Lane Line Pavement Markings

Standard:

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

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

Guidance:

03 Lane line markings should be used:

A. 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.

B. At congested locations where the roadway will accommodate more traffic lanes with lane line markings than without the markings.

Support:

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

Standard:

05 Except as provided in Paragraph 1 of Section 3B.07, where crossing the lane line markings with care is not discouraged or prohibited, the lane line markings shall consist of a normal width broken white line.

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

Guidance:

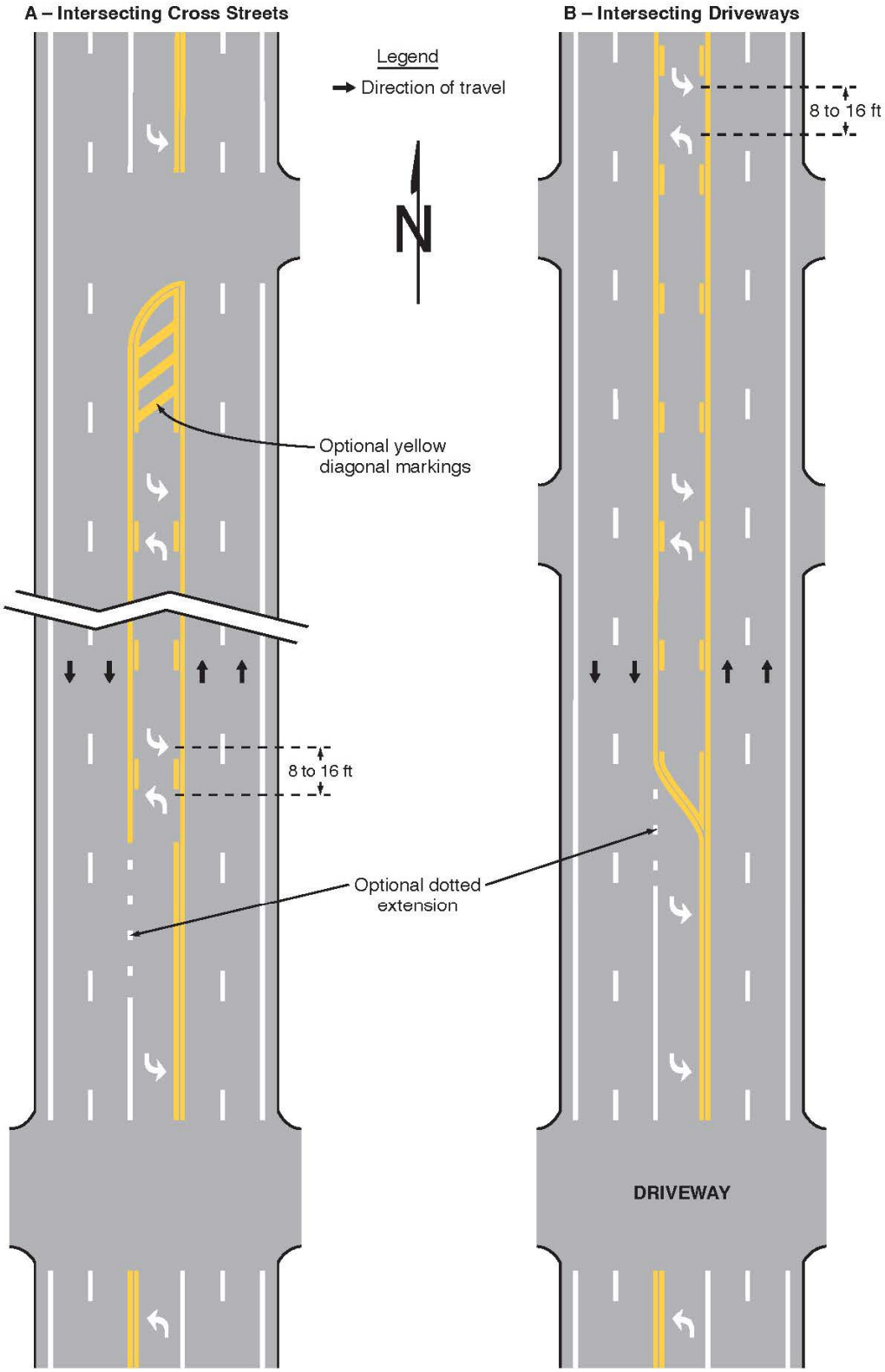
07 *A solid white lane line marking should be used on approaches to:*

A. Intersections to separate a through lane from a mandatory turn lane.

B. Intersections to separate contiguous mandatory turn lanes from each other.

C. Toll collection points to separate toll lanes, payment methods, channelized movements, or obstructions.

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



Option:

08 Solid white lane line markings may be used:

A. On approaches to intersections to separate contiguous through lanes.
B. To separate through traffic lanes from auxiliary lanes, such as an added uphill truck lane.
C. On approaches to crosswalks across multi-lane roadways.

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

10 A curved transition may be used where a lane line changes direction.

Support:

11 Examples of locations where a curved transition can have value include freeway exit and entrance ramps.

Standard:

12 Where crossing the lane line markings is prohibited, the lane line markings shall consist of a double solid white line (see Figure 3B-8).

Section 3B.07 White Lane Line Markings for Non-Continuing Lanes

Standard:

01 A normal width dotted white line marking shall be used as the lane line to separate a through lane that continues beyond the interchange or intersection from an adjacent deceleration or acceleration lane.

02 For exit ramps with a parallel deceleration lane, a normal width dotted white lane line extension shall be installed from the upstream end of the taper 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 in Figure 3B-9.

03 For an exit ramp with a tapered deceleration lane, a normal width dotted white line extension shall 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 in Figure 3B-9.

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

Option:

05 For entrance ramps with a parallel acceleration lane, a normal width dotted white line extension may be installed from the downstream end of the dotted white lane line to the downstream end of the acceleration taper, as shown in Drawing A in Figure 3B-10.

06 For entrance ramps with a tapered acceleration lane, a normal width dotted white line extension may be installed from the downstream end of the channelizing line adjacent to the through lane to the downstream end of the acceleration taper, as shown in Drawings B and C in Figure 3B-10.

Figure 3B-8. Example of a Double Solid White Line Used to Prohibit Lane Changing

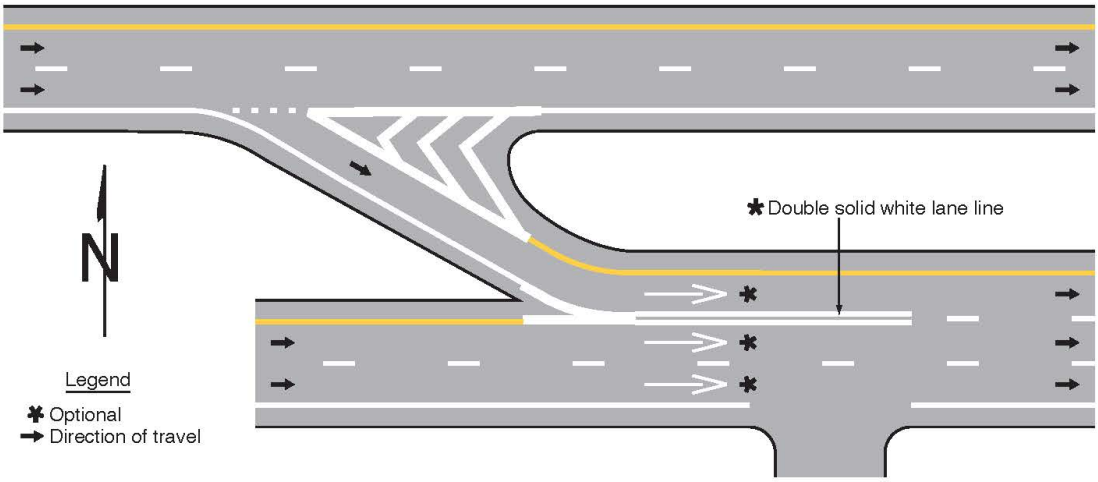


Figure 3B-9. Examples of Dotted Line and Channelizing Line Applications for Exit Ramp Markings (Sheet 1 of 2)

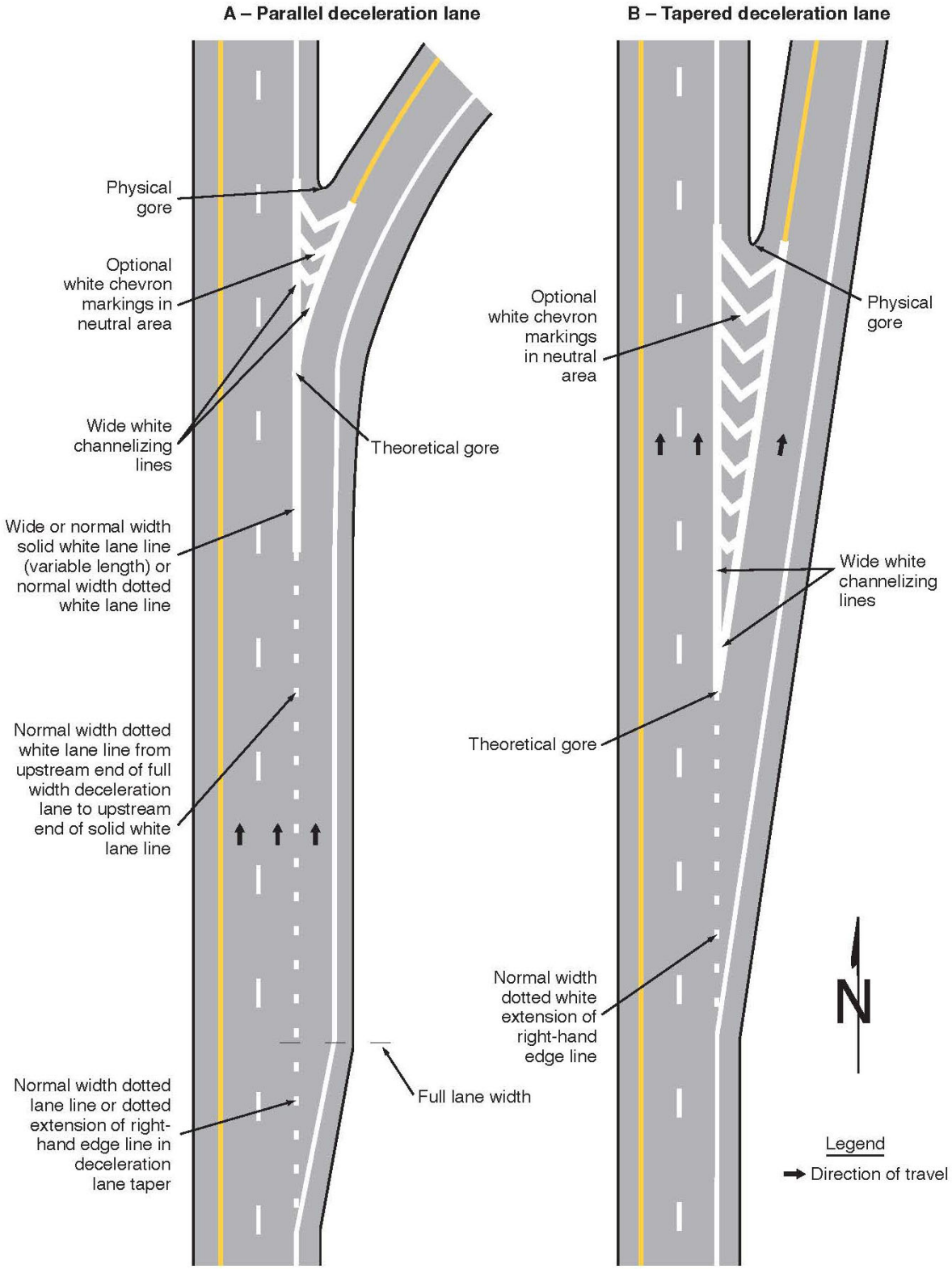


Figure 3B-9. Examples of Dotted Line and Channelizing Line Applications for Exit Ramp Markings (Sheet 2 of 2)

C – Parallel deceleration lane at a multi-lane exit ramp having an optional exit lane that also carries the through route

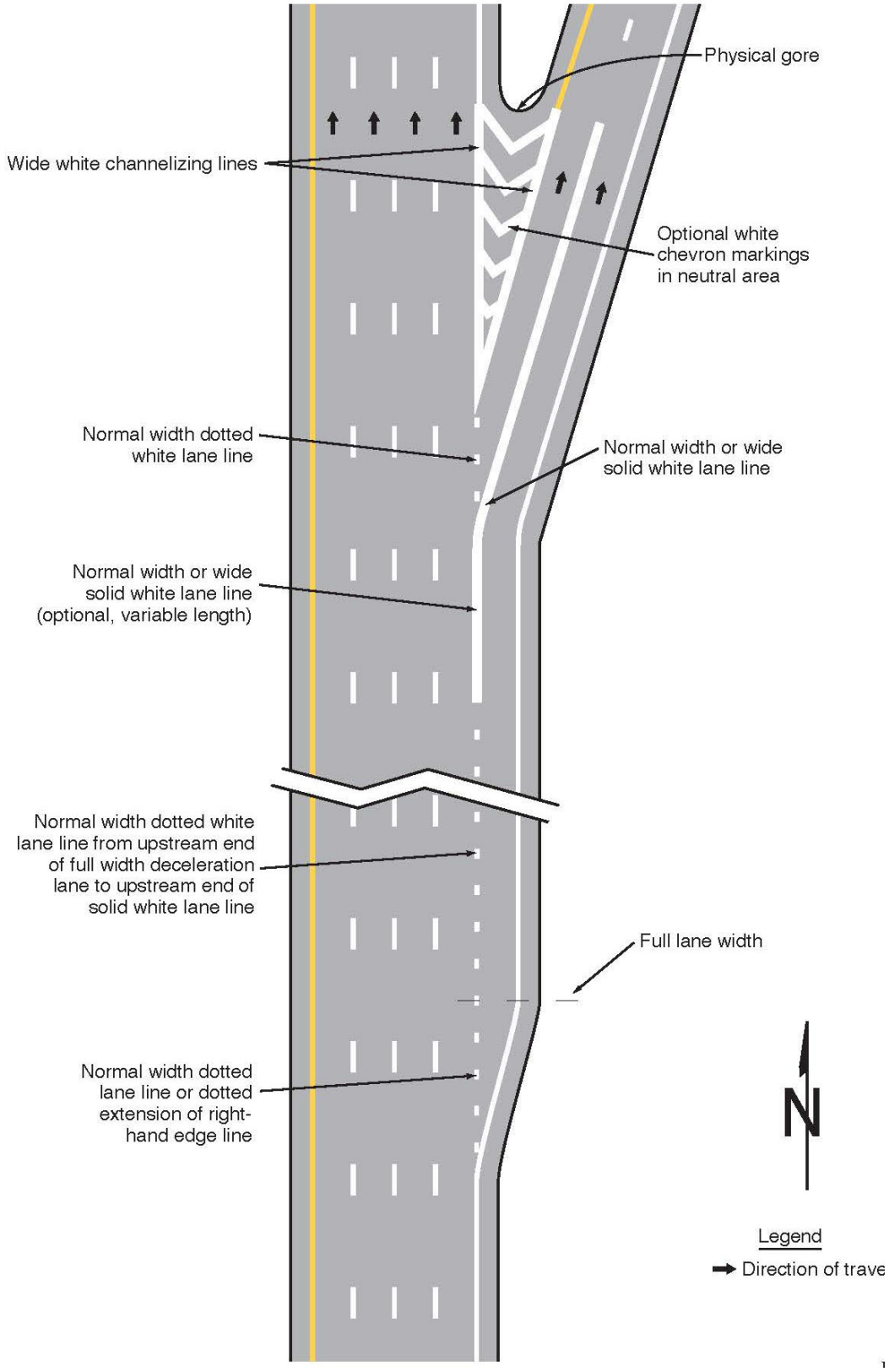


Figure 3B-10. Examples of Dotted Line and Channelizing Line Applications for Entrance Ramp Markings (Sheet 1 of 2)

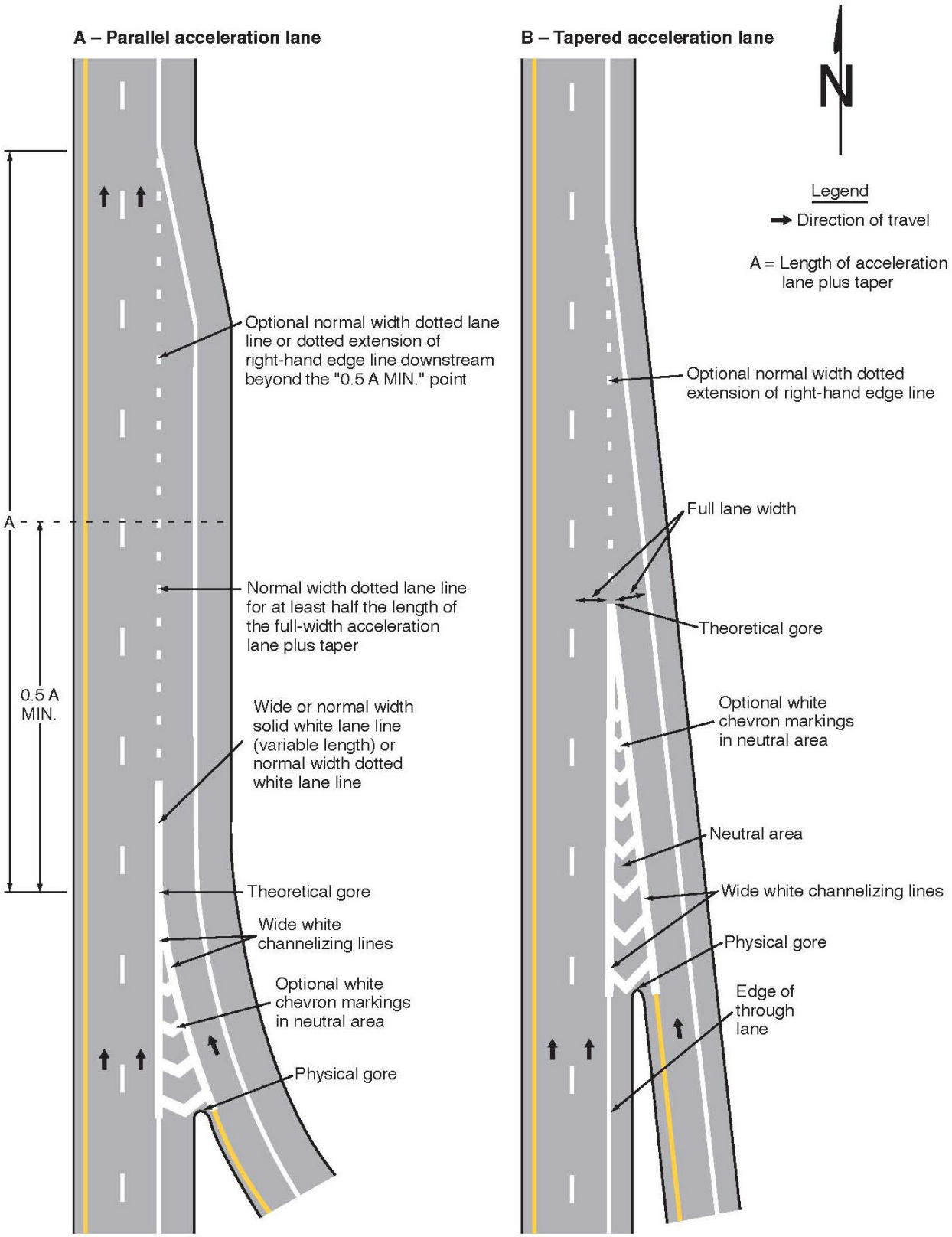
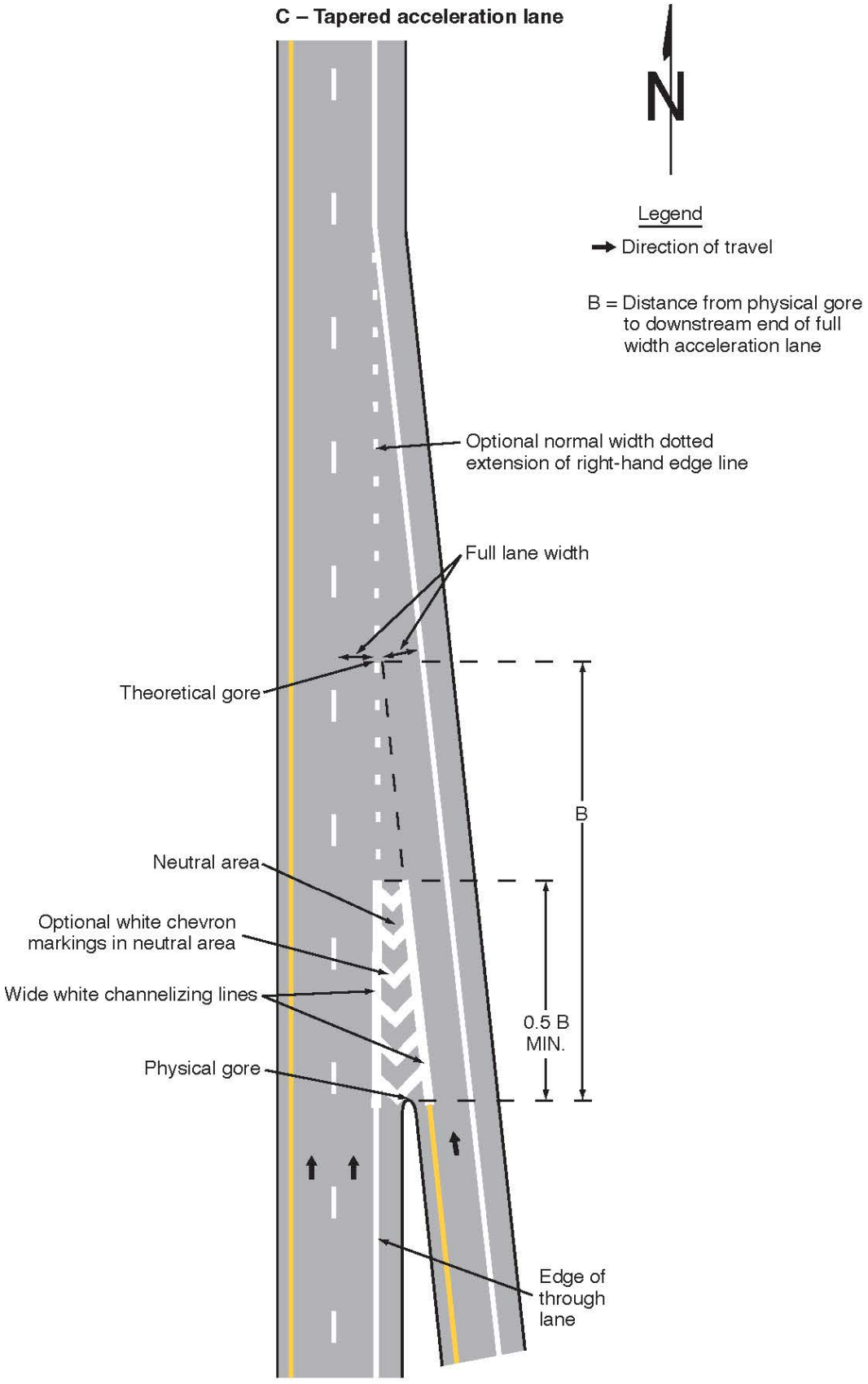


Figure 3B-10. Examples of Dotted Line and Channelizing Line Applications for Entrance Ramp Markings (Sheet 2 of 2)



Standard:

07 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 in Figure 3B-11),
B. In advance of freeway route splits with dedicated lanes (see Drawing D in Figure 3B-11),
C. In advance of freeway route splits with an option lane (see Drawing E in Figure 3B-11),
D. To separate a through lane that continues beyond an interchange from an adjacent continuous auxiliary lane between an entrance ramp and an exit ramp (see Drawing F in Figure 3B-11),
E. As a lane drop marking in advance of lane drops at intersections to distinguish a lane drop from an intersection through lane (see Drawing A in Figure 3B-12), and
F. To separate a through lane that continues beyond an intersection from an adjacent auxiliary lane between two intersections (see Drawing B in Figure 3B-12).

Guidance:

08 Lane drop markings used in advance of lane drops at freeway and expressway exit ramps should begin at least ½ mile in advance of the theoretical gore.

09 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 in Figure 3B-11.

10 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 markings should begin no closer to the intersection than the most upstream regulatory or warning sign associated with the lane drop.

11 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.

Support:

12 Sections 3B.21 and 3B.23 contain information regarding other markings that are associated with lane drops, such as ONLY word pavement markings and lane-use arrows.

13 Section 3B.12 contains information about the lane line markings that are to be used for transition areas where the number of through lanes is reduced at a location that is not at an interchange or intersection.

Option:

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

15 A curved transition may be used where a dotted extension lane line changes direction.

Support:

16 Examples of locations where a curved transition can have value include freeway exit and entrance ramps.

Section 3B.08 Channelizing Lines

Support:

01 Channelizing lines are used to form neutral areas where traffic traveling in the same general direction is permitted on both sides including entrance and exit ramps, access and egress points to and from managed lanes, toll-plaza bypasses, and left-turn lanes separated from through lanes. Channelizing lines are also sometimes used to alter travel paths for speed management or other purposes.

02 Chapter 3J contains information for the application of channelizing lines used in conjunction with islands.

Standard:

03 Except as provided in Section 3E.04 and Paragraph 6 of Section 3J.05, a channelizing line shall be a solid wide or double solid white line.

Support:

04 Examples of channelizing line applications are shown in Figures 3B-9, 3B-10, 3B-11, Drawing C in Figure 3B-15, Figures 3J-1 through 3J-5, and Drawing B in Figure 3J-6.

Standard:

05 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-9 and 3B-11 and Drawing A in Figure 3B-10).

Figure 3B-11. Examples of Applications of Freeway and Expressway Lane-Drop Markings (Sheet 1 of 6)

A – Lane drop at a single lane exit ramp

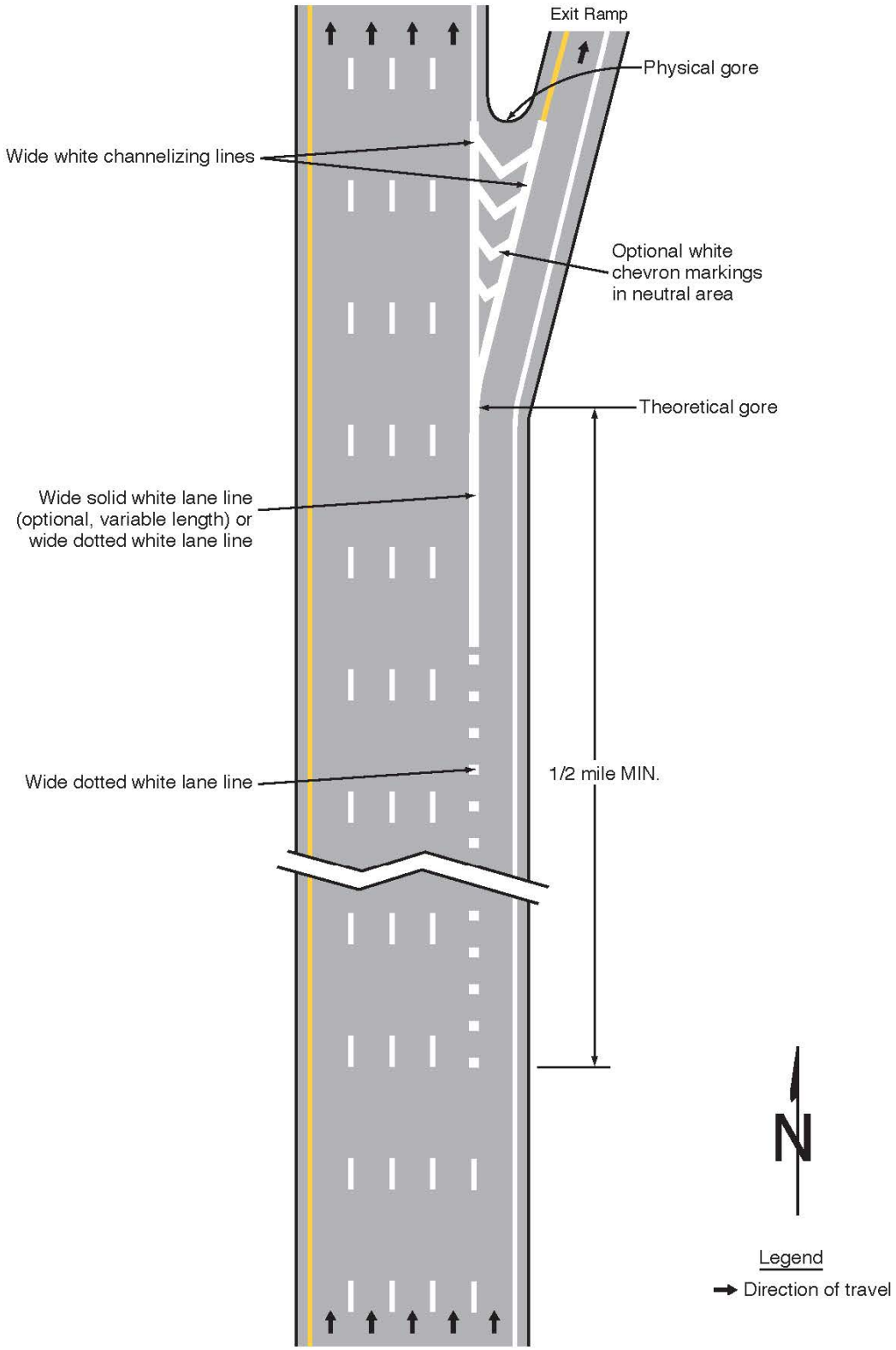


Figure 3B-11. Examples of Applications of Freeway and Expressway Lane-Drop Markings (Sheet 2 of 6)

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

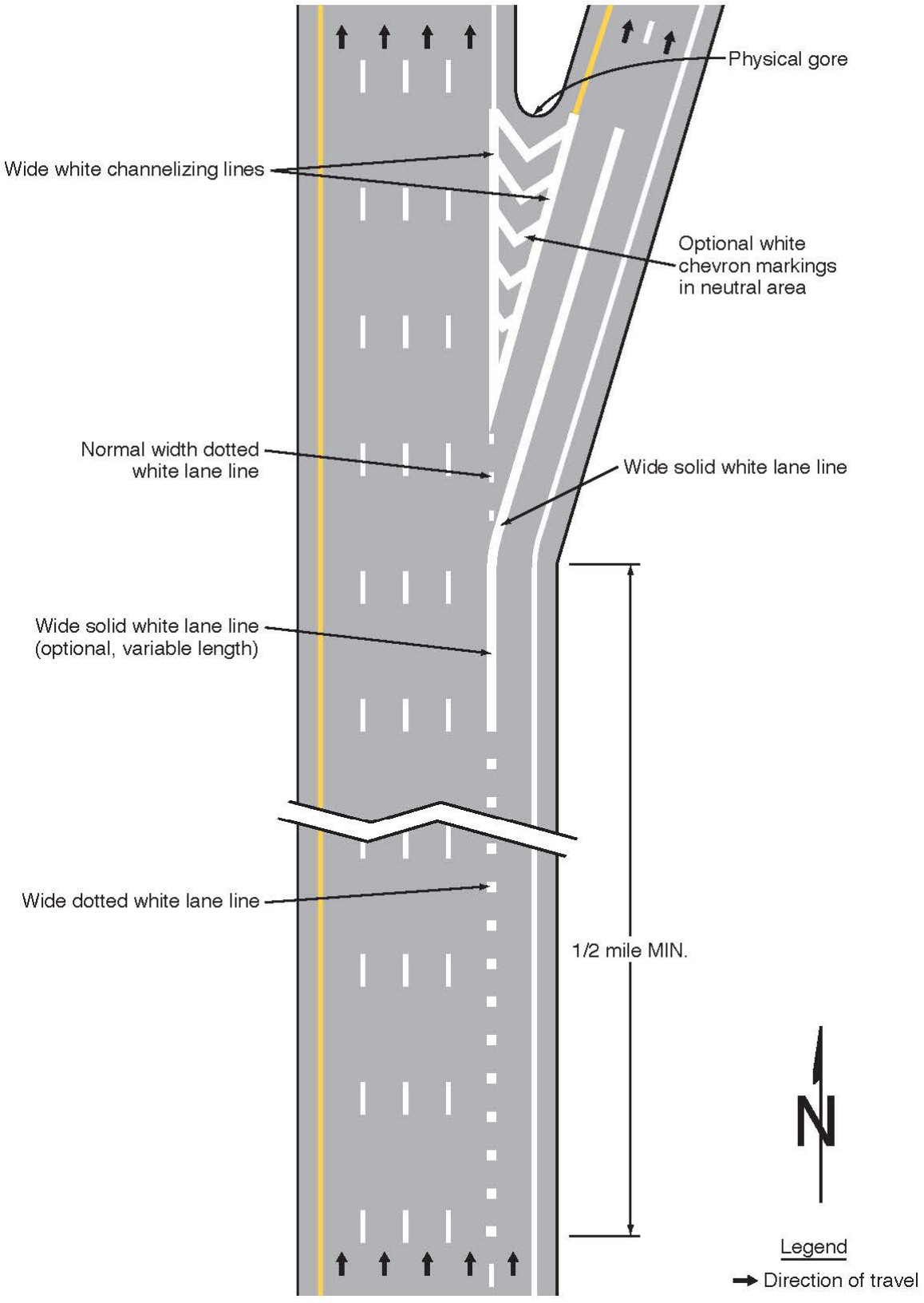


Figure 3B-11. Examples of Applications of Freeway and Expressway Lane-Drop Markings (Sheet 3 of 6)

C – Two-lane lane drop at an exit ramp

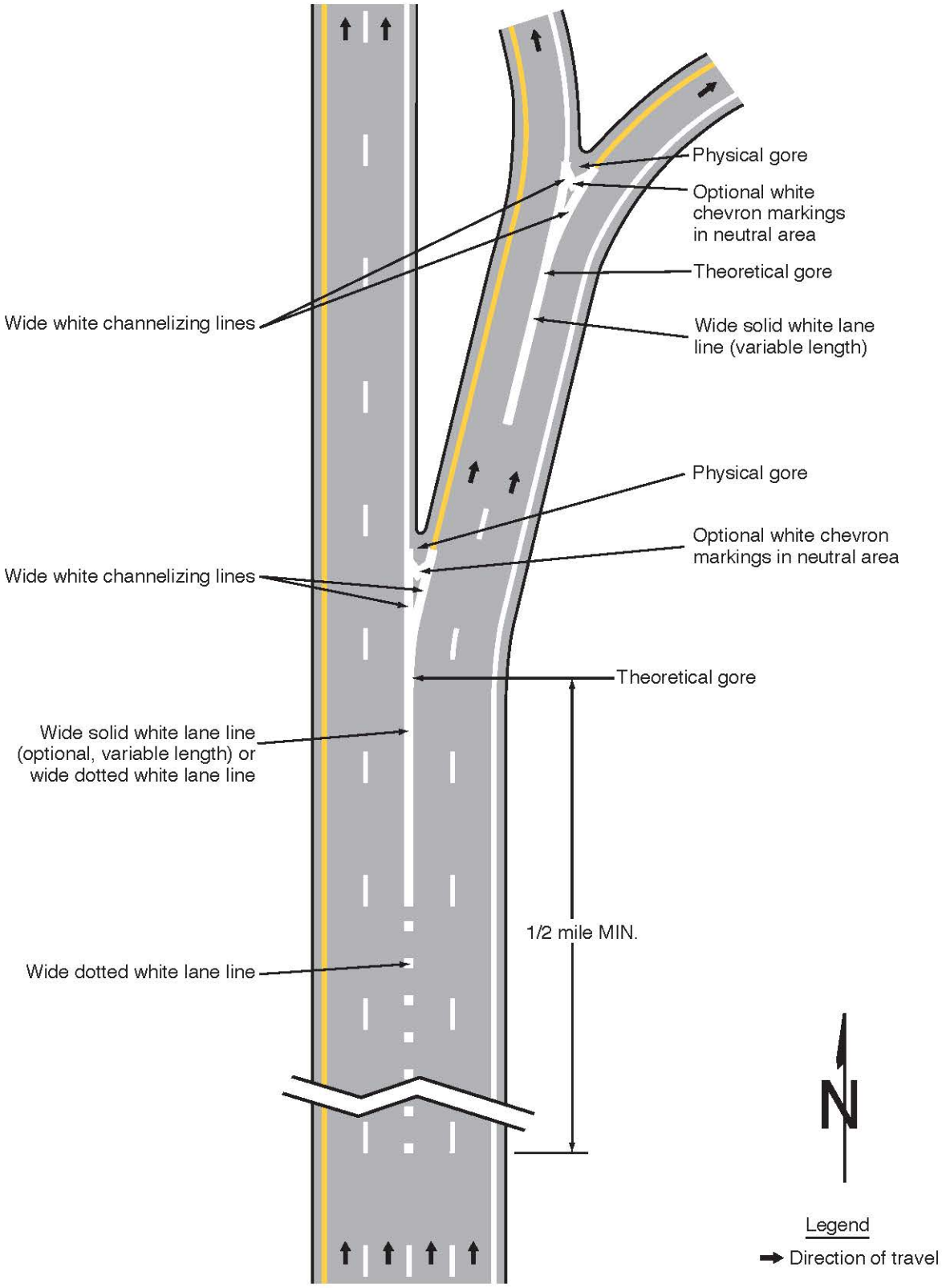


Figure 3B-11. Examples of Applications of Freeway and Expressway Lane-Drop Markings (Sheet 4 of 6)

D – Route split with dedicated lanes

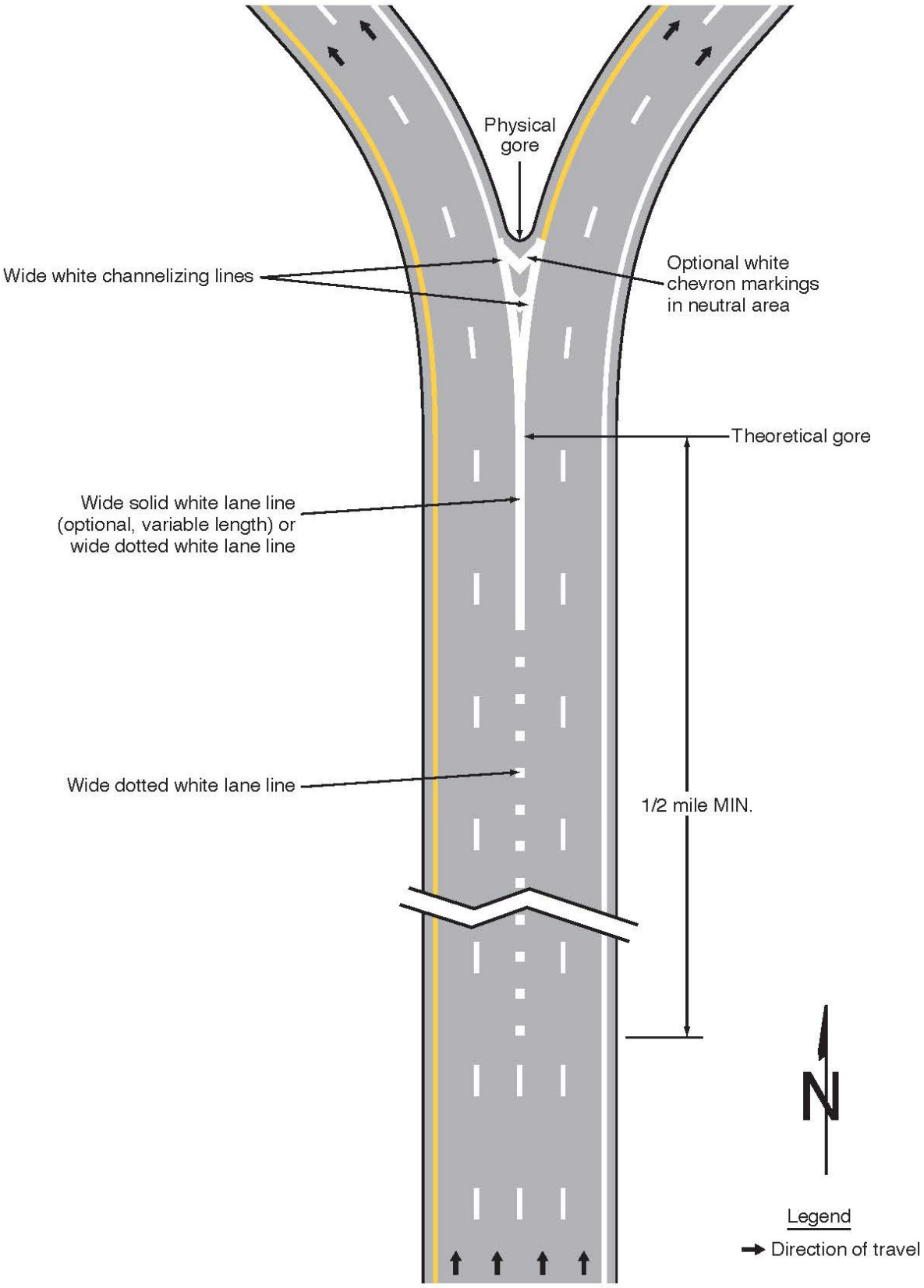


Figure 3B-11. Examples of Applications of Freeway and Expressway Lane-Drop Markings (Sheet 5 of 6)

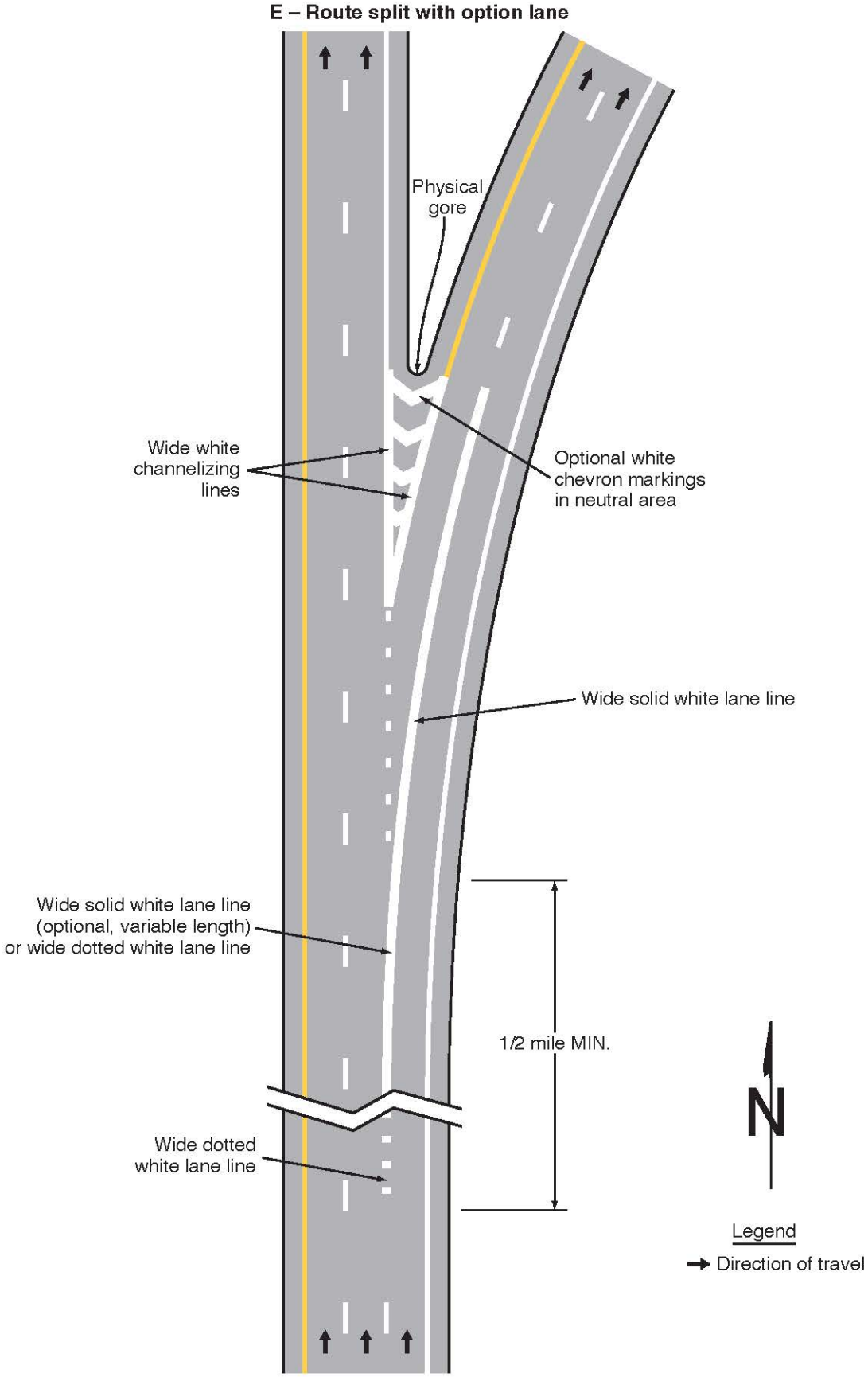


Figure 3B-11. Examples of Applications of Freeway and Expressway Lane-Drop Markings (Sheet 6 of 6)

F – Continuous auxiliary lane, such as at a cloverleaf interchange

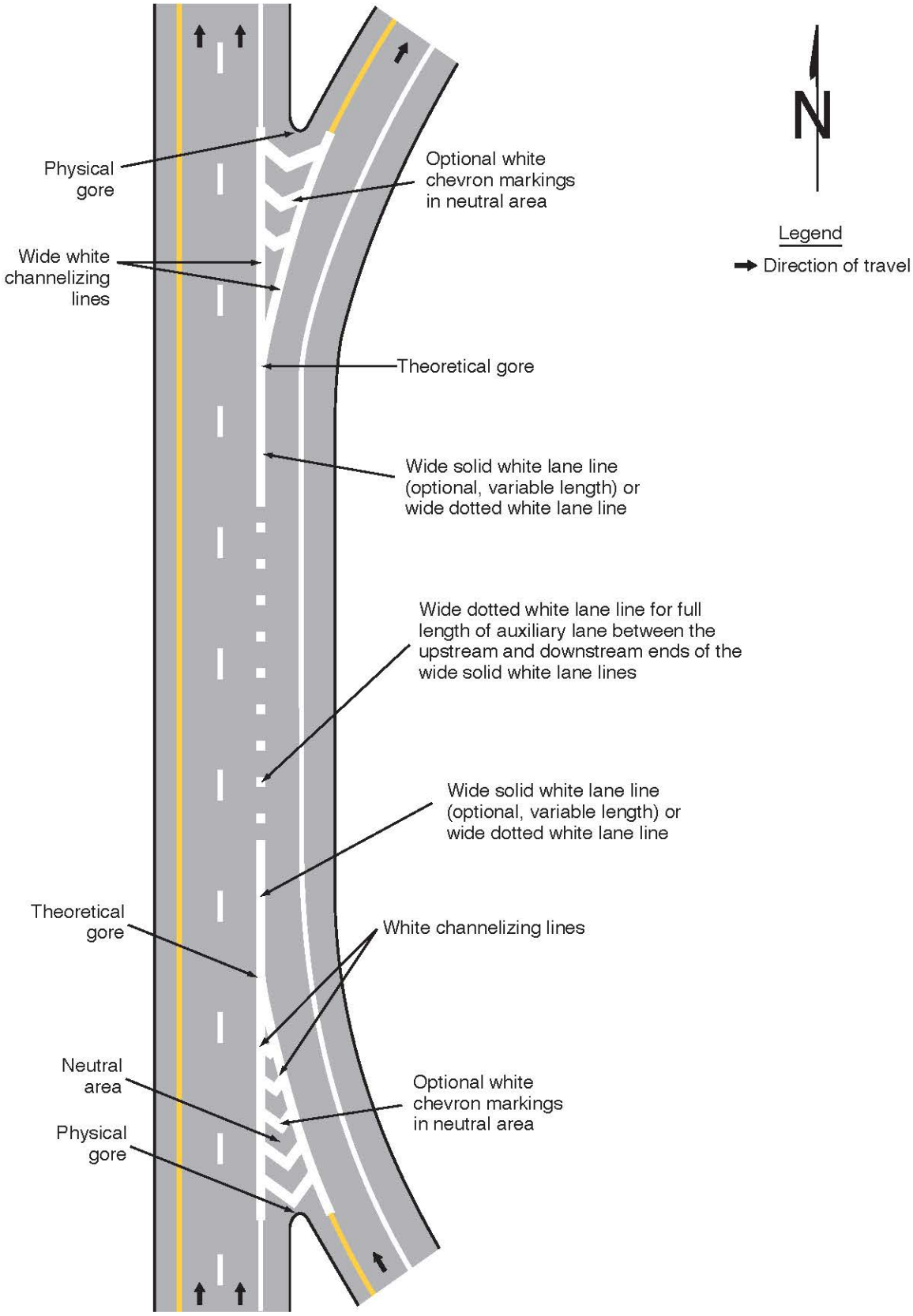


Figure 3B-12. Examples of Applications of Conventional Road Lane-Drop Markings
(Sheet 1 of 2)

A – Lane drop at an intersection

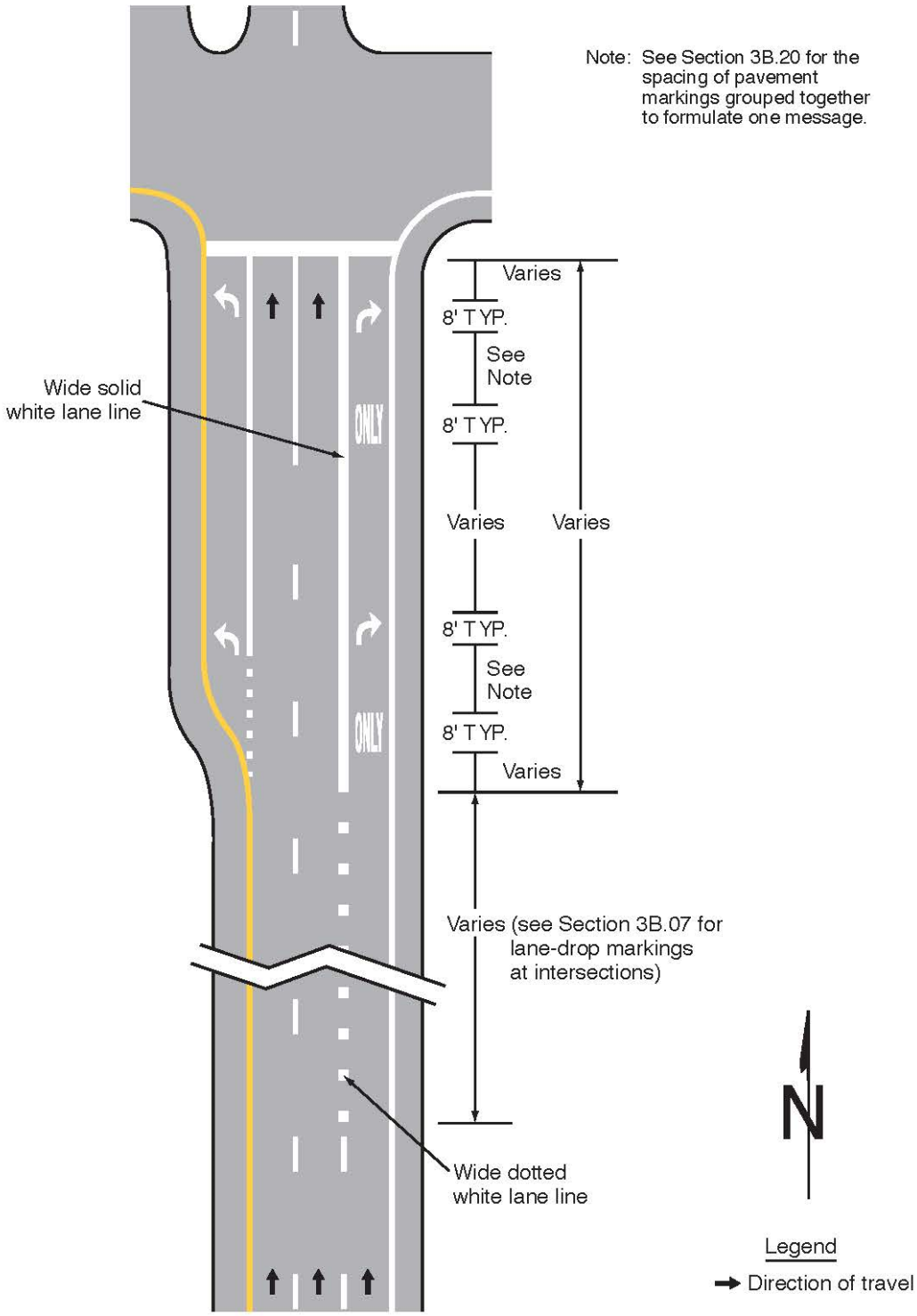
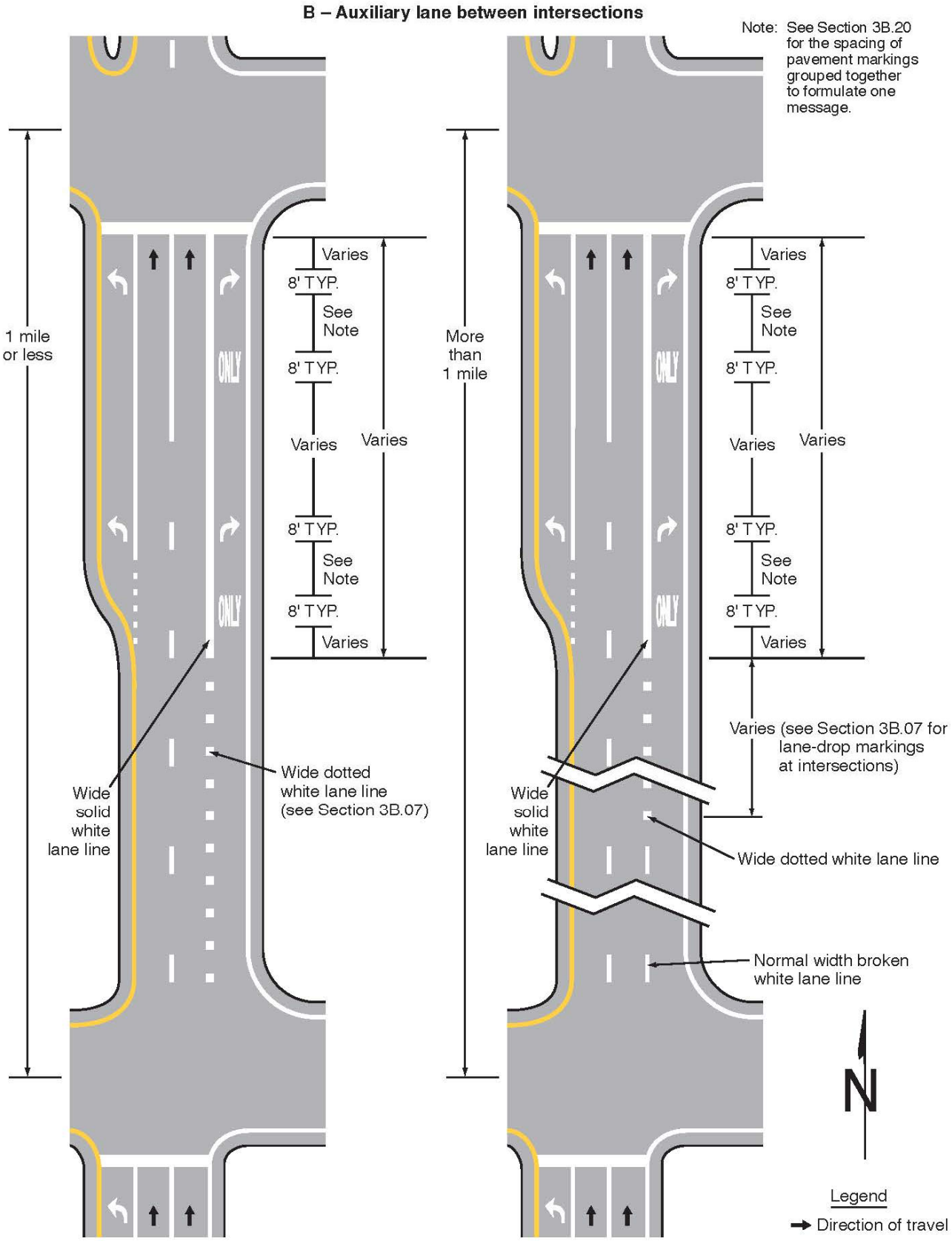


Figure 3B-12. Examples of Applications of Conventional Road Lane-Drop Markings
(Sheet 2 of 2)



06 For entrance ramps with tapered acceleration lanes, channelizing lines shall be placed along both sides of the neutral area to a point at least one-half of the distance to the theoretical gore (see Drawing C in Figure 3B-10).

07 Channelizing lines shall be placed on both sides of the neutral area for bifurcations created from open-road tolling lanes that bypass a conventional toll plaza.

08 Where neutral areas are formed at access and egress points to and from a managed-lane facility, channelizing lines shall be placed on both sides of the neutral area (see Figures 2G-8, 2G-10, 2G-13, 2G-16, 2G-22, 2G-23, 2G-27, and 2G-28).

Option:

09 For entrance ramps with tapered acceleration lanes, the channelizing lines may extend to the theoretical gore as shown in Drawing B in Figure 3B-10.

Standard:

10 Other pavement markings in the neutral area shall be white.

Support:

11 Pavement markings within the neutral area include chevron markings (see Section 3B.25), retroreflective raised pavement markers (see Section 3B.16), and internally illuminated raised pavement markers (see Section 3B.16).

Option:

12 A curved transition may be used where a channelizing line changes direction.

Support:

13 Examples of locations where a curved transition can have value include freeway exit and entrance ramps and separated turn lanes.

Section 3B.09 Edge Line Pavement Markings

Standard:

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

02 Except as provided in Section 3E.04, right edge line pavement markings, if used, shall consist of a normal width solid white line to delineate the right-hand edge of the roadway.

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 width solid yellow line to delineate the left-hand edge of a roadway or to indicate driving or passing restrictions left of these markings, except as provided in Section 3E.04.

Support:

04 Edge line markings provide visual references to guide road users during adverse weather and visibility conditions.

Option:

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

Support:

06 Increasing edge line width from 4 inches to at least 6 inches can be a beneficial countermeasure on all facility types in both urban and rural areas.

Guidance:

07 *Edge line markings should not be continued through intersections, except for the following situations:*

A. Dotted edge line extensions (see Section 3B.11), or

B. Through that part of an intersection with no intersection approach (such as the far side of a T-intersection).

Support:

08 Section 3B.11 contains information on the use and application of edge lines through intersections, interchanges, and driveways.

Option:

9 A curved transition may be used where an edge line changes direction.

Support:

10 Examples of locations where a curved transition can have value include freeway exit and entrance ramps and turn lanes.

Section 3B.10 Warrants for Use of Edge Lines

Standard:

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

A. Freeways,

B. Expressways, and

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

Guidance:

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

A. Rural arterials and collectors with a traveled way of 20 feet or more in width and an ADT of 3,000 vehicles per day or greater.

B. On other paved streets and highways where an engineering study indicates a need for edge line markings.

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

Option:

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

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

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

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

Section 3B.11 Application of Pavement Markings Through Intersections or Interchanges

Standard:

01 Pavement markings extended into or continued through an intersection or interchange area shall be the same color as the line markings they extend (see Figure 3B-13).

Guidance:

02 Pavement markings extended into or continued through an intersection or interchange area should be at least the same width as the line markings they extend.

03 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-leg intersections, on curved roadways, where multiple turn lanes are used, or where offset left-turn lanes might cause driver confusion, dotted lane line extension markings consisting of 2-foot line segments and 2-foot to 6-foot gaps should be used to extend longitudinal line markings through an intersection or interchange area.

04 Where greater restriction is preferred, solid lane lines or channelizing lines should be extended into or continued through intersections.

Standard:

05 Extensions of center lines through intersections shall be dotted lines.

Guidance:

06 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.

Standard:

07 Solid lines shall not be used to extend edge lines into or through intersections except through that part of an intersection with no intersecting approach (such as at the far side of a T-intersection).

Guidance:

08 Edge line markings should be discontinued across intersecting approaches at intersections or interchanges.

09 Driveways that do not meet the definition of an intersection (see Section 1C.02) should have edge line markings maintained across the intersecting approach of the driveway.

Option:

10 Dotted edge line extensions may be placed through intersections.

Support:

11 Section 3B.31 contains information about edge lines through diamond interchanges with a transposed alignment crossroad.

12 Section 3D.03 provides information for edge lines through roundabouts.

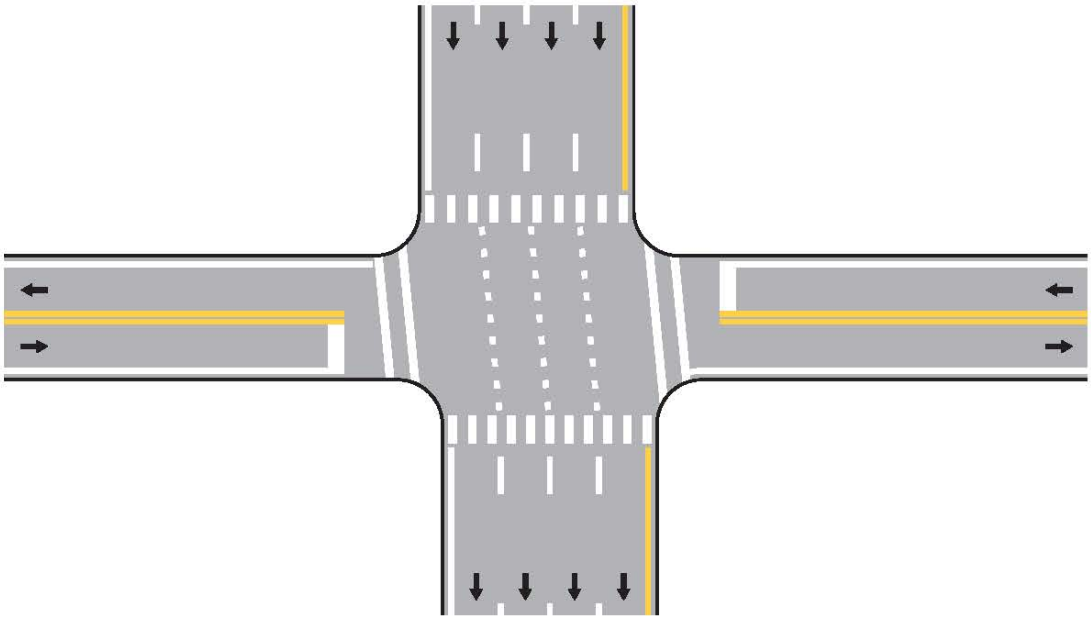
13 Section 5B.02 contains information on edge line extensions for driving automation system considerations.

14 Section 8C.05 contains information about the extension of edge lines through grade crossing areas.

15 Section 9E.03 contains information for the extensions of bicycle lanes through intersections.

Figure 3B-13. Examples of Line Extensions through Intersections (Sheet 1 of 2)

A – Typical pavement markings with offset lane lines continued through the intersection



B – Typical pavement markings with line extensions into intersection for double turns

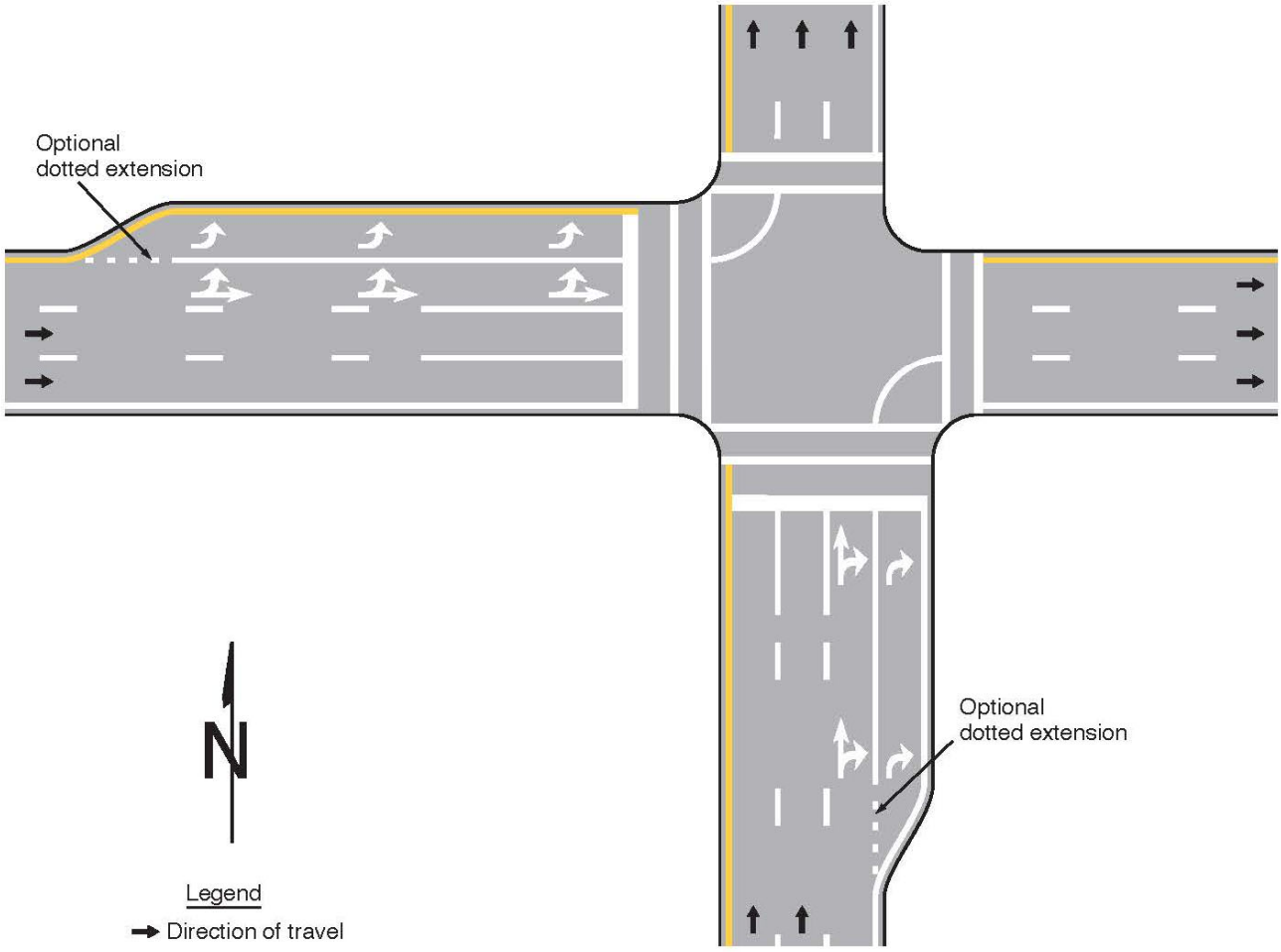
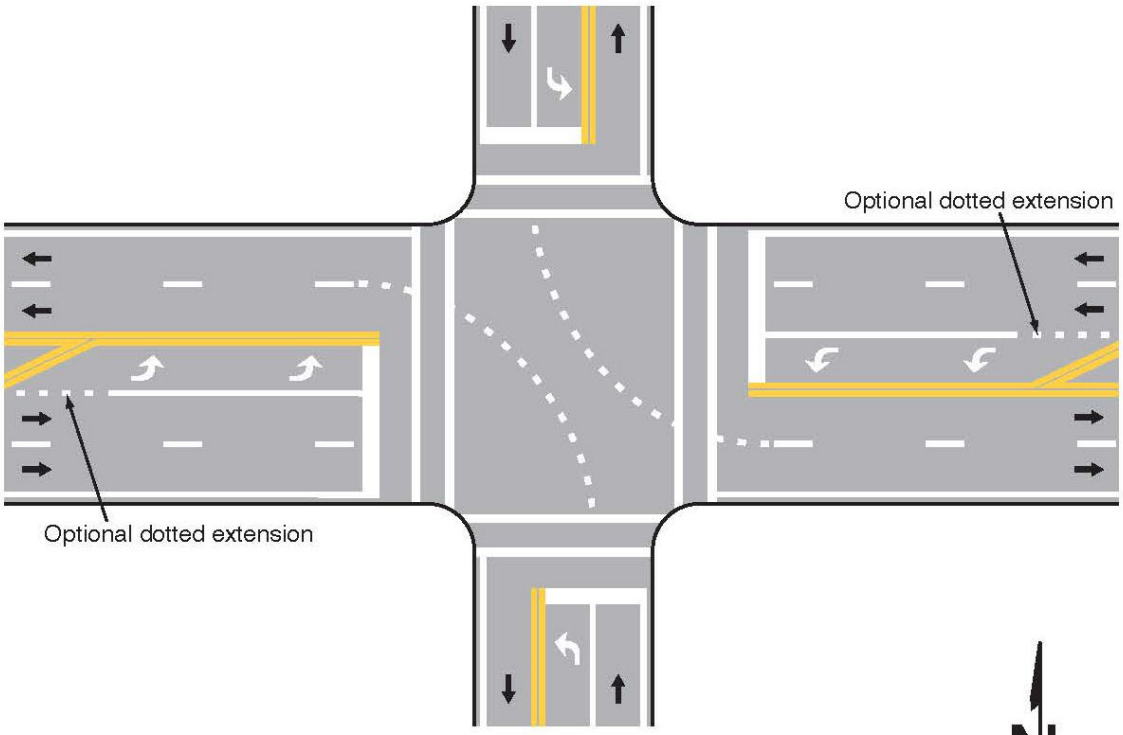


Figure 3B-13. Examples of Line Extensions through Intersections (Sheet 2 of 2)

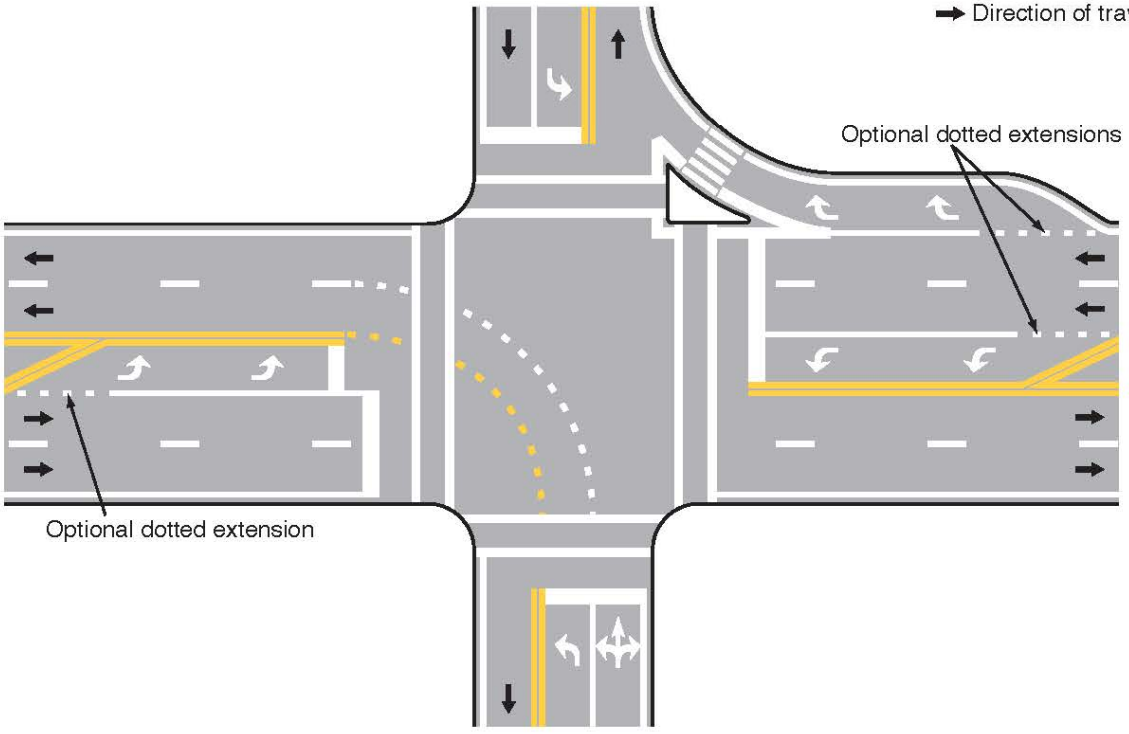
C – Typical dotted line markings to extend lane line markings into the intersection



D – Typical dotted line markings to extend center line and lane line markings into the intersection

Legend

→ Direction of travel



Section 3B.12 Lane-Reduction Transitions

Support:

01 A lane-reduction is where the number of through lanes is reduced at a location that is not at an interchange or intersection because of narrowing of the roadway or because of a section of on-street parking in what would otherwise be a through lane.

02 Section 3B.07 contains information on pavement markings for lane drops and splits.

03 Section 2C.47 contains information for warning signing used for lane reductions.

Standard:

04 Lane-reduction transitions (see Figure 3B-14) shall include the following elements:

- **A. A no-passing zone (see Section 3B.03) to prohibit passing in the direction of the convergence and through the transition area except where not applicable such as one-way streets, expressways, and freeways; and**
- **B. An edge line (see Section 3B.09) in the direction of the convergence and through the transition area, except as provided in Paragraph 6 of this Section.**

Guidance:

05 Except as provided in Paragraph 6 of this Section, the edge line marking should be installed from the location of the Lane Ends warning sign to beyond the beginning of the narrower roadway.

Option:

06 On roadways with operating speeds less than 25 mph where curbs clearly define the roadway edge in the lane-reduction transition, or where a through lane becomes a parking lane, the edge line may be omitted as determined by engineering judgment.

Guidance:

07 Lane-reduction transitions should include the following elements:

- *A. Delineators installed adjacent to the lane or lanes reduced for the full length of the transition and should be so placed and spaced (see Section 3G.04) to show the reduction except as provided in Paragraph 13 of this Section and except as provided in Paragraph 2 of Section 3G.03 for freeways and expressways,*
- *B. Lane-reduction arrow markings (see Drawing I in Figure 3B-21) on the roadway with a speed limit of 45 mph or more, and*
- *C. A termination of the broken white lane line at a point that is ¼ of the advance placement distance (see Section 2C.04) between the Lane Ends sign (see Section 2C.47) and the point where the transition taper begins.*

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

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

10 Where observed speeds exceed speed limits, longer tapers should be used.

Option:

11 The minimum taper length may be less than 100 feet on roadways where the operating speed is less than 25 mph.

12 On new construction, where no speed limit has been established, the design speed may be used in the transition taper length formula.

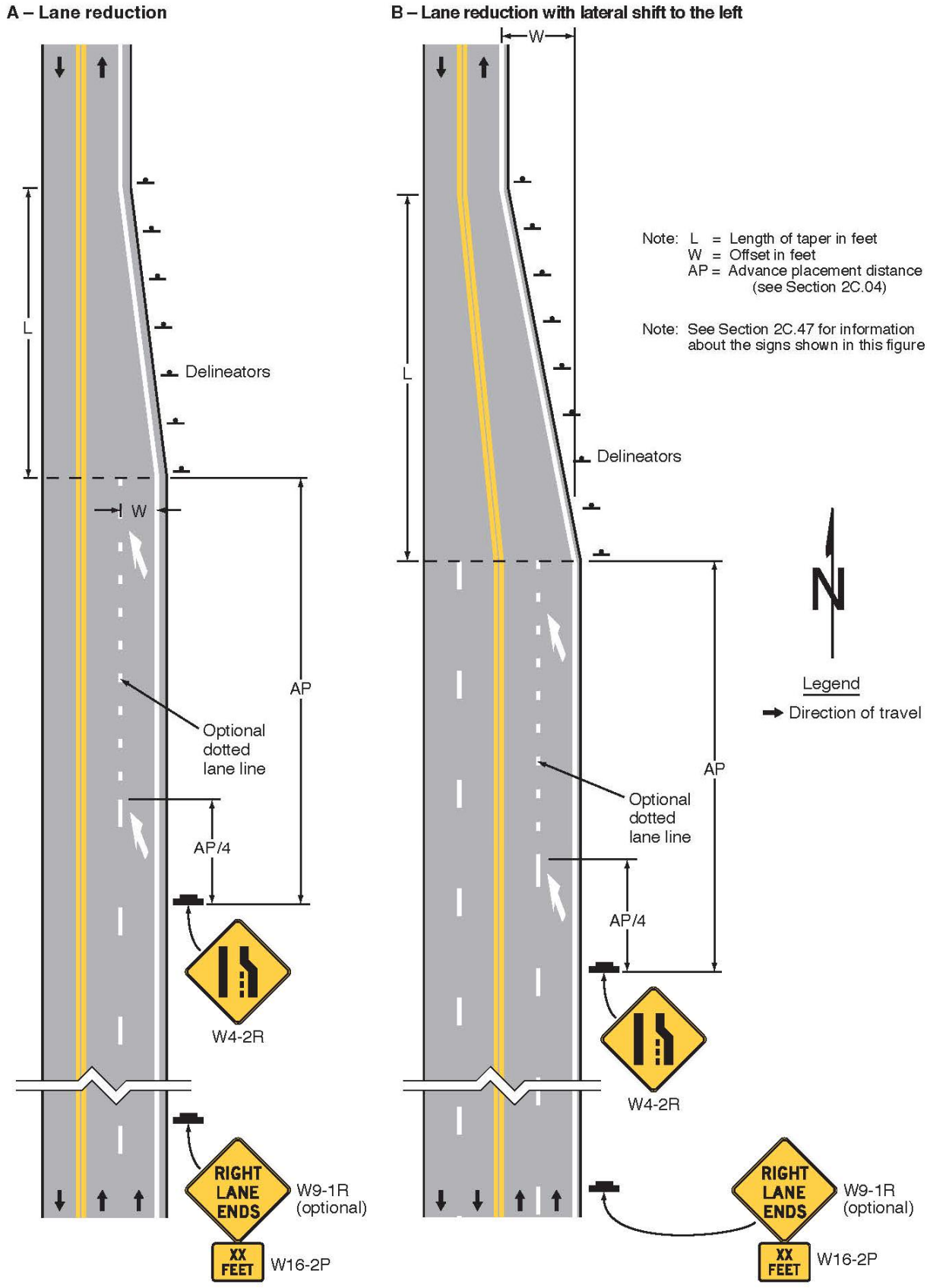
13 On low-speed urban roadways where curbs clearly define the roadway edge in the lane-reduction transition, or where a through lane becomes a parking lane, delineators may be omitted as determined by engineering judgment.

14 Where a lane-reduction transition occurs on a roadway with a speed limit of less than 45 mph, lane-reduction arrow markings may be used.

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

16 A dotted white line may be used between the point where the broken white lane line is terminated to the point where the transition taper begins.

Figure 3B-14. Examples of Applications of Lane-Reduction Transition Markings



Section 3B.13 Approach Markings for Obstructions

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:

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

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

Option:

04 The minimum taper length may be less than 100 feet on roadways where the operating speed is less than 25 mph.

Standard:

05 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 in Figure 3B-15).

Option:

06 If traffic is required to pass only to the right of the obstruction, yellow diagonal markings (see Section 3B.25) may be placed in the flush median islands (see Section 3J.03) between the no-passing zone markings as shown in Drawings A and B in Figure 3B-15.

Standard:

07 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 width double solid 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 in Figure 3B-15).

Option:

08 If traffic can pass either to the right or left of the obstruction, additional white chevron markings (see Section 3B.25) may be placed in the flush neutral area between the channelizing lines as shown in Drawing C in Figure 3B-15. Other markings, such as white delineators, white channelizing devices, white raised pavement markers, and white crosswalk markings may also be placed in the flush neutral area.

Section 3B.14 Raised Pavement Markers – General

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.

Option:

02 The side of a raised pavement marker that is visible to traffic proceeding in the wrong direction may be red (see Section 3A.03).

03 Retroreflective or internally illuminated raised pavement markers may be used in the roadway immediately adjacent to curbed approach ends of raised medians and curbs of islands, or on top of such curbs (see Section 3J.06).

Standard:

04 When used, internally illuminated raised pavement markers shall be steadily illuminated and shall not be flashed.

Support:

05 Flashing raised pavement markers are considered to be In-Roadway Warning Lights (see Chapter 4U).

Guidance:

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

Figure 3B-15. Examples of Applications of Markings for Obstructions in the Roadway
(Sheet 1 of 2)

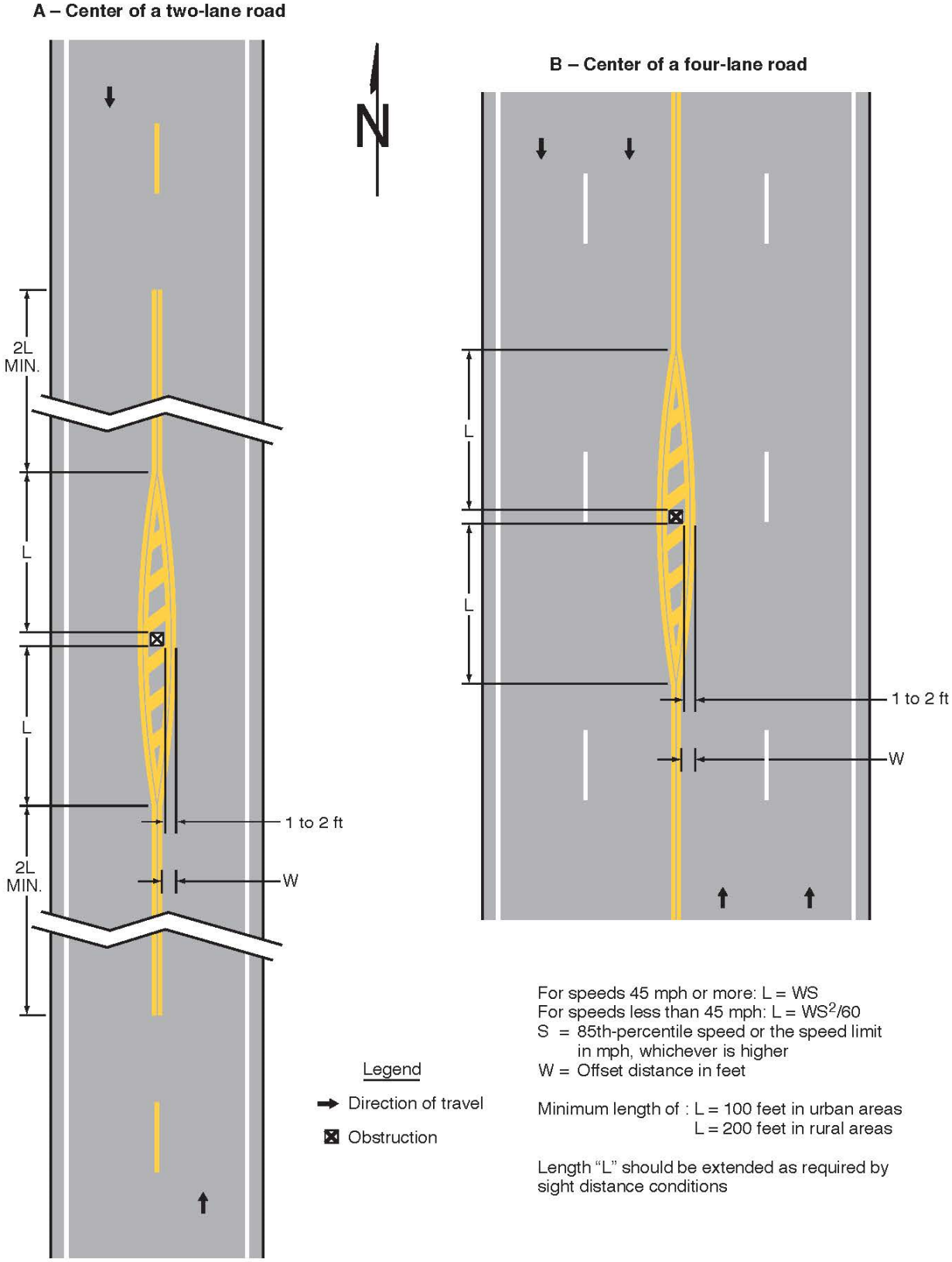
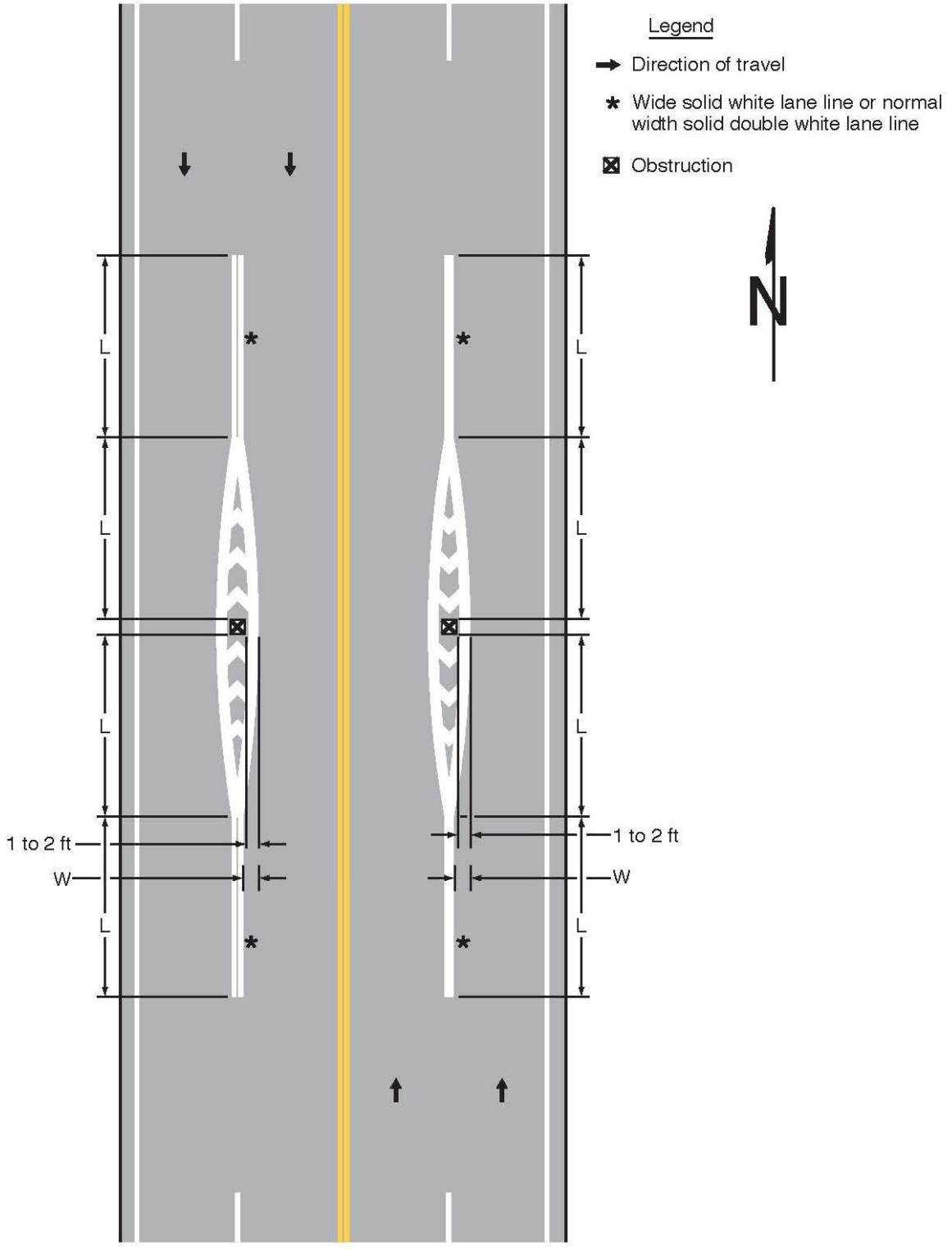


Figure 3B-15. Examples of Applications of Markings for Obstructions in the Roadway
(Sheet 2 of 2)

C – Traffic passing in the same direction on both sides of an obstruction



For speeds of 45 mph or more: L = WS
For speeds of less than 45 mph: $L = WS^2/60$
S = 85th-percentile speed or the speed limit in mph, whichever is higher
W = Offset distance in feet

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

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

Standard:

07 The value of N cited in Sections 3B.15 through 3B.17 for the spacing of raised pavement markers shall equal the length of one line segment plus one gap of the broken lines used on the highway.

Option:

08 For additional emphasis, retroreflective raised pavement markers may be spaced closer than described in Sections 3B.15 through 3B.17, as determined by engineering judgment or engineering study.

Support:

09 Section 9A.03 contains information for the application of raised pavement markers to bicycle facilities.

Section 3B.15 Raised Pavement Markers as Vehicle Positioning Guides with Other Longitudinal Markings

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 Except as otherwise provided in Paragraphs 3 and 4 of this Section, the spacing for such applications should be 2N (see Section 3B.14).

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

Section 3B.16 Raised Pavement Markers Supplementing Other Markings

Guidance:

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

- *A. Lateral Positioning*
  - *1. When supplementing double line markings, pairs of raised pavement markers placed laterally in line with or immediately outside of the two lines should be used.*
  - *2. When supplementing wide line markings, pairs of raised pavement markers placed laterally adjacent to each other should be used.*
- *B. Longitudinal Spacing*
  - *1. When supplementing solid line markings, raised pavement markers at a spacing no greater than N (see Section 3B.14) 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 no greater than 3N should be used. However, when supplementing broken line markings identifying reversible lanes, a spacing of no greater than N should be used.*
  - *3. When supplementing dotted lane line markings, a spacing appropriate for the application 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.*

02 Raised pavement markers should not supplement right-hand edge lines unless an engineering study or engineering judgment indicates the benefits of enhanced delineation of a curve or other location would outweigh

possible impacts on bicyclists using the shoulder, and the spacing of raised pavement markers on the right-hand edge does not simulate a broken line during wet night conditions.

Option:

03 Raised pavement markers also may be used to supplement other markings such as channelizing islands, gore areas, approaches to obstructions, or wrong-way arrows.

04 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.

Section 3B.17 Raised Pavement Markers Substituting for Pavement Markings

Option:

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

Guidance:

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

Standard:

03 Non-retroreflective raised pavement markers shall not be used alone, without supplemental retroreflective or internally illuminated markers, as a substitute for other types of pavement markings.

Support:

04 Section 6J.03 contains information for flexible temporary pavement markers used during surface treatment paving operations.

Standard:

05 If raised pavement markers are used to substitute for broken line markings, a group of three to five markers equally spaced at a distance no greater than N/8 (see Section 3B.14) shall be used. If N is other than 40 feet, the markers shall be equally spaced over the line segment length (at ½ points for three markers, at ⅓ points for four markers, and at ¼ points for five markers). At least one retroreflective or internally illuminated marker per group shall be used or a retroreflective or internally illuminated marker shall be installed midway in each gap between successive groups of non-retroreflective markers.

06 When raised pavement markers substitute for solid line markings, the markers shall be equally spaced at no greater than N/4, with retroreflective or internally illuminated units at a spacing no greater than N/2.

Guidance:

07 Raised pavement markers should not substitute for right-hand edge line markings unless an engineering study or engineering judgment indicates the benefits of enhanced delineation of a curve or other location would outweigh possible impacts on bicyclists using the shoulder, and the spacing of raised pavement markers on the right-hand edge line does not simulate a broken line during wet night conditions.

Standard:

08 When raised pavement markers substitute for dotted lines, they shall be spaced at no greater than N/4, with not less than one raised pavement marker per dotted line segment. At least one raised marker every N shall be retroreflective or internally illuminated.

Option:

09 When substituting for wide lines, raised pavement markers may be placed laterally adjacent to each other to simulate the width of the line.

Support:

10 Section 5B.02 contains information on raised pavement marker considerations for driving automation systems.

Section 3B.18 Curb Markings for Parking Regulations

Guidance:

01 Except as provided in Paragraph 3~~4~~ of this Section, since yellow and white curb markings are frequently used for curb delineation and visibility, parking regulations should be established through the installation of standard signs (see Sections 2B.53 and 2B.54), especially in areas where curb markings are frequently obscured by snow and ice accumulation.

02 Except as provided in Paragraph 3~~4~~ of this Section, when curb markings are used without signs to convey parking regulations, a legible word marking regarding the regulation (such as "No Parking" or "No Standing") should be placed on the curb.

Option:

03 Curb markings without word markings or signs may be used to convey a general prohibition by statute of parking within a specified distance of a STOP sign, YIELD sign, driveway, fire hydrant, or crosswalk.

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

Section 3B.19 Stop and Yield Lines

Option:

01 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) sign, a Stop Here for School Crossing (R1-5c) sign, a Stop Here for Trail Crossing (R-5e) sign, or some other traffic control device that requires vehicles to stop, except YIELD signs that are not associated with passive grade crossings.

Standard:

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

03 Except as provided in Section 8C.03, stop lines shall not be used at locations where drivers are required to yield in compliance with a YIELD (R1-2) sign, a Yield Here to Pedestrians (R1-5) sign, a Yield Here to School Crossings (R1-5a) sign, a Yield Here to Trail Crossings (R1-5d) sign, or at locations on uncontrolled approaches where drivers or bicyclists are required by State law to yield to pedestrians.

Guidance:

04 Stop lines should be used to indicate the point behind which vehicles are required to stop in compliance with a traffic control signal (see Section 4D.08).

05 Stop lines should be 12 to 24 inches wide.

Option:

06 Stop lines may be omitted at ramp control signals.

Support:

07 Section 4J.02 contains information regarding the use and application of stop lines in conjunction with a pedestrian hybrid beacon.

Standard:

08 If used, a yield line pavement marking shall not be installed without a Yield (R1-2) sign, a Yield Here to Pedestrians (R1-5) sign, a Yield Here to School Crossings (R1-5a) sign, a Yield Here to Trail Crossings (R1-5d) sign, or some other traffic control device that requires vehicles to yield (see Figure 3B-16).

09 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) sign, a Stop Here for School Crossing (R1-5c) sign, a Stop Here for Trail Crossing (R1-5e) sign, a traffic control signal, or some other traffic control device.

10 Yield lines shall consist of a row of solid white isosceles triangles pointing toward approaching vehicles extending across approach lanes to indicate the point at which the yield is intended or required to be made.

Option:

11 If a yield line marking is used on a bicycle facility, a Bicycles Yield to Pedestrians (R9-6) sign (see Section 9B-12) may be used.

Guidance:

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

13 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 3D.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.

Standard:

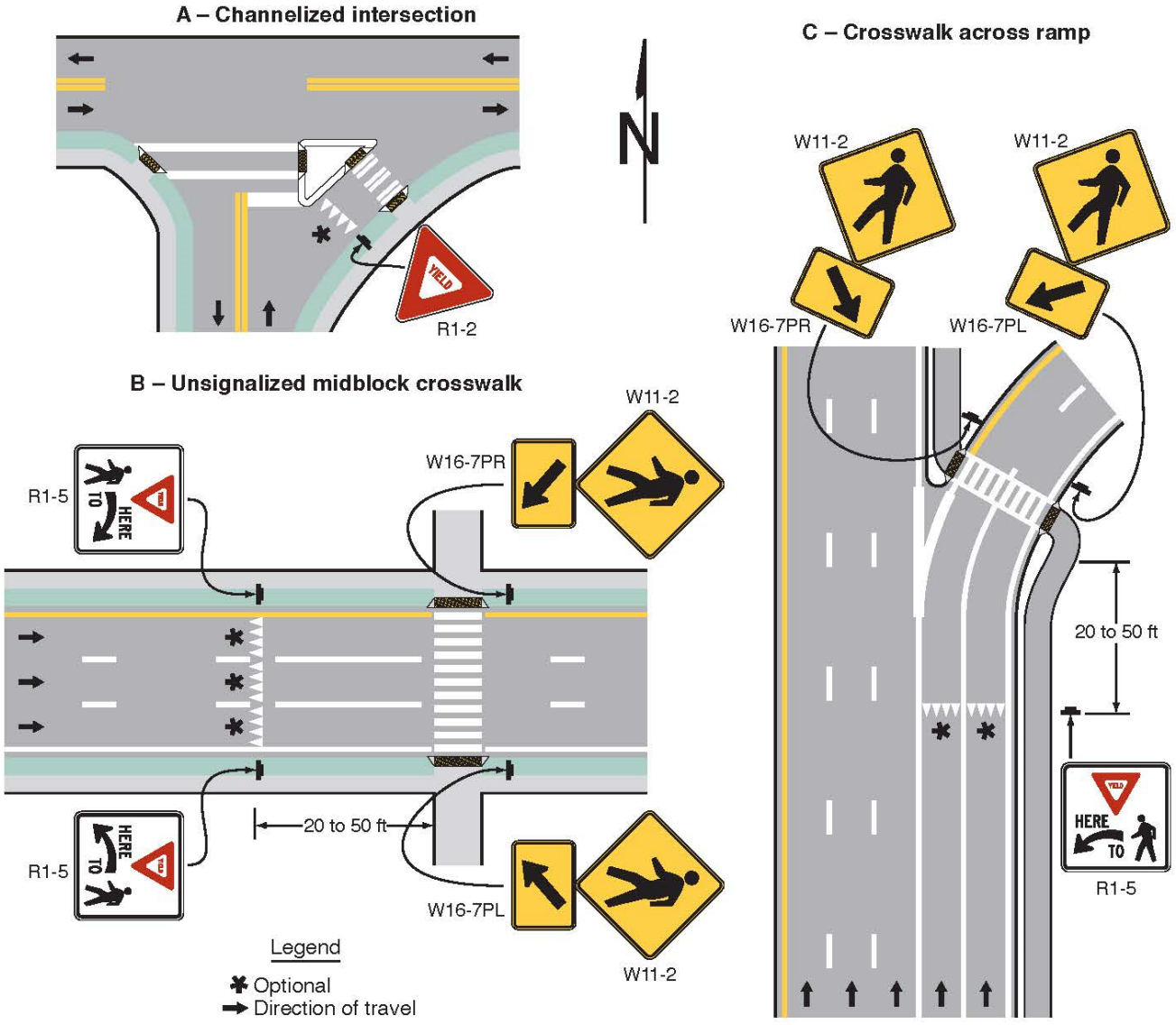
14 If yield (stop) lines are used at a crosswalk that crosses an uncontrolled multi-lane approach, Yield Here to (Stop Here for) Pedestrians (R1-5 series) signs (see Section 2B.19) shall be used.

Guidance:

15 If yield (stop) lines are used at a crosswalk that crosses an uncontrolled multi-lane approach, the yield (stop) line should be placed 20 to 50 feet in advance of the nearest crosswalk line (see Drawing B in Figure 3B-16).

16 If yield or stop lines are used in advance of a crosswalk that crosses an uncontrolled multi-lane approach, parking should be prohibited in the area between the yield or stop line and the crosswalk.

Figure 3B-16. Examples of Yield Line Applications



Support:

17 Section 9B.12 contains information for providing signing applicable to bicyclists also subject to a yielding requirement at a crosswalk that crosses an uncontrolled approach.

Guidance:

18 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 circular intersection.

Support:

19 Section 8C.03 contains information regarding the use of stop lines and yield lines at grade crossings.

Option:

20 Stop and yield lines may be staggered longitudinally on a lane-by-lane basis (see Drawing D in Figure 3B-13).

Support:

21 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.

Section 3B.20 Word, Symbol, and Arrow Pavement Markings – General

Support:

01 Word, symbol, and arrow markings on the pavement are used for the purpose of regulating, warning, or guiding traffic. These pavement markings can be helpful to road users in some locations by supplementing signs and providing additional emphasis for important regulatory, warning, or guidance messages, because the markings do not require diversion of the road user's attention from the roadway surface. Symbol messages are preferable to word messages. Examples of standard word and arrow pavement markings are shown in Figures 3B-17 and 3B-21, respectively.

Option:

02 Word, symbol, and arrow pavement markings may be used as determined by engineering judgment to supplement signs and/or to provide additional emphasis for regulatory, warning, or guidance messages provided by other devices.

Support:

03 Section 8C.04 contains information for arrow pavement markings in the vicinity of grade crossings.

Standard:

04 Word, symbol, and arrow markings shall be white, except as otherwise provided in Sections 3A.03 and 3B.22.

05 Pavement marking letters, numerals, symbols, and arrows shall be installed in accordance with the design details in the Pavement Markings chapter of the "Standard Highway Signs" publication (see Section 1A.05).

Guidance:

06 Word, symbol, and/or arrow markings that are grouped together to formulate one interrelated message should not exceed three lines of information.

07 Except for the two opposing white arrows of a two-way left-turn lane marking (see Figure 3B-7) and the pavement word marking messages described in Items B and D of Paragraph 2 of Section 3B.26, the longitudinal space between word, symbol, and/or arrow markings that are used together to formulate one interrelated message 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.

08 Except for the SCHOOL word marking (see Section 7C.02), pavement word, symbol, and arrow markings should be no more than one lane in width.

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

Option:

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

11 On roadways where the operating speed is less than 25 mph, word, symbol, and arrow markings may be proportionally reduced by 25 percent.

Section 3B.21 Word Pavement Markings

Guidance:

01 Letters and numerals should be 6 feet or more in height, except as provided in Section 9E.01 for the BIKE LANE word pavement marking and in Section 9E.15 for a bicycle detector symbol and WAIT HERE FOR GREEN word pavement marking.

02 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.

Standard:

03 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.

Guidance:

04 Where through lanes approaching an intersection become mandatory turn lanes, ONLY word pavement markings (see Figure 3B-17) should be used in addition to signs (see Sections 2B.27 and 2B.28) and the required lane-use arrow markings (see Section 3B.23).

Option:

05 The ONLY word marking may be used to supplement the lane-use arrow markings in lanes that are designated for the exclusive use of a single movement such as turn bays.

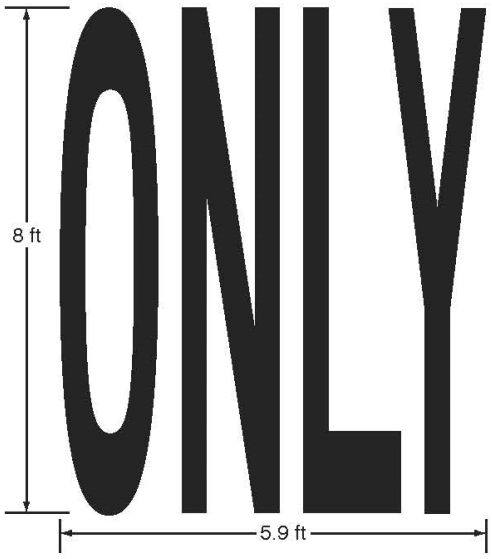
06 The ONLY word marking may be used to supplement a preferential lane word or symbol marking (see Section 3E.03).

07 On roadways where the operating speed is less than 25 mph, word markings may be proportionally reduced by 25 percent.

Standard:

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

Figure 3B-17. Example of Elongated Letters for Word Pavement Markings



Section 3B.22 Symbol Pavement Markings

Support:

01 Section 3E.03 contains information on the diamond-shaped symbol for high-occupancy vehicle (HOV) lanes.

02 Chapter 9E contains information on symbol markings that can be used for bicycle lanes.

Option:

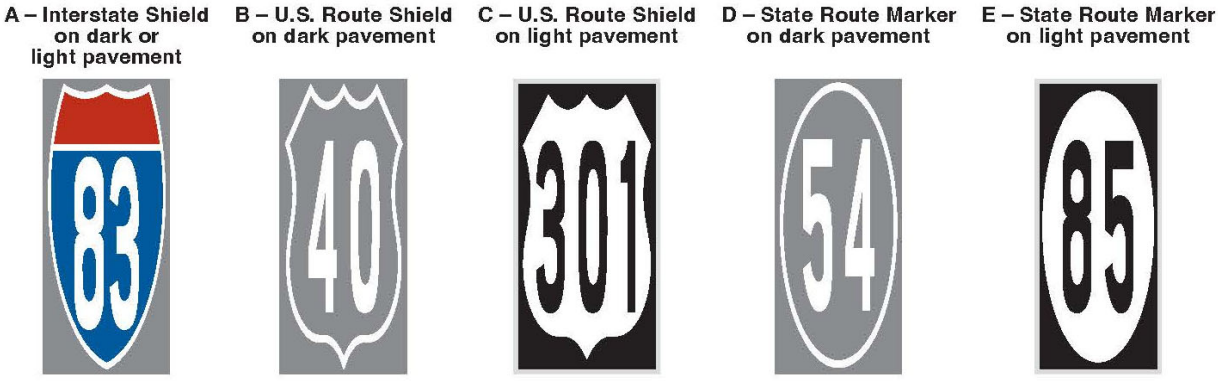
03 Pavement markings simulating Interstate, U.S., State, and County route signs (see Figure 2D-4) with appropriate route numbers, but elongated for proper proportioning when viewed as a marking, may be used to guide road users to their destinations (see Figure 3B-18).

Guidance:

04 If route sign markings are provided to guide road users, those route sign markings should be provided in option lanes if markings are provided in any lanes.

05 If two route sign markings are provided in an option lane, they should be placed in sequence and not divided around an optional lane arrow.

Figure 3B-18. Examples of Elongated Route Shields and Markers Applied as Pavement Markings



Note: See the "Standard Highway Signs" publication for sizes and details

Support:

06 Section 3A.03 provides information on route sign colors.

07 Section 9E.14 contains information on route markers for designated bicycle routes that can be used on shared-use paths.

Guidance:

08 The International Symbol of Accessibility parking space marking (see Figure 3B-19) should be placed in each parking space designated for use by persons with disabilities.

Option:

09 A blue background with white border may supplement the wheelchair symbol as shown in Figure 3B-19.

10 A yield-ahead triangle symbol or YIELD AHEAD word pavement marking may be used on approaches to intersections where the approaching traffic will encounter a YIELD sign at the intersection.

Standard:

11 The yield-ahead triangle symbol or YIELD AHEAD word pavement marking shall not be used unless a YIELD sign (see Section 2B.05) is in place at the intersection. The yield-ahead triangle symbol marking shall be as shown in Figure 3B-20.

Option:

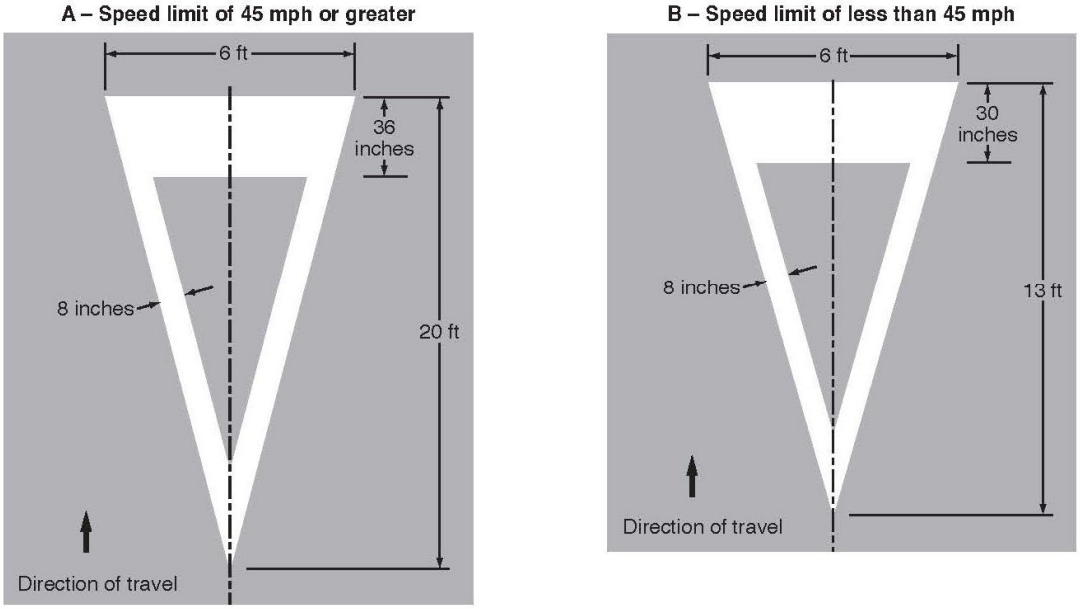
12 A pedestrian symbol pavement marking may be used on portions of facilities that are reserved exclusively for pedestrian use, such as where a shared-use path transitions to become separate facilities for different types of users.

Figure 3B-19. International Symbol of Accessibility Parking Space Marking

Notes:

1. See the "Standard Highway Signs" publication for sizes and details
2. The blue-colored background with white border is optional

Figure 3B-20. Yield Ahead Triangle Symbols



Section 3B.23 Lane-Use Arrows

Support:

01 Lane-use arrow markings (see Figure 3B-21) are used to indicate the mandatory or permissible movements in certain lanes (see Figure 3B-22) and in two-way left-turn lanes (see Figure 3B-7).

02 Section 8C.04 contains information about the placement of lane-use arrow markings in the vicinity of grade crossings.

Guidance:

03 Lane-use arrow markings should be used in lanes and turn bays designated for the exclusive use of a turning movement, 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 in Figure 3B-13).

04 When used in turn lanes, at least two arrows should be used, one at or near the upstream end of the full-width turn lane and one an appropriate distance upstream from the stop line or intersection (see Drawing A in Figure 3B-12).

05 Where opposing offset channelized left-turn lanes exist, lane-use arrow markings should be placed near the downstream terminus of the offset left-turn lanes to reduce wrong-way movements (see Figure 2B-20).

Option:

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

Support:

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

Standard:

08 Where through lanes approaching an intersection become mandatory turn lanes, turn lane-use arrow markings (see Drawing A in Figure 3B-12 and Figure 3B-21) shall be used and shall be accompanied by standard signs (see Section 2B.28).

Guidance:

09 Where through lanes approaching an intersection become mandatory turn lanes, ONLY word markings (see Figure 3B-17) should be used in addition to signs (see Sections 2B.27 and 2B.28) and the required turn lane-use arrow markings. These signs and markings should be placed well in advance of the turn and should be repeated as necessary to provide the through motorist advance notification to vacate the lane prior to reaching a point where roadway geometrics or a queue of waiting vehicles forces the motorist to make an unintended turn.

Option:

10 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.

Section 3B.24 Wrong-Way Arrows

Guidance:

01 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-15).

Option:

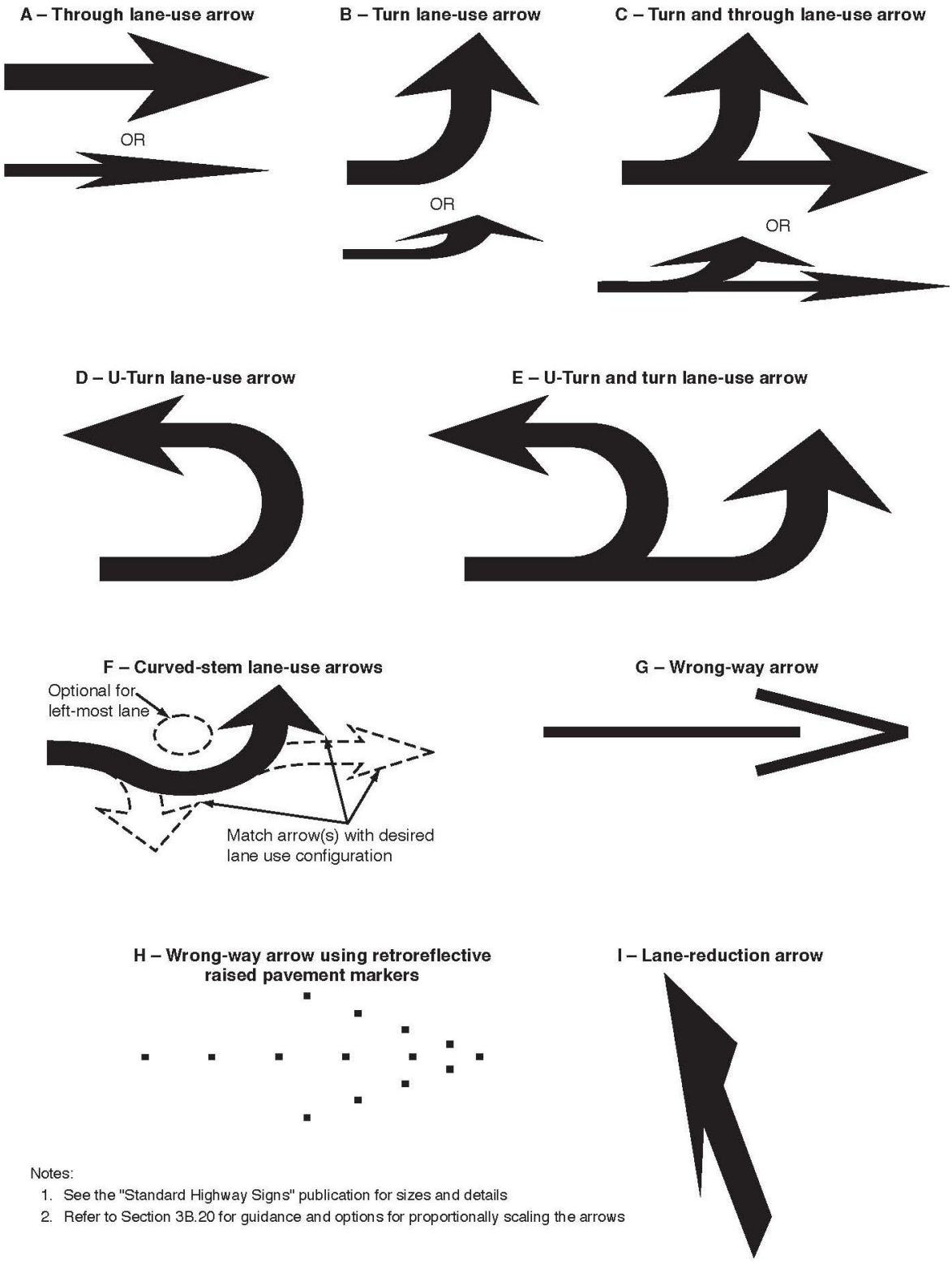
02 The wrong-way arrow markings shown in Drawing G in Figure 3B-21 may be placed near the downstream terminus of a ramp as shown in Figure 2B-15 and in Drawing A in Figure 2B-16, or at other locations where lane-use arrows are not appropriate, to indicate the correct direction of traffic flow and to discourage drivers from traveling in the wrong direction.

Section 3B.25 Chevron and Diagonal Markings

Support:

01 Chevron or diagonal markings are used to discourage travel on certain paved areas, such as shoulders, neutral areas, and flush median islands.

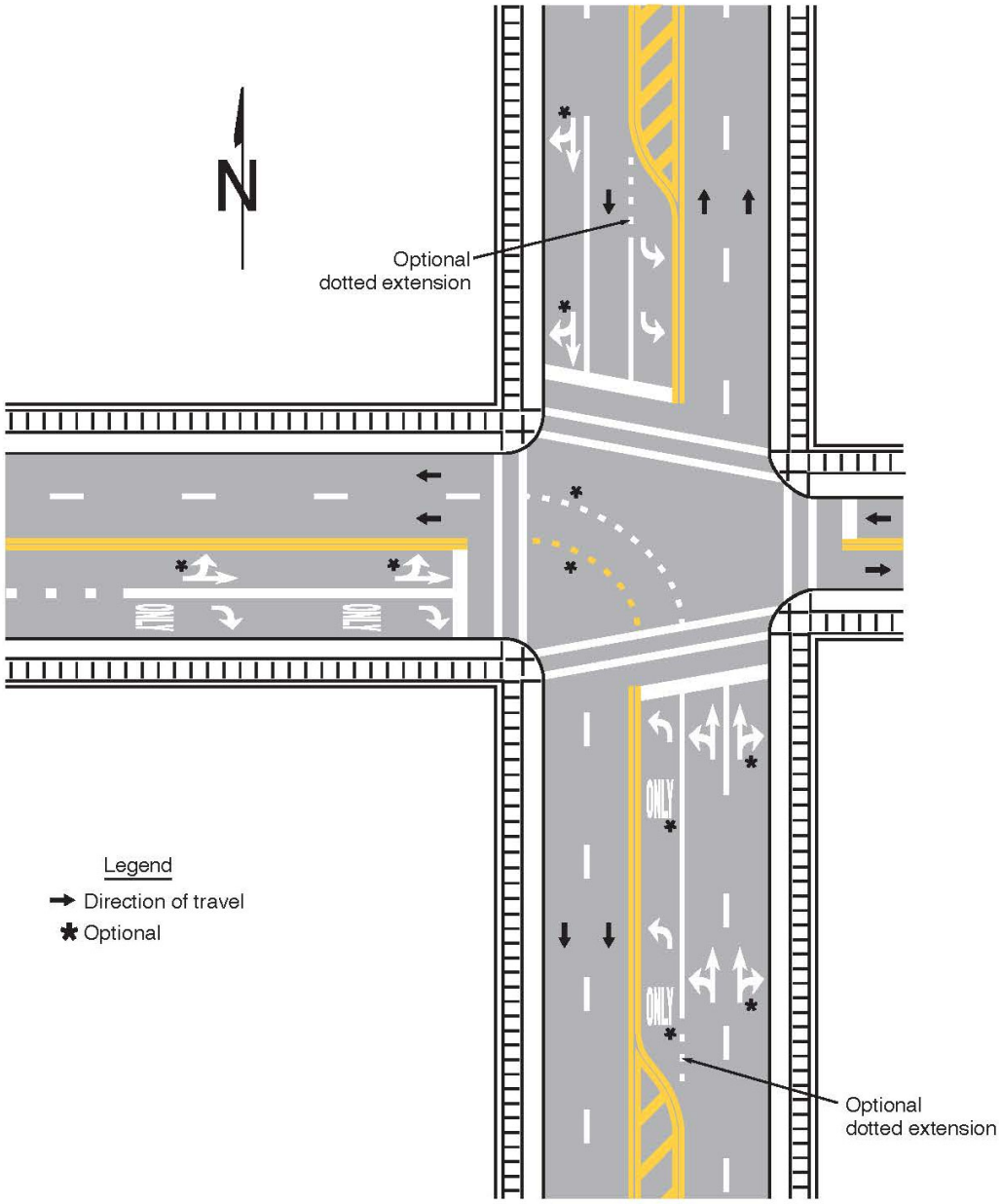
Figure 3B-21. Examples of Standard Arrows for Pavement Markings



Notes:

1. See the "Standard Highway Signs" publication for sizes and details
2. Refer to Section 3B.20 for guidance and options for proportionally scaling the arrows

Figure 3B-22. Examples of Lane-Use Control Word and Arrow Pavement Markings



Option:

02 Chevron and diagonal markings may be used:

A. On approaches to obstructions in the roadway (see Sheet 2 of Figure 3B-15),
B. For channelized travel paths on approaches to intersections,
C. In buffer spaces between preferential lanes and general-purpose lanes (see Drawing A in Figure 3E-2),
D. In the neutral area gores (see Figures 3B-9 through 3B-11),
E. In the neutral area of bifurcations created from open-road tolling lanes that bypass a conventional toll plaza,
F. In the neutral areas at access and egress points to and from a managed-lane facility (see Figures 2G-8, 2G-10, 2G-22, and 2G-23), and
G. In the neutral areas of islands.

03 Chevron markings may be supplemented with white retroreflective or internally illuminated raised pavement markers (see Section 3B.16) for enhanced nighttime visibility.

Support:

04 Section 5B.02 contains information on chevron markings for driving automation system considerations.

Standard:

05 Except as provided in Section 3J.03, chevron markings shall be white, with the point of each chevron facing toward approaching traffic, as shown in Figures 3B-9 through 3B-11, and Drawing C in Figure 3B-15.

Option:

06 Diagonal markings for opposing directions of traffic may be used:

A. On approaches to obstructions in the roadway (see Drawings A and B in Figure 3B-15),
B. In flush median islands between double solid yellow center line markings (see Figure 3B-5), and
C. In buffer spaces between preferential lanes and general-purpose lanes (see Drawing D in Figure 3E-4).

07 Diagonal markings may be used on paved shoulders or in no-parking zones, or other locations for special emphasis.

Standard:

08 When diagonal markings are used between opposing directions of traffic or on the left shoulder of a one-way or divided roadway, they shall be yellow and slant away from traffic in the adjacent travel lanes, as shown in Figures 3B-2 and 3B-5, and Drawings A and B in Figure 3B-15.

09 When diagonal markings are used on the right shoulder or in no-parking zones (see Figure 3B-23), they shall be white and slant away from traffic in the adjacent travel lane.

Guidance:

10 Except as provided in Paragraph 11 of this Section, chevrons and diagonal markings should be at least 12 inches wide for roadways having a speed limit of 45 mph or greater, and at least 8 inches wide for roadways having a speed limit of less than 45 mph. The longitudinal spacing of the chevrons or diagonal lines should be determined by engineering judgment considering factors such as speeds and desired visual impacts. The chevrons and diagonal lines should form an angle of approximately 30 to 45 degrees with the longitudinal lines that they intersect.

Option:

11 Diagonal markings used in no-parking zones or on roadways with operating speeds of less than 25 mph may be 4 inches wide (see Figure 3B-23).

Section 3B.26 Do Not Block Intersection Markings

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-24) 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.59), one or more DO NOT STOP ON TRACKS (R8-8) signs (see Section 8B.07), or one or more similar signs.

Section 3B.27 Parking Space Markings

Standard:

01 On-street parking space markings shall be white.

Support:

02 Examples of on-street parking space markings are shown in Figure 3B-23.

Figure 3B-23. Examples of Parking Space Markings

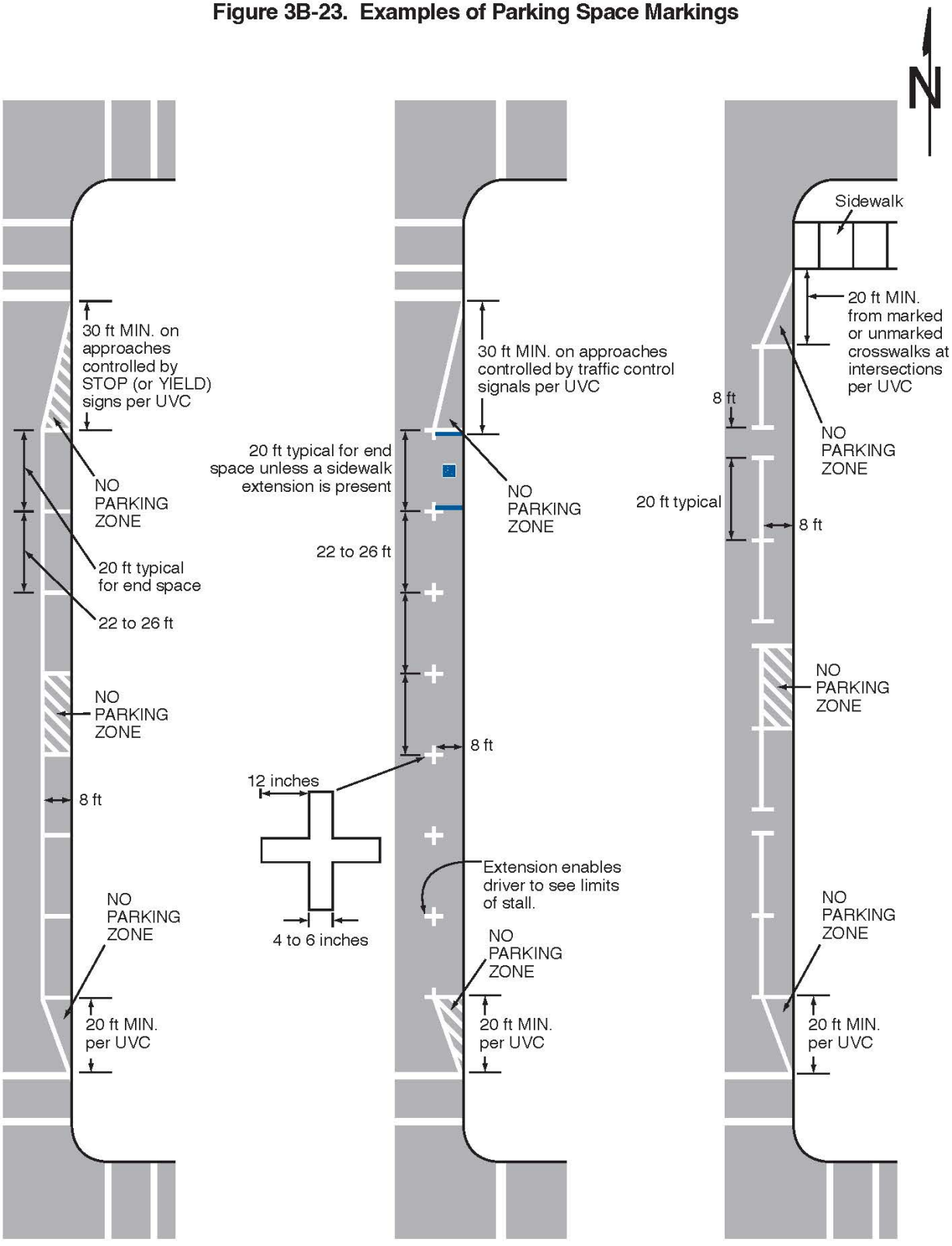
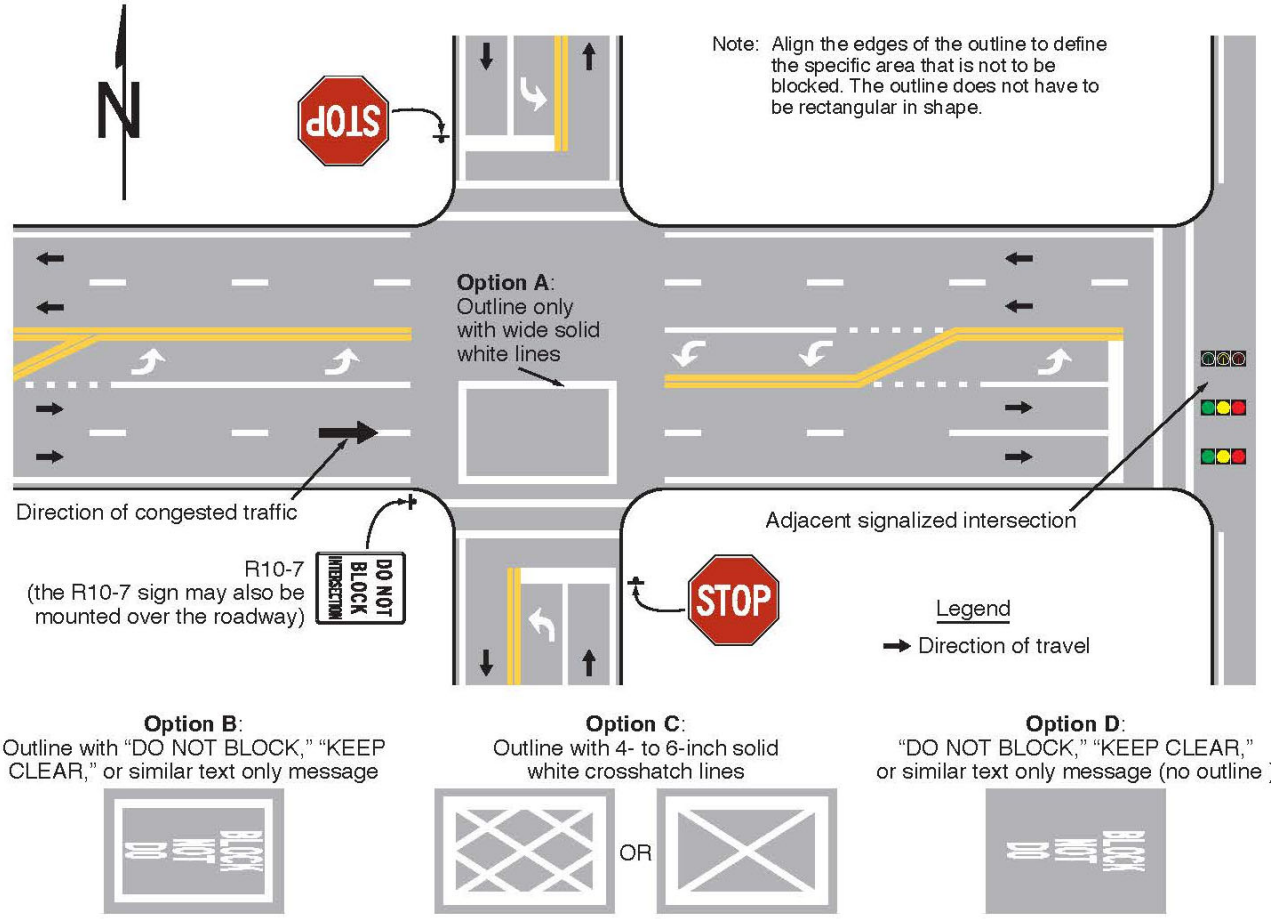


Figure 3B-24. Do Not Block Intersection Markings



Option:

03 Blue lines may supplement white parking space markings of each parking space designated for use only by persons with disabilities (see Figure 3B-23).

Support:

04 Additional parking space markings for the purpose of designating spaces for use only by persons with disabilities are discussed in Section 3B.22 and illustrated in Figure 3B-19.

Wisconsin State Statutes 346.51 to 346.55 describe provisions for standing, stopping and parking. Figure 3B-23 shows parking prohibited for a distance of 20 to 30 feet from the near limits of a crosswalk. Wisconsin State Statute 346.53(5) restricts parking no closer than 15 feet to the near limits of any crosswalk. This limitation would apply on the approach to a traffic signal as well, but in usual practice, prohibitions of up to 100 feet are common on the approach to a signal where the approach is one lane plus parking or otherwise restricted such that provisions need to be made to allow through traffic to bypass left turning traffic thereby increasing intersection efficiency.

Section 3B.28 Speed Reduction Markings

Support:

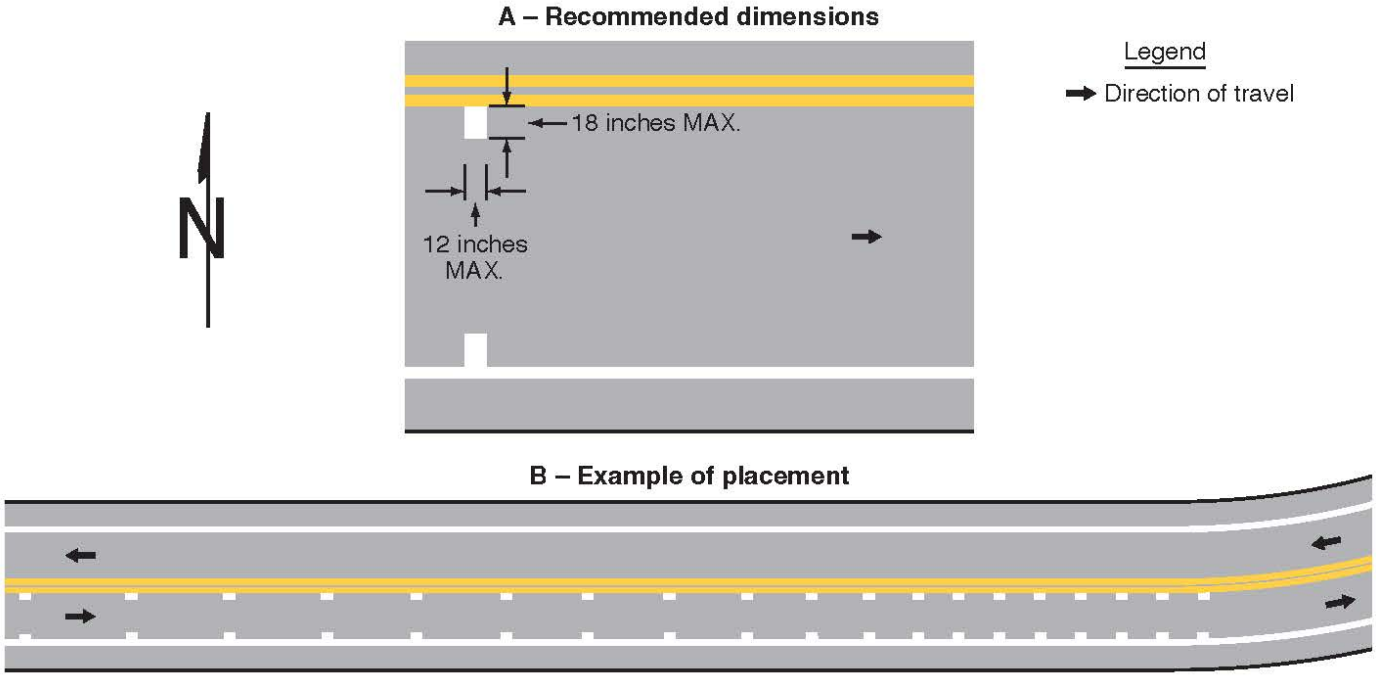
01 Speed reduction markings (see Figure 3B-25) are transverse markings that are placed on the roadway within a lane (along both edges of the lane) in a pattern of progressively reduced spacing to give drivers the impression that their speed is increasing.

02 Speed reduction markings have been shown to enhance safety around curves and locations with a history of run-off-the-road crashes when applied in combination with horizontal alignment warning signs (see Section 2C.05).

Option:

03 Speed reduction markings may be placed in advance of an unexpectedly severe horizontal or vertical curve or other roadway feature where drivers need to decelerate prior to reaching the feature and where the desired reduction in speeds has not been achieved by the installation of warning signs and/or other traffic control devices.

Figure 3B-25. Example of the Application of Speed Reduction Markings



Guidance:

04 If used, speed reduction markings should be reserved for unexpected curves or other usages based on engineering judgment. Speed reduction markings should not be used on long tangent sections of roadway or in areas frequented mainly by local or familiar drivers, such as 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:

05 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.

Guidance:

06 The longitudinal spacing between the markings should be progressively reduced from the upstream to the downstream end of the marked portion of the lane.

Standard:

08 Speed reduction markings shall be used only in lanes that have a longitudinal line (center line, edge line, or lane line) on both sides of the lane.

Section 3B.29 Speed Hump and Speed Table Markings

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-26. 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-27.

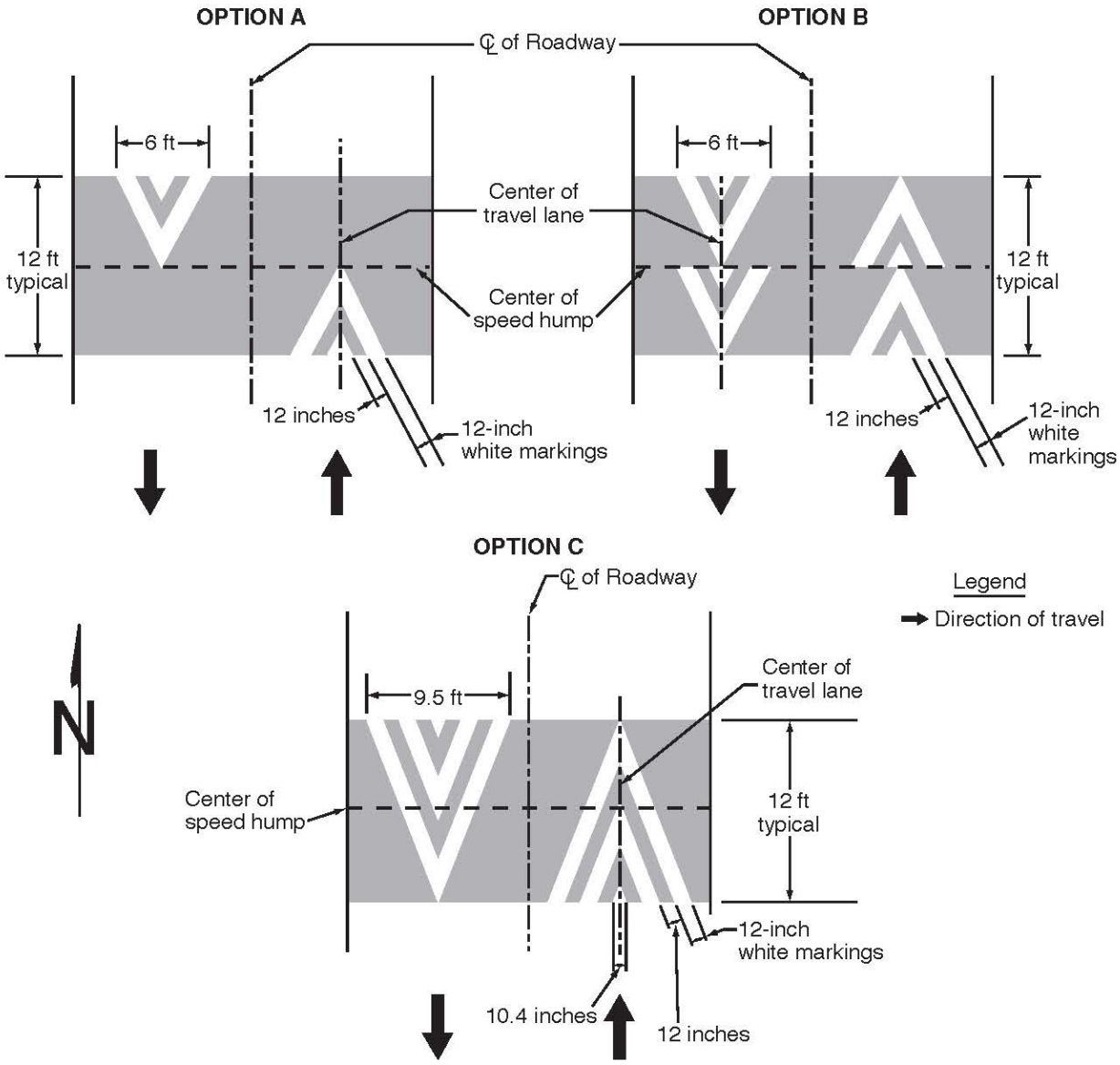
Option:

02 Where used, center line markings, lane line markings, and edge lines may be discontinued on the profile of the speed hump.

Standard:

03 Where a speed hump or a speed table specifically incorporates a crossing movement for pedestrians, bicyclists, or equestrians, and functions as a raised crosswalk, crosswalk markings (see Chapter 3C) shall be provided.

Figure 3B-26. Pavement Markings for Speed Humps without Crosswalks



Section 3B.30 Advance Speed Hump and Speed Table Markings

Option:

01 Advance speed hump markings (see Figure 3B-28) may be used in advance of speed humps or other engineered vertical roadway deflections such as dips where added visibility is desired or where such deflection is not expected.

02 Advance word pavement markings such as BUMP or HUMP (see Section 3B.20) may be used on the approach to a speed hump either alone or in conjunction with advance speed hump markings. Appropriate advance warning signs may be used in compliance with Section 2C.27.

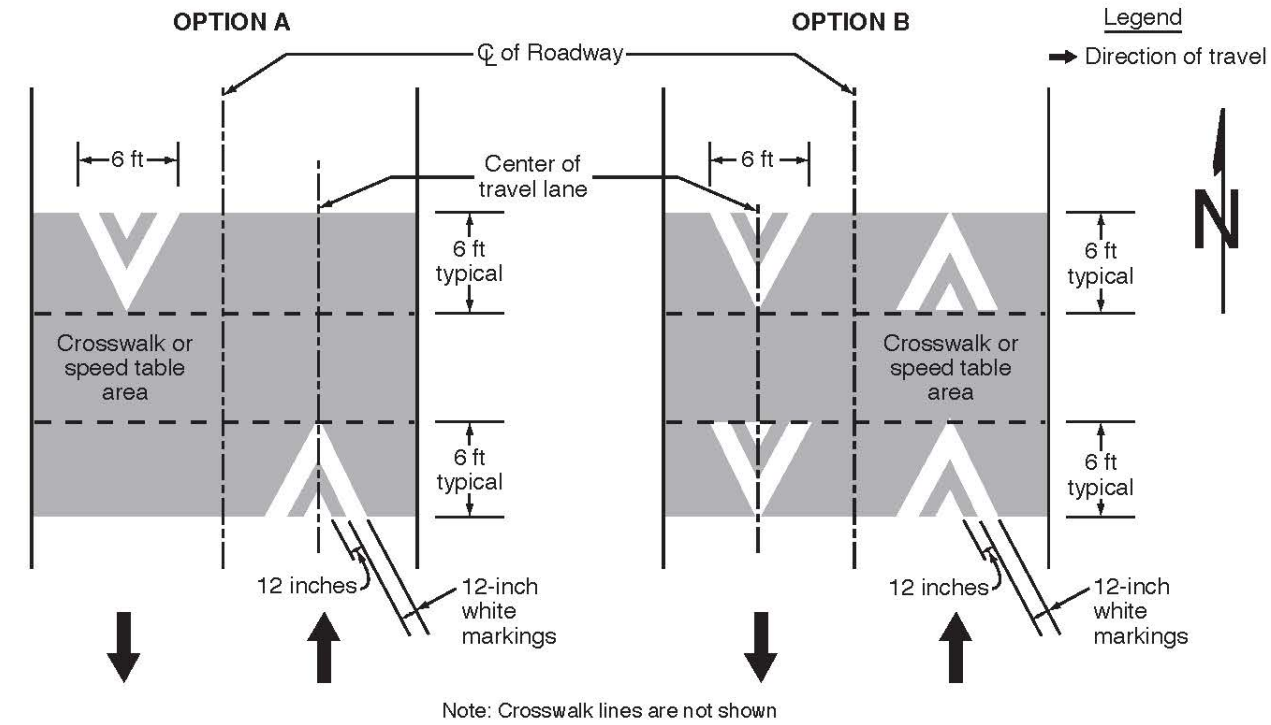
Standard:

03 If advance speed hump or speed table markings are used, they shall be a series of eight white 12-inch transverse lines that become longer and are spaced closer together as the vehicle approaches the speed hump or other deflection. If advance markings are used, they shall comply with the detailed design shown in Figure 3B-28.

Guidance:

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

Figure 3B-27. Pavement Markings for Speed Tables or Speed Humps with Crosswalks



Section 3B.31 Markings for a Diamond Interchange with a Transposed Alignment Crossroad

Support:

01 Markings used in a diamond interchange with a transposed alignment crossroad can be advantageous for minimizing wrong-way movements. The potential for wrong-way movements is greatest at the crossover intersections where the alignment becomes transposed.

Standard:

02 On the transposed alignment, each direction shall be considered a one-way roadway whereas the edge line convention shall be in accordance with Section 3B.09. Both yellow and white edge lines shall be used.

03 A lane-use arrow (see Section 3B.23) shall be used in each approach lane at the crossover intersection.

Support:

04 Section 3C.11 contains information on crosswalks and pedestrian movements for diamond interchanges with a transposed alignment crossroad.

Standard:

05 Flush median islands (see Section 3J.03) shall not be used to divide the inverted flow of traffic.

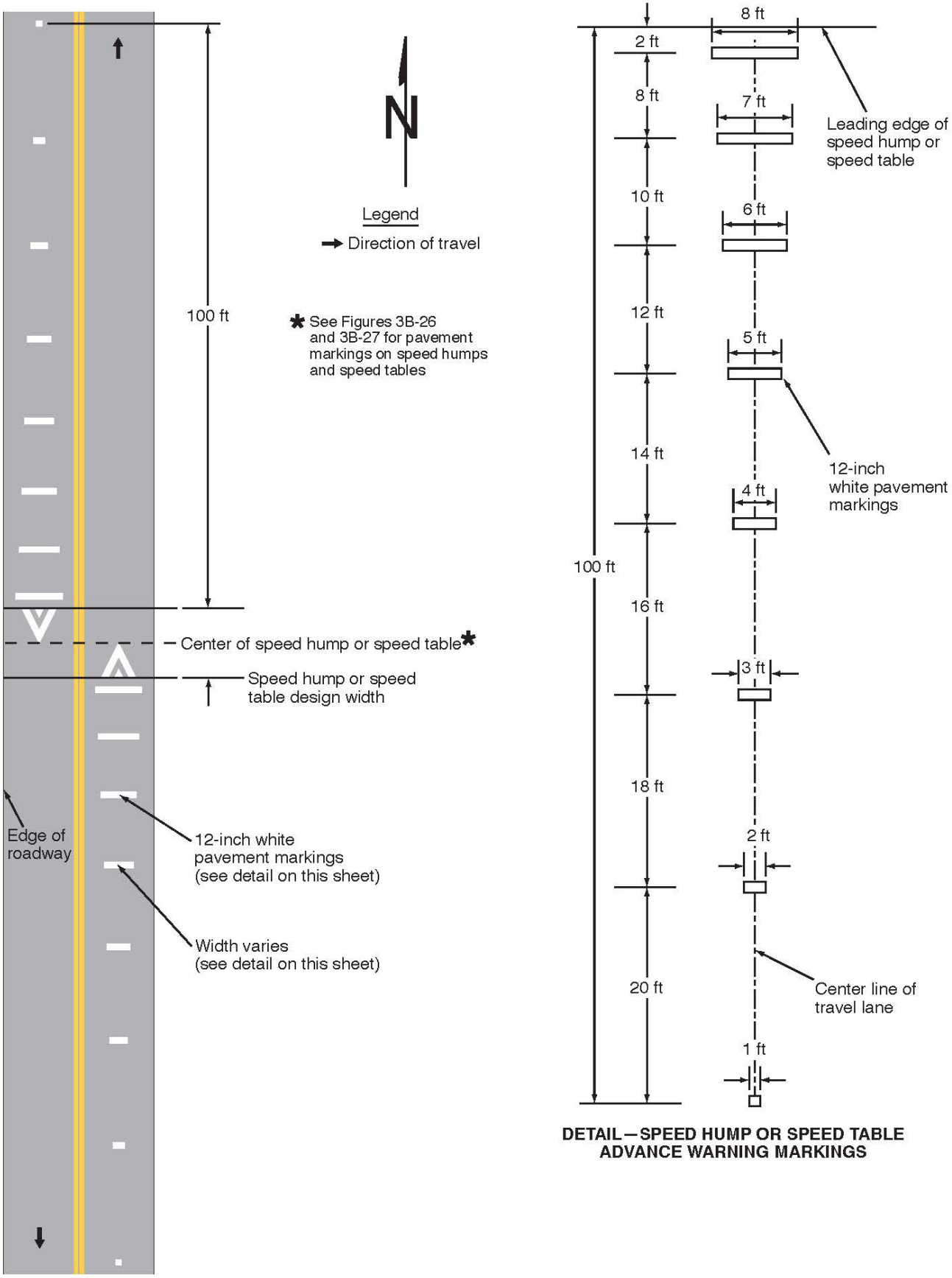
Guidance:

06 Edge line and lane line extensions (see Section 3B.11) should be provided through the crossing points.

Support:

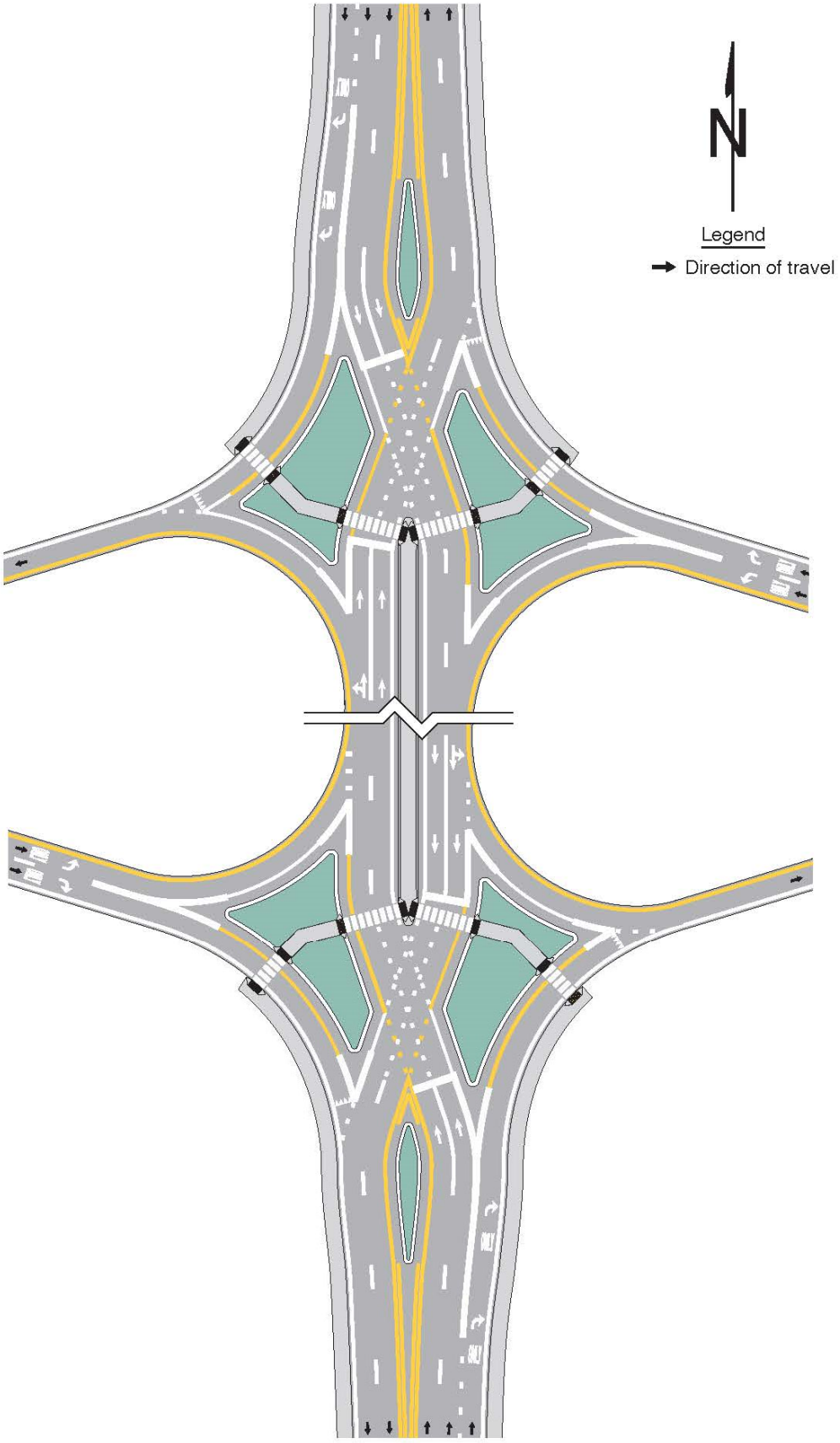
07 Figure 3B-29 illustrates an example of pavement markings for a diamond interchange with a transposed alignment crossroad.

Figure 3B-28. Advance Warning Markings for Speed Humps or Speed Tables



DETAIL—SPEED HUMP OR SPEED TABLE ADVANCE WARNING MARKINGS

Figure 3B-29. Example of Pavement Markings for a Diamond Interchange with a Transposed Alignment Crossroad



CHAPTER 3C. CROSSWALK MARKINGS

Section 3C.01 General

Support:

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

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

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

04 Detectable warning surfaces mark boundaries between pedestrian and vehicular ways where there is no raised curb. Detectable warning surfaces are typically installed where curb ramps are constructed at the junction of sidewalks and the roadway or shoulder, for marked and unmarked crosswalks. Detectable warning surfaces contrast visually with adjacent walking surfaces, either light-on-dark, or dark-on-light. The U.S. Department of Justice 2010 ADA Standards for Accessible Design, September 15, 2010, 28 CFR 35 and 36, Americans with Disabilities Act of 1990 contains specifications for the design of detectable warning surfaces.

Section 3C.02 Application of Crosswalk Markings

Guidance:

01 At locations controlled by traffic control signals, crosswalk markings should be installed.

Option:

02 Crosswalk markings may be omitted if engineering judgment indicates they are not needed to direct pedestrians to the proper crossing path(s).

Guidance:

03 On approaches controlled by STOP or YIELD signs, crosswalk markings should be installed where engineering judgment indicates they are needed to direct pedestrians to the proper crossing path(s).

04 At uncontrolled approaches, an engineering study should be performed before a marked crosswalk is installed. The following criteria should be considered:

- *A. Total number of approach lanes,*
- *B. The presence of a median,*
- *C. The distance from adjacent signalized intersections or other controlled crossings,*
- *D. Projected pedestrian and bicyclist volumes,*
- *E. Pedestrian and bicyclist paths of travel,*
- *F. Pedestrian ages and abilities,*
- *G. Pedestrian and bicyclist delays,*
- *H. Location or frequency of public transit stops,*
- *I. Average daily traffic (ADT),*
- *J. Speed limit or the 85th-percentile speed,*
- *K. The horizontal and vertical geometry of the crossing location,*
- *L. The possible consolidation of multiple crossing points,*
- *M. The availability of street lighting, and*
- *N. Other appropriate factors.*

Standard:

05 Crosswalk markings shall be provided at legally established crosswalks at non-intersection locations.

Guidance:

06 The installation of other traffic control devices and 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 be considered in addition to a new marked crosswalk and signs across an uncontrolled approach to an intersection or midblock crossing location where any of the following conditions exist:

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, or*

C. *The posted speed limit is 40 mph or greater, or*

D. *A crash study reveals that multiple-threat crashes are the predominant crash type on a multi-lane approach, or*

E. *When adequate visibility cannot be provided by parking prohibitions.*

Support:

07 Chapter 4J contains information on pedestrian hybrid beacons.

08 Chapter 4L contains information on rectangular rapid flashing beacons.

09 Section 4S.03 contains information regarding Warning Beacons to provide active warning of a pedestrian's presence.

10 Section 4U.02 contains information regarding In-Roadway Warning Lights at crosswalks.

11 Chapter 7C contains information on school crosswalks.

12 Chapter 7D contains information regarding school crossing supervision.

13 Section 9E.13 contains information on crosswalk markings for shared-use path crossings.

Section 3C.03 Design of Crosswalk Markings

Support:

01 Section 3B.19 contains information regarding placement of stop line markings and yield line markings near crosswalk markings.

02 Crosswalk markings are classified as either transverse line or high-visibility. Transverse crosswalk markings consist of two transverse lines. High-visibility markings consist of longitudinal lines parallel to traffic flow with or without transverse lines. Figure 3C-1 presents crosswalk marking designs.

Standard:

03 Crosswalk markings shall be white. When used, transverse lines shall not be less than 6 inches or greater than 24 inches in width.

Support:

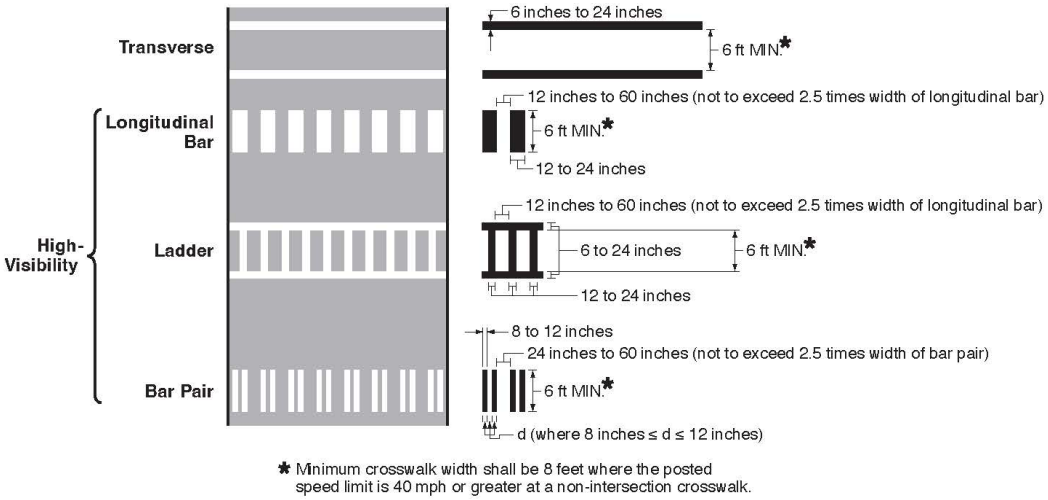
04 The allowable upper limit approaching 24 inches for the width of the transverse lines is normally applied where no stop or yield line is used in advance of the crosswalk or when approach speeds exceed 35 miles per hour.

Standard:

05 Except as provided in Paragraph 6 of this Section, the minimum width of a marked crosswalk shall be 6 feet.

06 At a non-intersection crosswalk where the posted speed limit is 40 mph or greater, the minimum width of the crosswalk shall be 8 feet.

Figure 3C-1. Crosswalk Markings



* Minimum crosswalk width shall be 8 feet where the posted speed limit is 40 mph or greater at a non-intersection crosswalk.

Guidance:

07 High-visibility crosswalk markings (such as shown in Figure 3C-1) and warning signs (see Section 2C.55) should be installed for all crosswalks at non-intersection locations.

08 Added visibility should be provided by parking prohibitions on the approach to marked crosswalks at non-intersection locations.

Standard:

09 At marked crosswalk locations where curb ramps are provided, crosswalk markings shall be located so that the curb ramps are within the extension of the crosswalk markings.

Guidance:

10 Crosswalk marking designs should extend across the full width of pavement or to the edge of the intersecting crosswalk to discourage diagonal walking between crosswalks.

Support:

11 Provisions for aesthetic treatments for the interior portion of a legally-established crosswalk are contained in Section 3H.03.

Standard:

12 If paving materials are used to function as the white transverse lines to establish a marked crosswalk, white additives shall be part of the mixture to produce a white surface. The white paving materials shall be retroreflective.

Section 3C.04 Transverse Line Crosswalks

Guidance:

01 Transverse line crosswalk markings should be limited to locations controlled by traffic control signals or on approaches controlled by STOP or YIELD signs.

Support:

02 Transverse line crosswalk marking design consists of two parallel transverse lines (see Figure 3C-1).

03 Transverse line crosswalk markings can provide benefits to crosswalk operations including:

A. Define where the channelization of pedestrians or other non-motorized users is necessary to facilitate crossing the roadway.
B. Alert motorists to the location of where pedestrians and other non-motorized users might be expected when crossing the roadway.
C. Emphasize a crosswalk at a controlled intersection.
D. Fulfill a legal need to mark the crosswalk.

Section 3C.05 High-Visibility Crosswalks

Option:

01 High-visibility crosswalk markings may be used where additional conspicuity is desired for a crosswalk over transverse line crosswalk markings.

Support:

02 High-visibility crosswalk markings include the longitudinal bar, ladder, and bar pair designs (see Figure 3C-1).

03 High-visibility crosswalk markings can provide benefits to crosswalk operations including:

A. Providing greater detection distances for the approaching motorist.
B. Emphasizing a crosswalk where substantial numbers of pedestrians cross without any other traffic control device.
C. Emphasizing a crosswalk at an uncontrolled approach.
D. Emphasizing the location where a high number of conflicts between turning motorists and users of the crosswalk are expected.
E. Improving visibility of the crosswalk location for otherwise difficult to detect pedestrians or other non-motorized users of the crosswalk.
F. Emphasizing a school crossing.

Standard:

04 The minimum number of individual longitudinal elements to establish a high-visibility crosswalk shall be three. For the bar pair crosswalk design (see Section 3C.08), a coupling set of two longitudinal bars shall be considered to be one individual longitudinal element.

Guidance:

05 The dimensions of the individual longitudinal element and the lateral spacing between subsequent individual longitudinal elements for a high-visibility crosswalk should be uniform when establishing the crosswalk.

06 The dimensions of the individual longitudinal element and the lateral spacing between subsequent individual longitudinal elements for a high-visibility crosswalk should be uniform when establishing separate crosswalks on multiple approaches to the same intersection and on both sides of a median refuge if one is present.

07 The individual longitudinal elements of a high-visibility crosswalk should be angled such that they are parallel to the travel path of approaching traffic.

Option:

08 The lateral spacing between longitudinal elements may be staggered to avoid wheel paths, center lines, and lane lines.

Section 3C.06 Longitudinal Bar Crosswalks

Support:

01 The longitudinal bar crosswalk marking design (see Figure 3C-1) provides for improved detection and recognition over the transverse line crosswalk for people with low vision and cognitive impairments.

Standard:

02 The width of an individual longitudinal bar shall not be less than 12 inches or greater than 24 inches.

03 The lateral spacing between subsequent longitudinal bars shall not be less than 12 inches or greater than 60 inches. The lateral spacing of the longitudinal bars shall not exceed 2.5 times the width of a longitudinal bar.

Section 3C.07 Ladder Crosswalks

Support:

01 Ladder crosswalks (see Figure 3C-1) implement a design where longitudinal bars are used in the interior portion of the crosswalk between the transverse lines that define the limits of the crosswalk.

02 The ladder crosswalk marking design provides for improved detection and recognition over the transverse crosswalk for people with low vision and cognitive impairments.

03 Since the longitudinal component of the ladder crosswalk marking design is similar to the benefits provided by the longitudinal bar crosswalk design, the ladder crosswalk design is normally used to discourage or prohibit diagonal walking between crosswalks.

Standard:

04 The transverse lines used to establish the limits of the ladder crosswalk shall not be less than 6 inches or greater than 24 inches in width.

05 The width of an individual interior longitudinal bar shall not be less than 12 inches or greater than 24 inches.

06 The lateral spacing between subsequent interior longitudinal bars shall not be less than 12 inches or greater than 60 inches. The lateral spacing of the interior longitudinal bars shall not exceed 2.5 times the width of an interior longitudinal bar.

Option:

07 Where it might be necessary to alleviate a distortion due to perspective (foreshortening) caused by approaching roadway geometry that curves or to accommodate low approach angles of the approaching motorists, the interior longitudinal bars may be rotated up to 45 degrees to the transverse lines to remain parallel to approaching traffic.

Section 3C.08 Bar Pair Crosswalks

Support:

01 Bar pair crosswalks (see Figure 3C-1) can provide the same benefits as other high-visibility crosswalk designs with the opportunity for less maintenance.

02 Bar pair crosswalks can be useful in locations that are susceptible to slip and fall incidents exacerbated by extreme or inclement weather, or in locations where high motorcycle or bicycle use is expected in order to maximize wheel traction with the road surface.

Standard:

03 The width of an individual longitudinal bar that establishes one-half of the bar pair shall not be less than 8 inches or greater than 12 inches. The lateral spacing between successive individual longitudinal bars within the same bar pair shall be equal to the width of one longitudinal bar.

04 The lateral spacing between subsequent longitudinal bar pairs shall not be less than 24 inches or greater than 60 inches, or 2.5 times the width of the total width of a bar pair.

05 Longitudinal bar pair crosswalks shall not be installed with accompanying transverse lines.

Section 3C.09 Crosswalk Markings at Circular Intersections

Standard:

01 Crosswalk markings shall not be provided to or from the central island of a roundabout.

Guidance:

02 If pedestrian facilities are provided, crosswalks should be marked across roundabout entrances and exits to indicate where pedestrians are intended to cross.

03 On an approach to a circular intersection controlled by a YIELD sign and at uncontrolled exits, crosswalks should be a minimum of 20 feet from the edge of the circulatory roadway.

Support:

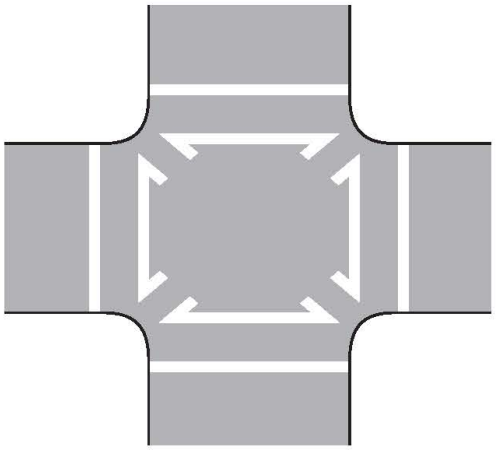
04 Chapter 3D provides figures that illustrate examples of crosswalk markings for roundabouts.

Section 3C.10 Crosswalks for Exclusive Pedestrian Phases that Permit Diagonal Crossings

Option:

01 When an exclusive pedestrian phase that permits diagonal crossing of an intersection is provided at a traffic control signal, a marking as shown in Figure 3C-2 may be used for the crosswalk.

Figure 3C-2. Example of Crosswalk Markings for an Exclusive Pedestrian Phase that Permits Diagonal Crossings



Note: High-visibility crosswalks can be used for the crosswalks around the perimeter of the intersection

Guidance:

02 The segments of the crosswalk marking that facilitate the diagonal crossing should not use high-visibility crosswalk markings.

Section 3C.11 Crosswalks at Diamond Interchanges with a Transposed Alignment Crossroad

Support:

01 Diamond interchanges with a transposed alignment crossroad, also known as double-crossover diamond interchanges or diverging diamond interchanges, include directional crossovers on either side of the interchange that transpose the crossroad which results in vehicles traveling on the left-hand side of the street or highway between the crossover intersections. The potential for altered travel paths for pedestrians and the associated, unique, operational aspects such as traffic approaching from unexpected directions and unfamiliar signal phasing schemes are important considerations.

Guidance:

02 If pedestrian facilities are provided, pedestrian crossing movements of the crossroads at a diamond interchange with a transposed alignment crossroad should be marked at the crossover intersections where motor vehicle traffic becomes transposed.

03 If pedestrian facilities are provided, crosswalks should be marked across ramp terminals at diamond interchanges with a transposed alignment crossroad to indicate where pedestrians are intended to cross.

04 Crosswalks across ramps at diamond interchanges with a transposed alignment crossroad with yield controlled vehicle movements should be located a minimum of 20 feet from the edge of an intersecting ramp.

Support:

05 Section 3B.31 contains information on markings, such as edge lines, lane lines, and lane-use arrows, for diamond interchanges with a transposed alignment crossroad.

06 Figure 3B-29 shows an example of pedestrian crossing locations at a diamond interchange with a transposed alignment crossroad.

Section 3C.12 Pedestrian Islands and Medians

Support:

01 Raised islands or raised medians of sufficient width that are placed in the center area of a street or highway can serve as a place of refuge for pedestrians who are attempting to cross at a midblock or intersection location. Center islands or medians allow pedestrians to find an adequate gap in one direction of traffic at a time, as the pedestrians are able to stop, if necessary, in the center island or median area and wait for an adequate gap in the other direction of traffic before crossing the second half of the street or highway. The U.S. Department of Justice 2010 ADA Standards for Accessible Design, September 15, 2010, 28 CFR 35 and 36, Americans with Disabilities Act of 1990 contains specifications for the design of detectable warning surfaces and provides technical requirements that can be used to determine the minimum width for accessible refuge islands.

CHAPTER 3D. CIRCULAR INTERSECTION MARKINGS

Section 3D.01 General

Guidance:

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

02 Markings on the approaches to a circular intersection and on the circulatory roadway should be compatible with each other to provide a consistent message to road users. The markings should supplement the signing, both conveying the optional and mandatory movements such that road users will know to choose the proper lane in the approach to the circular intersection and remain in that lane throughout departure from the circulatory roadway.

Support:

03 Common circular intersection types include roundabouts, rotaries, and traffic circles (see definitions in Section 1C.02). Traffic circles and rotaries are often much larger than roundabouts. Modern roundabouts feature channelized, curved approaches that reduce vehicle speed. Traffic calming circles are smaller and are typically used on urban or suburban neighborhood streets.

04 Figure 3D-1 provides an example of the pavement markings for approach and circulatory roadways at a roundabout. Figures 3D-2 through 3D-8 illustrate examples of markings for roundabouts of various geometric and lane-use configurations.

05 Actuated LED pedestrian warning signs (see Section 2A.12), traffic control signals, pedestrian hybrid beacons, and rectangular rapid flashing beacons (see Part 4) are sometimes used at roundabouts to facilitate the crossing of pedestrians or to meter traffic.

06 Section 8A.12 provides information about circular intersections that contain or are in close proximity to grade crossings.

07 Section 9E.05 contains information regarding bicycle lane markings at circular intersections.

08 Section 3C.09 contains information regarding crosswalks at circular intersections.

Section 3D.02 White Lane Line Pavement Markings for Roundabouts

Standard:

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

02 A through lane on a roadway that becomes a dropped lane (mandatory left-turn or right-turn lane) at a roundabout shall be marked with a dotted white lane line in accordance with Section 3B.07.

Guidance:

03 Multi-lane roundabouts should have lane line markings within the circulatory roadway to continuously channelize traffic in the circulatory roadway and through the departure movement.

Standard:

04 Continuous concentric lane lines shall not be used within the circulatory roadway of a roundabout.

Option:

05 Channelizing lines (see Section 3B.08) and chevron and diagonal markings (see Section 3B.25) may be used on the approaches to and within the circulatory roadway of multi-lane roundabouts to separate traffic lanes, discourage lane changing, and/or compensate for off-tracking of larger trucks and vehicles.

Support:

06 Reducing the spacing between lines of a broken lane line allows better delineation of the lower-radius curves typically found in circular intersections.

Section 3D.03 Edge Line Pavement Markings for Roundabout Circulatory Roadways

Guidance:

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

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

A. A solid line adjacent to the splitter island, and

B. A wide dotted line 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.

Option:

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

Figure 3D-1. Example of Markings for Approach and Circulatory Roadways at a Roundabout

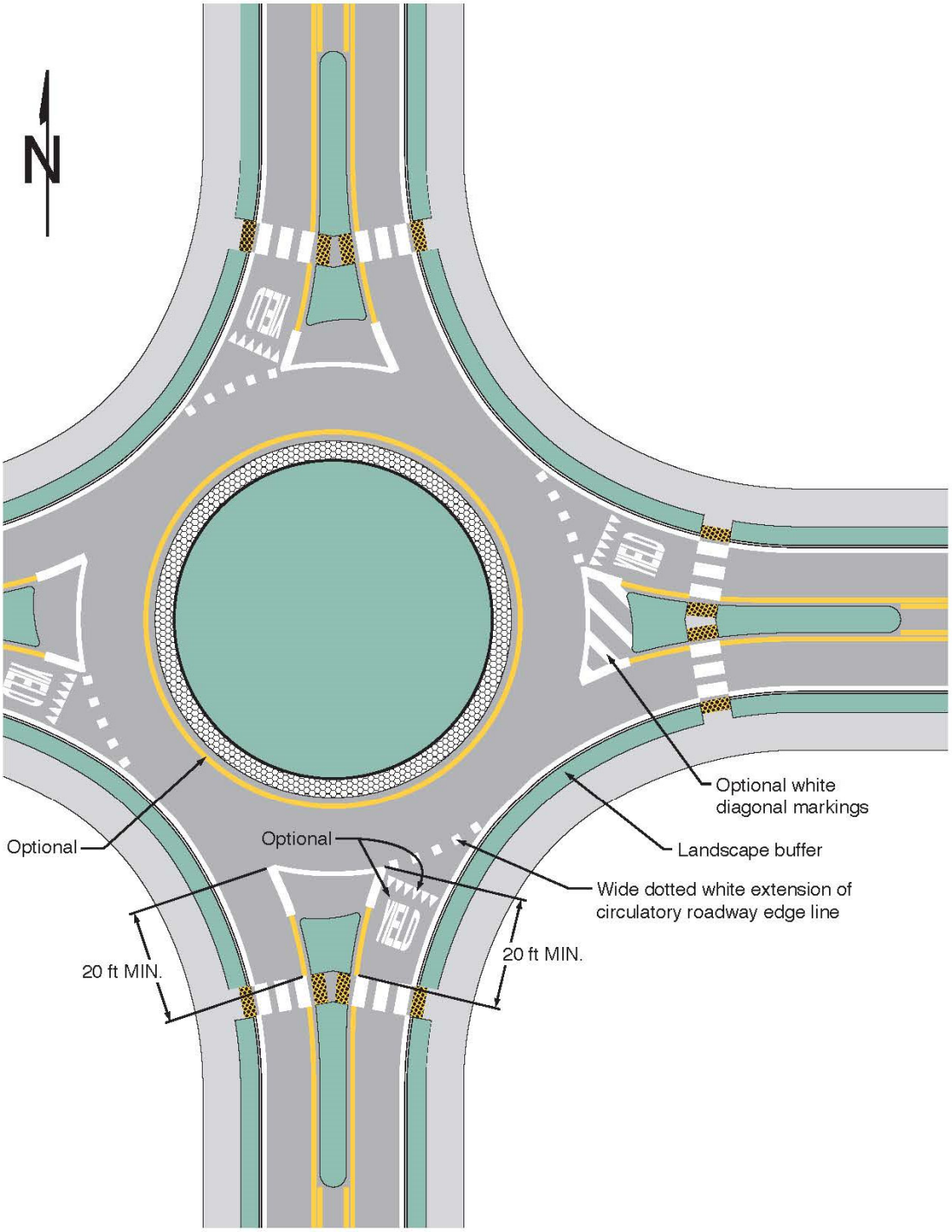


Figure 3D-2. Example of Markings for a One-Lane Roundabout

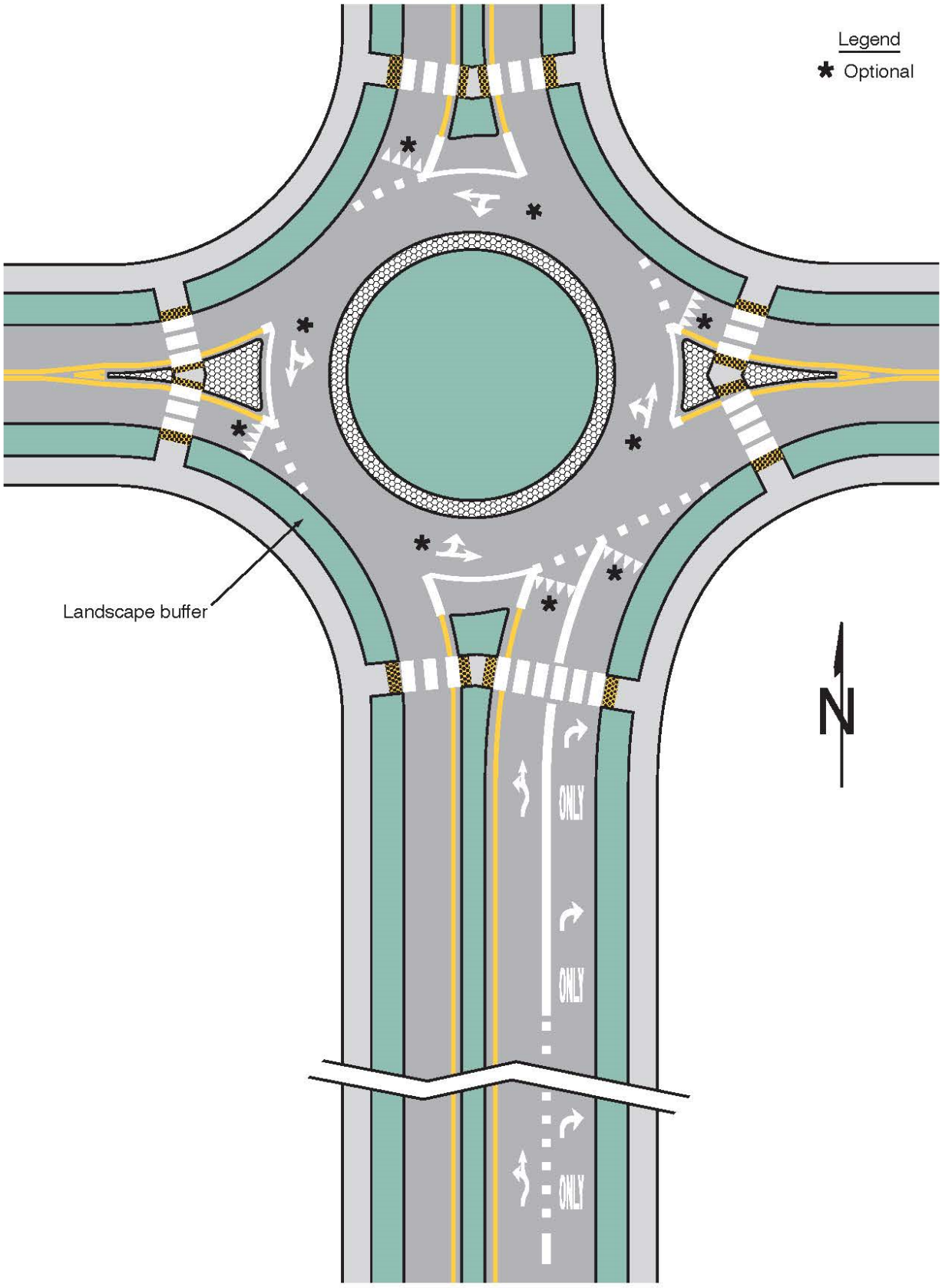


Figure 3D-3. Example of Markings for a Two-Lane Roundabout with One-Lane and Two-Lane Approaches (Sheet 1 of 2)

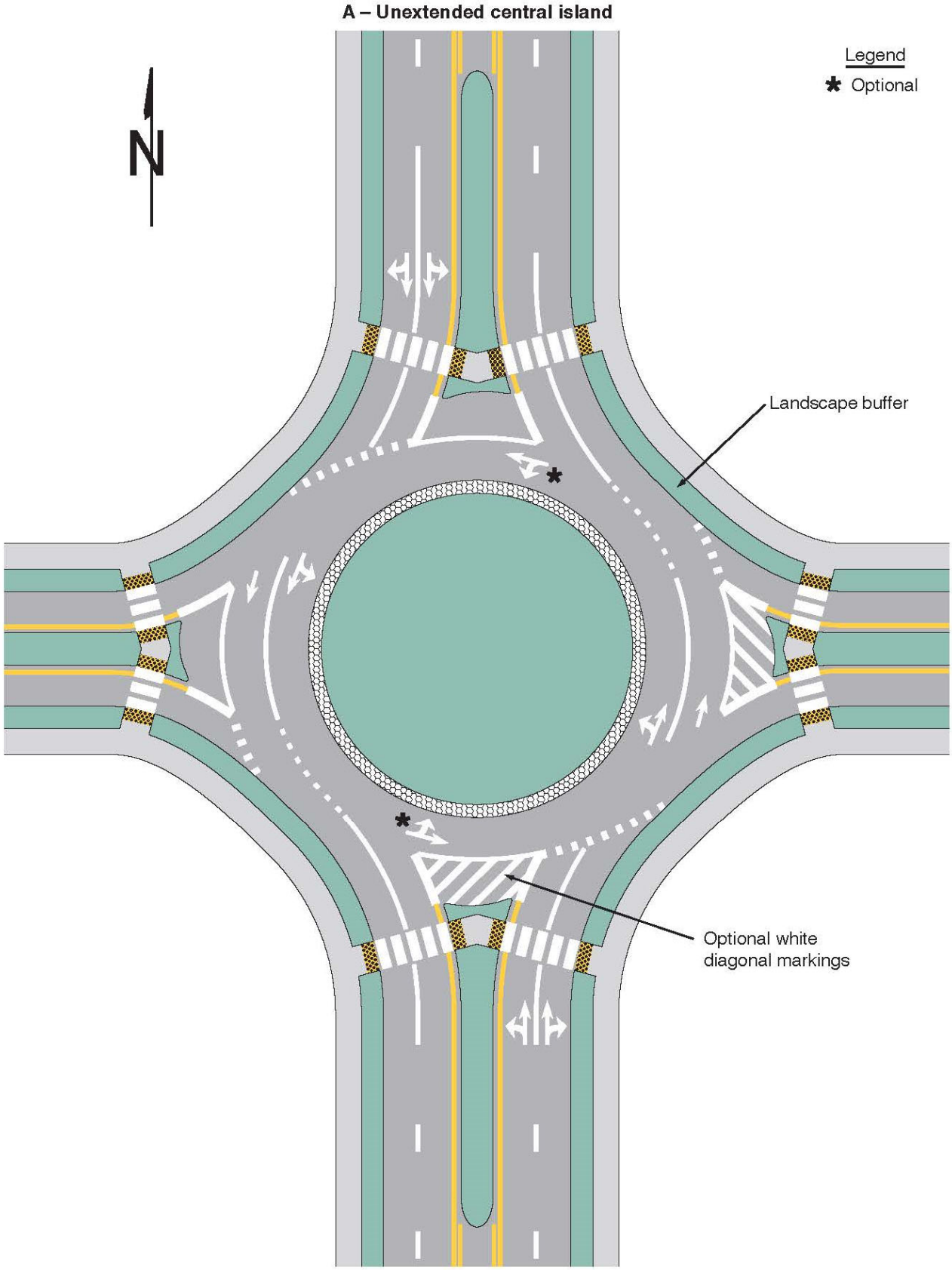
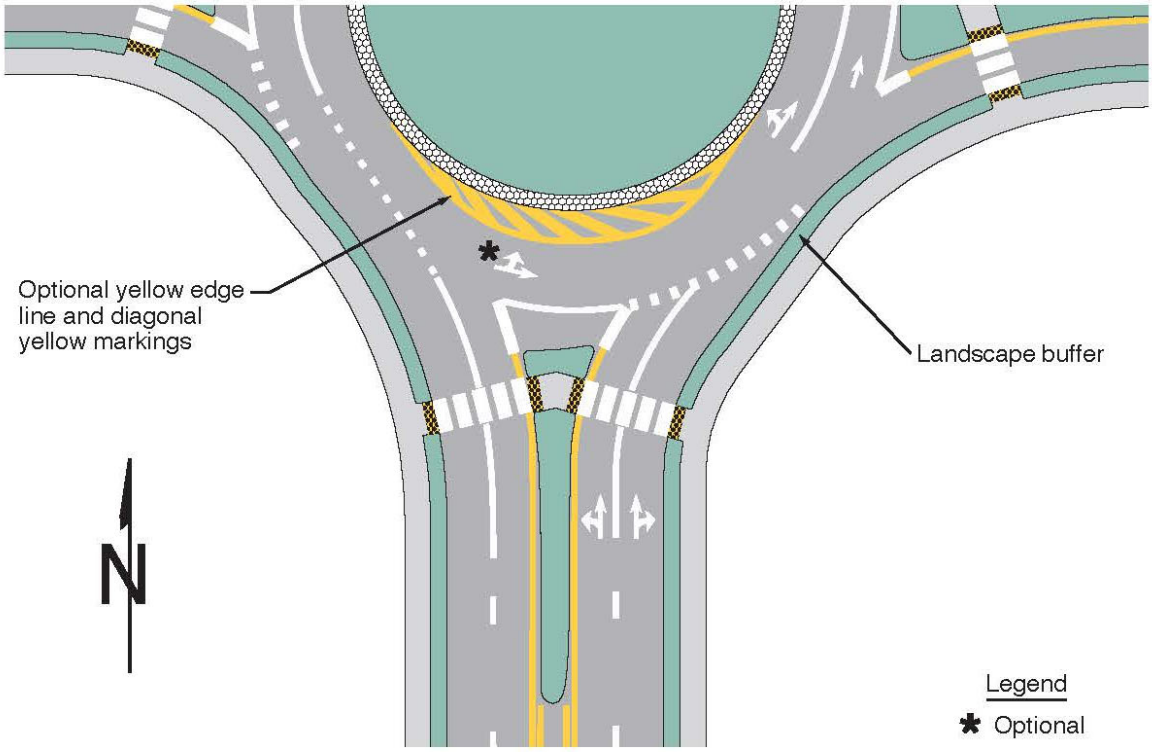


Figure 3D-3. Example of Markings for a Two-Lane Roundabout with One-Lane and Two-Lane Approaches (Sheet 2 of 2)

B – Central island extended by pavement markings



C – Central island extended by a truck apron

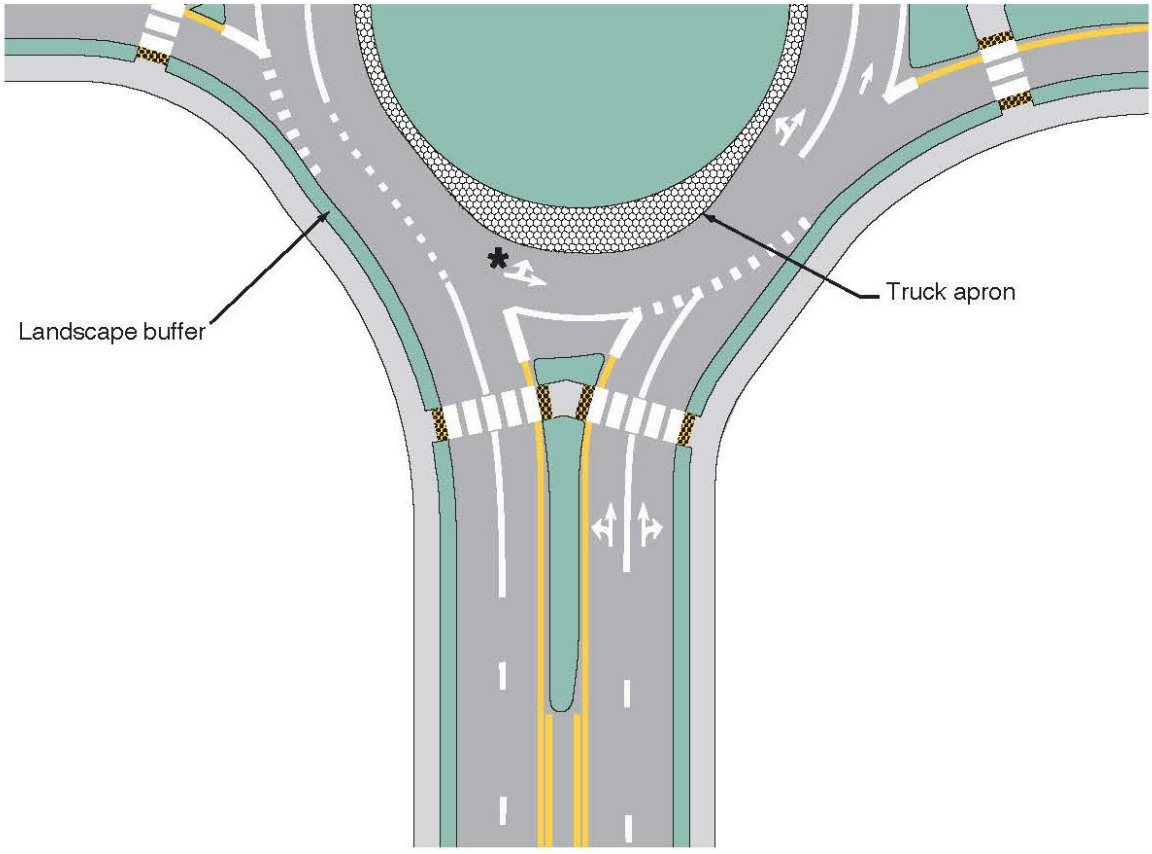


Figure 3D-4. Example of Markings for a Two-Lane Roundabout with One-Lane Exits

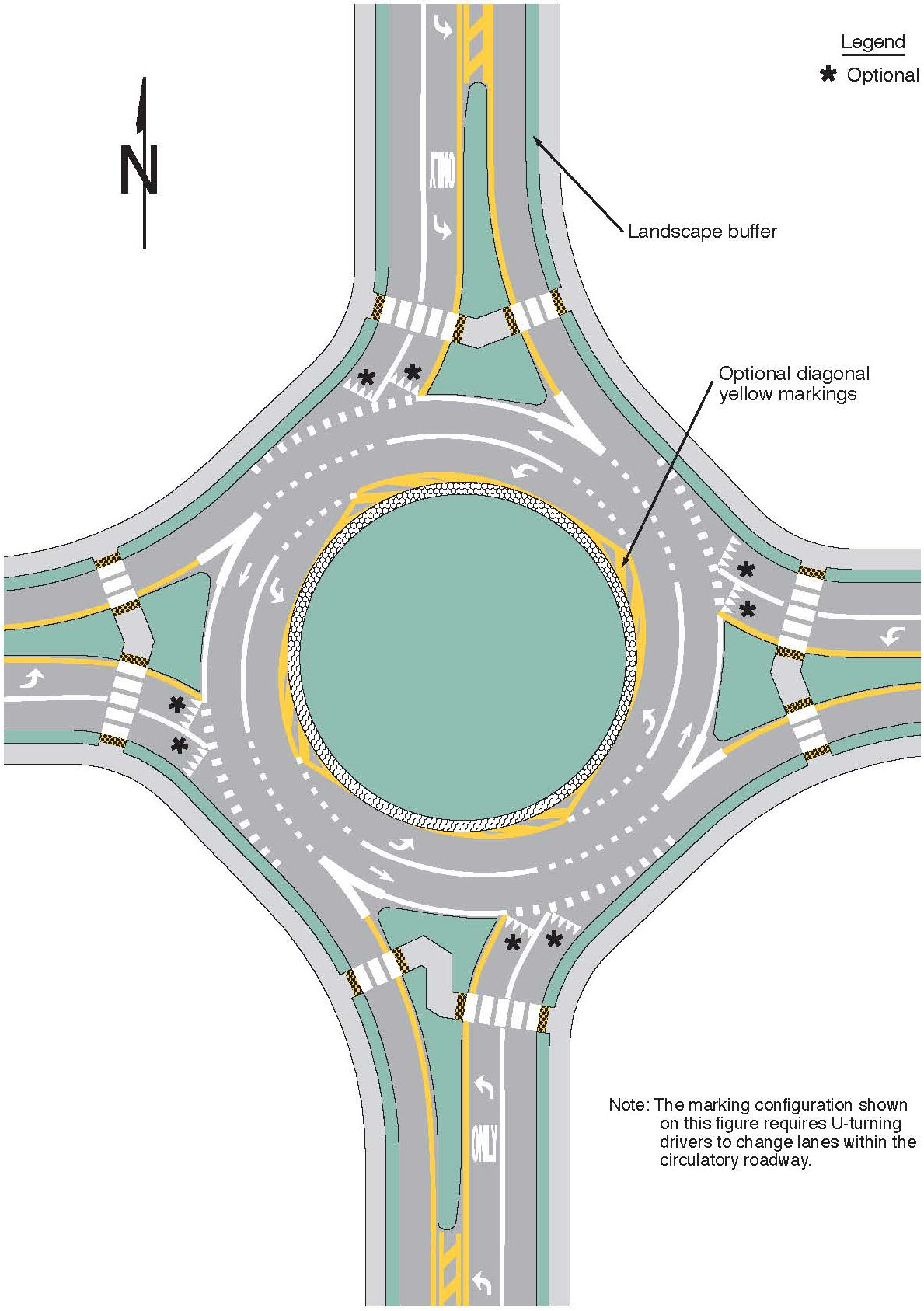


Figure 3D-5. Example of Markings for a Two-Lane Roundabout with Two-Lane Exits

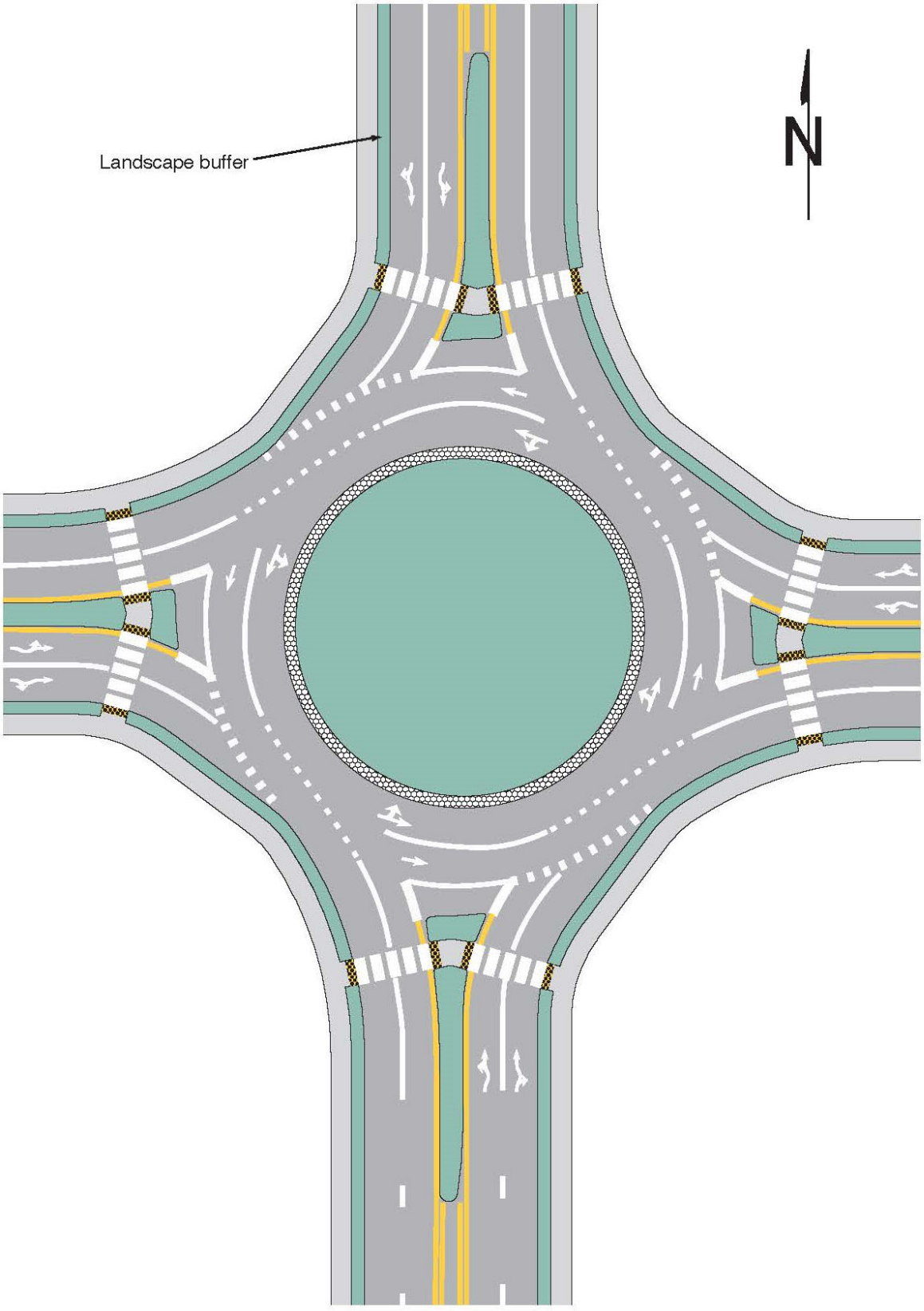


Figure 3D-6. Example of Markings for a Two-Lane Roundabout with a Double Left Turn

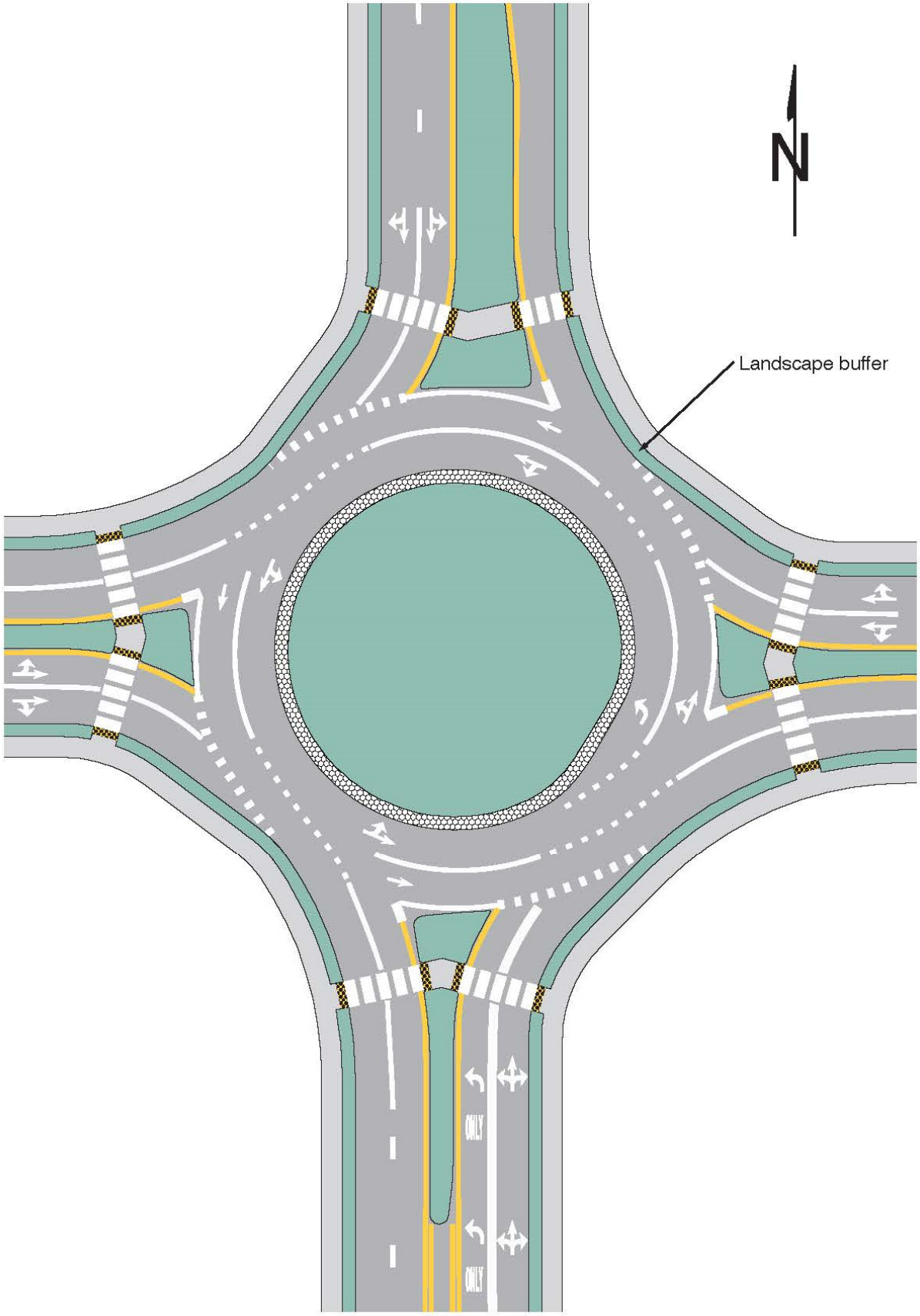


Figure 3D-7. Example of Markings for a Two-Lane Roundabout with a Double Right Turn

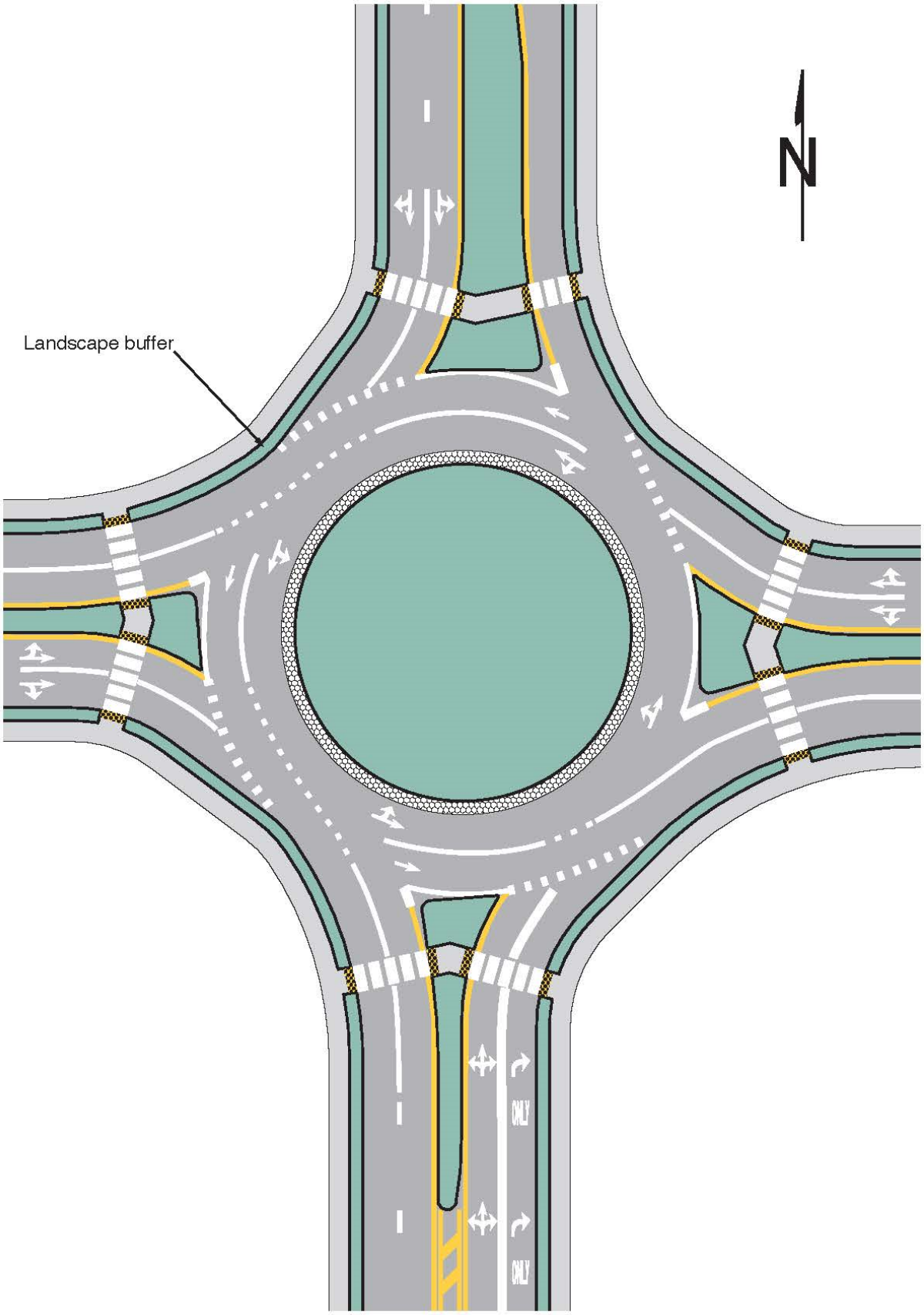
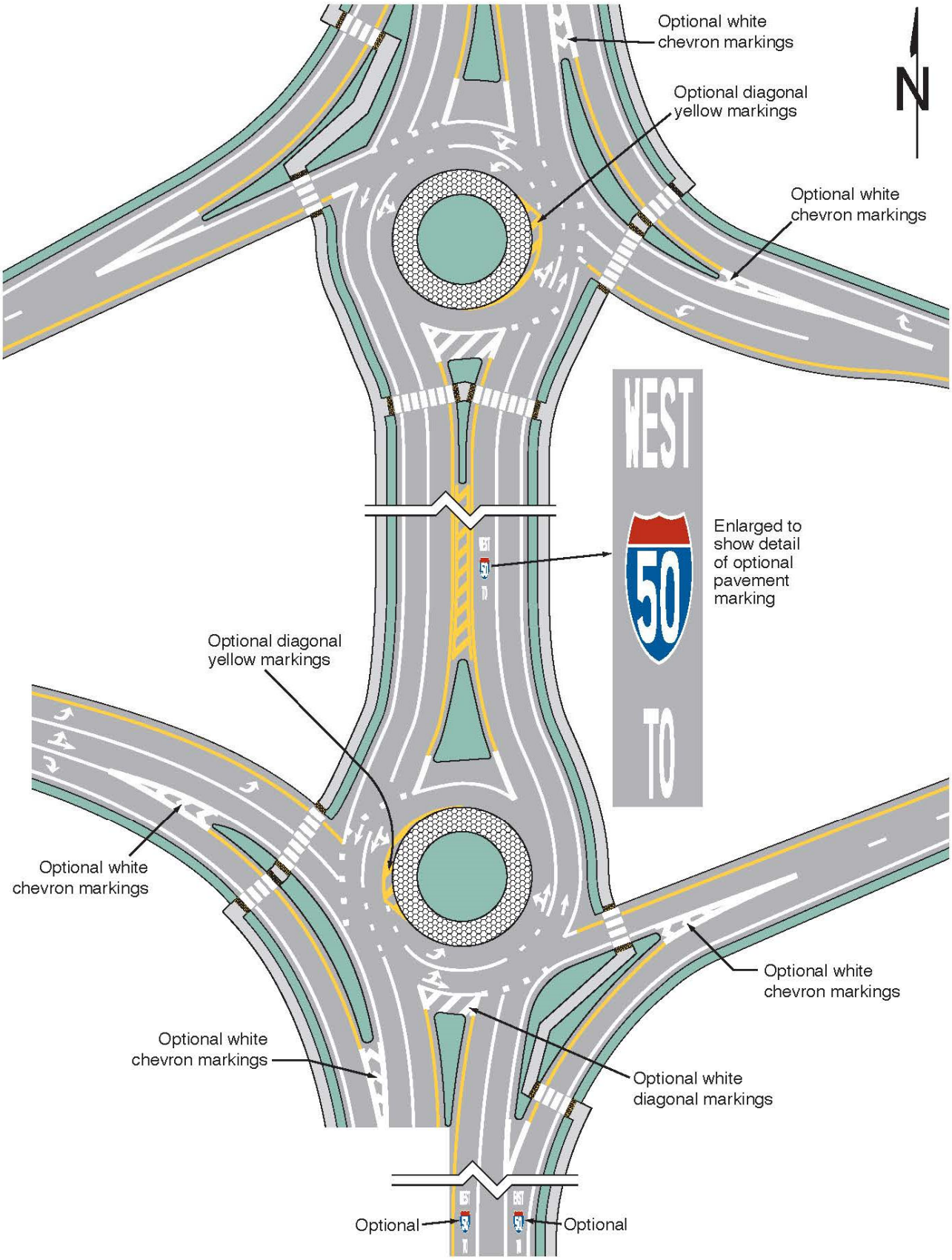


Figure 3D-8. Example of Markings for a Diamond Interchange with Two Circular-Shaped Roundabout Ramp Terminals



Section 3D.04 Yield Lines for Roundabouts

Support:

01 Section 2B.18 contains information regarding the TO ALL LANES (R1-2cP) plaque that can be used beneath the YIELD sign.

Option:

02 A yield line (see Section 3B.19) may be used to indicate the point behind which vehicles are required to yield at the entrance to a roundabout (see Figures 3D-1 and 3D-2).

Section 3D.05 Word and Symbol Pavement Markings for Roundabouts

Option:

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

02 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 3D-8).

Section 3D.06 Arrow Pavement Markings for Roundabouts

Guidance:

01 Lane-use arrow pavement markings should not be used on single-lane approaches to circular intersections.

02 Lane-use arrows should be used on approaches to circular intersections with double left or double right turns.

Standard:

03 Lane-use arrow pavement markings shall not be provided between a crosswalk and a wide dotted line across the lane(s) entering the circular roadway.

Option:

04 Where lane-use arrows are used on the approaches to a roundabout, they may be either normal or curved-stem (see Drawing F in Figure 3B-21).

05 An oval or circle may be used with the lane-use arrows to symbolize the central island (see Drawing F in Figure 3B-21).

Guidance:

06 If lane-use arrows are used on the approaches to a roundabout, the style used should match the style of the lane-use arrows (normal or curved-stem) used on the regulatory lane-use signs on the approach.

07 If lane-use arrow pavement markings are used within the circulatory roadway of multi-lane roundabouts, normal lane-use arrows (see Section 3B.23 and Figure 3B-21) should be used.

Support:

08 Details and sizes of the standard and curved-stem arrows that can be used for circular intersections are contained in the "Standard Highway Signs" publication (see Section 1A.05).

Section 3D.07 Markings for Other Circular Intersections

Option:

01 The markings shown in this Chapter may be used at other circular intersections if engineering judgment indicates that their presence will benefit drivers, pedestrians, or other road users. Figure 2B-21 provides an example of markings at a mini-roundabout.

CHAPTER 3E. PREFERENTIAL LANE MARKINGS FOR MOTOR VEHICLES

Section 3E.01 General

Support:

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

02 This Chapter contains the pavement marking provisions for preferential lanes used by motor vehicles and light rail transit. Part 9 contains information for pavement markings for bicycle lanes.

03 Chapter 3H contains information for the use and application of colored pavement that can be used in preferential lanes to supplement the pavement markings described in this Chapter.

Section 3E.02 Longitudinal Markings

Support:

01 Preferential lanes can take many forms depending on the level of usage and the design of the facility. They might be barrier-separated or buffer-separated from the adjacent general-purpose lanes, or they might be contiguous with the adjacent general-purpose lanes. Barrier-separated preferential lanes might be operated in a constant direction or be operated as reversible lanes. Some reversible preferential lanes on a divided highway might be operated counter-flow to the direction of traffic on the immediately adjacent general-purpose lanes. Section 1C.02 contains definitions of these terms.

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

Standard:

03 The left-hand and right-hand edge lines and lane lines used for preferential lanes that are adjacent to general-purpose lanes where traffic is flowing in the same direction shall be in accordance with Table 3E-1.

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

05 Preferential lanes for motor vehicles shall have appropriate regulatory signs in accordance with Sections 2G.03 through 2G.07.

Support:

06 Figure 3E-1 illustrates pavement markings used for barrier-separated preferential lanes. Figure 3E-2 illustrates pavement markings used for buffer-separated preferential lanes. Figure 3E-3 illustrates pavement markings used for contiguous preferential lanes.

Guidance:

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

08 Where preferential lanes and other travel lanes are separated by a buffer space wider than 4 feet and crossing the buffer space is prohibited, chevron markings (see Section 3B.25) should be placed in the buffer area (see Drawing A in Figure 3E-2).

09 The buffer space for a conventional road should be designed so that it is not misinterpreted as on-street parking, a bicycle lane, or any other type of lane.

Option:

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

Standard:

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

12 Signs (see Section 2B.34), lane-use control signals (see Chapter 4T), or both shall be used to supplement the reversible lane markings on a divided highway where a part-time counter-flow preferential lane is present.

Table 3E-1. Standard Edge Line and Lane Line Markings for Preferential Lanes

Type of Preferential Lane	Left-Hand Line	Right-Hand Line
Barrier-Separated, Non-Reversible	A normal solid single yellow edge line	A normal solid single white edge line (see Drawing A in Figure 3E-1)
Barrier-Separated, Reversible	A normal solid single white edge line	A normal solid single white edge line (see Drawing B in Figure 3E-1)
Buffer-Separated, Left-Hand Side	A normal solid single yellow edge line	A wide solid double white line along both edges of the buffer space where crossing is prohibited (see Drawing A in Figure 3E-2) A wide solid single white line along both edges of the buffer space where crossing is discouraged (see Drawing B in Figure 3E-2) A wide broken single white line along both edges of the buffer space, or a wide broken single white line within the buffer space (resulting in wider lanes), where crossing is permitted (see Drawing C in Figure 3E-2)
Buffer-Separated, Right-Hand Side	A wide solid double white line along both edges of the buffer space where crossing is prohibited, or a wide solid single white line along both edges of the buffer space where crossing is discouraged (see Drawing D in Figure 3E-2) A wide broken single white line along both edges of the buffer space, or a wide broken single white line within the buffer space (resulting in wider lanes), where crossing is permitted (see Drawing D in Figure 3E-2) A wide dotted single white line within the buffer space (resulting in wider lanes) where crossing is permitted for any vehicle to perform a right-turn maneuver (see Drawing D in Figure 3E-2)	A normal solid single white edge line (if warranted)
Contiguous, Left-Hand Side	A normal solid single yellow edge line	A wide solid double white lane line where crossing is prohibited (see Drawing A in Figure 3E-3) A wide solid single white lane line where crossing is discouraged (see Drawing B in Figure 3E-3) A wide broken single white lane line where crossing is permitted (see Drawing C in Figure 3E-3)
Contiguous, Right-Hand Side	A wide solid double white lane line where crossing is prohibited (see Drawing D in Figure 3E-3) A wide solid single white lane line where crossing is discouraged (see Drawing D in Figure 3E-3) A wide broken single white lane line where crossing is permitted (see Drawing D in Figure 3E-3) A wide dotted single white lane line where crossing is permitted for any vehicle to perform a right-turn maneuver (see Drawing D in Figure 3E-3)	A normal solid single white lane line (if warranted)

Notes: 1. If there are two or more preferential lanes, the lane lines between the preferential lanes shall be normal broken white lines.

2. The standard lane markings listed in this table are provided in a tabular format for reference.

Figure 3E-1. Markings for Barrier-Separated Preferential Lanes

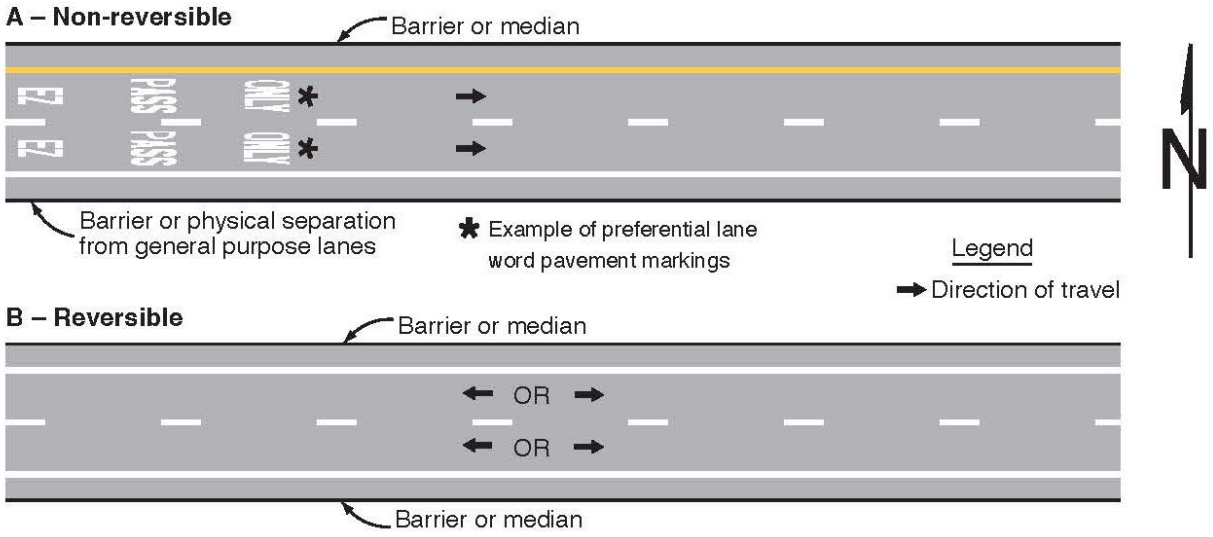
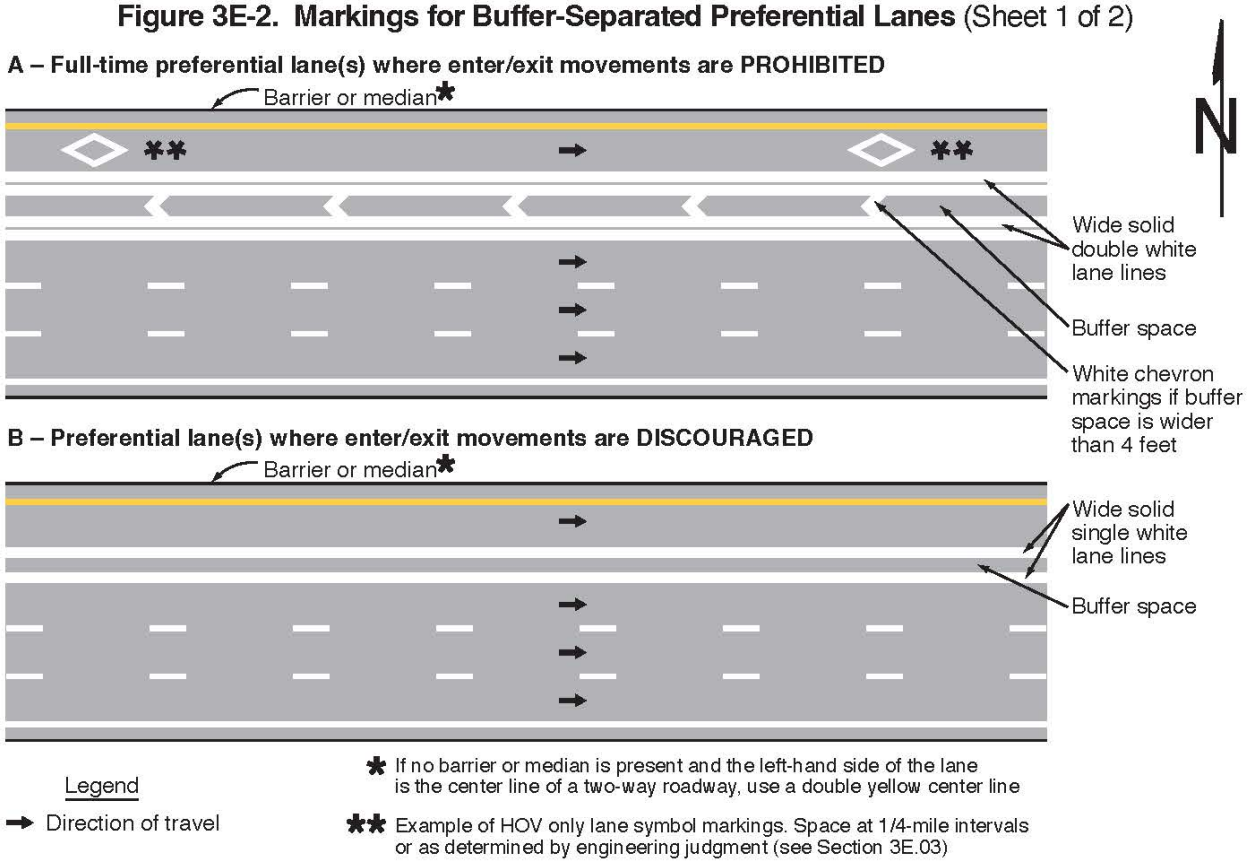


Figure 3E-2. Markings for Buffer-Separated Preferential Lanes (Sheet 1 of 2)



13 The longitudinal pavement markings used for preferential lanes that are adjacent to general-purpose lanes where traffic is flowing in the opposite direction (see Figure 3E-4) shall be in accordance with Table 3E-2.

Support:

14 Figure 3E-4 illustrates pavement markings used for counter-flow preferential lanes on divided highways or on transitions to and from other divided highways such as bridges and crossovers.

Option:

15 Cones, tubular markers, or other channelizing devices (see Chapter 3I) may also be used in addition to longitudinal markings to separate the opposing lanes when a counter-flow preferential lane operation is in effect.

Section 3E.03 Preferential Lane Word and Symbol Markings

Support:

01 Sections 3B.20 through 3B.22 contain information on general applications of word and symbol markings.

Standard:

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

- **A. HOV lane—white lines formed in a diamond-shaped symbol or the word message HOV. The diamond shall be at least 2.5 feet wide and 12 feet in length. The lines shall be at least 6 inches in width.**
- **B. ETC Account-Only lane—except as provided in Paragraph 8 of this Section, a word marking or pictograph using the name of the ETC payment system required for use of the lane, such as E-Z PASS ONLY.**
- **C. Price-managed lane—the word marking EXPRESS or EXPRESS LANE(S) (see Section 2G.17).**
- **D. Bus only lane or bus stop—the word marking BUS ONLY or BUS STOP.**
- **E. Taxi only lane or taxi stand —the word marking TAXI ONLY or TAXI STAND.**
- **F. Light rail transit lane—the word marking LRT ONLY.**
- **G. Other type of preferential lane—a word marking appropriate to the restriction.**

Figure 3E-2. Markings for Buffer-Separated Preferential Lanes (Sheet 2 of 2)

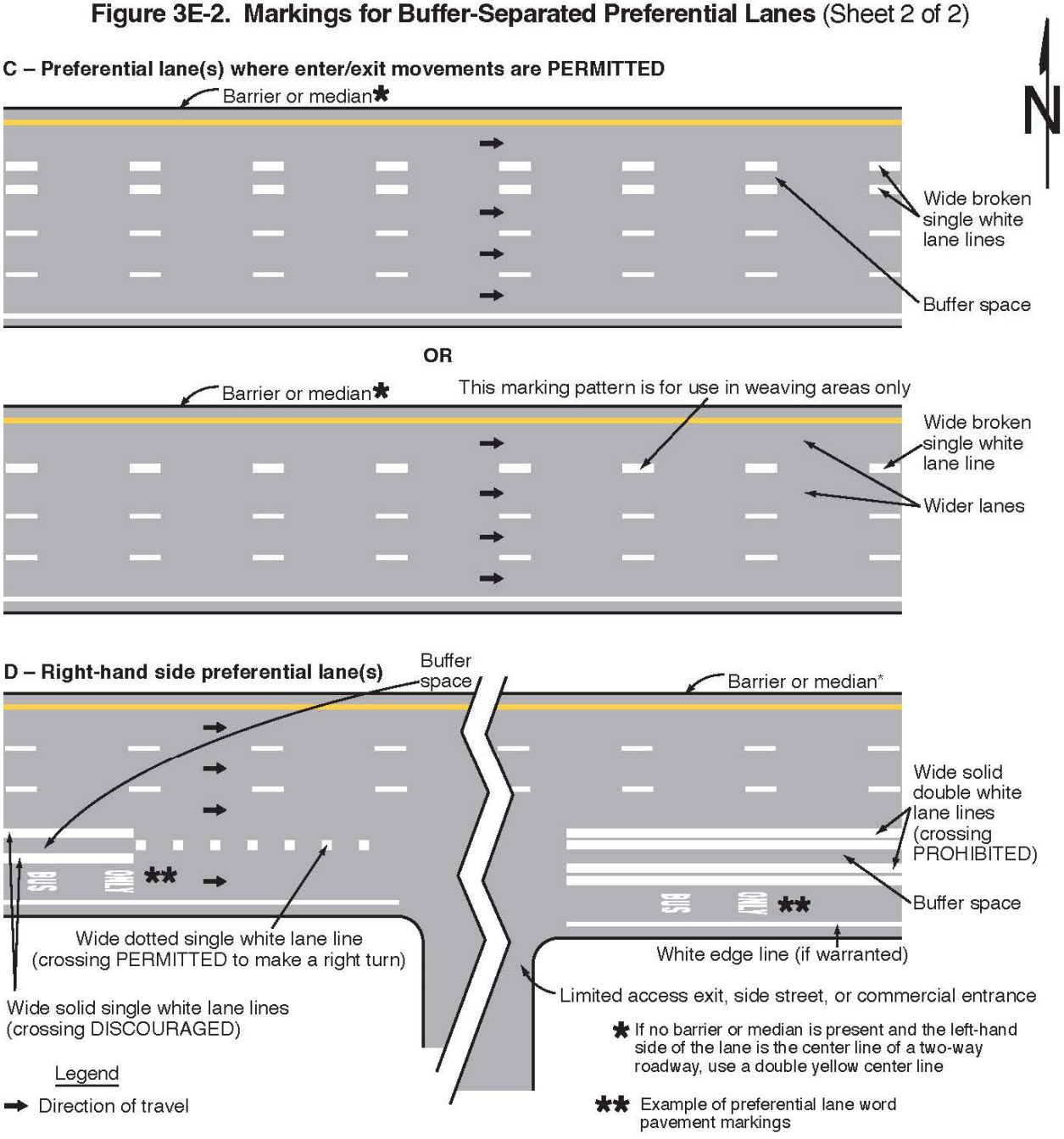
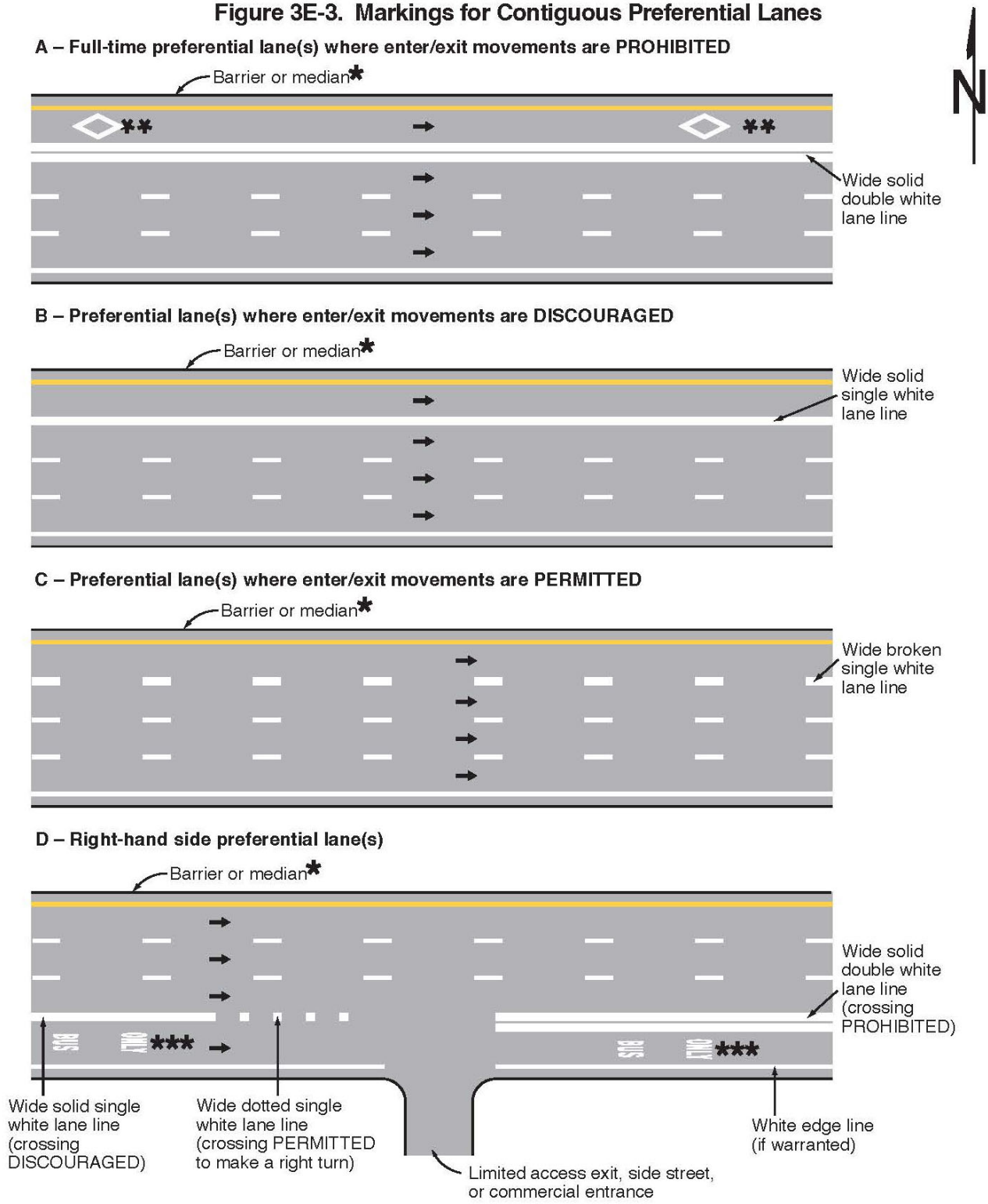


Table 3E-2. Standard Center Line and Edge Line Markings for Counter-Flow Preferential Lanes on Divided Highways

Type of Preferential Lane	Center Line on Left-Hand Side	Edge Line on Left-Hand Side
Part-Time Contiguous	A normal width broken double yellow line	A normal solid single white line (if warranted)
Part-Time Buffer-Separated	A normal width broken double yellow line along both edges of the buffer space	A normal solid single white line (if warranted)
Full-Time Contiguous	A normal width solid double yellow line	A normal solid single white line (if warranted)
Full-Time Buffer-Separated	A normal width solid double yellow line along both edges of the buffer space	A normal solid single white line (if warranted)

Figure 3E-3. Markings for Contiguous Preferential Lanes



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

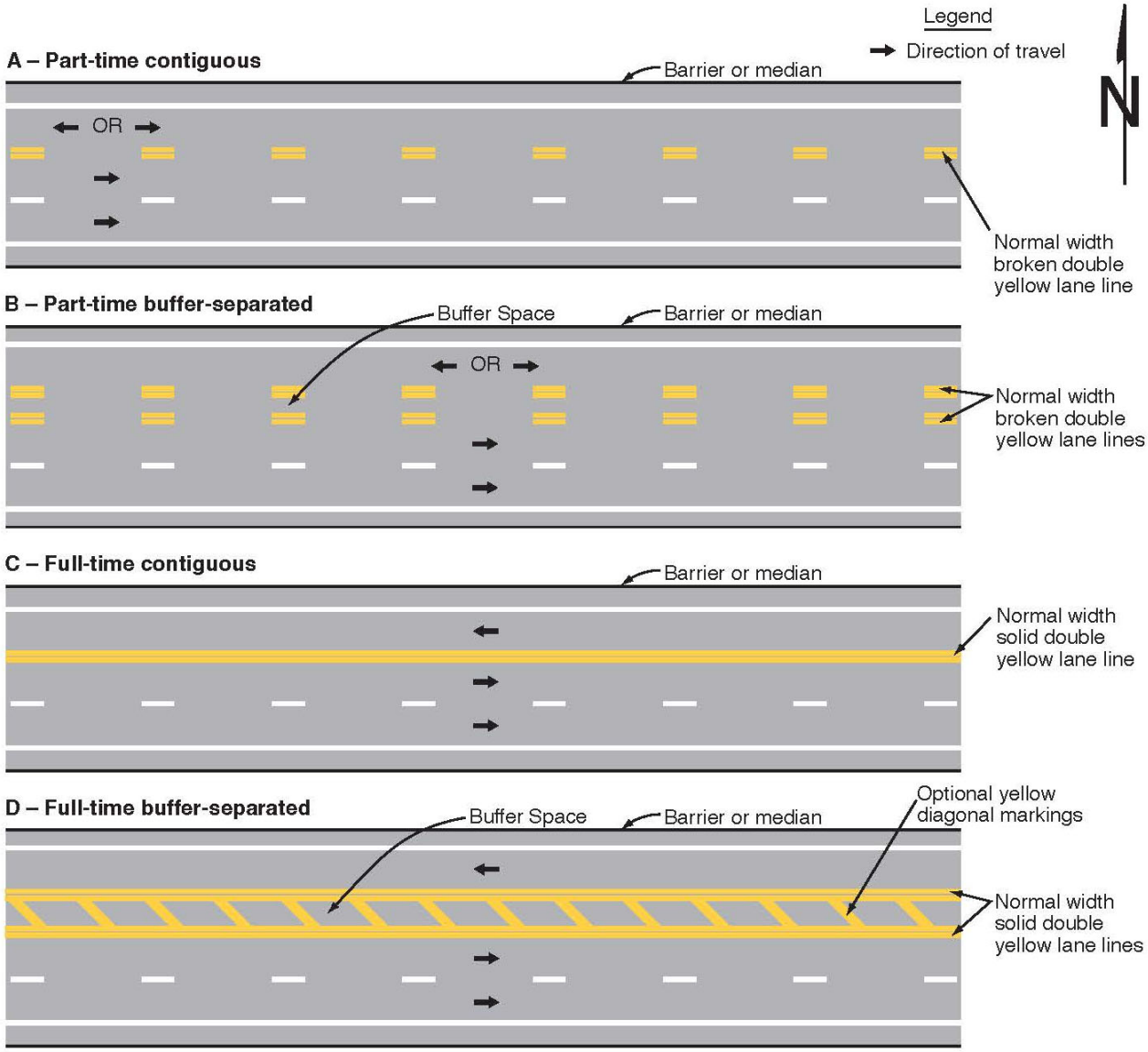
** Example of HOV only lane symbol markings. Space at 1/4-mile intervals or as determined by engineering judgment (see Section 3E.03)

*** Example of preferential lane word pavement markings

Legend

→ Direction of travel

Figure 3E-4. Markings for Counter-Flow Preferential Lanes on Divided Highways



Guidance:

03 If multiple preferential lane uses are allowed in a single lane, the word or symbol marking for each preferential lane should be used.

Standard:

04 Pavement word or symbol markings for motorcycles and Inherently Low Emission Vehicles (ILEV) shall not be used to mark the preferential lane if motorcycles and ILEVs are allowed to use the preferential lane.

Support:

05 Motorcycles and Inherently Low Emission Vehicles (ILEV) that are allowed to use a preferential lane are granted an exception such as through an established High-Occupancy Vehicle (HOV) regulation. Communicating that motorcycles and ILEVs are allowed to use the preferential lane is accomplished through regulatory signing (see Sections 2G.03 and 2G.04) that complements HOV signing.

Standard:

06 Static or changeable message regulatory signs (see Sections 2G.03 through 2G.07) shall be used with preferential lane word or symbol markings.

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

Option:

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

09 Lane-use arrow markings may be placed on the curb lanes on approaches to intersections to signify non-preferential road users can use the lane for turning movements.

Guidance:

10 All longitudinal pavement markings, as well as word and symbol pavement markings, associated with a preferential lane should end at approximately where the Preferential Lane Ends (R3-12a or R3-12c) sign (see Section 2G.07) designating the downstream end of the preferential only lane restriction is installed.

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

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

Option:

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

Section 3E.04 Markings for Part-Time Travel on a Shoulder

Support:

01 Shoulders are sometimes used to add capacity to a roadway in peak hour conditions to provide for transit or HOV priority or to provide higher throughput when open to all traffic.

02 A shoulder that has been opened to travel on a permanent, rather than a part-time basis is considered to be a travel lane and is signed and marked in accordance with other provisions of this Manual.

Standard:

03 When part-time travel on a shoulder is open to all traffic, pavement word and symbol markings shall not be used in the shoulder.

04 When a shoulder is assigned part-time to a particular class or classes of vehicles, the shoulder shall be marked with one or more pavement word markings that identify the special use of the shoulder such as BUS ONLY, TRANSIT ONLY, HOV, or instead of the HOV pavement word marking, white lines formed in a diamond-shaped symbol (see Section 3E.03). A pavement word or symbol marking shall be provided in the shoulder immediately after exit and entry ramps (see Figure 3E-5) or immediately departing an intersection at the full-width shoulder (see Figure 3E-6). Appropriate regulatory signing (see Section 2G.03) shall be installed with the pavement word or symbol markings.

05 The channelizing line emanating from the entrance ramp shall be a wide dotted line through the intersecting alignment of the shoulder to the theoretical gore (see Drawings A and B in Figure 3E-5). At exit ramps, the channelizing line proceeding from the theoretical gore across the intersecting alignment of the shoulder shall be a wide dotted line (see Figure 3E-5).

06 If used, the extension of the channelizing line at entrance ramps proceeding from the theoretical gore across the opening of the on-ramp alignment shall be a wide dotted line (see Drawing C in Figure 3E-5) where it is demonstrated that traffic entering from an on-ramp stops or yields to traffic on the shoulder of the highway mainline.

07 An additional outside solid edge line shall be provided on the shoulder in accordance with Sections 3B.09 and 3B.10.

Guidance:

08 Changes in edge line pattern or direction should occur at appropriate regulatory signs.

Option:

09 At locations where traffic is allowed to enter, exit, or merge with the shoulder, a dotted edge line may be used either in a continuous manner or angled to the pavement edge (see Figure 3E-6).

10 Red-colored pavement (see Section 3H.07) may be used on shoulders that allow only transit vehicles.

Standard:

11 If used, red-colored pavement shall be discontinued on the shoulder through the influence area of the ramp (see Figure 3E-5).

Figure 3E-5. Markings for Part-Time Travel on Shoulder and Application of Pavement Word Markings (Sheet 1 of 3)

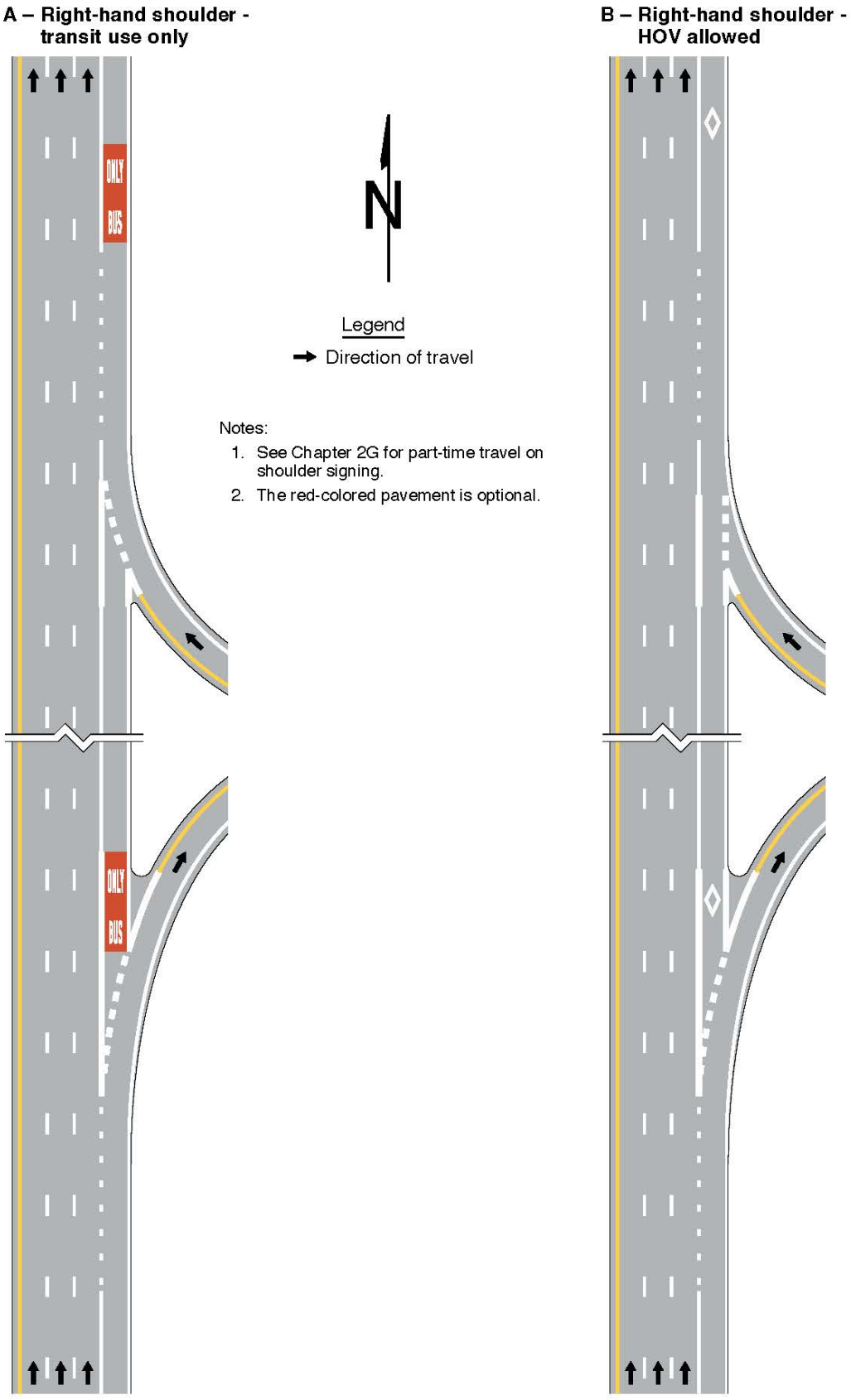


Figure 3E-5. Markings for Part-Time Travel on Shoulder and Application of Pavement Word Markings (Sheet 2 of 3)

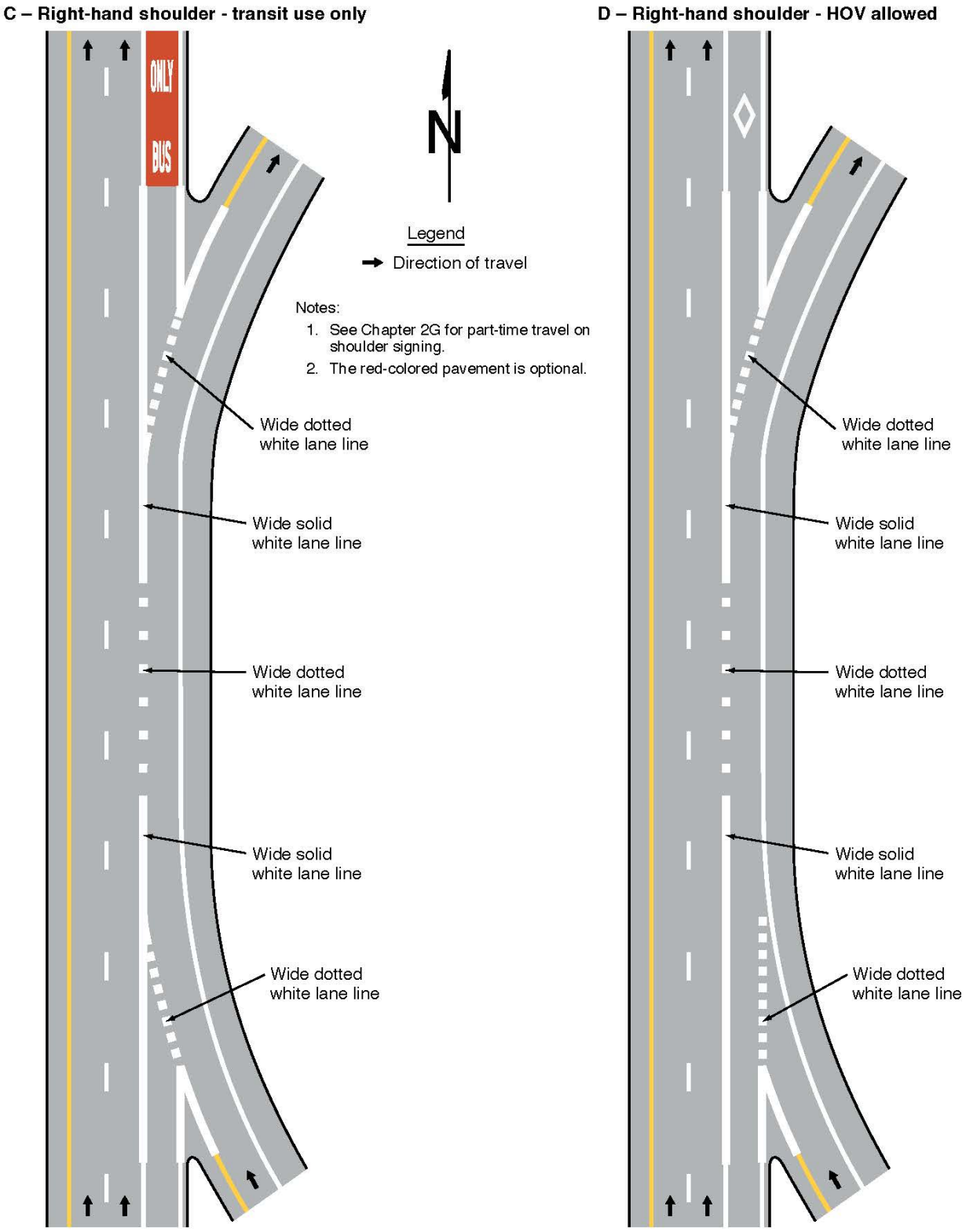


Figure 3E-5. Markings for Part-Time Travel on Shoulder and Application of Pavement Word Markings (Sheet 3 of 3)

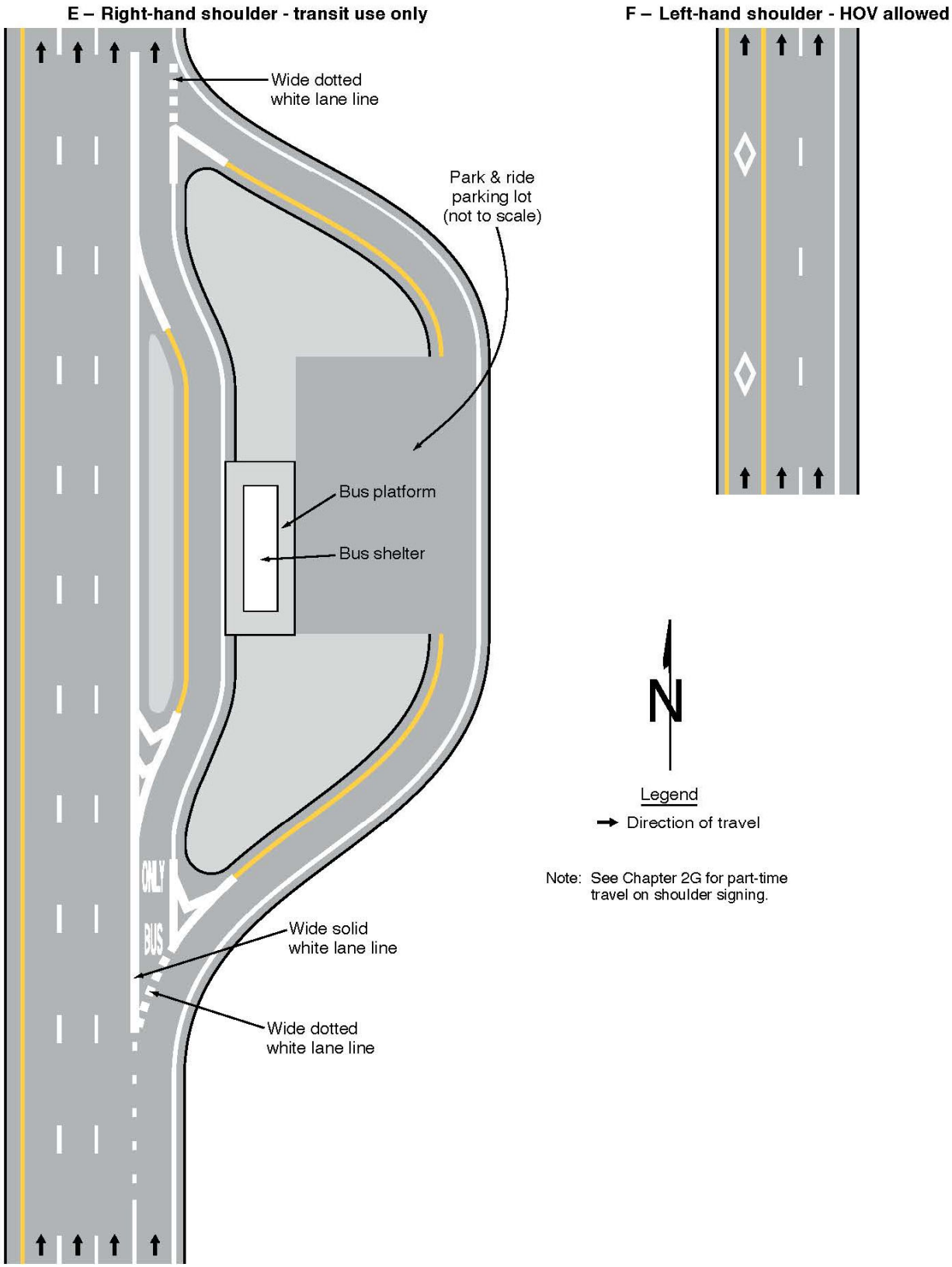
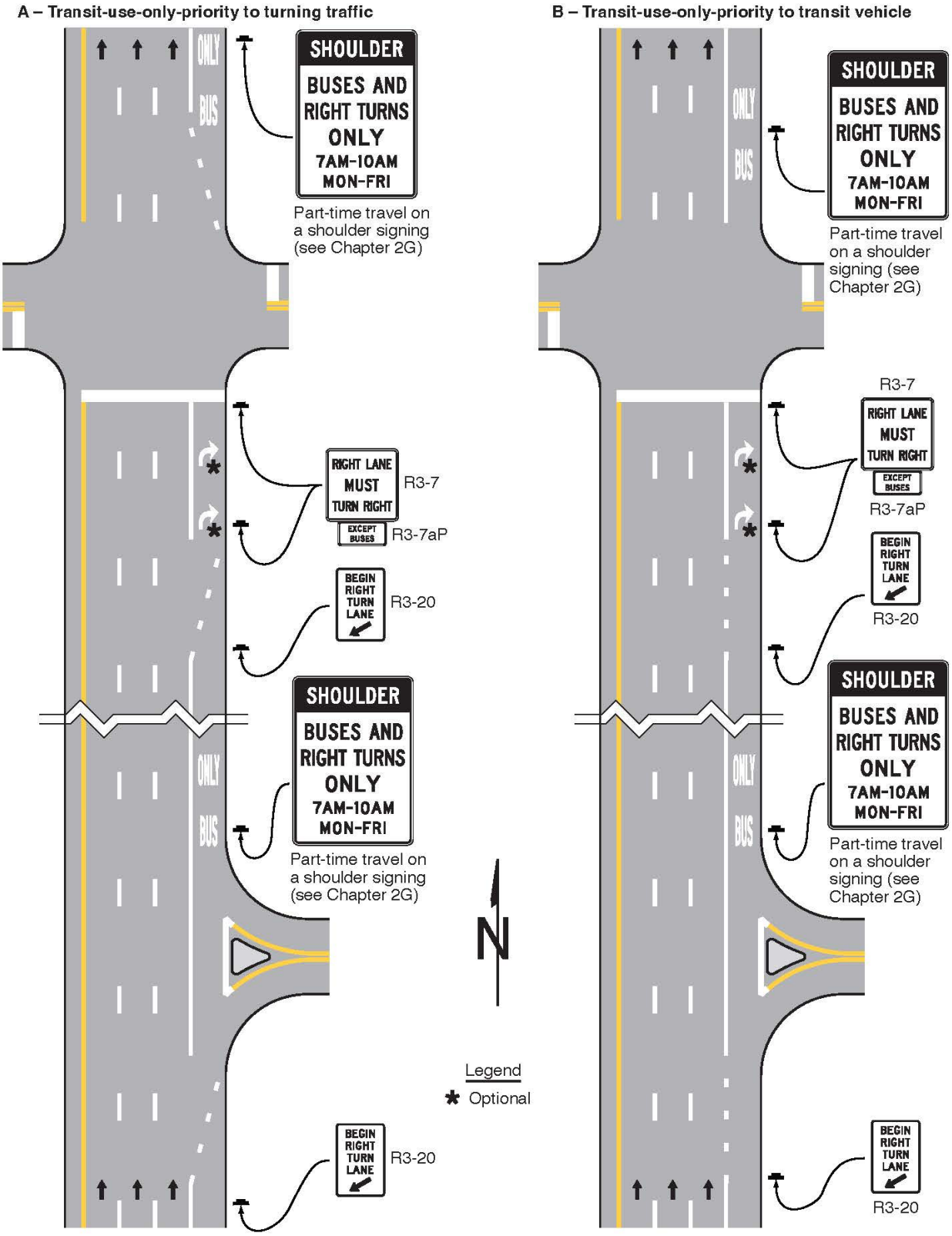


Figure 3E-6. Markings for Part-Time Travel on a Shoulder through an Intersection



CHAPTER 3F. MARKINGS FOR TOLL PLAZAS

Section 3F.01 General

Support:

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

02 Section 3H.08 contains information on the use and application of purple-colored pavement at toll plazas for vehicles with registered electronic toll collection (ETC) accounts.

Section 3F.02 Longitudinal Markings

Guidance:

01 Solid white lane line markings should be used to separate toll lanes, payment methods, or to channelize movements at toll plazas.

02 Solid white lane line markings should begin at the upstream end of the full-width toll lane and be continued to the toll plaza.

Option:

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

Standard:

04 If the purple solid longitudinal markings described in Paragraph 3 of this Section are used, the purple markings shall be at least 3 inches wide.

Guidance:

05 If the purple solid longitudinal markings described in Paragraph 3 of this Section are used, the purple markings should not be wider than the line they supplement.

Standard:

06 Toll booths and the islands on which they are located are considered to be obstructions in the roadway and they shall be provided with markings that comply with the provisions of Section 3B.13 and Chapter 3J.

Option:

07 Longitudinal pavement markings may be omitted alongside toll booth islands between the approach markings and any departure markings.

Section 3F.03 Pavement Word and Symbol Markings

Support:

01 Section 3E.03 contains information on the use of pavement word and symbol markings for ETC Account-Only lanes not specific to toll plazas.

Standard:

02 Except as provided in Paragraph 4 of this Section, when a lane on the approach to a toll plaza is restricted to use only by vehicles with registered ETC accounts, the ETC Account-Only lane word markings or pictograph described in Section 3E.03 shall be used (see Drawing A in Figure 3H-6).

03 When one or more open-road tolling (ORT) lanes that are restricted to use only by vehicles with registered ETC accounts bypass a mainline toll plaza on a separate alignment, pavement word markings or pictographs shall be used on the approach to the point where the ORT lanes diverge from the lanes destined for the mainline toll plaza (see Drawings B and C in Figure 3H-6).

Option:

04 Preferential lane-use markings may be omitted at toll plazas where physical conditions preclude the use of the markings.

Guidance:

05 If an ORT lane that is immediately adjacent to a mainline toll plaza is not separated from adjacent cash payment toll plaza lanes by a curb or barrier, then channelizing devices (see Section 3I.01), and/or longitudinal pavement markings that discourage or prohibit lane changing should be used to separate the ORT lane from the adjacent cash payment lane. This separation should begin on the approach to the mainline toll plaza at approximately the point where the vehicle speeds in the adjacent cash lanes drop below 30 mph during off-peak periods and should extend downstream beyond the toll plaza approximately to the point where the vehicles departing the toll plaza in the adjacent cash lanes have accelerated to 30 mph.

CHAPTER 3G. DELINEATORS

Section 3G.01 General

Support:

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

02 Delineators are considered guidance devices to help road users navigate the roadway alignment, rather than warning devices.

Option:

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

Section 3G.02 Design

Standard:

01 Delineators shall consist of retroreflective devices that are capable of clearly retroreflecting light under normal atmospheric conditions from a distance of 1,000 feet when illuminated by the high beams of standard automobile lights. They shall be mounted on crashworthy (see definition in Section 1C.02) supports.

02 Retroreflective elements for delineators shall have a minimum vertical and horizontal dimension of 3 inches, or a minimum diameter dimension of 3 inches when circular.

Support:

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

Option:

04 A vertically-elongated delineator of appropriate size may be used in place of a double delineator.

Section 3G.03 Application

Standard:

01 The color of delineators shall comply with the color of edge lines stipulated in Sections 3A.03 and 3B.09.

02 A series of single delineators shall be provided on the right-hand side of freeways and expressways and on at least one side of interchange ramps, except when either Condition A or Condition B is met, as follows:

- **A. On tangent sections of freeways and expressways when both of the following conditions are met:**
  - **1. Raised pavement markers are used continuously on lane lines throughout all curves and on all tangents to supplement pavement markings, and**
  - **2. Roadside delineators are used to lead into all curves, or**
- **B. On sections of roadways where continuous lighting is in operation between interchanges.**

Option:

03 Delineators may be provided on other classes of roads.

04 A series of single delineators may be provided on the left-hand side of roadways.

05 Chevron Alignment (W1-8) signs may be used instead of or in addition to standard delineators, as provided in Section 2C.08.

Standard:

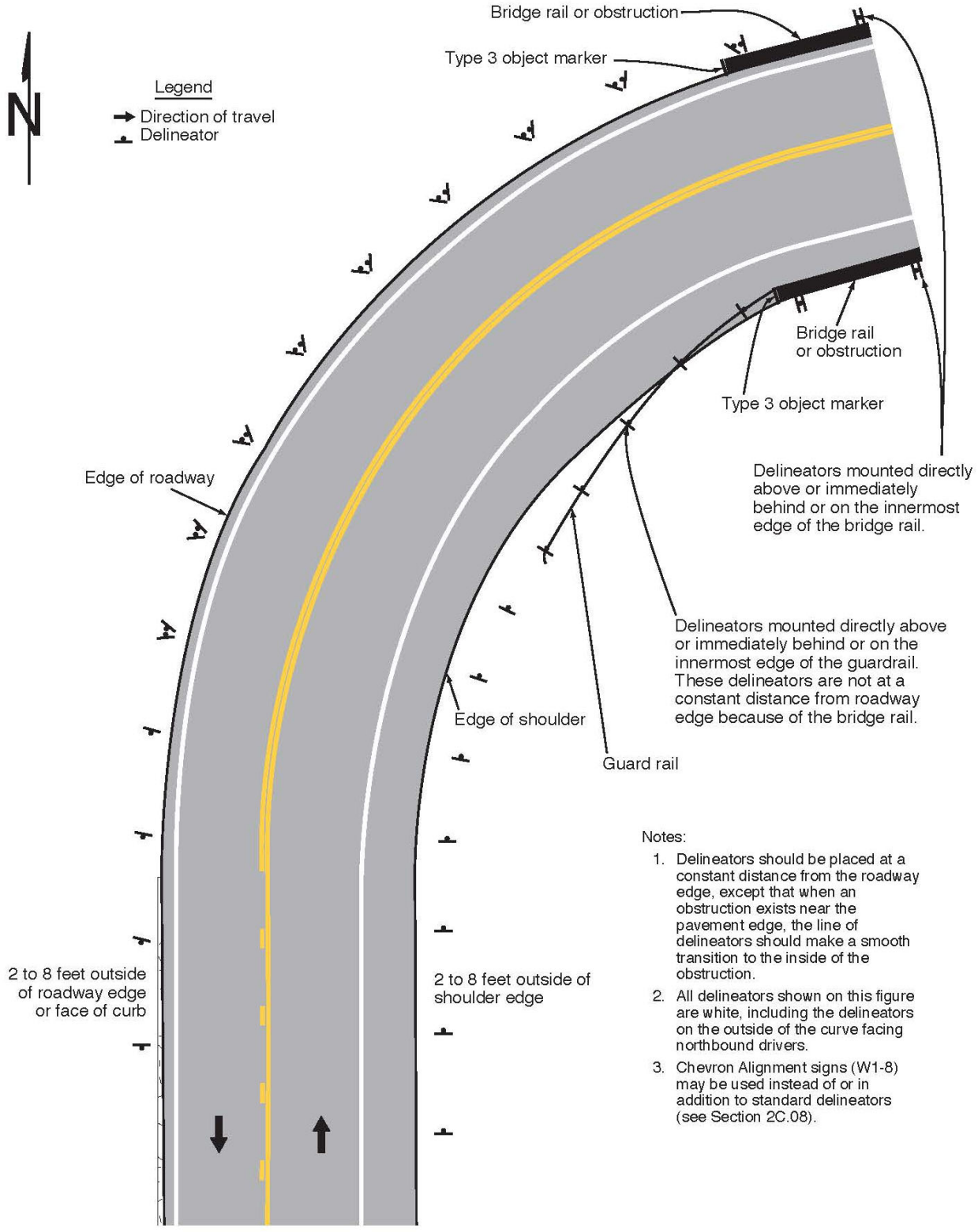
06 Delineators on the left-hand side of a two-way roadway shall be white (see Figure 3G-1).

Guidance:

07 A series of single delineators should be provided on the outside of curves on interchange ramps.

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

Figure 3G-1. Examples of Delineator Placement



09 Double or vertically-elongated delineators should be installed at approximately 100-foot intervals along acceleration and deceleration lanes.

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

Option:

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

Guidance:

12 Except as provided in Paragraph 13 of Section 3B.12, delineators of the appropriate color should be used to indicate a lane-reduction transition where either an outside or inside lane merges into an adjacent lane.

13 When used for lane-reduction transitions, the delineators should be installed adjacent to the lane or lanes reduced for the full length of the transition and should be so placed and spaced to show the reduction (see Section 3B.12 and Figure 3B-14).

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

Standard:

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

Guidance:

16 Red delineators should be placed on both sides of truck escape ramps.

Support:

In Wisconsin, delineators denoting driveways are blue as required under Wisconsin State Statute 346.41(3).

Section 3G.04 Placement and Spacing

Guidance:

01 Except as provided in Paragraph 2 of this Section, delineators should be mounted at a height, measured vertically from the bottom of the lowest retroreflective device to the elevation of the near edge of the roadway, of approximately 4 feet.

Option:

02 When mounted on the face of or on top of guardrails or other longitudinal barriers, delineators may be mounted at a lower elevation than the normal delineator height recommended in Paragraph 1 of this Section.

Guidance:

03 Delineators should be placed 2 to 8 feet outside the outer edge of the shoulder, or if appropriate, in line with the roadside barrier that is 8 feet or less outside the outer edge of the shoulder.

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

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

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

Option:

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

08 When uniform spacing is interrupted by such features as driveways and intersections, delineators which would ordinarily be located within the features may be relocated in either direction for a distance not exceeding ¼ of the uniform spacing. Delineators still falling within such features may be eliminated.

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

Guidance:

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

11 The spacing between red delineators that are placed on both sides of a truck escape ramp should not exceed 50 feet for a distance that is sufficient to identify the ramp entrance. The spacing between red delineators that are placed beyond the ramp entrance should be such that adequate guidance is provided based on the length and design of the escape ramp.

Option:

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

Support:

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

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

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

Notes: 1. Spacing for specific radii may be interpolated from table.

2. The minimum spacing should be 20 feet.

3. The spacing on curves should not exceed 300 feet.

4. In advance of or beyond a curve, and proceeding away from the end of the curve, the spacing of the first delineator is 2S, the second 3S, and the third 6S, but not to exceed 300 feet.

5. S refers to the delineator spacing for specific radii computed from the formula $S=3\sqrt{R-50}$.

6. The distances for S shown in the table above were rounded to the nearest 5 feet.

CHAPTER 3H. COLORED PAVEMENT

Section 3H.01 Standardization of Application

Support:

01 Colored pavements consist of differently-colored road paving materials, such as colored asphalt or concrete. Other surface treatments can be applied to the surface of a road, island, or area outside the traveled way to simulate a colored pavement.

02 If non-retroreflective colored pavement is used as a purely aesthetic surface treatment (see Section 3H.03) within the provisions of this Chapter and are not intended to communicate regulations, warnings, guidance, or other information 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 communicate regulations, warnings, guidance, or other information to road users, or if retroreflectivity is used, the colored pavement shall be considered a traffic control device and shall be limited to the colors and applications specified in this Chapter.

04 Except as provided in Paragraph 5 of Section 3H.07, colored pavement shall only be used if the corresponding regulations, warnings, or guidance are applicable at all times.

Guidance:

05 Colored pavements used as traffic control devices should only be used where the color pavement contrasts significantly with adjoining paved areas.

Support:

06 The chromaticity coordinates that define the ranges of acceptable colors for traffic control devices are found in the Appendix to Subpart F of 23 CFR 655.

Standard:

07 If used, colored pavement shall only be used to supplement other markings as provided in this Manual.

Support:

08 Longitudinal pavement markings, crosswalks, pavement marking symbols, and elongated route markers are not considered colored pavements.

Section 3H.02 Materials

Option:

01 Colored pavements may be either retroreflective or non-retroreflective, in accordance with the provisions of this Chapter for specific applications.

Guidance:

02 If surface treatments are applied to the surface of a road, island, or other area outside the traveled way to simulate a colored pavement, pavement marking materials should be selected that will minimize loss of traction for road users (see Paragraph 2 of Section 3A.02).

Support:

03 Providing for retroreflectivity, such as incorporating glass beads, can affect the skid resistance of pavement markings.

04 Installation of colored pavement to one lane or an area or portion of a multi-lane traveled way can create differentials in skid resistance values between the areas of colored pavement and non-colored pavement that might be unexpected by the road user.

Section 3H.03 Aesthetic Surface Treatments

Support:

01 Aesthetic surface treatments are sometimes used between the transverse lines within a crosswalk, in islands, in medians, in shoulders, within sidewalk extensions designated by pavement markings, or in other areas outside of the traveled way.

02 Common examples of materials used as aesthetic surface treatments include brick, paving bricks, paving stones, or other materials designed to simulate such paving. Some examples of geometries for aesthetic surface treatments include honeycomb, lattice, mesh, grid, and regular polygon patterns.

03 Surfaces with individual units laid out of plane and those that are heavily-textured, rough, or chamfered, could increase rolling resistance and subject pedestrians who use wheelchairs to the effects of vibration; it is desirable to minimize surface discontinuities.

04 Common examples of colors for aesthetic surface treatments incorporated into the material or geometry are brick red, rust, brown, burgundy, clay, tan, or similar earth-tone equivalents (see Figure 3H-1).

Standard:

05 Aesthetic surface treatments shall not interfere with traffic control devices.

06 Aesthetic surface treatments shall not be of a surface that can confuse pedestrians with vision disabilities that rely on tactile treatments or cues for navigation.

In Wisconsin, where aesthetic surface treatments are used in crosswalks, they shall only be used within transverse line crosswalks.

07 Colors used for aesthetic surface treatments shall be outside the chromaticity coordinates that define the ranges of acceptable colors for traffic control devices.

08 Patterns that constitute a purely aesthetic surface treatment shall be devoid of advertising and shall not contain elements of retroreflectivity.

09 Patterns that constitute a purely aesthetic surface treatment for the interior area of a crosswalk shall not be designed to encourage road users to remain in the crosswalk, engage or interact with the pattern, or otherwise inhibit users from crossing the street in a safe and efficient manner.

Guidance:

10 Aesthetic surface treatments should not use colors or patterns that degrade the contrast of markings used to delineate an area, or that might be mistaken by road users as a traffic control application.

11 To provide contrast, a gap of at least one-half the width of the white transverse line used to establish the crosswalk, but not less than 6 inches, should be used between the white crosswalk lines and the aesthetic surface treatment, such as unmarked pavement or a black contrast line (see Section 3A.03).

12 To provide contrast, a gap of at least the width of the longitudinal line used to establish the area should be used between the longitudinal line and the aesthetic surface treatment, such as unmarked pavement or a black contrast line (see Section 3A.03). If the longitudinal line is a double line, the gap should be at least the width of one of the lines that makes up the double line.

13 Aesthetic surface treatments should not contain pictographs, illusions, or symbols.

Section 3H.04 Yellow-Colored Pavement

Support:

01 Yellow-colored pavement is used to enhance the conspicuity of areas separating traffic traveling in opposite directions of travel and the left-hand edge of the roadway.

Standard:

02 If used, yellow-colored pavement shall be limited to:

A. Flush or raised median islands separating traffic flows in opposite directions,

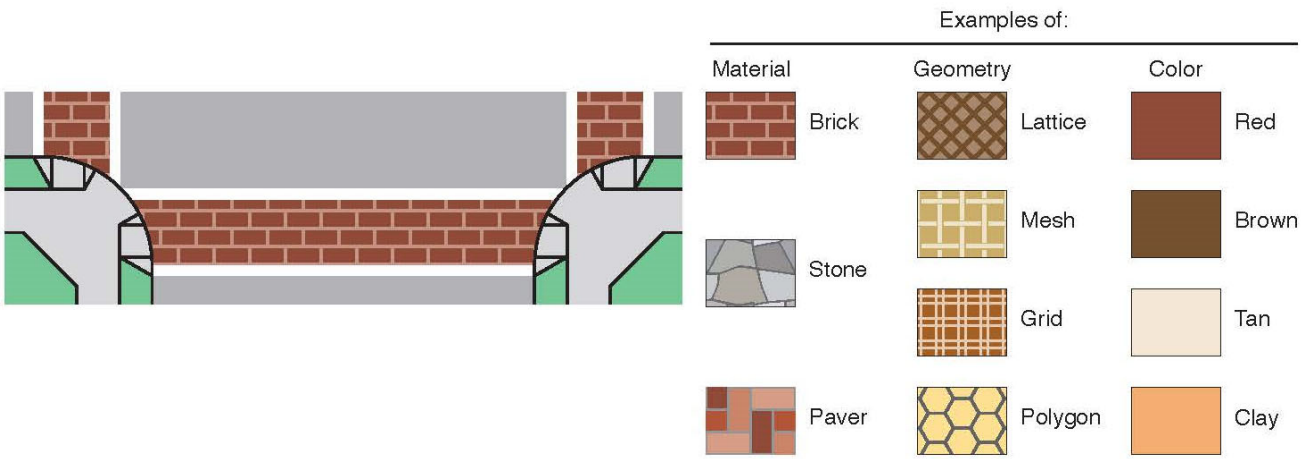
B. Left-hand shoulders of divided highways, and

C. Left-hand shoulders of one-way streets or ramps.

03 Yellow-colored pavement shall not be incorporated into elements of the roadway that function as reversible lanes or two-way left-turn lanes.

04 Yellow-colored pavement shall not be used on channelizing islands where traffic travels in the same general direction on both sides.

Figure 3H-1. Aesthetic Treatments for Transverse Crosswalks



Option:

05 Yellow-colored pavement may be installed for the entire length of the roadway, island, or shoulder, or for only a portion or portions of the roadway, island, or shoulder.

Support:

06 An example of an application of yellow-colored pavement is shown in Figure 3H-2.

Section 3H.05 White-Colored Pavement

Support:

01 White-colored pavement is used to enhance the conspicuity of areas separating traffic traveling in the same direction of travel and the right-hand edge of the roadway.

Standard:

02 If used, white-colored pavement shall be limited to:

- **A. Flush or raised channelizing islands where traffic passes on both sides in the same general direction,**
- **B. Right-hand shoulders,**
- **C. Exit gore areas, and**
- **D. Entrance gore areas.**

Guidance:

03 When used on right-hand shoulders, white-colored pavement should be limited to areas not intended for use by motor vehicle traffic except those shoulders designated for emergency use.

Option:

04 White-colored pavement may be installed for the entire length of the roadway, island, or shoulder, or for only a portion or portions of the roadway, island, or shoulder.

05 White-colored pavement may be used instead of chevron markings (see Sections 3B.13 and 3B.25) in neutral areas.

Support:

06 An example of an application of white-colored pavement is shown in Figure 3H-3.

Figure 3H-2. Examples of Yellow-Colored Pavement Applications

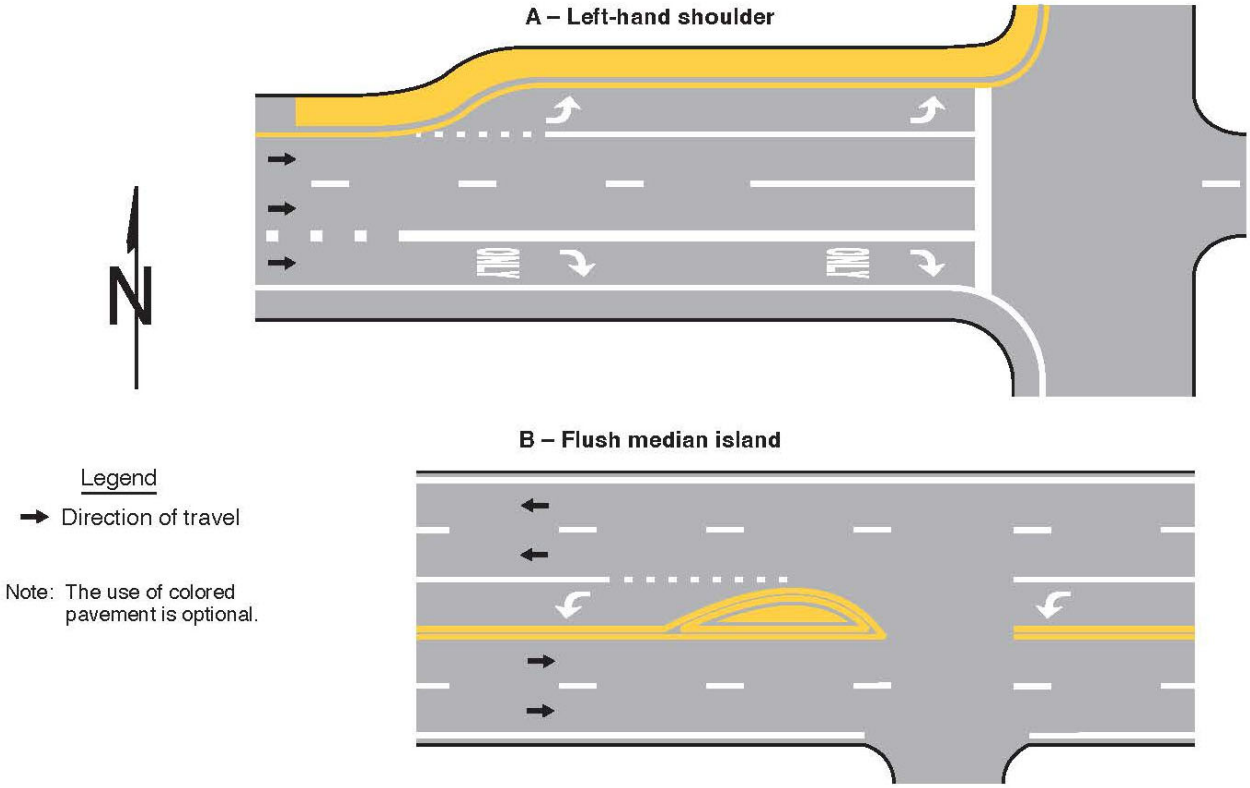
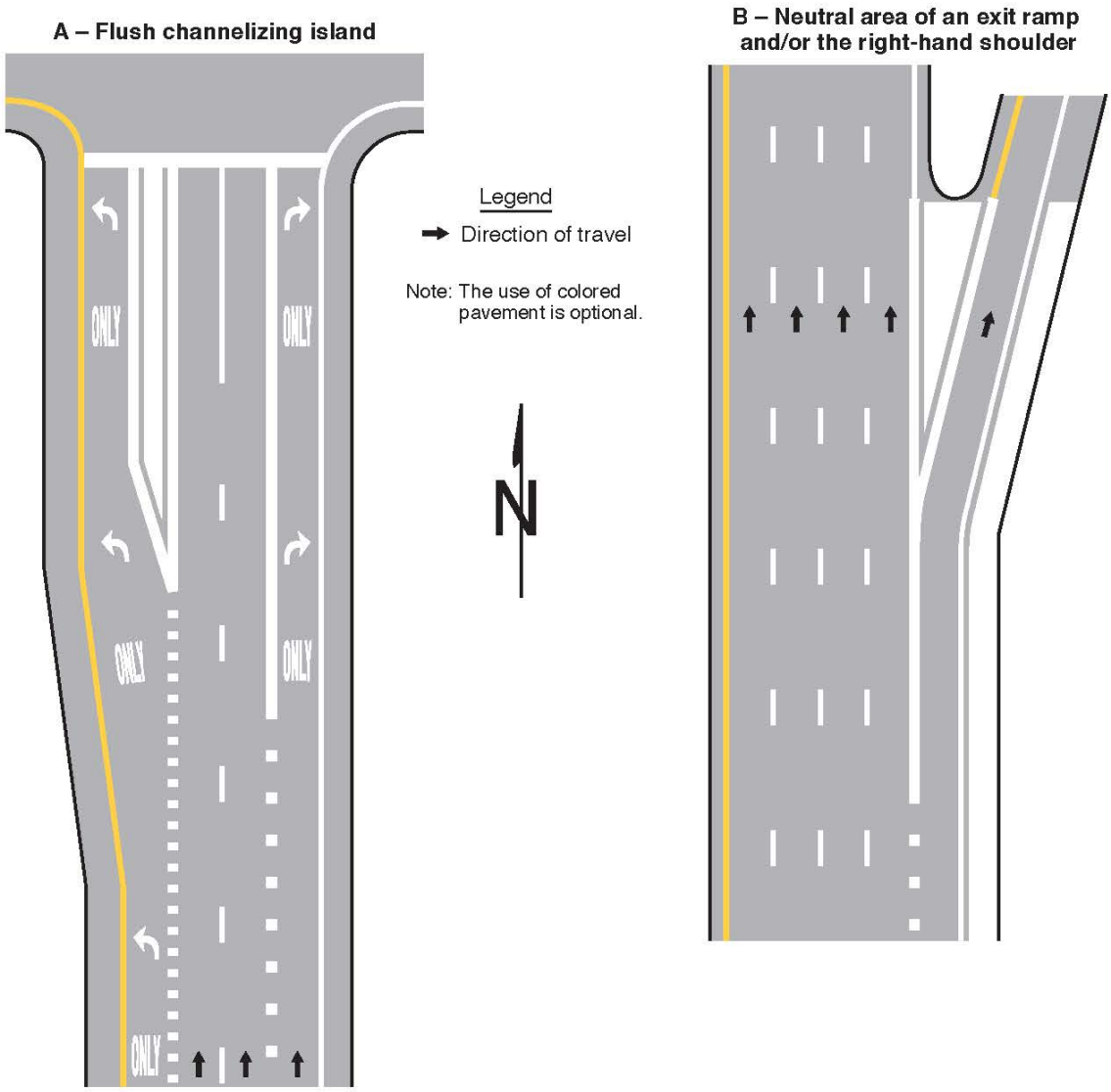


Figure 3H-3. Examples of White-Colored Pavement Applications



Section 3H.06 Green-Colored Pavement for Bicycle Facilities

Support:

01 Green-colored pavement is used to enhance the conspicuity of locations where bicyclists are expected to operate, and areas where bicyclists and other traffic might have potentially conflicting, weaving, or crossing movements. Green-colored pavement is also used to enhance the conspicuity of word, symbol, and/or arrow pavement markings when these markings are used in certain bicycle facilities.

Standard:

02 If used, green-colored pavement shall be limited to:

- **A. Bicycle lanes (see Sections 9E.01, 9E.06, 9E.07, and 9E.08),**
- **B. Extensions of bicycle lanes through intersections (see Section 9E.03),**
- **C. Extensions of bicycle lanes through areas where motor vehicles enter a mandatory turn lane in which motor vehicles must weave across bicyclists in bicycle lanes (see Section 9E.02),**
- **D. Two-stage bicycle turn boxes (see Section 9E.11),**
- **E. Bicycle Boxes (see Section 9E.12), and**
- **F. As a background for bicycle detector symbols (see Section 9E.15).**

03 Green-colored pavement shall not be:

- **A. Incorporated into electric-vehicle parking stations or parking stalls,**

B. Incorporated into crosswalks (see Chapter 3C),
C. Used as a background for shared-lane markings (see Section 9E.09), or
D. Used instead of the required markings for bicycle facilities (see Chapter 9E).

04 If used, the pattern of the green-colored pavement supplementing dotted extension lines shall match the pattern of the dotted lines, thus filling in only the areas that are directly between a pair of dotted line segments. If used, the pattern of the green-colored pavement supplementing a dotted longitudinal line, which defines a bicycle lane (see Paragraph 11 of Section 9E.02), shall match the pattern of the dotted line, thus filling in only the areas that are directly between a line segment and the curb, or, in the absence of a curb, the edge of the roadway.

Guidance:

05 If green-colored pavement is used within separated bicycle lanes on an independent alignment, it should be used only at the entrances to those facilities from roadways open to public travel or at conflict, weaving, or crossing locations.

06 If green-colored pavement is used within shared-use paths, it should be used only where pedestrian and bicyclist movements are separated and for only a portion (or portions) of the path designated for bicyclist use.

Option:

07 Green-colored pavement may be installed for the entire length of a bicycle lane or bicycle lane extension or for only a portion (or portions) of the bicycle lane or bicycle lane extension.

08 Green-colored pavement may be installed for the entire length of a physically-separated bikeway within the roadway or for only a portion (or portions) of the physically-separated bikeway within the roadway.

Guidance:

09 Appropriate regulatory (see Chapter 9B) or guide signing (see Chapter 9D) should be installed to provide related information to the presence of the colored pavement.

Support:

10 Examples of applications of green-colored pavement are shown in Figure 3H-4.

Section 3H.07 Red-Colored Pavement for Public Transit Systems

Support:

01 Red-colored pavement is used to enhance the conspicuity of locations, station stops, or travel lanes in the roadway exclusively reserved for vehicles of public transit systems or multi-modal facilities where public transit is the primary mode. These public transit vehicles include buses, streetcars, trolleys, light-rail trains, and rapid transit fleets.

Option:

02 Red-colored pavement may be used where engineering judgment determines that one or more of the following conditions are expected to result from its application:

A. Increased travel speeds will be expected by the public transport vehicle after an exclusive lane or facility is provided,
B. Reduced overall service time through the corridor will be expected by the public transport vehicle,
C. Decreased rates of illegal parking or occupation of the transit or multi-mode lane or facility will be expected.

Standard:

03 If used, red-colored pavement shall be applied only in lanes, areas, or locations where general-purpose traffic is not allowed to use, queue, wait, idle, or otherwise occupy the lane, area, or location where red-colored pavement is used.

04 Red-colored pavement shall be installed for the full width of the lane.

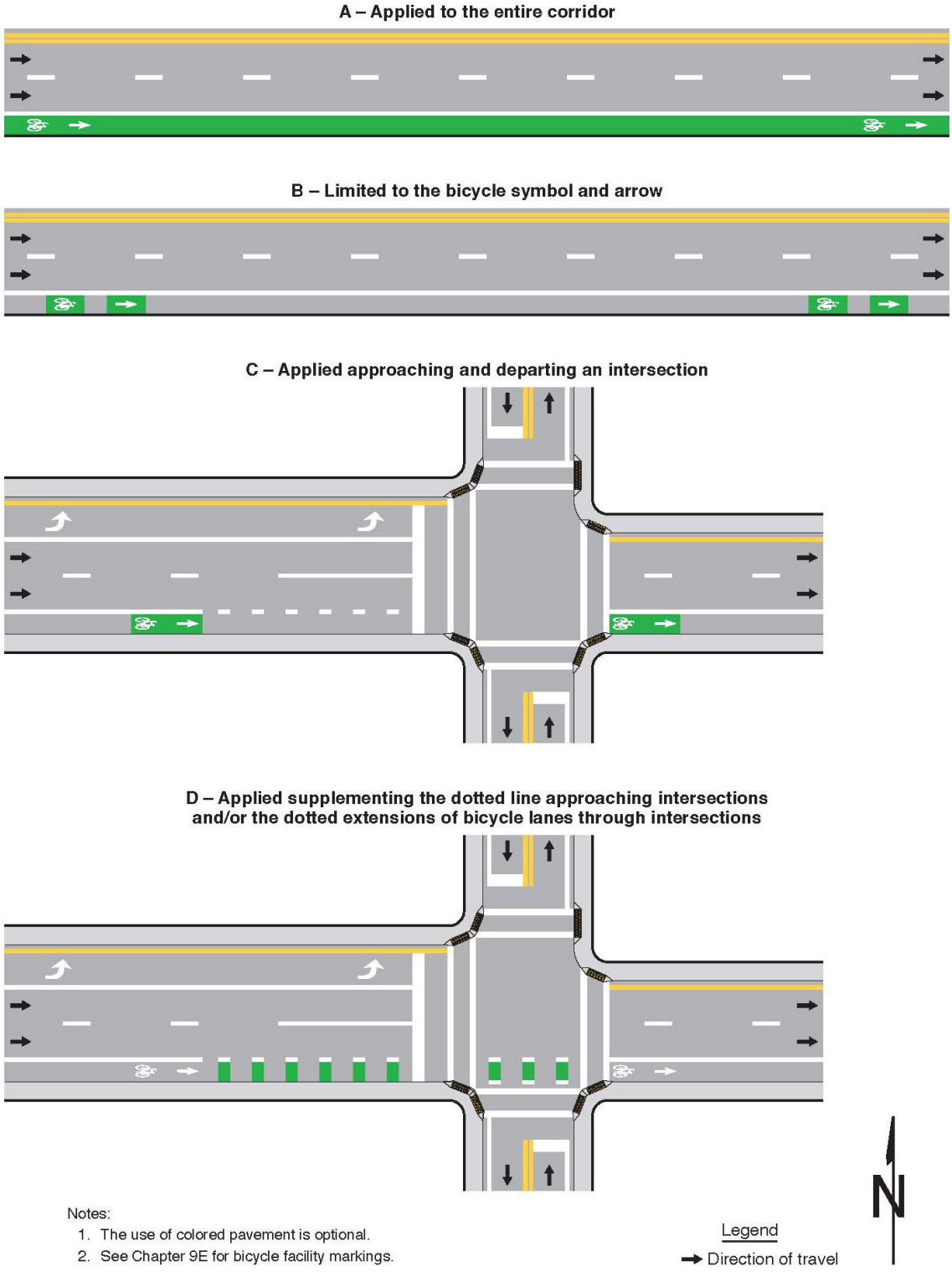
Option:

05 Red-colored pavement may be used for full-time or part-time operations.

06 Red-colored pavement may be installed for the entire length of a restricted lane or for only a portion (or portions) of the restricted lane.

07 Red-colored pavement may be installed in a broken or dotted pattern where entrance into the transit lane is permitted by general traffic, for example where general traffic is allowed in a transit lane in advance of a turn.

Figure 3H-4. Examples of Green-Colored Pavement Applications



Standard:

08 Regulatory signs (see Sections 2B.02 and 2G.03) shall be used to establish the allowable use of the lane, area, or location. Regulatory signs shall also be used when it is determined that other vehicles will be allowed to enter the lane to turn or bypass queues.

Guidance:

09 If red-colored pavement is used on public transit facilities separated from the roadway or on facilities on an independent alignment, it should be used only at the entrances to those facilities from roadways open to public travel.

Support:

10 Examples of applications of red-colored pavement are shown in Figure 3H-5.

Section 3H.08 Purple-Colored Pavement for Electronic Toll Collection (ETC) Account-Only Preferential Lanes

Standard:

01 Purple-colored pavement shall be limited to:

A. Lanes on the approach to a toll plaza where the lane is restricted to use only with a registered ETC account; and

B. Lanes or approaches to an open-road tolling (ORT) collection facility that bypasses the physical toll plaza, where the ORT facility is restricted for use only by vehicles with registered ETC accounts.

02 Purple-colored pavement shall not be used in an approach lane that also facilitates additional payment methods downstream.

03 If used approaching a physical toll plaza, purple-colored pavement shall be flanked by white solid longitudinal lines that establish the toll lane.

04 If used on an ORT collection facility that bypasses the physical toll plaza, purple-colored pavement shall be flanked by appropriate edge lines, and if applicable in multi-lane bypasses, appropriate longitudinal solid or broken white lane lines.

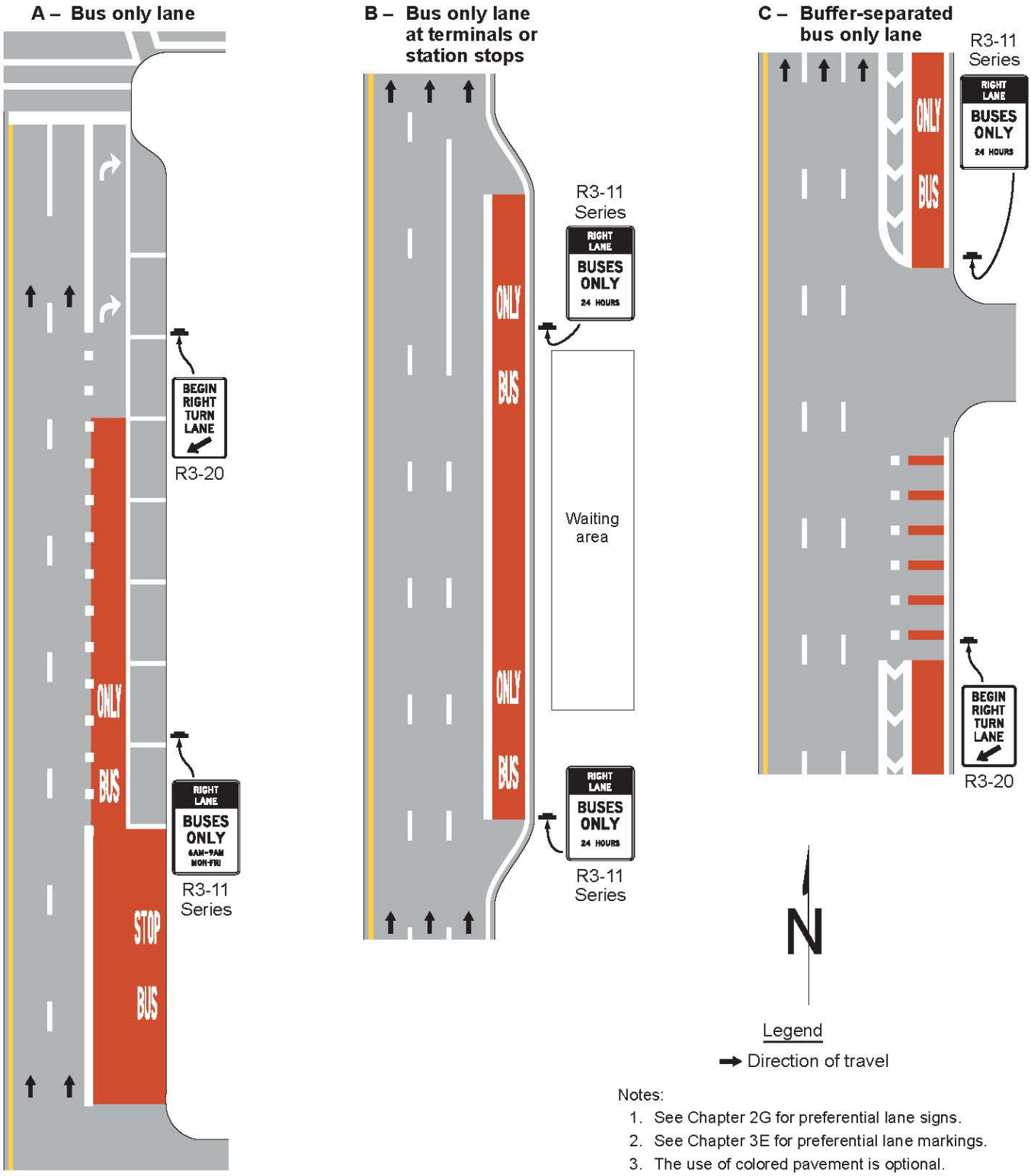
Option:

05 Purple-colored pavement may be installed for the entire length of a toll lane or ORT collection facility or for only a portion (or portions) of the toll lane or ORT collection facility.

Support:

06 Figure 3H-6 illustrates examples of purple-colored pavement for use at toll plazas.

Figure 3H-5. Examples of Red-Colored Pavement Applications

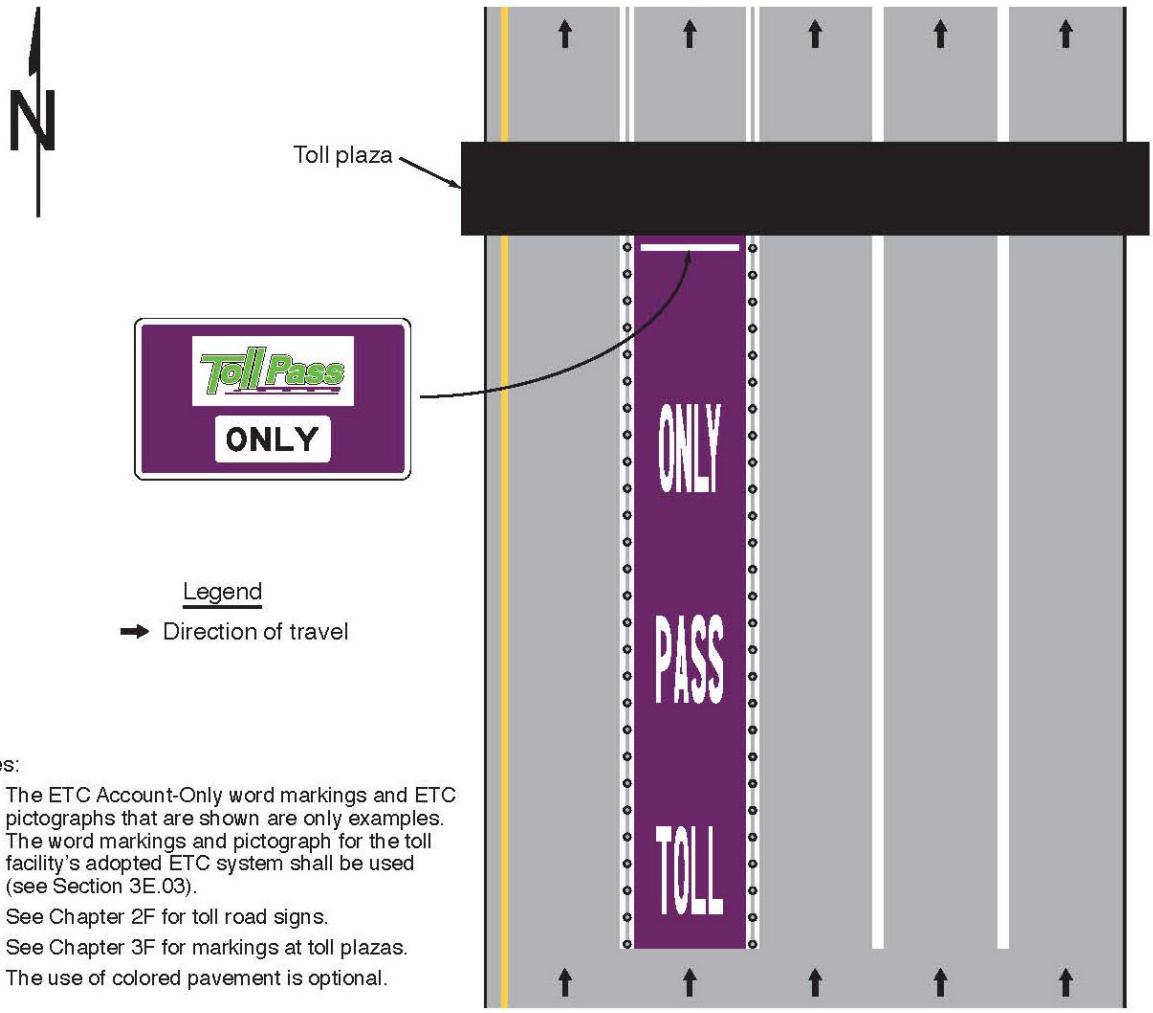


Notes:

1. See Chapter 2G for preferential lane signs.
2. See Chapter 3E for preferential lane markings.
3. The use of colored pavement is optional.

Figure 3H-6. Examples of Purple-Colored Pavement Applications (Sheet 1 of 2)

A – Electronic toll collection only toll plaza lane

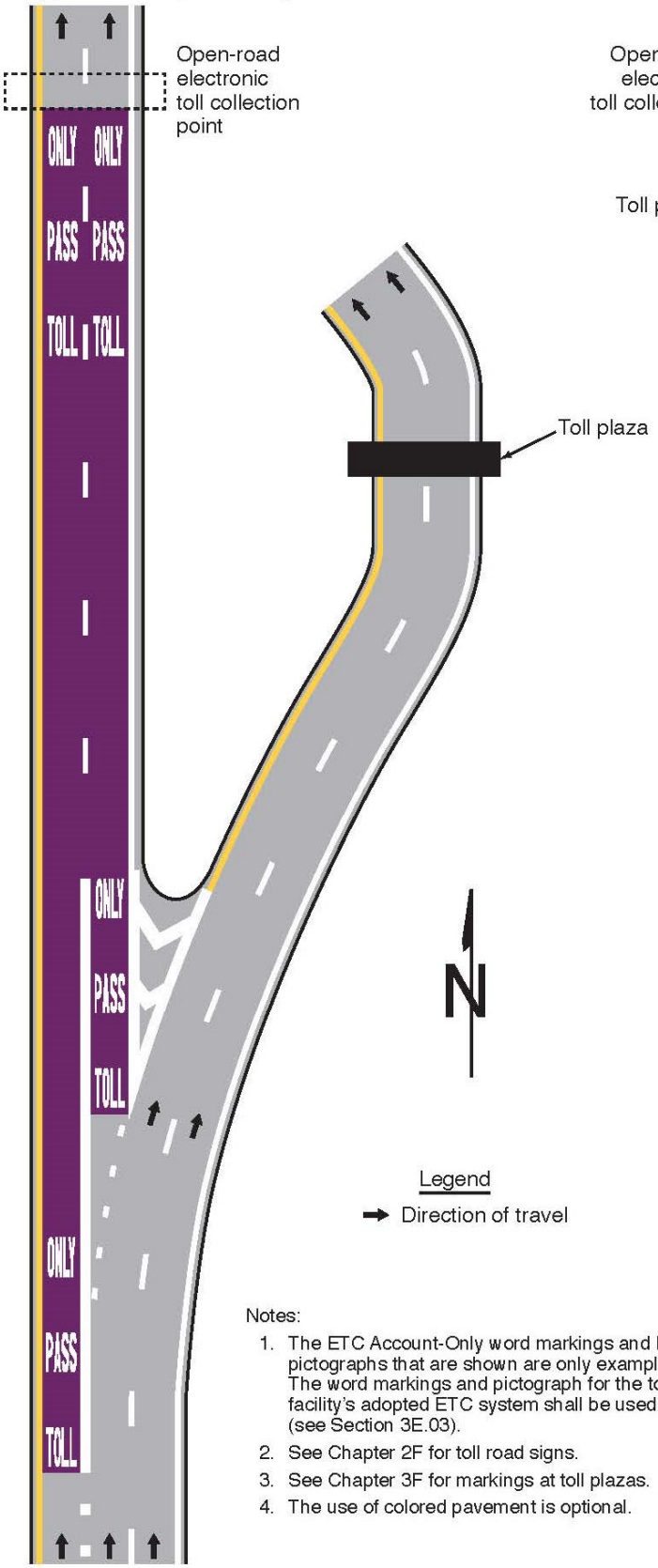


Notes:

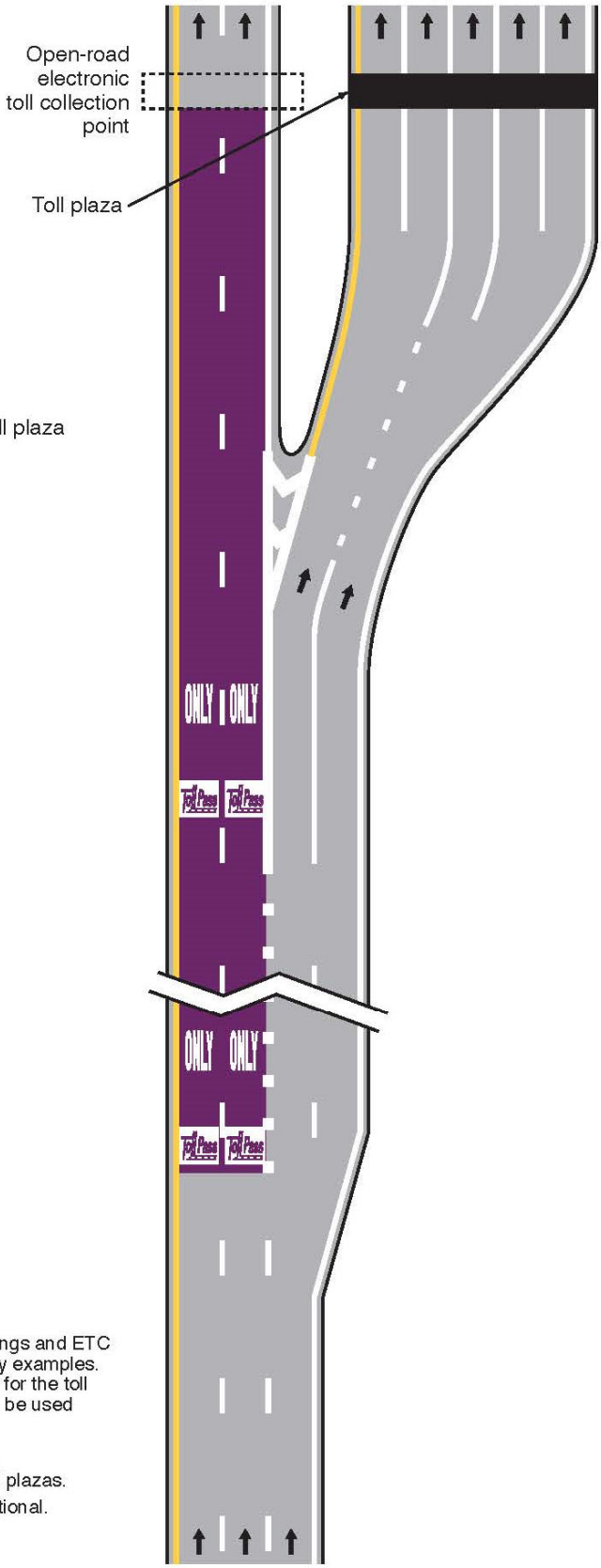
1. The ETC Account-Only word markings and ETC pictographs that are shown are only examples. The word markings and pictograph for the toll facility's adopted ETC system shall be used (see Section 3E.03).
2. See Chapter 2F for toll road signs.
3. See Chapter 3F for markings at toll plazas.
4. The use of colored pavement is optional.

Figure 3H-6. Examples of Purple-Colored Pavement Applications (Sheet 2 of 2)

B – Open-road electronic toll collection bypass with upstream option lane



C – Open-road electronic toll collection bypass with dedicated approach lanes



Legend

→ Direction of travel

Notes:

1. The ETC Account-Only word markings and ETC pictographs that are shown are only examples. The word markings and pictograph for the toll facility's adopted ETC system shall be used (see Section 3E.03).
2. See Chapter 2F for toll road signs.
3. See Chapter 3F for markings at toll plazas.
4. The use of colored pavement is optional.

CHAPTER 3I. CHANNELIZING DEVICES USED FOR EMPHASIS OF PAVEMENT MARKING PATTERNS

Section 3I.01 Channelizing Devices

Option:

01 Channelizing devices (see Sections 6K.01 through 6K.07 and Figure 6K-1) such as cones, tubular markers, vertical panels, lane separators, drums, and barricades may be used for general traffic control purposes such as adding emphasis to reversible lane delineation, channelizing lines, islands, pedestrian facilities, or bicycle facilities. Channelizing devices may also be used along a center line to preclude turns or along lane lines to preclude lane changing, as determined by engineering judgment.

Support:

02 Although they are not considered to be traffic control devices, raised islands (see Chapter 3J) are also sometimes used to channelize traffic.

Standard:

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

04 Except as provided in Paragraph 5 of this Section, the color of channelizing devices used outside of temporary traffic control zones shall be the same color as the pavement marking that they supplement, or for which they are substituted, in accordance with Section 3A.03.

Option:

05 The color of channelizing devices used to emphasize pavement marking patterns outside of temporary traffic control zones may be orange provided that the application of the orange-colored channelizing device is not permanent.

Support:

06 Emergency incidents and planned special events are the most common temporary traffic control zones that would justify orange channelizing devices to emphasize standard pavement marking colors. These events do not necessitate police officers or other authorized personnel to obtain and deploy channelizing devices that match the color of the existing pavement marking.

Standard:

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

Section 3I.02 Tubular Markers

Standard:

01 Tubular markers for permanent installations shall be a minimum of 28 inches in height and shall be a minimum of 2 inches wide facing road users.

Guidance:

02 Tubular markers should be affixed to the pavement or other surface either directly or by means of an attachment system that is affixed to the pavement or other surface. Tubular markers should normally be spaced no greater than N as cited in Section 3B.14.

Option:

03 Other spacing may be used based on engineering judgment.

Support:

04 Tubular markers are sometimes used to provide additional emphasis or improve lane discipline in advance of an unsignalized crosswalk (see Figure 3I-1).

Guidance:

05 When tubular markers are used to supplement a R1-6 series sign (see Section 2B.20) that is either on the center line, lane line, or median island, they should not be used on the same pavement marking line where the R1-6 series sign is installed.

Support:

06 Section 6K.04 contains information for temporary installations of tubular markers.

Figure 3I-1. Examples of Tubular Markers Supplementing Pavement Markings in Advance of an Unsignalized Crosswalk (Sheet 1 of 2)

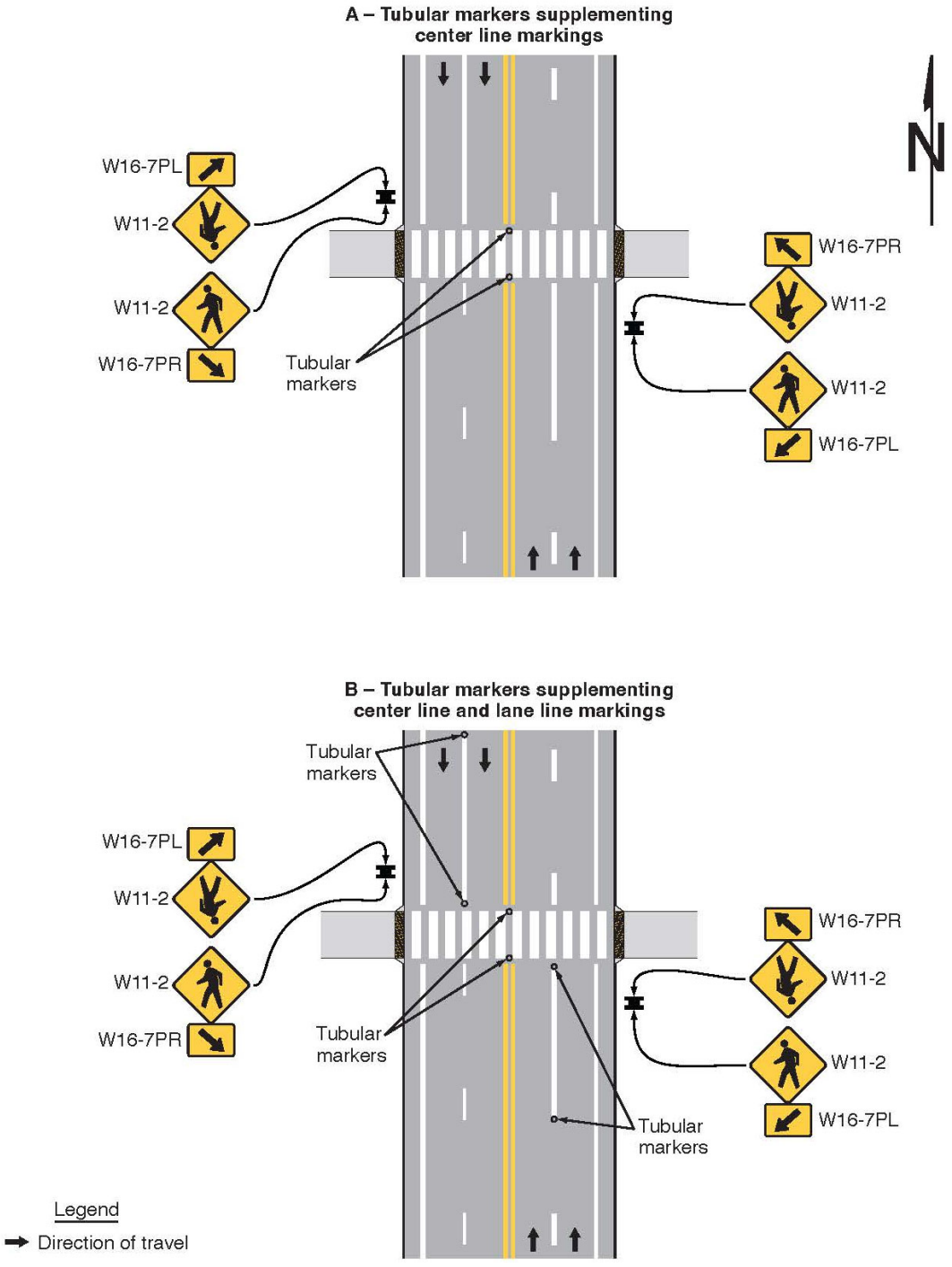
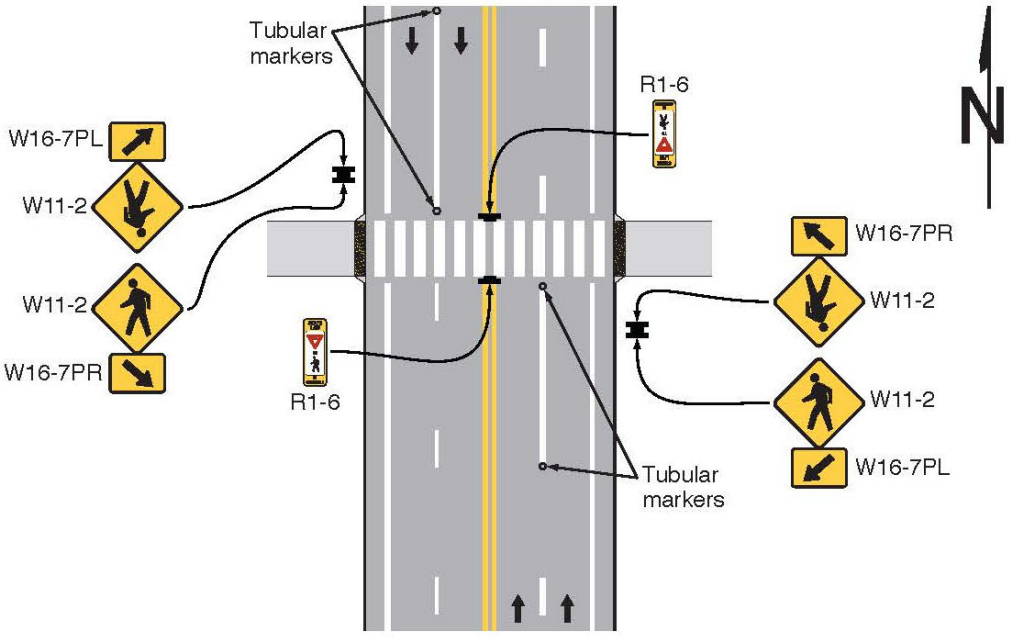
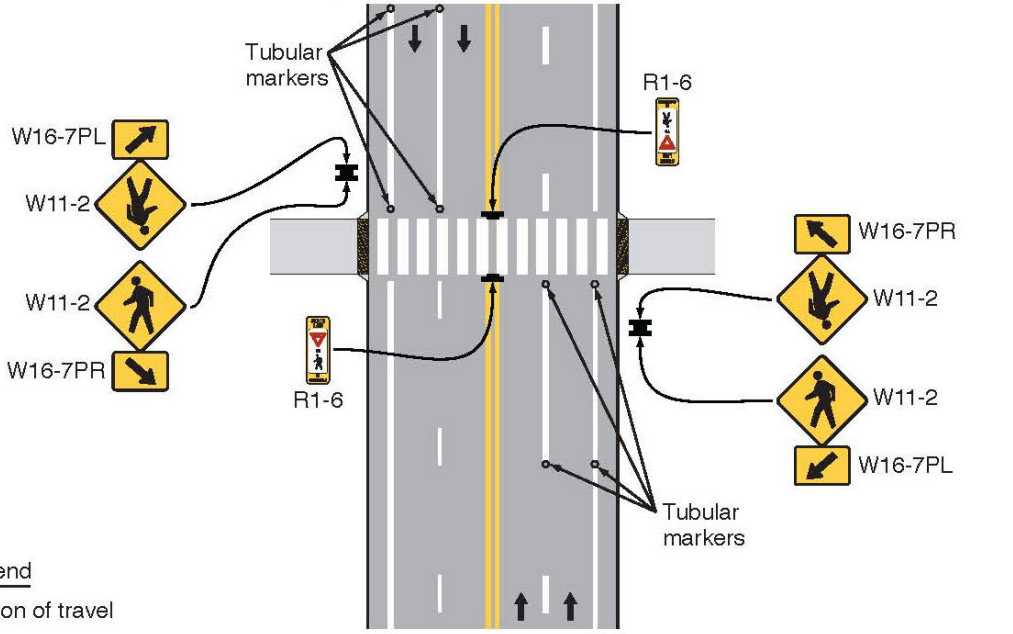


Figure 3I-1. Examples of Tubular Markers Supplementing Pavement Markings in Advance of an Unsignalized Crosswalk (Sheet 2 of 2)

C – Tubular markers supplementing lane lines with in-street pedestrian crossing sign on center line



D – Tubular markers supplementing edge and lane lines; in-street pedestrian sign crossing on center line



Legend

→ Direction of travel

CHAPTER 3J. MARKING AND DELINEATION OF ISLANDS AND SIDEWALK EXTENSIONS

Section 3J.01 General

Support:

01 This Chapter addresses the marking and delineation of islands (see definition in Section 1C.02) and sidewalk extensions designated by pavement markings. Definitions, types, sizes, and other criteria for the design of islands are set forth in "A Policy on Geometric Design of Highways and Streets," 2018 Edition, AASHTO.

02 Section 3C.12 contains information on pedestrian islands and medians.

03 Sections 3H.04 and 3H.05 contain information on colored pavement that can be used within islands.

Option:

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

Section 3J.02 Approach-End Treatment

Support:

01 An approach-end treatment to an island consists of longitudinal pavement markings and/or channelizing devices upstream of the island followed by a divergence of those pavement markings and/or channelizing devices concluding with a transition to other pavement markings that demarcate or outline the island (see Figure 3J-1).

02 Section 3B.13 contains information on pavement markings that function as approach-end treatments for obstructions.

Guidance:

03 The ends of islands first approached by traffic should be marked with an approach-end treatment, curb markings (see Section 3J.04), or both to guide vehicles into desired paths of travel along the island edge.

04 When raised bars or buttons that project more than 1 inch above the pavement surface are used to create a rumble section in the neutral area, the raised bars or buttons should be marked with white or yellow retroreflective materials, as determined by the direction or directions of travel they separate.

Section 3J.03 Islands Designated by Pavement Markings

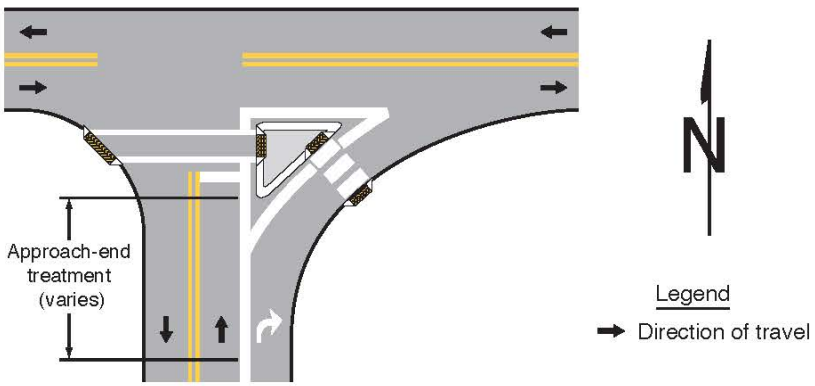
Standard:

01 Except as provided in Paragraph 2 of this Section, islands formed by pavement markings only shall be established using channelizing lines, and shall be white when separating traffic flows in the same general direction or yellow when separating opposing directions of traffic.

02 If a continuous flush median island separating travel in opposite directions is used, two sets of double solid yellow lines shall be used to form the island (see Figure 3B-5). Other markings in the median island area, such as diagonal lines (see Section 3B.25), shall also be yellow, except crosswalk markings which shall be white (see Chapter 3C).

03 If used, chevron or diagonal markings (see Section 3B.25) within the island shall be the same color as the channelizing line.

Figure 3J-1. Example of Markings for an Approach-End Treatment to an Island



Option:

04 Both chevron and diagonal markings of the same color may be used within the same island based on engineering judgment.

05 The area within the flush island delineated by pavement markings may use colored pavement in accordance with the provisions of Chapter 3H.

Support:

06 Figure 3J-2 illustrates examples of islands designated by pavement markings.

Section 3J.04 Curb Markings for Raised Islands

Standard:

01 Where curbs are marked for delineation or visibility purposes, the colors shall comply with the general principles of markings (see Section 3A.03).

Guidance:

02 Retroreflective solid yellow curb markings should be placed on the approach ends of raised medians and curbs of islands that are located in the line of traffic flow where the curb serves to channel traffic to the right of the obstruction (see Figure 3J-3).

03 Retroreflective solid white curb markings should be used when traffic is permitted to pass on either side of the island (see Figure 3J-3).

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

Option:

05 Where the curbs of the islands become parallel to the direction of traffic flow or where the island is illuminated or marked with delineators, curb markings may be discontinued based on engineering judgment or study.

06 Curb markings at openings in a continuous median island may be omitted based on engineering judgment or study.

Section 3J.05 Pavement Markings for Raised Islands

Support:

01 Pavement markings for raised islands include the approach-end treatment (see Section 3J.02), channelizing lines, edge lines, and chevron or diagonal markings.

Option:

02 Solid yellow edge lines (see Sections 3B.09 and 3B.10) may be used adjacent to raised islands separating travel in opposite directions (see Drawing A in Figure 3J-3).

Figure 3J-2. Examples of Islands Designated by Pavement Markings

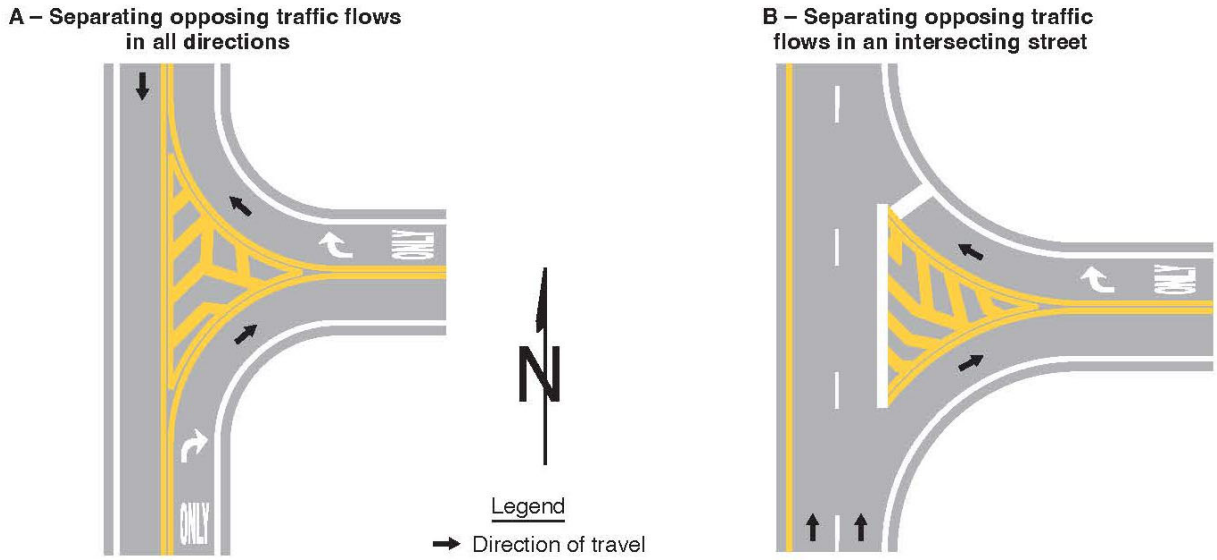
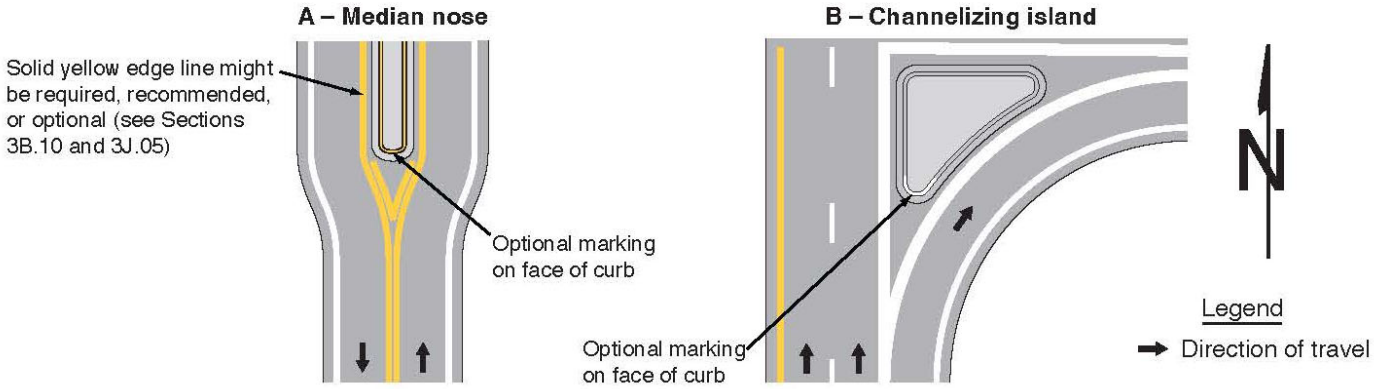


Figure 3J-3. Examples of Curb Markings for Raised Islands



Standard:

03 Except as provided in Paragraphs 4 and 6 of this Section, raised islands separating traffic flows in the same general direction shall be outlined with white channelizing lines (see Drawing A in Figure 3J-4).

Option:

04 Pavement markings for smaller raised islands may be omitted based on engineering judgment.

Guidance:

05 Smaller raised islands without marked channelizing lines, edge lines, or chevron or diagonal markings should use curb markings (see Section 3J.04).

06 Where traffic passes on the right of a raised island separating traffic flows in the same general direction, a yellow edge line should be used adjacent to raised islands of discernible size or length instead of continuing the white channelizing line from the approach-end treatment (see Drawing B in Figure 3J-4).

Figure 3J-4. Examples of Pavement Markings for Raised Islands (Sheet 1 of 2)

A – White channelizing lines applied to a raised island separating traffic flow in the same general direction

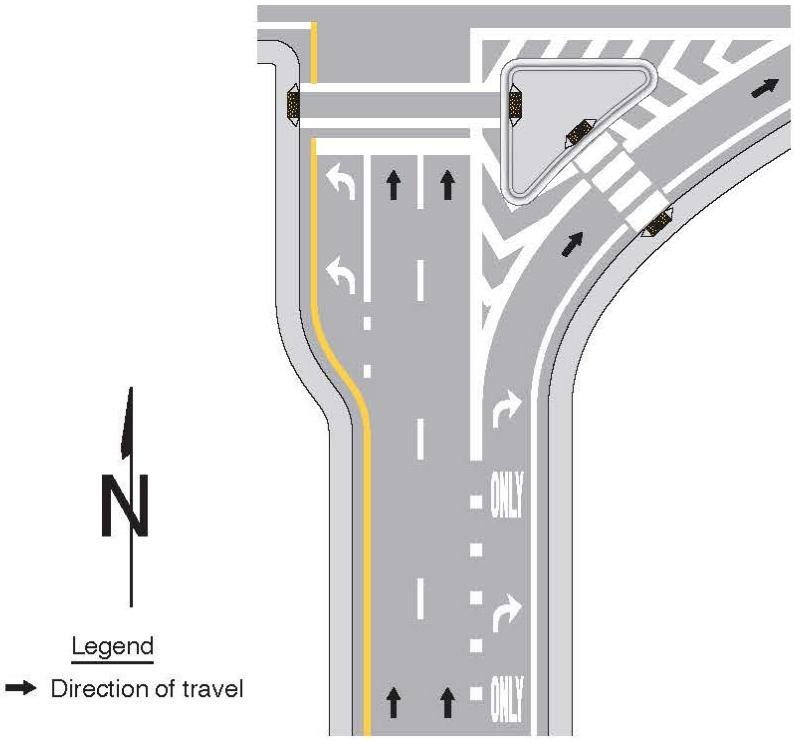
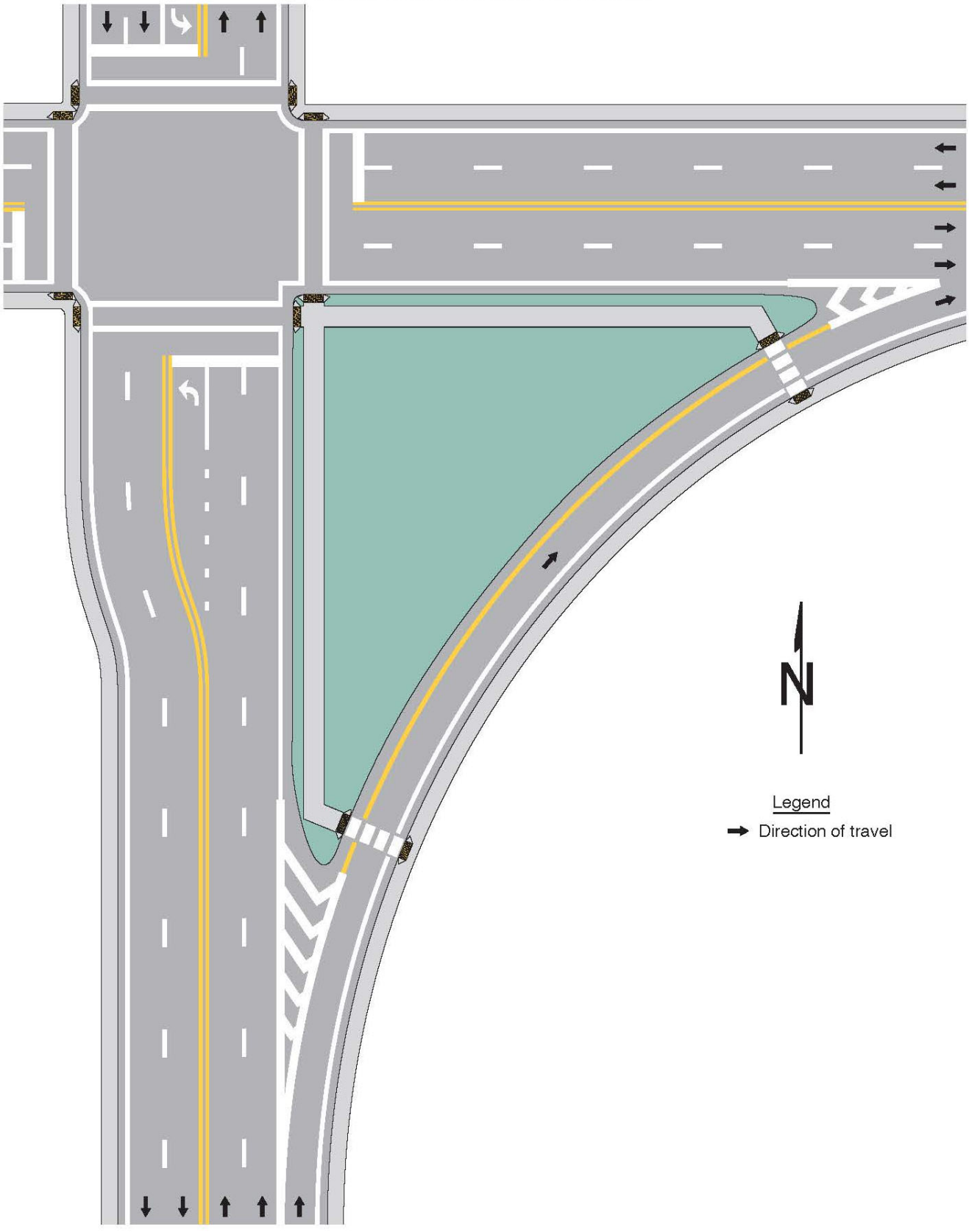


Figure 3J-4. Examples of Pavement Markings for Raised Islands (Sheet 2 of 2)

B – Yellow edge line applied to raised island separating traffic flows in the same general direction



Support:

07 Yellow edge lines adjacent to raised islands that separate traffic flows in the same general direction can be advantageous as a countermeasure for wrong-way entry or travel if the yellow edge line is of discernible length.

Option:

08 Chevron markings may be used in neutral areas formed by diverging channelizing lines at raised islands separating traffic flows in the same general direction.

09 Diagonal markings of an appropriate color may be used in buffer areas between the channelizing line and the raised island (see Figure 3J-5).

Section 3J.06 Island Delineation

Standard:

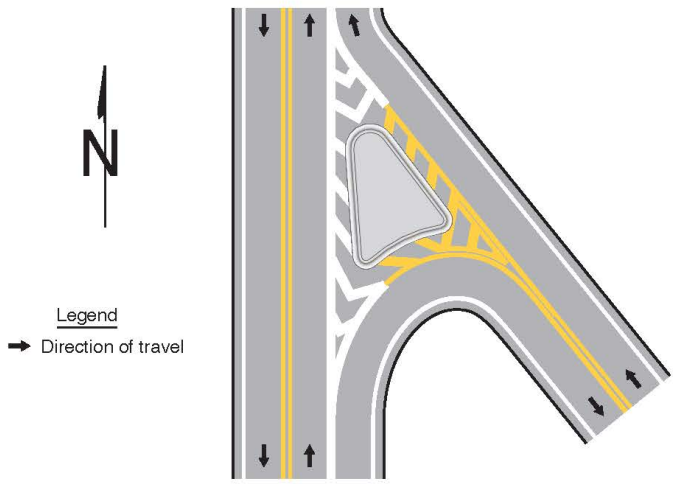
01 Delineators installed on islands shall be the same colors as the related channelizing or edge lines except that, when only facing wrong-way traffic, they shall be red (see Section 3G.03).

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

Option:

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

Figure 3J-5. Example of Optional Chevron and Diagonal Pavement Markings at a Raised Island



Section 3J.07 Sidewalk Extensions Designated by Pavement Markings

Support:

01 Sidewalk extensions reclaim a portion of the roadway, sometimes including a portion of parking lanes, shoulders, and/or the traveled way, and repurpose that area for non-vehicular uses. They extend the sidewalk or other pedestrian space, shorten pedestrian crossing distances, alter the roadway geometry for speed management or channelizing, or serve other purposes.

02 Sidewalk extensions, sometimes referred to as curb extensions, neckdowns, or bulb-outs, typically are created by physical infrastructure including concrete or asphalt to form a physical narrowing of the roadway with the finished surface at the same level as the adjoining sidewalk.

03 Sidewalk extensions can also be designated by pavement markings for temporary or semi-permanent applications in which the finished surface is at the same level as the vehicular travel pavement. Where an adjoining curb and raised sidewalk are present, this type of application results in a multi-level sidewalk due to the difference in elevation between the adjoining pedestrian surfaces.

04 Sidewalk extensions designated by pavement markings differ from other paved areas designated by pavement markings that are intended to be traversable by a vehicle for authorized or emergency purposes.

Standard:

05 Sidewalk extensions designated by pavement markings shall be established using double solid lines connecting to the outside physical curb or, in the absence of a curb, to the edge of the roadway. The color of the double solid line shall comply with the provisions of Section 3A.03.

Support:

06 The paved area between the double solid line forming the sidewalk extension designated by pavement markings and the sidewalk or other roadside area is not part of the roadway. Sidewalk extensions designated by pavement markings formed by double solid lines are distinct from areas such as shoulders or gore areas where travel is discouraged by the presence of a single line, or flush medians where travel is prohibited by a double solid line.

Sidewalk extensions designated by pavement markings with double solid lines designate areas outside the roadway where vehicle traversal is prohibited.

07 Areas formed by a single wide line are sometimes used to alter the roadway geometry for speed management or channelizing, or to serve other purposes, where pedestrians are not expected (see Drawing B in Figure 3J-6). These areas are not considered a sidewalk extension, and provisions to delineate areas where vehicle traversal is discouraged include channelizing lines (see Section 3B.08), edge lines (see Section 3B.09), and diagonal markings (see Section 3B.25).*Guidance:*

08 Channelizing devices such as tubular markers (see Chapter 3I) should be used to provide conspicuity for, and to prevent vehicles from traversing, the area of the sidewalk extension designated by pavement markings. They should be located adjacent to the double solid line outside the traveled way.

Support:

09 When selecting other methods of physical separation, the visual contrast from adjoining pavement and maximum separation distances are considerations so they are visible to pedestrians having limited vision and detectable by pedestrians who travel with a long cane.

10 Sight lines and the visibility of road users within the sidewalk extension area are considerations when selecting methods of physical separation.

11 The swept path of turning design or other prevailing vehicle types is a consideration, especially if a larger vehicle is expected to traverse a portion of the sidewalk extension while turning where pedestrians might be present.

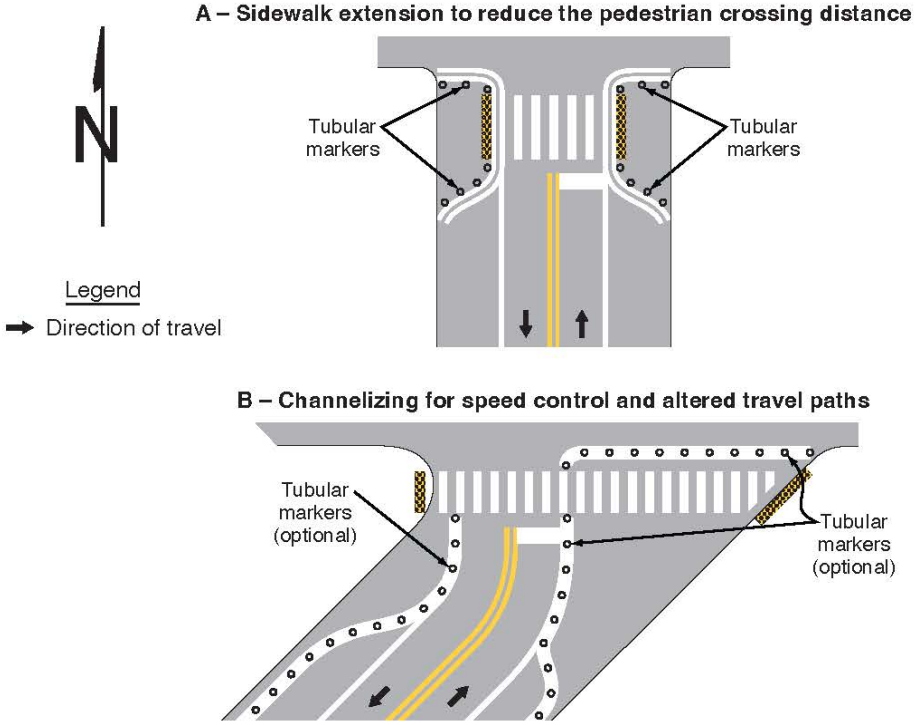
Standard:

12 Crosswalk markings shall not be extended through sidewalk extensions designated by pavement markings.

Support:

13 Accessibility provisions at sidewalk extensions designated by pavement markings are outside the scope of this Manual. State and local organizations providing support services to pedestrians with vision disabilities can provide advice to the traffic engineer on site-specific accessibility decisions. In addition, orientation and mobility specialists or similar staff can provide advice to inform such decisions. The U.S. Access Board (www.access-board.gov) provides technical assistance for making pedestrian facilities accessible to persons with disabilities.

Figure 3J-6. Examples of Sidewalk Extensions Designated by Pavement Markings and Channelization



Guidance:

14 Traffic control devices that are critical to the specific conditions at the sidewalk extension, such as STOP or YIELD signs or Pedestrian Crossing signs, should be located within the sidewalk extension designated by pavement markings. Their lateral offset (see Section 2A.16) should be measured from the center of the double solid line designating a sidewalk extension rather than from the physical curb line behind the sidewalk extension area so that the signs are more visible to approaching traffic and not occluded by any physical features placed within the sidewalk extension area.

Support:

15 The location of accessible pedestrian signals (see Section 4K.02) is a consideration when providing a sidewalk extension designated by pavement markings.

16 Aesthetic surface treatments (see Chapter 3H) are sometimes used in sidewalk extensions designated by pavement markings to emphasize that the area is outside of the traveled way.

Standard:

17 In accordance with the provisions of Section 3H.03, aesthetic surface treatments, if used within a sidewalk extension designated by pavement markings, shall be non-retroreflective.

Support:

18 Figure 3J-6 illustrates an example of a sidewalk extension designated by pavement markings and an example of channelizing.

CHAPTER 3K. RUMBLE STRIP MARKINGS

Section 3K.01 Longitudinal Rumble Strip Markings

Support:

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

02 This Manual contains no provisions regarding the design and placement of longitudinal rumble strips. The provisions in this Manual address the use of markings in combination with a longitudinal rumble strip. Figure 3K-1 illustrates markings used with or near longitudinal rumble strips.

03 Section 6M.06 contains information related to longitudinal rumble strips.

Option:

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

Standard:

05 The color of an edge line or center line associated with a longitudinal rumble stripe shall be in accordance with Section 3A.03.

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

Section 3K.02 Transverse Rumble Strip Markings

Support:

01 Transverse rumble strips consist of intermittent narrow, transverse areas of rough-textured or slightly raised or depressed road surface that extend across the travel lanes to alert drivers to unusual vehicular traffic conditions. Through noise and vibration, they attract the attention of road users to features such as unexpected changes in alignment and conditions requiring a reduction in speed or a stop.

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

03 Section 6M.06 contains information related to transverse rumble strips.

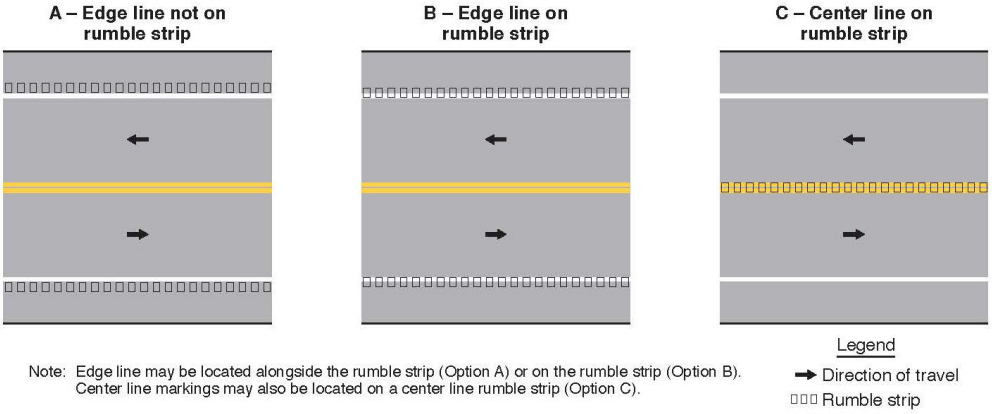
Standard:

04 Except as otherwise provided in Section 6M.06 for TTC zones, if the color of a transverse rumble strip used within a travel lane is not the color of the pavement, the color of the transverse rumble strip shall be either black or white.

Guidance:

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

Figure 3K-1. Examples of Longitudinal Rumble Strip Markings



Note: Edge line may be located alongside the rumble strip (Option A) or on the rumble strip (Option B). Center line markings may also be located on a center line rumble strip (Option C).

PART 6
TEMPORARY TRAFFIC CONTROL

CHAPTER 6A. GENERAL

Section 6A.01 General

Support:

01 Whenever the acronym "TTC" is used in Part 6, it refers to "temporary traffic control."

Standard:

02 The needs and control of all road users (motorists, bicyclists, and pedestrians within the highway, or on a site roadway open to public travel (see definition in Section 1C.02), including persons with disabilities) through a TTC zone shall be an essential part of highway construction, utility work, maintenance operations, and the management of traffic incidents.

Support:

03 When the normal function of the roadway, or a site roadway open to public travel, is suspended, TTC planning provides for continuity of the movement of motor vehicle, bicycle, and pedestrian traffic (including accessible passage); transit operations; and access (and accessibility) to property and utilities.

04 The primary function of TTC is to facilitate movement of road users through or around TTC zones while protecting road users, workers, responders to traffic incidents, and equipment.

05 Of equal importance to the public traveling through the TTC zone is the safety of workers performing the many varied tasks within the work space. TTC zones present constantly changing conditions that are unexpected by the road user. This creates an even higher degree of vulnerability for the workers and incident management responders on or near the roadway (see Section 6C.04). At the same time, the TTC zone provides for the efficient completion of whatever activity interrupted the normal use of the roadway.

06 Consideration for road user safety, worker and responder safety, and the efficiency of road user flow is an integral element of every TTC zone, from planning through completion. A concurrent objective of the TTC is the efficient construction and maintenance of the highway and the efficient resolution of traffic incidents.

07 No one set of TTC devices can satisfy all conditions for a given project or incident. At the same time, defining details that would be adequate to cover all applications is impractical. Instead, Part 6 displays typical applications that depict common applications of TTC devices. The TTC selected for each situation depends on the type of highway, road user conditions, the duration of operation, physical constraints, and the nearness of the work space or incident management activity to road users.

08 The TTC needs on low-volume and special purpose roads will sometimes be minimal, especially for shorter-term durations and for lower-speed roads. The use of maintenance vehicle warning flashers, a limited number of signs, or a single flagger could be adequate for these situations.

09 Improved road user performance might be realized through a well-prepared public relations effort that covers the nature of the work, the time and duration of its execution, the anticipated effects upon road users, and possible alternate routes and modes of travel. Such programs have been found to result in a significant reduction in the number of road users traveling through the TTC zone, which reduces the possible number of conflicts.

10 Operational improvements might be realized by using intelligent transportation systems (ITS) in work zones. The use in work zones of ITS technology, such as portable camera systems, highway advisory radio, variable speed limits, ramp metering, traveler information, merge guidance, warning systems for vehicles exiting the work space, and queue detection information, is aimed at increasing safety for both workers and road users and helping to ensure a more efficient traffic flow. The use in work zones of ITS technologies has been found to be effective in providing traffic monitoring and management, data collection, and traveler information.

Standard:

11 TTC plans and devices shall be the responsibility of the public body or official or the owners of site roadways open to public travel having jurisdiction for guiding road users.

Guidance:

12 There should be adequate statutory authority for the implementation and enforcement of needed road user regulations, parking controls, speed zoning, and the management of traffic incidents. Such statutes should provide sufficient flexibility in the application of TTC to meet the needs of changing conditions in the TTC zone.

Support:

13 The provisions of Part 6 apply to both rural and urban areas. A rural highway is normally characterized by lower volumes, higher speeds, fewer turning conflicts, and less conflict with pedestrians or other vulnerable road users. An urban street is typically characterized by relatively low speeds, wide ranges of road user volumes,

narrower roadway lanes, frequent intersections and driveways, significant vulnerable road user activity, and more businesses and houses.

14 The determination as to whether a particular facility at a particular time of day can be considered to be a high-volume roadway or can be considered to be a low-volume roadway is made by the public agency or official having jurisdiction.

15 Special plans preparation and coordination with transit, other highway agencies, law enforcement and other emergency units, utilities, schools, trucking associations, and railroad companies might be needed to reduce unexpected and unusual road user operation situations.

Section 6A.02 Fundamental Principles of Temporary Traffic Control

Guidance:

01 Road user and worker safety and accessibility in TTC zones should be an integral and high-priority element of every project from planning through design and construction. Similarly, maintenance and utility work should be planned and conducted with the safety and accessibility of all motorists, bicyclists, pedestrians (including those with disabilities), and workers being considered at all times. If the TTC zone includes a grade crossing, early coordination with the railroad company or light rail transit agency should take place.

02 The following are the seven fundamental principles of TTC:

A. General plans or guidelines should be developed to provide safety for motorists, bicyclists, pedestrians, workers, enforcement/emergency officials, and equipment, with the following factors being considered:

1. The basic safety principles governing the design of permanent roadways and roadsides should also govern the design of TTC zones. The goal should be to route road users through such zones using roadway geometrics, roadside features, and TTC devices as nearly as possible comparable to those for normal highway situations.

2. A TTC plan, in detail appropriate to the complexity of the work project or incident, should be prepared and understood by all responsible parties before the site is occupied. Any changes in the TTC plan should be approved by an official who is knowledgeable (for example, trained and/or certified) in proper TTC practices.

B. Road user movement should be inhibited as little as practical, based on the following considerations:

1. TTC at work and incident sites should be designed on the assumption that drivers will only reduce their speeds if they clearly perceive a need to do so (see Section 6B.01).

2. Frequent and abrupt changes in geometrics such as lane narrowing, dropped lanes, or main roadway transitions that require rapid maneuvers, should be avoided.

3. Work should be scheduled in a manner that minimizes the need for lane closures or alternate routes, while still getting the work completed quickly and the lanes or roadway open to traffic as soon as possible.

4. Attempts should be made to reduce the volume of traffic using the roadway or freeway to match the restricted capacity conditions. Road users should be encouraged to use alternative routes. When the roadway capacity is reduced because of lane closures, the demand could exceed the available capacity, which might result in either a lengthy stopped or slow moving queue of vehicles that might extend past the normal location of the signs shown in the typical advance warning area. An assessment of the expected queue length, which should be a part of the TTC plan design process, might result in adjustments to the sign spacing and number of signs as well as the use of more conspicuous devices to increase the distance and conspicuity of the advance warning area. For high-volume roadways and freeways, the closure of selected entrance ramps or other access points and the use of signed diversion routes should be evaluated.

5. Bicyclists and pedestrians, including those with disabilities, should be provided with access and passage through the TTC zone.

6. If work operations permit, lane closures on high-volume streets and highways should be scheduled during off-peak hours. Night work should be considered if the work can be accomplished with a series of short-term operations.

7. Early coordination with officials having jurisdiction over the affected cross streets and providing emergency services should occur if significant impacts to roadway operations are anticipated.

C. Motorists, bicyclists, and pedestrians should be guided in a clear and positive manner while approaching and traversing TTC zones and incident sites. The following principles should be applied:

1. *Adequate warning, delineation, and channelization should be provided to assist in guiding road users in advance of and through the TTC zone or incident site by using proper pavement marking, signing, or other devices that are effective under varying conditions. Information should be provided in usable formats for pedestrians with vision disabilities.*
2. *TTC devices inconsistent with intended travel paths through TTC zones should be removed or covered. However, in intermediate-term stationary, short-term, and mobile operations, where visible permanent devices are inconsistent with intended travel paths, devices that highlight or emphasize the appropriate path should be used. Traffic control devices should provide information in usable formats for pedestrians with vision disabilities.*
3. *Flagging procedures, when used, should provide positive guidance to road users traversing the TTC zone.*

D. *To provide acceptable levels of operations, routine day and night inspections of TTC elements should be performed as follows:*
   1. *Individuals who are knowledgeable (for example, trained and/or certified) in the principles of proper TTC should be assigned responsibility for safety in TTC zones. The most important duty of these individuals is to check that TTC devices on the project are consistent with the TTC plan and are effective for motorists, bicyclists, pedestrians, and workers.*
   2. *As the work progresses, temporary traffic controls and/or working conditions should be modified, as needed, to facilitate road user movement and provide worker safety. The individual responsible for TTC should have the authority to halt work until applicable or remedial safety measures are taken.*
   3. *TTC zones should be carefully monitored under varying conditions of road user volumes, light, and weather to check that applicable TTC devices are effective, clearly visible, clean, and in compliance with the TTC plan.*
   4. *When warranted, an engineering study should be made (in cooperation with law enforcement officials) of reported crashes occurring within the TTC zone. Crash records in TTC zones should be monitored to identify the need for changes in the TTC zone.*

E. *Attention should be given to the maintenance of roadside safety during the life of the TTC zone by applying the following principles:*
   1. *To accommodate run-off-the-road incidents, disabled vehicles, or emergency situations, unencumbered roadside recovery areas or clear zones should be provided where practical.*
   2. *Channelization of road users should be accomplished by the use of pavement markings, signing, and crashworthy, detectable channelizing devices.*
   3. *Work equipment, workers' private vehicles, materials, and debris should be stored in such a manner to reduce the probability of being impacted by run-off-the-road vehicles.*

F. *Each person whose actions affect TTC zone safety, from the upper-level management through the field workers, should receive training appropriate to the job decisions each individual is required to make. Only those individuals who are trained in proper TTC practices and have a basic understanding of the principles (established by applicable standards and guidelines, including those of this Manual) should supervise the selection, placement, and maintenance of TTC devices used for TTC zones and for incident management.*

G. *Good public relations should be maintained by applying the following principles:*
   1. *The needs of all road users should be assessed such that appropriate advance notice is given and clearly defined alternative paths are provided.*
   2. *The cooperation of the various news media should be sought in publicizing the existence of and reasons for TTC zones because news releases can assist in keeping the road users well informed.*
   3. *The needs of abutting property owners, residents, and businesses should be assessed and appropriate accommodations made.*
   4. *The needs of emergency service providers (law enforcement, fire, and medical) should be assessed and appropriate coordination and accommodations made.*
   5. *The needs of railroads and transit should be assessed and appropriate coordination and accommodations made.*
   6. *The needs of operators of commercial vehicles such as buses and large trucks should be assessed and appropriate accommodations made.*
   7. *Early coordination should occur with school officials to discuss potential impacts on picking up and dropping off schoolchildren, on school bus routing, and on safe routes to school patterns.*

Section 6A.03 TTC Devices

Guidance:

01 The design and application of TTC devices used in TTC zones should consider the needs of all road users (motorists, bicyclists, and pedestrians), including those with disabilities.

Standard:

02 Traffic control devices shall be defined as all signs, signals, markings, channelizing devices, or other devices that use colors, shapes, symbols, words, sounds, or tactile information for the primary purpose of communicating a regulatory, warning, or guidance message to road users on a street, highway, pedestrian facility, bikeway, pathway, or site roadway open to public travel.

03 All traffic control devices used for construction, maintenance, utility, or incident management operations on a street, highway, pedestrian facility, bikeway, pathway, or site roadway open to public travel shall comply with the applicable provisions of this Manual.

04 All TTC devices shall be removed as soon as practical when they are no longer needed. When work is suspended for short periods of time, TTC devices that are no longer appropriate shall be removed or covered.

Section 6A.04 Crashworthiness of TTC Devices

Support:

01 Various Sections of the MUTCD require certain traffic control devices, their supports, and/or related appurtenances to be crashworthy (see definition in Section 1C.02). Such MUTCD crashworthiness provisions apply to all streets, highways, and site roadways open to public travel.

Section 6A.05 Night Work

Support:

01 Conducting highway construction and maintenance activities during night hours could provide an advantage when traditional daytime traffic control strategies cannot achieve an acceptable balance between worker and public safety, traffic and community impact, and constructability. The two basic advantages of working at night are reduced traffic congestion and less involvement with business activities. However, the two basic conditions that must normally be met for night work to offer any advantage are reduced traffic volumes and easy set up and removal of the traffic control patterns on a nightly basis.

02 Shifting work activities to night hours, when traffic volumes are lower and normal business is less active, might offer an advantage in some cases, as long as the necessary work can be completed and the worksite restored to essentially normal operating conditions to carry the higher traffic volume during non-construction hours.

03 Although working at night might offer advantages, it also includes safety issues. Reduced visibility inherent in night work impacts the performance of both drivers and workers. Because traffic volumes are lower and congestion is minimized, speeds are often higher at night necessitating greater visibility at a time when visibility is reduced. Finally, the incidence of impaired (alcohol or drugs), fatigued, or drowsy drivers might be higher at night.

04 Working at night also involves other factors, including construction productivity and quality, social impacts, economics, and environmental issues. A decision to perform construction or maintenance activities at night normally involves some consideration of the advantages to be gained compared to the safety and other issues that might be impacted.

05 Section 6N.18 contains specific provisions on TTC for work during nighttime hours.

CHAPTER 6B. TEMPORARY TRAFFIC CONTROL ELEMENTS

Section 6B.01 Temporary Traffic Control Plans

Support:

01 Each TTC zone is different. Many variables, such as location of work, highway type, geometrics, vertical and horizontal alignment, intersections, interchanges, road user volumes, road user mix (motorists, bicyclists, and pedestrians), road vehicle mix (buses, trucks, and cars), and road user speeds affect the needs of each zone. The goal of TTC in work zones is safety with minimum disruption to road users. The key factor in promoting TTC zone safety is proper judgment.

02 A TTC plan describes TTC measures to be used for facilitating road users through a work zone or an incident area. TTC plans play a vital role in facilitating road user flow when a work zone, incident, or other event temporarily disrupts normal road user flow. Important auxiliary provisions that cannot conveniently be specified on project plans can easily be incorporated into Special Provisions within the TTC plan.

03 TTC plans range in scope from being very detailed to simply referencing typical drawings contained in this Manual, standard approved highway agency drawings and manuals, or specific drawings contained in the contract documents. The degree of detail in the TTC plan depends entirely on the nature and complexity of the situation.

04 During TTC activities, commercial vehicles might need to follow a different route from passenger vehicles because of bridge, weight, clearance, or geometric restrictions. Also, vehicles carrying hazardous materials might need to follow a different route from other vehicles. The Hazardous Materials and National Network signs are included in Sections 2B.67 and 2B.68, respectively.

Guidance:

05 A TTC plan should be developed for planned activities that will affect road users. A TTC plan should be developed for unplanned and emergency situations where practicable.

06 The TTC plan should start in the planning phase and continue through the design, construction, and restoration phases. The TTC plans and devices should follow the principles set forth in Part 6. The management of traffic incidents should follow the principles set forth in Chapter 6O.

07 TTC plans should be prepared by persons knowledgeable (for example, trained and/or certified) about the fundamental principles of TTC and work activities to be performed. The design, selection, and placement of TTC devices for a TTC plan should be based on engineering judgment.

08 Coordination should be made between adjacent or overlapping projects to check that duplicate signing is not used and to check compatibility of traffic control between adjacent or overlapping projects.

09 Traffic control planning should be completed for all highway construction, utility work, maintenance operations, and incident management including minor maintenance and utility projects prior to occupying the TTC zone. Planning for all road users should be included in the process.

10 For any planned special event that will have an impact on the traffic on any street or highway, a TTC plan should be developed in conjunction with and be approved by the agency or agencies that have jurisdiction over the affected roadways.

11 Provisions for effective continuity of accessible circulation paths for pedestrians should be incorporated into the TTC plan.

Option:

12 Provisions may be incorporated into the project bid documents that enable contractors to develop an alternate TTC plan.

13 Modifications of TTC plans may be necessary because of changed conditions or a determination of better methods of safely and efficiently handling road users.

Guidance:

14 This alternate or modified plan should have the approval of the responsible highway agency or owner of site roadways open to public travel prior to implementation.

15 Provisions for effective continuity of transit service should be incorporated into the TTC planning process because often public transit buses cannot efficiently be detoured in the same manner as other vehicles (particularly for short-term maintenance projects). Where applicable, the TTC plan should provide for features such as accessible temporary bus stops, pull-outs, and satisfactory waiting areas for transit patrons, including persons with disabilities (see Section 8A.13 for additional light rail transit issues to consider for TTC).

16 Provisions for effective continuity of railroad service and acceptable access to abutting property owners and businesses should also be incorporated into the TTC planning process.

17 Reduced speed zoning (lowering the regulatory speed limit) should be avoided as much as practical because drivers will reduce their speeds only if they clearly perceive a need to do so.

18 If reduced speed limits are used, they should be used only in the specific portion of the TTC zone where conditions or restrictive features are present. However, frequent changes in the speed limit should be avoided. A TTC plan should be designed so that vehicles can travel through the TTC zone with a speed limit reduction of no more than 10 mph.

19 A reduction of more than 10 mph in the speed limit should be used only when required by restrictive features in the TTC zone. Where restrictive features justify a speed reduction of more than 10 mph, additional driver notification should be provided. The speed limit should be stepped down in advance of the location requiring the lowest speed, and additional TTC warning devices should be used.

Support:

20 Research has demonstrated that large reductions in the speed limit, such as a 30 mph reduction, increase speed variance and the potential for crashes. Smaller reductions in the speed limit of up to 10 mph cause smaller changes in speed variance and lessen the potential for increased crashes. A reduction in the regulatory speed limit of only up to 10 mph from the normal speed limit has been shown to be more effective.

21 Chapter 6P contains typical applications (TAs) of TTC zones that are organized according to duration, location, type of work, and highway type. Table 6P-1 is an index of these typical applications. These typical applications include the use of various TTC methods, but do not include a layout for every conceivable work situation.

22 Decisions regarding the selection of the most appropriate typical application to use as a guide for a specific TTC zone require an understanding of each situation. Although there are many ways of categorizing TTC zone applications, the typical applications illustrated in Chapter 6P are characterized by work duration, work location, work type, and highway type.

Guidance:

23 Typical applications should be altered, when necessary, to fit the conditions of a particular TTC zone.

Option:

24 Other devices may be added to supplement the devices shown in the typical applications. The sign spacings and taper lengths may be increased to provide additional time or space for driver response.

25 Devices labeled as optional in the typical applications may be deleted.

Support:

26 Formulating specific plans for TTC at traffic incidents is difficult because of the variety of situations that can arise.

27 Well-designed TTC plans for planned special events will likely be developed from a combination of treatments from several of the typical applications.

Section 6B.02 Temporary Traffic Control Zones

Support:

01 A TTC zone is an area of a highway where road user conditions are changed because of a work zone, an incident zone, or a planned special event through the use of TTC devices, uniformed law enforcement officers, or other authorized personnel.

02 A work zone is an area of a highway with construction, maintenance, or utility work activities. A work zone is typically marked by signs, channelizing devices, barriers, pavement markings, and/or work vehicles. It extends from the first warning sign or high-intensity rotating, flashing, oscillating, or strobe lights on a vehicle to the END ROAD WORK sign or the last TTC device.

Wisconsin State Statute 340.01(22e) “Highway maintenance or construction area" means the entire section of roadway between the first advance warning sign of highway maintenance or construction work and an “END ROAD WORK" or “END CONSTRUCTION" sign or, in the case of a moving vehicle engaged in the maintenance or construction work, that section of roadway where traffic may return to its normal flow without impeding such work.

03 An incident zone is an area of a highway where temporary traffic controls are imposed by authorized officials in response to a traffic incident (see Section 6O.01). It extends from the first warning device (such as a sign,

light, or cone) to the last TTC device or to a point where road users return to the original lane alignment and are clear of the incident.

04 A planned special event often creates the need to establish altered traffic patterns to handle the increased traffic volumes generated by the event. The size of the TTC zone associated with a planned special event can be small, such as closing a street for a festival, or can extend throughout a municipality for larger events. The duration of the TTC zone is determined by the duration of the planned special event.

Section 6B.03 Components of Temporary Traffic Control Zones

Support:

01 A TTC zone is often divided into four areas as needed, based on engineering judgment: the advance warning area, the transition area, the activity area, and the termination area. Figure 6B-1 illustrates the four areas typically included in a TTC zone. These four areas are described in Sections 6B.04 through 6B.07.

Section 6B.04 Advance Warning Area

Support:

01 The advance warning area is the section of highway where road users are informed about the upcoming transition and activity areas or incident area.

Option:

02 The advance warning area may vary from a single sign or high-intensity rotating, flashing, oscillating, or strobe lights on a vehicle to a series of signs in advance of the TTC zone activity area.

Guidance:

03 Typical distances for placement of advance warning signs on freeways and expressways should be longer because drivers are conditioned to uninterrupted flow. Therefore, the advance warning sign placement should extend on these facilities as far as ½ mile or more.

04 On urban streets, the effective placement of the nearest warning sign to the TTC zone, in feet, should range from 4 to 8 times the speed limit in mph, with the high end of the range being used when speeds are relatively high. When two or more advance warning signs are used on higher-speed streets, such as major arterials, the advance warning area should extend a greater distance (see Table 6B-1).

Option:

05 When a single advance warning sign is used (in cases such as low-speed residential streets), the advance warning area may be as short as 100 feet.

Guidance:

06 Since rural highways are normally characterized by higher speeds, the effective placement of the first warning sign in feet should be substantially longer—from 8 to 12 times the speed limit in mph. Since two or more advance warning signs are normally used for these conditions, the advance warning area should extend 1,500 feet or more for open highway conditions (see Table 6B-1).

07 The distances contained in Table 6B-1 are approximate, are intended for guidance purposes only, and should be applied with engineering judgment. These distances should be adjusted for field conditions, if necessary, by increasing or decreasing the recommended distances.

Support:

08 The need to provide additional reaction time for a condition is one example of justification for increasing the sign spacing. Conversely, decreasing the sign spacing might be justified in order to place a sign immediately downstream of an intersection or major driveway such that traffic turning onto the roadway in the direction of the TTC zone will be warned of the upcoming condition.

Option:

09 Advance warning may be eliminated when the activity area is sufficiently removed from the road users' path so that it does not interfere with the normal flow.

Section 6B.05 Transition Area

Support:

01 The transition area is that section of highway where road users are redirected out of their normal path. Transition areas usually involve strategic use of tapers, which because of their importance are discussed separately in detail.

Standard:

02 Except for mobile operations, when redirection of the road users' normal path is required, road users shall be directed from the normal path to a new path with appropriate channelizing devices, traffic control devices, and/or TTC methods.

Option:

03 Because it is impracticable in mobile operations to redirect the road users' normal path with stationary channelization, more dominant vehicle-mounted traffic control devices, such as arrow boards, portable changeable message signs, and high-intensity rotating, flashing, oscillating, or strobe lights, may be used instead of channelizing devices to establish a transition area.

Figure 6B-1. Component Parts of a Temporary Traffic Control Zone

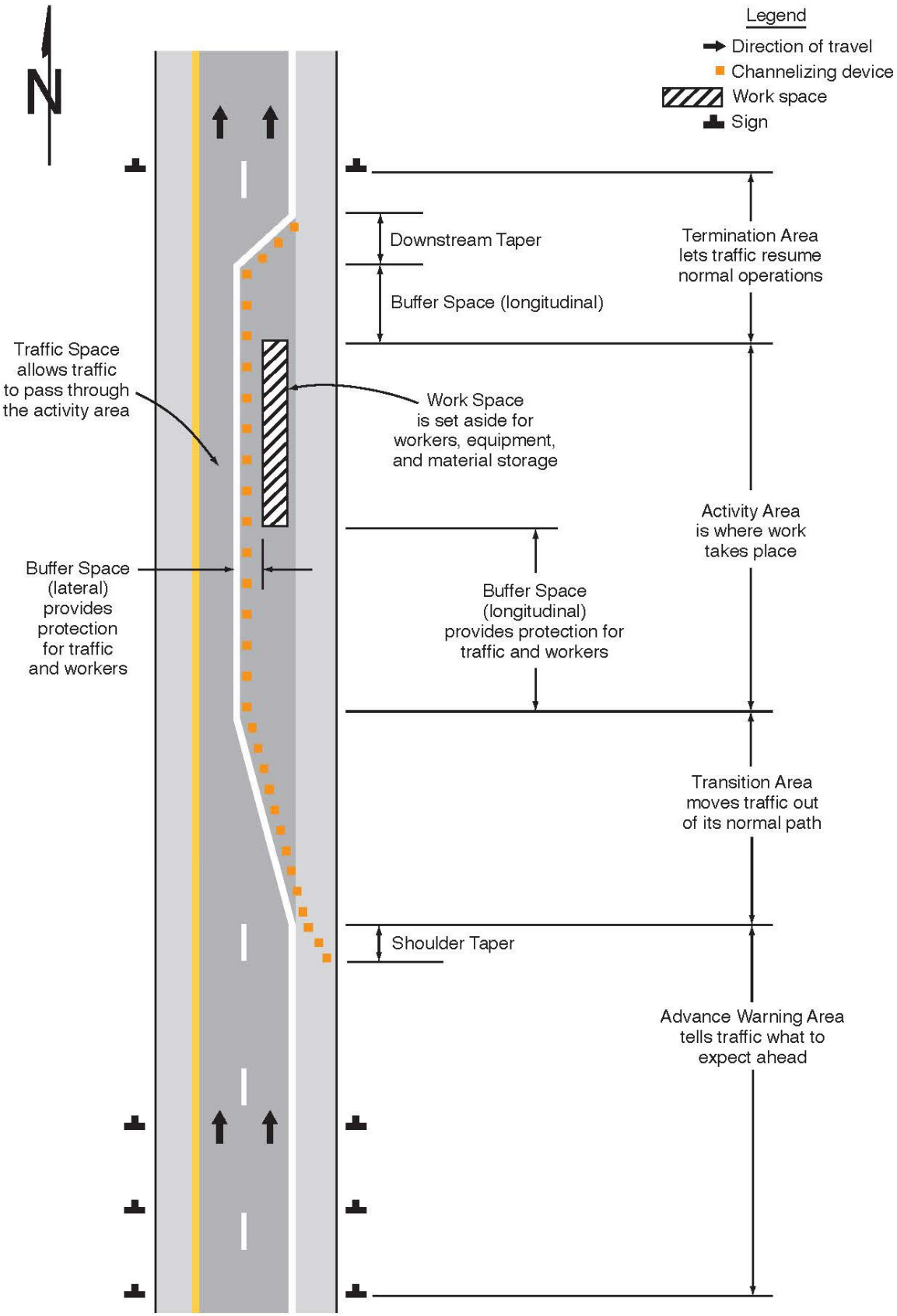


Table 6B-1. Recommended Advance Warning Sign Minimum Spacing

Road Type	Distance between Signs**		
	A	B	C
Urban (low speed)*	100 feet	100 feet	100 feet
Urban (high speed)*	350 feet	350 feet	350 feet
Rural	500 feet	500 feet	500 feet
Expressway / Freeway	1,000 feet	1,500 feet	2,640 feet

* Speed category to be determined by the highway agency or owner of site roadways open to public travel.

** The column headings A, B, and C are the dimensions shown in Figures 6P-1 through 6P-54. The A dimension is the distance from the transition or point of restriction to the first sign. The B dimension is the distance between the first and second signs. The C dimension is the distance between the second and third signs. (The "first sign" is the sign in a three-sign series that is closest to the TTC zone. The "third sign" is the sign that is furthest upstream from the TTC zone.)

Section 6B.06 Activity Area

Support:

01 The activity area is the section of the highway where the work activity takes place. It is comprised of the work space, the traffic space, and the buffer space.

02 The work space is that portion of the highway closed to road users and set aside for workers, equipment, and material, and a shadow vehicle if one is used upstream. Work spaces are usually delineated for road users by channelizing devices or, to exclude vehicles and pedestrians, by temporary barriers.

Option:

03 The work space may be stationary or may move as work progresses.

Guidance:

04 Since there might be several work spaces (some even separated by several miles) within the project limits, each work space should be adequately signed to inform road users and reduce confusion.

Support:

05 The traffic space is the portion of the highway in which road users are routed through the activity area.

06 The buffer space is a lateral and/or longitudinal area that separates road user flow from the work space or an unsafe area, and might provide some recovery space for an errant vehicle.

Guidance:

07 Neither work activity nor storage of equipment, vehicles, or material should occur within a buffer space.

Option:

08 Buffer spaces may be positioned either longitudinally or laterally with respect to the direction of road user flow. The activity area may contain one or more lateral or longitudinal buffer spaces.

09 A longitudinal buffer space may be placed in advance of a work space.

10 The longitudinal buffer space may also be used to separate opposing road user flows that use portions of the same traffic lane, as shown in Figure 6B-2.

11 If a longitudinal buffer space is used, the values shown in Table 6B-2 may be used to determine the length of the longitudinal buffer space.

Support:

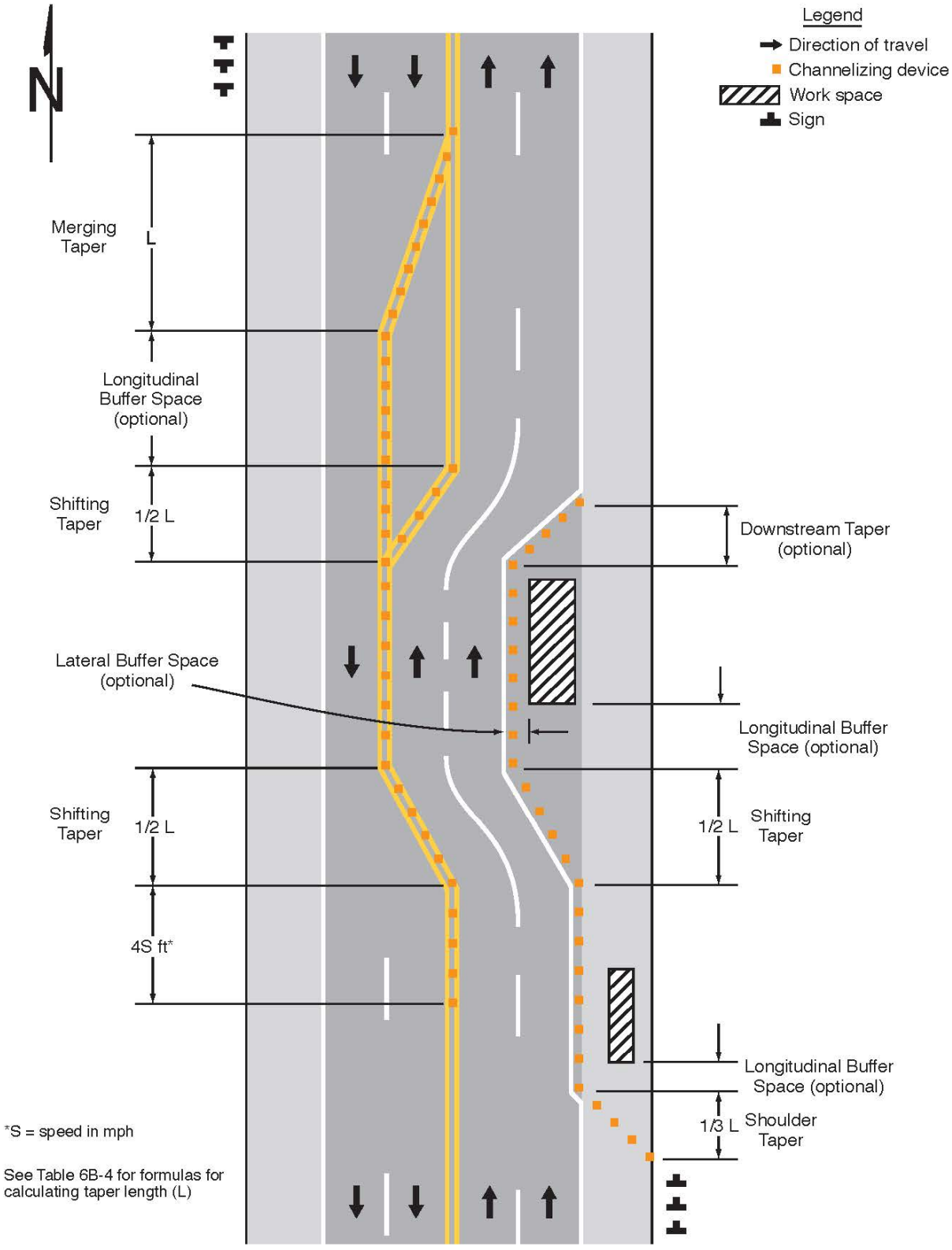
12 Typically, the buffer space is formed as a traffic island and defined by channelizing devices.

13 When a shadow vehicle, arrow board, or changeable message sign is placed in a closed lane in advance of a work space, only the area upstream of the vehicle, arrow board, or changeable message sign constitutes the buffer space.

Option:

14 The lateral buffer space may be used to separate the traffic space from the work space, as shown in Figures 6B-1 and 6B-2, or such areas as excavations or pavement-edge drop-offs. A lateral buffer space also may be used between two travel lanes, especially those carrying opposing flows.

Figure 6B-2. Types of Tapers and Buffer Spaces



Guidance:

15 The width of a lateral buffer space should be determined by engineering judgment.

Option:

16 When work occurs on a high-volume, highly-congested facility, a vehicle storage or staging space may be provided for incident response and emergency vehicles (for example, tow trucks and fire apparatus) so that these vehicles can respond quickly to road user incidents.

Table 6B-2. Stopping Sight Distance as a Function of Speed

Speed*	Distance
20 mph	115 feet
25 mph	155 feet
30 mph	200 feet
35 mph	250 feet
40 mph	305 feet
45 mph	360 feet
50 mph	425 feet
55 mph	495 feet
60 mph	570 feet
65 mph	645 feet
70 mph	730 feet
75 mph	820 feet

* Posted speed, off-peak 85th-percentile speed prior to work starting, or the anticipated operating speed

Section 6B.07 Termination Area

Support:

01 The termination area is the section of the highway where road users are returned to their normal driving path. The termination area extends from the downstream end of the work area to the last TTC device such as END ROAD WORK signs, if posted.

Option:

02 An END ROAD WORK sign, a Speed Limit sign, or other signs may be used to inform road users that they can resume normal operations.

03 A longitudinal buffer space may be used between the work space and the beginning of the downstream taper.

Section 6B.08 Tapers

Option:

01 Tapers may be used in both the transition and termination areas. Whenever tapers are to be used in close proximity to an interchange ramp, crossroads, curves, or other influencing factors, the length of the tapers may be adjusted.

Table 6B-3. Taper Length Criteria for Temporary Traffic Control Zones

Type of Taper	Taper Length
Merging Taper	at least L
Shifting Taper	at least 0.5 L
Shoulder Taper	at least 0.33 L
One-Lane, Two-Way Traffic Taper	50 feet minimum, 100 feet maximum
Downstream Taper	50 feet minimum, 100 feet maximum

Note: Use Table 6B-4 to calculate L

Support:

02 Tapers are created by using a series of channelizing devices and/or pavement markings to move traffic out of or into the normal path. Types of tapers are shown in Figure 6B-2.

03 Longer tapers are not necessarily better than shorter tapers (particularly in urban areas with characteristics such as short block lengths or driveways) because extended tapers tend to encourage sluggish operation and to encourage drivers to delay lane changes unnecessarily. The test concerning adequate lengths of tapers involves observation of driver performance after TTC plans are put into effect.

Guidance:

04 The appropriate taper length (L) should be determined using the criteria shown in Tables 6B-3 and 6B-4.

Table 6B-4. Formulas for Determining Taper Length

Speed (S)	Taper Length (L) in feet
40 mph or less	$L = \frac{WS^2}{60}$
45 mph or more	$L = WS$

Where: L = taper length in feet
W = width of offset in feet
S = posted speed limit, or off-peak 85th-percentile speed prior to work starting, or the anticipated operating speed in mph

Support:

05 A merging taper requires the longest distance because drivers are required to merge into common road space.

Guidance:

06 A merging taper should be long enough to enable merging drivers to have adequate advance warning and sufficient length to adjust their speeds and merge into an adjacent lane before the downstream end of the transition.

Support:

07 A shifting taper is used when a lateral shift is needed. When more space is available, a longer than minimum taper distance can be beneficial. Changes in alignment can also be accomplished by using horizontal curves designed for normal highway speeds.

Guidance:

08 A shifting taper should have a length of approximately ½ L (see Tables 6B-3 and 6B-4).

Support:

09 A shoulder taper might be beneficial on a high-speed roadway where shoulders are part of the activity area and are closed, or when improved shoulders might be mistaken as a driving lane. In these instances, the same type, but abbreviated, closure procedures used on a normal portion of the roadway can be used.

Guidance:

10 If used, shoulder tapers should have a length of approximately ⅓ L (see Tables 6B-3 and 6B-4). If a shoulder is used as a travel lane, either through practice or during a TTC activity, a normal merging or shifting taper should be used.

Support:

11 A downstream taper might be useful in termination areas to provide a visual cue to the driver that access is available back into the original lane or path that was closed.

Guidance:

12 If used, a downstream taper should have a minimum length of 50 feet and a maximum length of 100 feet with devices placed at a spacing of approximately 20 feet.

Support:

13 The one-lane, two-way taper is used in advance of an activity area that occupies part of a two-way roadway in such a manner that a portion of the road is used alternately by traffic in each direction.

Guidance:

14 A taper having a minimum length of 50 feet and a maximum length of 100 feet with channelizing devices at approximately 20-foot spacing should be used to guide traffic into the one-lane section, and a downstream taper should be used to guide traffic back into their original lane.

Support:

15 An example of a one-lane, two-way traffic taper is shown in Figure 6B-3.

Section 6B.09 Detours and Diversions

Support:

01 A detour is a temporary rerouting of road users onto an existing highway in order to avoid a TTC zone.

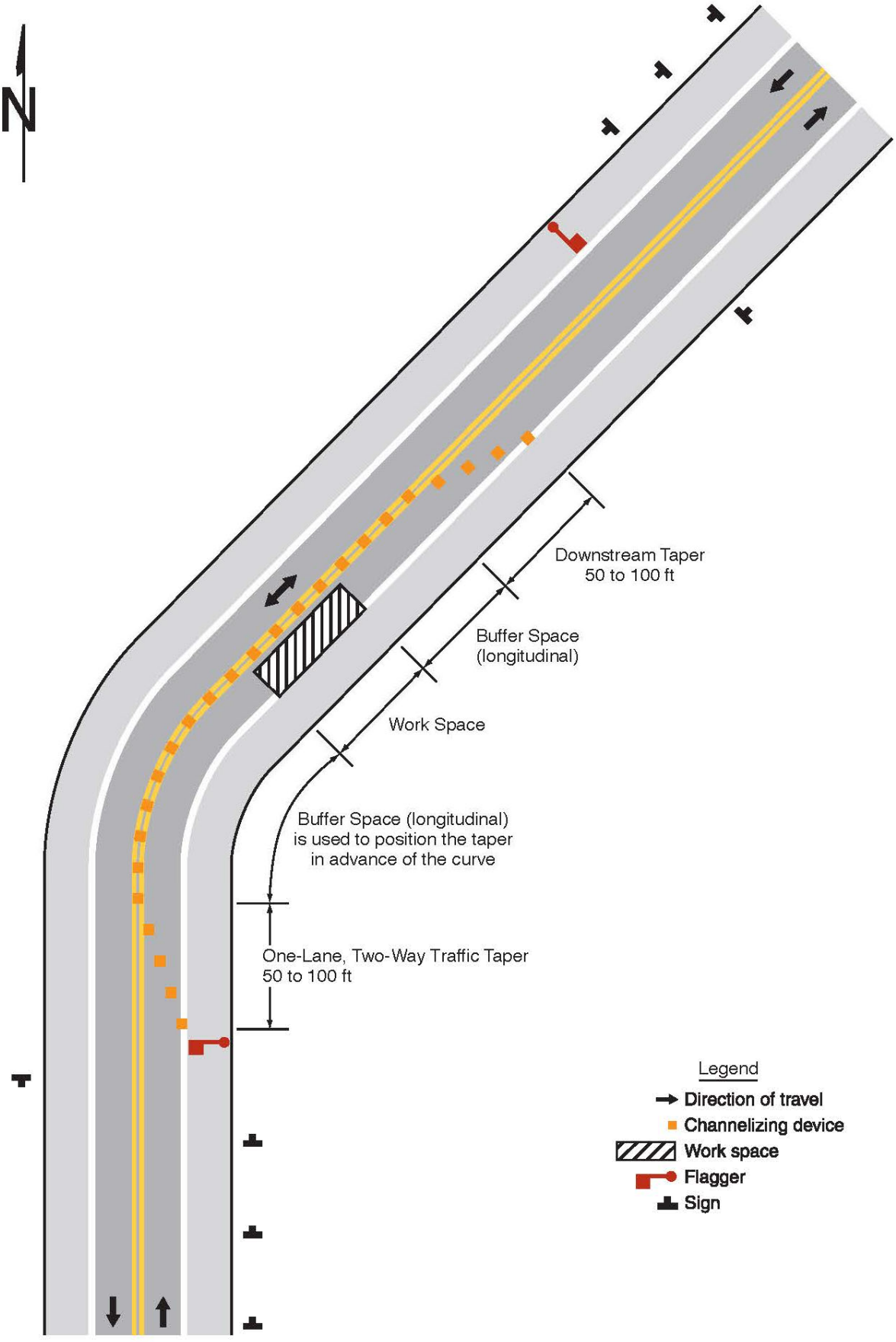
Guidance:

02 Detours should be clearly signed over their entire length so that road users can easily use existing highways to return to the original highway.

Support:

03 A diversion is a temporary rerouting of road users onto a temporary highway or alignment placed around the work area.

Figure 6B-3. Example of a One-Lane, Two-Way Traffic Taper



CHAPTER 6C. PEDESTRIAN AND WORKER SAFETY

Section 6C.01 Pedestrian and Worker Safety – General

Standard:

01 The various TTC provisions for pedestrian and worker safety set forth in Part 6 shall be applied by knowledgeable (for example, trained and/or certified) persons after appropriate evaluation and engineering judgment.

Section 6C.02 Pedestrian Considerations

Support:

01 A wide range of pedestrians might be affected by TTC zones, including the young, elderly, and people with disabilities such as hearing, vision, or mobility. Pedestrians need a clearly delineated and usable travel path. Considerations for pedestrians with disabilities are addressed in Section 6C.03.

Guidance:

02 Prior to closing a sidewalk or other pedestrian facility, the maintaining agency should advise users of the future closure.

Standard:

03 If the TTC zone affects the movement of pedestrians, adequate pedestrian access and walkways shall be provided.

Option:

04 If establishing or maintaining an alternate pedestrian route is not feasible during the project, an alternate means of providing for pedestrians may be used, such as adding free bus service around the project or assigning someone the responsibility to assist pedestrians with disabilities through the project limits.

05 If an existing pedestrian route is impacted by a short duration or a short-term stationary work zone that is attended with project personnel, establishing an alternate pedestrian route may not be necessary if the work can be stopped and pedestrians can navigate the work zone. Pedestrians may be delayed for a short period of time for project personnel to move equipment and material to facilitate passage. Work zone personnel may also provide assistance to pedestrians as necessary**.**

Support:

06 Pedestrians are reluctant to retrace their steps to a prior intersection for a crossing or to add distance or out-of-the-way travel to a destination.

Guidance:

07 The following three items should be considered when planning for pedestrians in TTC zones:

A. Pedestrians should not be led into conflicts with vehicles, equipment, and operations.
B. Pedestrians should not be led into conflicts with vehicles moving through or around the worksite.
C. Pedestrians should be provided with a convenient and accessible path that replicates as nearly as practical the most desirable characteristics of the existing sidewalk(s) or footpath(s).

08 A pedestrian route should not be severed and/or moved for non-construction activities such as parking for vehicles and equipment.

09 TTC zones should be designed to minimize conflicts between vehicular and pedestrian movements. Consideration should be made to separate pedestrian movements from both worksite activity and vehicular traffic. Unless an acceptable route that does not involve crossing the roadway can be provided, pedestrians should be appropriately directed with advance signing that encourages them to cross to the opposite side of the roadway. In urban and suburban areas with high vehicular traffic volumes, these signs should be placed at intersections (rather than midblock locations) so that pedestrians are not confronted with midblock worksites that will induce them to attempt skirting the worksite or making a midblock crossing.

Support:

10 Figures 6P-28 and 6P-29 show typical TTC device usage and techniques for pedestrian movement through work zones.

Guidance:

11 To accommodate the needs of pedestrians, including those with disabilities, the following considerations should be addressed when temporary pedestrian pathways in TTC zones are designed or modified:

A. *Provisions for continuity of accessible paths for pedestrians should be incorporated into the TTC plan.*
B. *Access to transit stops should be maintained.*
C. *A smooth, continuous hard surface should be provided throughout the entire length of the temporary pedestrian facility. There should be no curbs or abrupt changes in grade or terrain that could cause tripping or be a barrier to pedestrians with disabilities. The geometry and alignment of the facility should meet the applicable requirements of the "U.S. Department of Justice 2010 ADA Standards for Accessible Design, September 15, 2010, 28 CFR 35 and 36, Americans with Disabilities Act of 1990."*
D. *The width of the existing pedestrian facility should be provided for the temporary facility if practical. Traffic control devices and other construction materials and features should not intrude into the usable width of the sidewalk, temporary pathway, or other pedestrian facility. When it is not possible to maintain a minimum width of 60 inches throughout the entire length of the pedestrian pathway, a 60 x 60-inch passing space should be provided at least every 200 feet to allow individuals in wheelchairs to pass.*
E. *Blocked routes, alternate crossings, and sign and signal information should be communicated to pedestrians with vision disabilities by providing devices such as audible information devices or barriers and channelizing devices that are detectable to the pedestrians traveling with the aid of a long cane or who have vision disabilities.*
F. *When channelization is used to delineate a pedestrian pathway, a continuous detectable edging should be provided throughout the length of the facility such that pedestrians using a long cane can follow it. These detectable edgings should comply with the provisions of Section 6M.04.*
G. *Signs and other devices mounted lower than 7 feet above the temporary pedestrian pathway should not project more than 4 inches into accessible pedestrian facilities.*

Support:

12 Where pedestrians in TTC zones are routed on temporary pedestrian pathways, providing information in non-visual formats (such as accessible pedestrian signals with audible tones and/or speech messages, and vibrotactile surfaces) aids pedestrians with vision disabilities so they can navigate the temporary pathway. Section 6C.03 contains additional information on accessibility considerations in TTC zones. Section 4K.01 contains information on accessible pedestrian signals.

Option:

13 Whenever it is feasible, the worksite may be closed off from pedestrian intrusion if doing so is determined to be preferable to channelizing pedestrians along the site with TTC devices.

Guidance:

14 Fencing should not create sight distance restrictions for road users. Fences should not be constructed of materials that would be hazardous if impacted by vehicles. Wooden railing, fencing, and similar systems placed immediately adjacent to motor vehicle traffic should not be used as substitutes for crashworthy temporary traffic barriers.

15 Ballast for TTC devices should be kept to the minimum amount needed and should be mounted low to prevent penetration of the vehicle windshield.

16 Movement by work vehicles and equipment across designated pedestrian paths should be minimized and, when necessary, should be controlled by flaggers or other TTC. Staging or stopping of work vehicles or equipment along the side of pedestrian paths should be avoided, since it encourages movement of workers, equipment, and materials across the pedestrian path.

17 Access to the work space by workers and equipment across pedestrian walkways should be minimized because the access often creates unacceptable changes in grade, and rough or muddy terrain, and pedestrians will tend to avoid these areas by attempting non-intersection crossings where no curb ramps are available.

Option:

18 A canopied walkway may be used to protect pedestrians from falling debris, and to provide a covered passage for pedestrians.

Guidance:

19 Covered walkways should be sturdily constructed and adequately lighted for nighttime use.

20 When pedestrian and vehicle paths are rerouted to a closer proximity to each other, consideration should be given to separating them by a temporary traffic barrier.

21 If a temporary traffic barrier is used to shield pedestrians, it should be designed to accommodate site conditions.

Support:

22 Depending on the possible vehicular speed and angle of impact, temporary traffic barriers might deflect upon impact by an errant vehicle. Guidance for locating and designing temporary traffic barriers can be found in Chapter 9 of the "Roadside Design Guide," 4th Edition, 2011, AASHTO.

Additional guidance for locating and designing temporary traffic barriers can be found in the Wisconsin Facilities Development Manual Chapter 11-50-31 and Chapter 11-50-35.

Standard:

23 Normal vertical curbing shall not be used as a substitute for temporary traffic barriers when temporary traffic barriers are needed.

Option:

24 Temporary traffic barriers or longitudinal channelizing devices may be used to discourage pedestrians from unauthorized movements into the work space. They may also be used to inhibit conflicts with vehicular traffic by minimizing the possibility of midblock crossings.

Support:

25 A major concern for pedestrians is building construction encroaching onto the contiguous sidewalks, which forces pedestrians off the curb into direct conflict with moving vehicles.

Guidance:

26 If a significant potential exists for vehicle incursions into the pedestrian path, pedestrians should be rerouted or temporary traffic barriers should be installed.

Support:

27 TTC devices, temporary traffic barriers, and wood or chain link fencing with a continuous detectable edging can satisfactorily delineate a pedestrian path.

Guidance:

28 Tape, rope, or plastic chain strung between devices should not be used as a control for pedestrian movements because they are not detectable and are therefore not accessible to and usable by individuals with disabilities.

29 In general, pedestrian routes should be preserved in urban and commercial suburban areas. Alternative routing should be discouraged.

30 The highway agency in charge of the TTC zone should regularly inspect the activity area so that effective pedestrian TTC is maintained.

Section 6C.03 Accessibility Considerations

Support:

01 Additional information on the design and construction of accessible temporary facilities is found in the "Guidelines for Accessible Pedestrian Signals (NCHRP Web-Only Document 117B)," 2008 Edition

(TRB) and the U.S. Department of Justice 2010 ADA Standards for Accessible Design, September 15, 2010, 28 CFR 35 and 36, Americans with Disabilities Act of 1990.

02 Where pedestrians are detoured to a temporary traffic control signal, an accessible pedestrian signal (see Chapter 4K) provides information in non-visual formats (such as audible tones and/or speech messages, and vibrating surfaces) so that a pedestrian with vision disabilities can know when to cross the street along the alternate route.

Guidance:

03 Adequate provisions should be made for pedestrians with disabilities. The extent of needs for such provisions should be determined through engineering judgment or by the individual responsible for each TTC zone situation.

Standard:

04 When existing pedestrian facilities are disrupted, closed, or relocated in a TTC zone, the temporary facilities shall be detectable and include accessibility features consistent with the features present in the existing pedestrian facility. A barrier that is detectable by a person with a vision disability traveling with the aid of a long cane shall be placed across the full width of the closed pedestrian facility.

Support:

05 Maintaining a detectable, channelized pedestrian route is much more useful to pedestrians with vision disabilities than closing a walkway and providing audible directions to an alternate route involving additional crossings and a return to the original route. Braille is not useful in conveying such information because it is difficult to find. Audible instructions might be provided, but the extra distance and additional street crossings might add complexity to a trip.

Guidance:

06 Because printed signs and surface delineation are not usable by pedestrians with vision disabilities, blocked routes, alternate crossings, and sign and signal information should be communicated to pedestrians with vision disabilities by providing audible information devices, tactile and/or vibrating surface devices, and barriers and channelizing devices that are detectable to pedestrians traveling with the aid of a long cane or who have vision disabilities.

Support:

07 The most desirable way to provide information to pedestrians with vision disabilities that is equivalent to visual signing for notification of sidewalk closures is a speech message provided by an audible information device. Devices that provide speech messages in response to passive pedestrian actuation are the most desirable. Other devices that continuously emit a message, or that emit a message in response to use of a pushbutton, are also acceptable. Audible information devices might not be needed if detectable channelizing devices make an alternate route of travel evident to pedestrians with vision disabilities.

Guidance:

08 If a pushbutton is used to provide equivalent TTC information to pedestrians with vision disabilities, the pushbutton should be equipped with a locator tone to notify pedestrians with vision disabilities that a special accommodation is available, and to help them locate the pushbutton.

Section 6C.04 Worker Safety Considerations

Support:

01 Equally as important as the safety of road users traveling through the TTC zone is the safety of workers. TTC zones present temporary and constantly changing conditions that are unexpected by road users. This creates an even higher degree of vulnerability for workers on or near the roadway.

02 Maintaining TTC zones with road user flow inhibited as little as possible, and using TTC devices that get the road users' attention and provide positive direction are of particular importance. Likewise, equipment and vehicles moving within the activity area create a risk to workers on foot. When possible, the separation of moving equipment and construction vehicles from workers on foot provides the operators of these vehicles with a greater separation clearance and improved sight lines to minimize exposure to the hazards of moving vehicles and equipment.

Guidance:

03 The following are the key elements of worker safety and TTC management that should be considered to improve worker safety:

A. *Training—all workers should be trained on how to work next to motor vehicle traffic in ways that minimize their vulnerability. Workers having specific TTC responsibilities should be trained in TTC techniques, device usage, and placement.*
B. *Temporary Traffic Barriers—temporary traffic barriers should be placed along the work space depending on factors such as lateral clearance of workers from adjacent traffic, speed of traffic, duration and type of operations, time of day, and volume of traffic.*
C. *Speed Management—reducing the speed of vehicular traffic, mainly through regulatory speed zoning, funneling, lane reduction, and/or the use of speed safety cameras, uniformed law enforcement officers or flaggers should be considered.*

D. *Activity Area—operations entering and departing the work space, and within the work space, should be planned to minimize backing maneuvers by construction vehicles and equipment to minimize the risk of run-over and back-over crashes.*
E. *Worker Safety Planning—a trained person designated by the employer should conduct a basic hazard assessment for the worksite and job classifications required in the activity area. This safety professional should determine whether engineering, administrative, or personal protection measures should be implemented. This plan should be in accordance with the Occupational Safety and Health Act of 1970, as amended, "General Duty Clause" Section 5(a)(1) - Public Law 91-596, 84 Stat. 1590, December 29, 1970, as amended, and with the requirement to assess worker risk exposures for each job site and job classification, as per 29 CFR 1926.20 (b)(2) of "Occupational Safety and Health Administration Regulations, General Safety and Health Provisions."*

Option:

04 The following are additional elements of TTC management that may be considered to improve worker safety:

A. Shadow Vehicle—in the case of mobile and constantly moving operations, such as pothole patching and striping operations, a shadow vehicle, equipped with appropriate lights and warning signs, may be used to protect the workers from impacts by errant vehicles. The shadow vehicle may be equipped with a rear-mounted impact attenuator.
B. Road Closure—if alternate routes are available to handle road users, the road may be closed temporarily to facilitate project completion and thus further reduce worker vulnerability.
C. Law Enforcement Use—in highly vulnerable work situations, particularly those of relatively short-duration, law enforcement units may be stationed to heighten the awareness of passing vehicular traffic and to improve safety through the TTC zone.
D. Lighting—for nighttime work, the TTC zone and approaches may be lighted.
E. Special Devices—these include rumble strips, changeable message signs, hazard identification beacons, flags, and warning lights. Intrusion warning devices may be used to alert workers to the approach of errant vehicles.

Support:

05 Judicious use of the special devices described in Item E in Paragraph 4 of this Section might be helpful for certain difficult TTC situations, but misuse or overuse of special devices or techniques might lessen their effectiveness.

Section 6C.05 High-Visibility Safety Apparel

Standard:

01 For daytime and nighttime activity, all workers, including emergency responders, within the right-of-way who are within the TTC zone shall wear high-visibility safety apparel that meets the Performance Class 2 or 3 requirements of the ANSI/ISEA 107–2015 publication entitled "American National Standard for High-Visibility Safety Apparel and Headwear," or equivalent revisions, except as provided in Paragraph 4 of this Section. A person designated by the employer to be responsible for worker safety shall make the selection of the appropriate class of garment.

02 The apparel background (outer) material color shall be fluorescent orange-red, fluorescent yellow-green, or a combination of the two as defined in the ANSI standard. The retroreflective material shall be orange, yellow, white, silver, yellow-green, or a fluorescent version of these colors.

03 When uniformed law enforcement personnel are used to direct traffic, to investigate crashes, or to handle lane closures, obstructed roadways, and disasters, high-visibility safety apparel as described in this Section shall be worn by the law enforcement personnel.

Option:

04 Emergency and incident responders and law enforcement personnel within the TTC zone may wear high-visibility safety apparel that meets the performance requirements of the ANSI/ISEA 207-2006 publication entitled "American National Standard for High-Visibility Public Safety Vests," or equivalent revisions, and labeled as ANSI 207-2006, in lieu of ANSI/ISEA 107-2015 apparel.

Standard:

05 Except as provided in Paragraph 6 of this Section, firefighters or other emergency responders working within the right-of-way shall wear high-visibility safety apparel as described in this Section.

Option:

06 Firefighters or other emergency responders working within the right-of-way and engaged in emergency operations that directly expose them to flame, fire, heat, and/or hazardous materials may wear retroreflective turn-out gear that is specified and regulated by other organizations, such as the National Fire Protection Association.

Standard:

07 For flagger wear during nighttime activity, high-visibility safety apparel that meets the Performance Class 3 requirements of the ANSI/ISEA 107–2015 publication entitled "American National Standard for High-Visibility Apparel and Headwear," or equivalent revision, and labeled as meeting the ANSI 107-2015 standard performance for Class 3 risk exposure shall be worn.

For flagger wear during all hours, high-visibility safety pants that meet the Performance Class E requirements of the ANSI/ISEA 107-2015 publication entitled "American National Standard for High-Visibility Apparel and Headwear," or equivalent revision, and labeled as meeting the ANSI 107-2015 standard performance shall be worn.

Guidance:

For daytime flagging, flaggers should wear on their torso either high-visibility safety apparel that meets the Performance Class 2 or 3 requirements of the ANSI/ISEA 107-2015 publication entitled "American National Standard for High-Visibility Apparel and Headwear," or equivalent revision, and labeled as meeting the ANSI 107-2015.

CHAPTER 6D. FLAGGER CONTROL

Section 6D.01 Qualifications for Flaggers

Guidance:

01 Because flaggers are responsible for public safety and make the greatest number of contacts with the public of all highway workers, they should be trained in proper traffic control practices and public contact techniques. Flaggers should be able to satisfactorily demonstrate the following abilities:

A. *Ability to receive and communicate specific instructions clearly, firmly, and courteously;*
B. *Ability to move and maneuver quickly in order to avoid danger from errant vehicles;*
C. *Ability to control signaling devices (such as paddles and flags) in order to provide clear and positive guidance to drivers approaching a TTC zone in frequently changing situations;*
D. *Ability to understand and apply proper traffic control practices, sometimes in stressful or emergency situations; and*
E. *Ability to recognize dangerous traffic situations and warn workers in sufficient time to avoid injury.*

Standard:

Flaggers on the state highway system shall be certified.

Support:

Additional information on the certification process can be found in the Wisconsin Flagging Handbook.

Guidance:

Flagger certification is not required for traffic incident management areas but responders flagging should be trained.

Section 6D.02 STOP/SLOW Paddle for Hand-Signaling

Guidance:

01 The STOP/SLOW paddle (see Figure 6D-1 and Table 6G-1) should be the primary and preferred hand-signaling device because the STOP/SLOW paddle gives road users more positive guidance than red flags.

Standard:

02 The STOP/SLOW paddle (R1-1 and W20-8) shall have an octagonal shape on a rigid handle at least 5 feet tall. When used at night, the STOP/SLOW paddle shall be retroreflectorized.

Option

03 A STOP/STOP or a SLOW/SLOW paddle may be used in certain situations (see Section 6D.05), provided the device meets the size and shape requirements for the STOP/SLOW paddle.

Guidance:

04 The STOP/SLOW paddle should be fabricated from light semi-rigid material.

Support:

05 The optimum method of displaying a STOP or SLOW message is to place the STOP/SLOW paddle on a rigid staff that is tall enough that when the end of the staff is resting on the ground, the message is high enough to be seen by approaching or stopped traffic.

Option:

06 The STOP/SLOW paddle may be modified to improve conspicuity by incorporating either white or red flashing lights on the STOP face, and either white or yellow flashing lights on the SLOW face. The flashing lights may be arranged in any of the following patterns:

A. Two white or red lights, one centered vertically above and one centered vertically below the STOP legend; and/or two white or yellow lights, one centered vertically above and one centered vertically below the SLOW legend;
B. Two white or red lights, one centered horizontally on each side of the STOP legend; and/or two white or yellow lights, one centered horizontally on each side of the SLOW legend;
C. One white or red light centered below the STOP legend; and/or one white or yellow light centered below the SLOW legend;
D. A series of eight or more small white or red lights no larger than ¼ inch in diameter along the outer edge of the paddle, arranged in an octagonal pattern at the eight corners of the border of the STOP face; and/or a

series of eight or more small white or yellow lights no larger than ¼ inch in diameter along the outer edge of the paddle, arranged in a diamond pattern along the border of the SLOW face; or

E. A series of white lights forming the shapes of the letters in the legend.

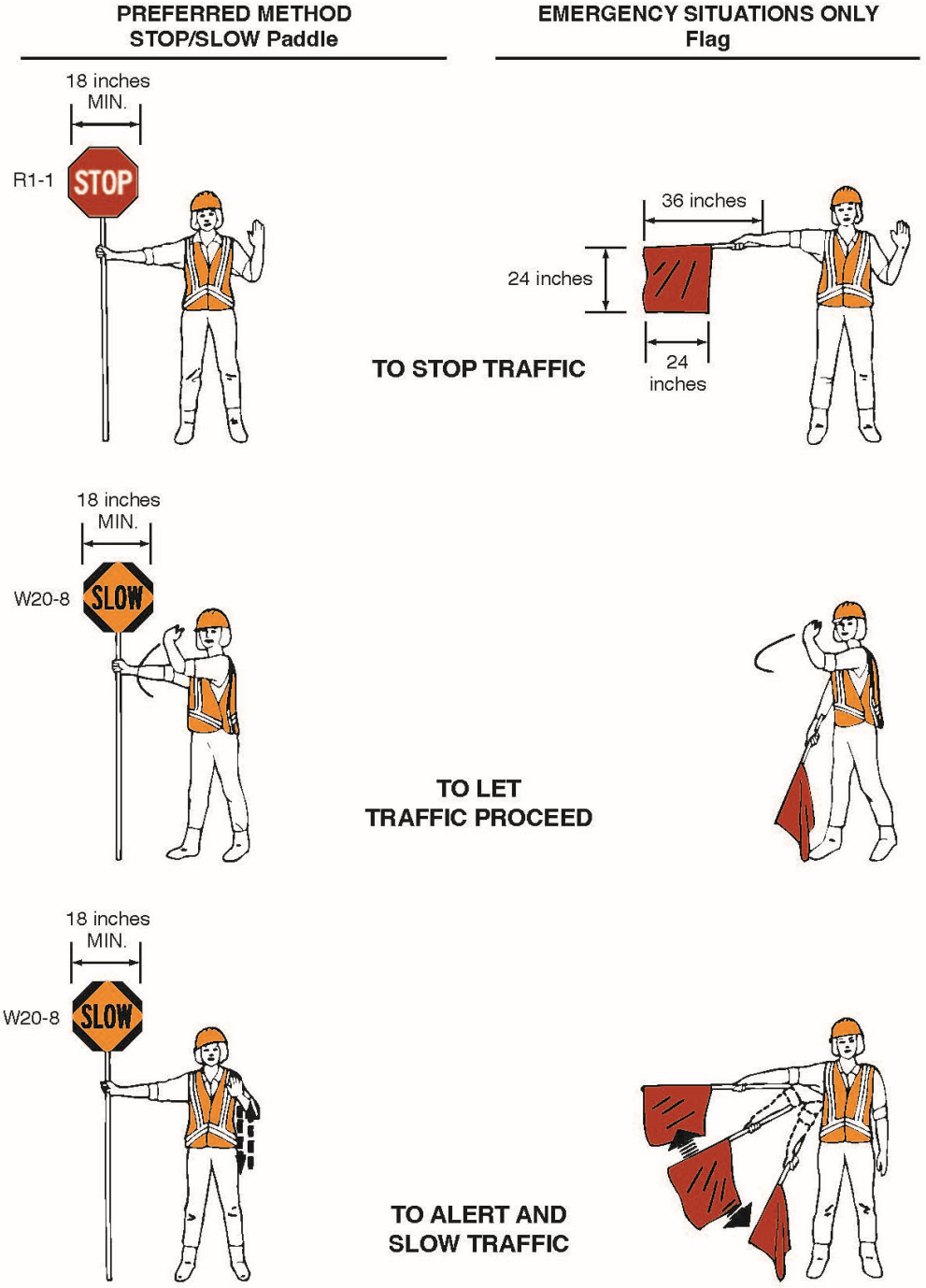
Standard:

07 If flashing lights are used on the STOP face of the paddle, their colors shall be all white or all red. If flashing lights are used on the SLOW face of the paddle, their colors shall be all white or all yellow.

08 If more than eight flashing lights are used, the lights shall be arranged such that they clearly convey the octagonal shape of the STOP face of the paddle and/or the diamond shape of the SLOW face of the paddle.

09 If flashing lights are used on the STOP/SLOW paddle, the flash rate shall be at least 50, but not more than 60, flashes per minute.

Figure 6D-1. Use of Hand-Signaling Devices by Flaggers



Section 6D.03 Flag for Hand-Signaling

Guidance:

01 Use of flags should be limited to emergency situations.

Standard:

02 Flags, when used, shall be red or fluorescent orange-red in color, shall be a minimum of 24 inches square, and shall be securely fastened to a staff that is approximately 36 inches in length.

Guidance:

03 The free edge of a flag should be weighted so the flag will hang vertically, even in heavy winds.

Standard:

04 When used at nighttime, flags shall be retroreflectorized.

Section 6D.04 Flashlight for Hand-Signaling

Option:

01 When flagging in an emergency situation at night in a non-illuminated flagger station, a flagger may use a flashlight with a red glow cone to supplement the STOP/SLOW paddle or flag.

Standard:

02 When a flashlight is used for flagging in an emergency situation at night in a non-illuminated flagger station, the flagger shall hold the flashlight in the left hand, shall hold the paddle or flag in the right hand as shown in Figure 6D-1, and shall use the flashlight in the following manner to control approaching road users:

- **A. To inform road users to stop, the flagger shall hold the flashlight with the left arm extended and pointed down toward the ground, and then shall slowly wave the flashlight in front of the body in a slow arc from left to right such that the arc reaches no farther than 45 degrees from vertical.**
- **B. To inform road users to proceed, the flagger shall point the flashlight at the vehicle's bumper, slowly aim the flashlight toward the open lane, then hold the flashlight in that position. The flagger shall not wave the flashlight.**
- **C. To alert or slow traffic, the flagger shall point the flashlight toward oncoming traffic and quickly wave the flashlight in a Figure eight motion.**

Section 6D.05 Flagger Procedures

Support:

01 The use of paddles and flags by flaggers is illustrated in Figure 6D-1.

Standard:

02 Flaggers shall use a STOP/SLOW paddle, a flag, or an Automated Flagger Assistance Device (AFAD) (see Sections 6L.02 through 6L.04) to control road users approaching a TTC zone. The use of hand movements alone without a paddle, flag, or AFAD to control road users shall be prohibited when controlling traffic in a one-lane two-way operation except when the control is provided by emergency responders at incident scenes as described in Section 6O.01 or provided by uniformed law enforcement officers.

03 The following methods of signaling with a paddle shall be used:

- **A. To stop road users, the flagger shall face road users and aim the STOP paddle face toward road users in a stationary position with the arm extended horizontally away from the body. The free arm shall be held with the palm of the hand above shoulder level toward approaching traffic.**
- **B. To direct stopped road users to proceed, the flagger shall face road users with the SLOW paddle face aimed toward road users in a stationary position with the arm extended horizontally away from the body. The flagger shall motion with the free hand for road users to proceed.**
- **C. To alert or slow traffic, the flagger shall face road users with the SLOW paddle face aimed toward road users in a stationary position with the arm extended horizontally away from the body.**

Option:

04 To further alert or slow traffic, the flagger holding the SLOW paddle face toward road users may motion up and down with the free hand, palm down.

Standard:

05 The following methods of signaling with a flag shall be used:

A. To stop road users, the flagger shall face road users and extend the flag staff horizontally across the road users' lane in a stationary position so that the full area of the flag is visibly hanging below the staff. The free arm shall be held with the palm of the hand above shoulder level toward approaching traffic.

B. To direct stopped road users to proceed, the flagger shall face road users with the flag and arm lowered from the view of the road users, and shall motion with the free hand for road users to proceed. Flags shall not be used to signal road users to proceed.

C. To alert or slow traffic, the flagger shall face road users and slowly wave the flag in a sweeping motion of the extended arm from shoulder level to straight down without raising the arm above a horizontal position. The flagger shall keep the free hand down.

Guidance:

06 The flagger should stand either on the shoulder adjacent to the road user being controlled or in the closed lane prior to stopping road users. A flagger should only stand in the lane being used by moving road users after road users have stopped. The flagger should be clearly visible to the first approaching road user at all times. The flagger also should be visible to other road users. The flagger should be stationed sufficiently in advance of the workers to warn them (for example, with audible warning devices such as horns or whistles) of approaching danger by out-of-control vehicles. The flagger should stand alone, away from other workers, work vehicles, or equipment.

Option:

07 In certain conditions, it may be more appropriate for a flagger to use a STOP/STOP or a SLOW/SLOW paddle to convey the appropriate message to approaching road users and avoid confusing those that are approaching the operation from the opposing direction.

Section 6D.06 Flagger Stations

Standard:

01 Except as provided in Paragraph 2 of this Section, flagger stations shall be located such that approaching road users will have sufficient distance to stop at an intended stopping point.

Option:

02 If sufficient stopping sight distance is not achievable, the location of the flagger station may be modified based on engineering judgment.

03 The distances shown in Table 6B-2, which provides information regarding the stopping sight distance as a function of speed, may be used for the location of a flagger station. These distances may be increased for downgrades and other conditions that affect stopping distance.

Guidance:

04 Flagger stations should be located such that an errant vehicle has additional space to stop without entering the work space. The flagger should identify an escape route that can be used to avoid being struck by an errant vehicle.

Standard:

05 Except in emergency situations, flagger stations shall be preceded by an advance warning sign or signs. Except in emergency situations, flagger stations shall be illuminated when flagging is used at night.

Guidance:

Illumination of the flagger station should be done with auxiliary lighting equipment independent of existing roadway illumination. The lighting should be placed as not to cause glare issues with either direction of traffic.

CHAPTER 6E. ONE-LANE, TWO-WAY TRAFFIC CONTROL

Section 6E.01 One-Lane, Two-Way Traffic Control – General

Standard:

01 Except as provided in Paragraph 4 of this Section, when traffic in both directions must use a single lane for a limited distance, movements from each end shall be coordinated.

Guidance:

02 Provisions should be made for alternate one-way movement through the constricted section via methods such as flagger control, a flag transfer, a pilot car, traffic control signals, or stop or yield control.

03 Control points at each end should be chosen to permit easy passing of opposing lanes of vehicles.

Option:

04 If the work space on a low-volume street or road is short and road users from both directions are able to see the traffic approaching from the opposite direction through and beyond the worksite, the movement of traffic through a one-lane, two-way constriction may be self-regulating.

Section 6E.02 Flagger Method

Guidance:

01 Except as provided in Paragraph 2 of this Section, traffic should be controlled by a flagger at each end of a constricted section of roadway. One of the flaggers should be designated as the coordinator. To provide coordination of the control of the traffic, the flaggers should be able to communicate with each other orally, electronically, or with manual signals. These manual signals should not be mistaken for flagging signals.

Option:

02 When a one-lane, two-way TTC zone is short enough to allow a flagger to see from one end of the zone to the other, traffic may be controlled by either a single flagger or by a flagger at each end of the section.

Guidance:

03 When a single flagger is used, the flagger should be stationed on the shoulder opposite the constriction or work space, or in a position where good visibility and traffic control can be maintained at all times. When good visibility and traffic control cannot be maintained by one flagger station, traffic should be controlled by a flagger at each end of the section.

Section 6E.03 Flag Transfer Method

Support:

01 The driver of the last vehicle proceeding into the one-lane section is given a red flag (or other token) and instructed to deliver it to the flagger at the other end. The opposite flagger, upon receipt of the flag, then knows that traffic can be permitted to move in the other direction. A variation of this method is to replace the use of a flag with an official pilot car that follows the last road user vehicle proceeding through the section.

Guidance:

02 The flag transfer method should be employed only where the one-way traffic is confined to a relatively short length of a road, usually no more than 1 mile in length.

Section 6E.04 Pilot Car Method

Option:

01 A pilot car may be used to guide a queue of vehicles through the TTC zone or detour.

Guidance:

02 The pilot car should have the name of the contractor or contracting authority prominently displayed.

The driver of the pilot car should be a Wisconsin certified flagger.

Standard:

03 The PILOT CAR FOLLOW ME (G20-4) sign (see Figure 6H-1) shall be mounted on the top or on the rear of the pilot vehicle (see Section 6H.37).

04 The pilot car operation shall be coordinated with flagging operations or other methods of control at each end of the one lane section of the work zone.

05 If an Automated Flagger Assistance Device (AFAD) (see Section 6L.02) is used in pilot car operations, the AFAD shall be operated by a flagger positioned near and within the line of sight of the AFAD. The AFAD shall not be left unattended at any time that the AFAD is being used.

Guidance:

06 If temporary traffic control signals are used in pilot car operations and long wait times will be encountered by road users, consideration should be given to using signs to notify drivers of the wait time and/or pilot car operation, based on engineering judgment.

Section 6E.05 Temporary Traffic Control Signal Method

Option:

01 Traffic control signals may be used to control vehicular traffic movements in one-lane, two-way TTC zones (see Figure 6P-12 and Chapter 4O).

Section 6E.06 Stop or Yield Control Method

Option:

01 STOP or YIELD signs may be used to control traffic on low-volume roads at a one-lane, two-way TTC zone when drivers are able to see the other end of the one-lane, two-way operation and have sufficient visibility of approaching vehicles.

Guidance:

02 If the STOP or YIELD sign is installed for only one direction, then the STOP or YIELD sign should face road users who are driving on the side of the roadway that is closed for the work activity area.

Standard:

If STOP signs are used at one-lane, two-way sites, both directions shall be stopped.

On low-volume State Trunk Highways, Connecting Highways, or any other roadways declared as through highways, STOP signs shall be used to control traffic at a one-lane, two-way TTC zone when drivers are able to see the other end of the one-lane, two-way operation and have sufficient visibility of approaching vehicles.

CHAPTER 6F. TEMPORARY TRAFFIC CONTROL ZONE SIGNS – GENERAL

Section 6F.01 General Characteristics of TTC Zone Signs

Support:

01 TTC zone signs convey both general and specific messages by means of words, symbols, and/or arrows and have the same three categories as all road user signs: regulatory, warning, and guide.

Option:

02 Where the color orange is required, the fluorescent orange color may also be used.

Support:

03 The fluorescent version of orange provides higher conspicuity than standard orange, especially during twilight.

Option:

04 Standard orange flags, flashing beacons, and/or flashing warning lights may be used in conjunction with signs.

Standard:

05 When standard orange flags, flashing beacons, and/or flashing warning lights are used in conjunction with a sign, they shall not block the sign face.

06 Except as provided in Section 2A.07, the sizes for TTC signs and plaques shall be as shown in Tables 6G-1, 6H-1, and 6I-1. The sizes in the minimum column shall only be used on low-volume rural roads, local streets, or roadways where the operating speed is 30 mph or less.

Option:

07 The dimensions of signs and plaques shown in Tables 6G-1, 6H-1, and 6I-1 may be increased wherever necessary for greater legibility or emphasis.

Guidance:

08 Deviations from standard sizes as prescribed in this Manual should be in 6-inch increments.

Support:

09 Sign design details are contained in the "Standard Highway Signs" publication (see Section 1A.05).

10 Section 2A.04 contains additional information regarding the design of signs, including an Option allowing the development of special word message signs if a standard word message or symbol sign is not available to convey the necessary regulatory, warning, or guidance information.

Standard:

11 All signs used at night shall be either retroreflective or illuminated to show the same shape and similar color both day and night.

12 The requirement for sign illumination shall not be considered to be satisfied by street, highway, or strobe lighting.

Option:

13 Sign illumination may be either internal or external.

14 Signs may be made of rigid or flexible material.

Section 6F.02 Sign Placement

Guidance:

01 Signs should be located on the right-hand side of the roadway unless otherwise provided in this Manual.

Option:

02 Where special emphasis is needed, signs may be placed on both the left-hand and right-hand sides of the roadway. Signs mounted on portable supports may be placed within the roadway itself. Signs may also be mounted on or above barricades.

Support:

03 The provisions of this Section regarding mounting height apply unless otherwise provided for a particular sign elsewhere in this Manual.

Standard:

04 The minimum height, measured vertically from the bottom of the sign to the elevation of the near edge of the pavement, of signs installed at the side of the road in rural areas shall be 5 feet (see Figure 6F-1).

05 The minimum height, measured vertically from the bottom of the sign to the top of the curb, or in the absence of curb, measured vertically from the bottom of the sign to the elevation of the near edge of the traveled way, of signs installed at the side of the road in business, commercial, or residential areas where parking or pedestrian movements are likely to occur, or where the view of the sign might be obstructed, shall be 7 feet (see Figure 6F-1).

06 The minimum height, measured vertically from the bottom of the sign to the sidewalk, of signs installed above sidewalks shall be 7 feet.

07 The bottom of a sign mounted on a barricade, or other portable support, shall be at least 1 foot above the traveled way.

Option:

08 The height to the bottom of a secondary sign mounted below another sign may be 1 foot less than the height provided in Paragraphs 4 through 6 of this Section.

Guidance:

09 Neither portable nor permanent sign supports should be located on open sidewalks, bicycle facilities, or areas designated for pedestrians or bicyclists. If placement of a sign impacts the movement of pedestrians or bicycles account for the diverted movement of them.

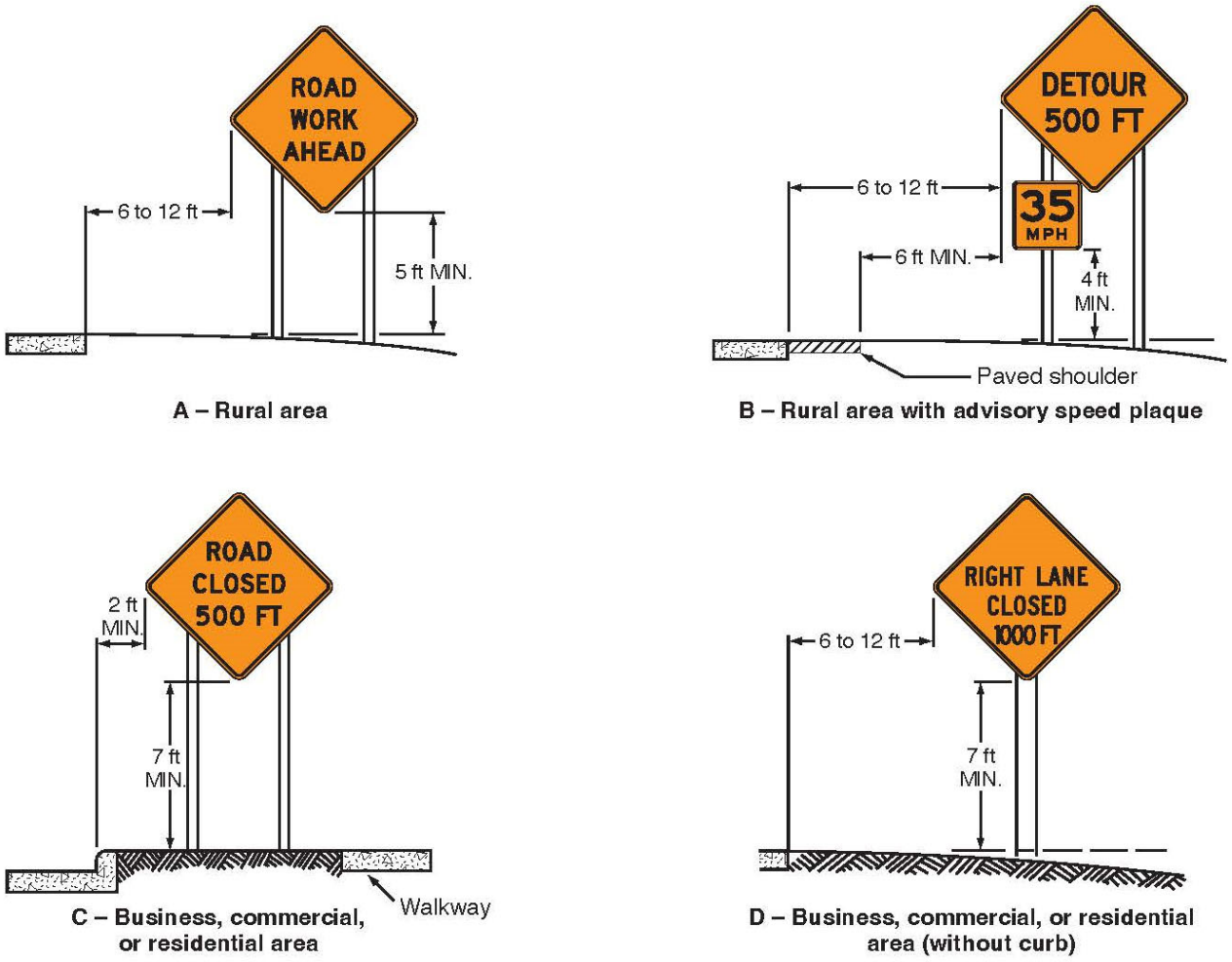
Standard:

10 Signs shall be mounted and placed in accordance with Section 307 of the U.S. Department of Justice 2010 ADA Standards for Accessible Design, September 15, 2010, 28 CFR 35 and 36, Americans with Disabilities Act of 1990.

Guidance:

11 Except as provided in Paragraph 12 of this Section, signs mounted on portable sign supports that do not meet the minimum mounting heights provided in Part 2 should not be used for a duration of more than 3 days.

Figure 6F-1. Height and Lateral Location of Signs—Typical Installations



Option:

12 The R9-8 through R9-11a series, R11 series, W1-6 through W1-8 series, M4-10, E5-1, or other similar type signs (see Figures 6G-1, 6H-1, and 6I-1) may be used on portable sign supports that do not meet the minimum mounting heights provided in Part 2 for longer than 3 days.

Support:

13 Methods of mounting signs other than on posts are illustrated in Figure 6F-2.

Guidance:

14 Signs mounted on Type 3 Barricades should not cover more than 50 percent of the top two rails or 33 percent of the total area of the three rails.

Standard:

15 Signs and sign supports used together shall be crashworthy (see Section 6A.04). Where large signs having an area exceeding 50 square feet are installed on multiple breakaway posts, the clearance from the ground to the bottom of the sign shall be at least 7 feet.

Option:

16 For mobile operations, a sign may be mounted on a work vehicle, a shadow vehicle, or a trailer stationed in advance of the TTC zone or moving along with it.

Section 6F.03 Sign Maintenance

Guidance:

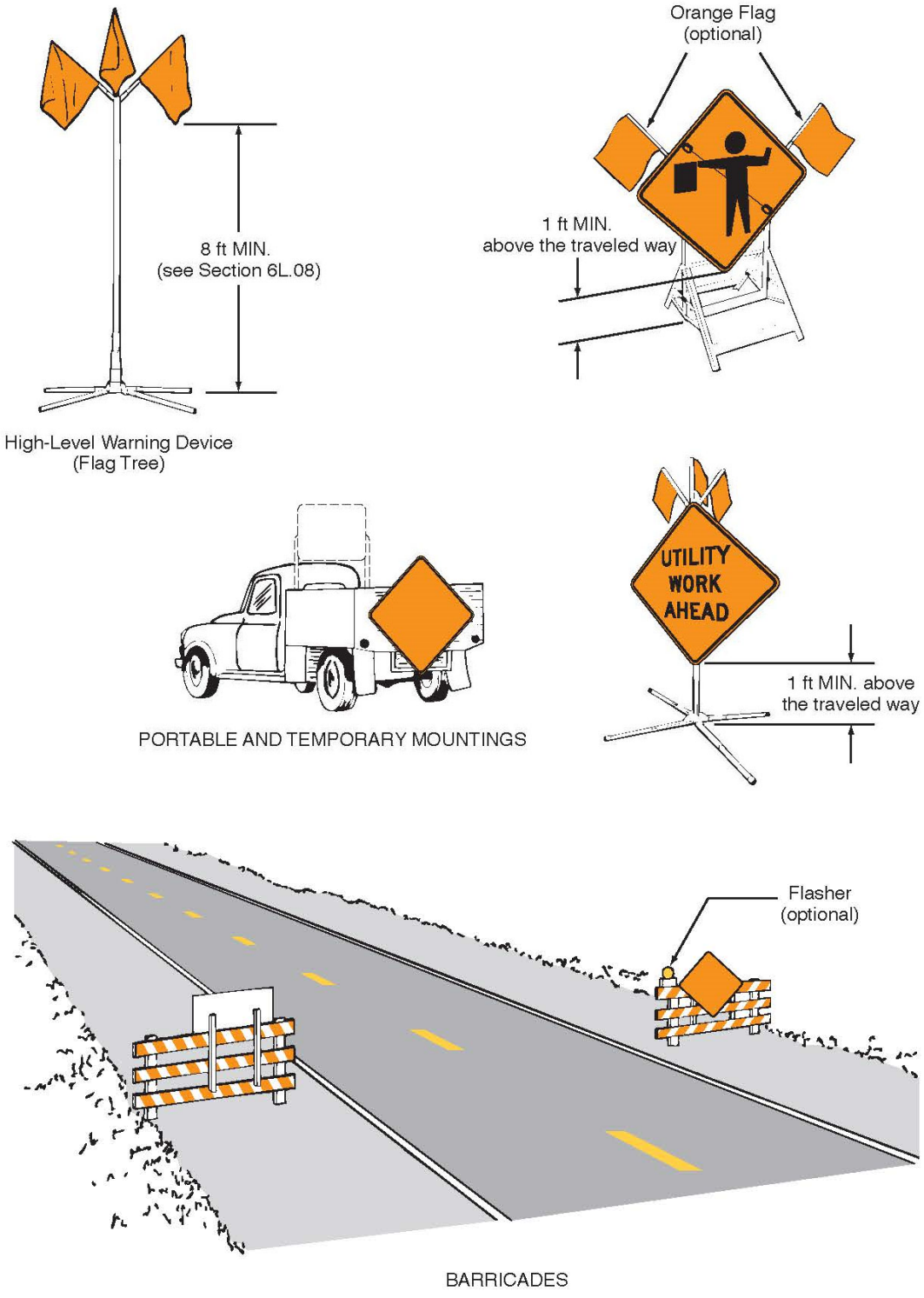
01 Signs should be properly maintained for cleanliness, visibility, retroreflectivity, and correct positioning.

02 Signs that have lost significant legibility should be promptly replaced.

Support:

03 Section 2A.21 contains information regarding the retroreflectivity of signs, including the signs that are used in TTC zones.

Figure 6F-2. Methods of Mounting Signs Other Than on Posts



CHAPTER 6G. TTC ZONE REGULATORY SIGNS

Section 6G.01 Regulatory Sign Authority

Support:

01 Regulatory signs such as those shown in Figure 6G-1 inform road users of traffic laws or regulations and indicate the applicability of legal requirements that would not otherwise be apparent.

Standard:

02 Regulatory signs shall be authorized by the public agency or official having jurisdiction and shall conform with Chapter 2B.

Section 6G.02 Regulatory Sign Design and Size

Standard:

01 TTC regulatory signs shall comply with the Standards for regulatory signs presented in Part 2 and in the FHWA's "Standard Highway Signs" publication (see Section 1A.05).

02 The sizes for TTC regulatory signs shall be as shown in Table 6G-1.

Section 6G.03 Regulatory Sign Applications

Standard:

01 If a TTC zone requires regulatory measures different from those existing, the existing permanent regulatory devices shall be removed or covered and superseded by the appropriate temporary regulatory signs. This change shall be made in compliance with applicable ordinances or statutes of the jurisdiction.

Section 6G.04 Road Closed Signs (R11-2 Series)

Guidance:

01 The ROAD CLOSED (R11-2) sign (see Figure 6G-1) should be used when the roadway is closed to all road users except contractors' equipment or officially authorized vehicles. The R11-2 sign should be accompanied by appropriate warning and detour signing.

Option:

02 STREET CLOSED (R11-2a), BRIDGE OUT (R11-2b), PATH CLOSED (R11-2c), or TRAIL CLOSED signs may be substituted for Road Closed signs where applicable.

Guidance:

03 Road Closed signs should be installed at or near the center of the roadway on or above a Type 3 Barricade that closes the roadway (see Section 6K.07).

Standard:

04 Road Closed signs shall not be used where road user flow is maintained through the TTC zone with a reduced number of lanes on the existing roadway or where the actual closure is some distance beyond the sign.

Section 6G.05 Local Traffic Only Signs (R11-3 Series and R11-4)

Guidance:

01 The Local Traffic Only signs (see Figure 6G-1) should be used where road users follow detours to avoid a closure some distance beyond the sign, but where local road users can use the roadway to the point of closure. These signs should be accompanied by appropriate warning and detour signing.

02 In rural applications, the Local Traffic Only sign should have the legend ROAD CLOSED XX MILES AHEAD, LOCAL TRAFFIC ONLY (R11-3).

Option:

03 In urban areas, a ROAD (STREET) CLOSED TO THRU TRAFFIC (R11-4) sign or the legend ROAD CLOSED, LOCAL TRAFFIC ONLY may be used.

04 In urban areas, a word message that includes the name of an intersecting street name or well-known destination may be substituted for the words XX MILES AHEAD on the R11-3 sign where applicable.

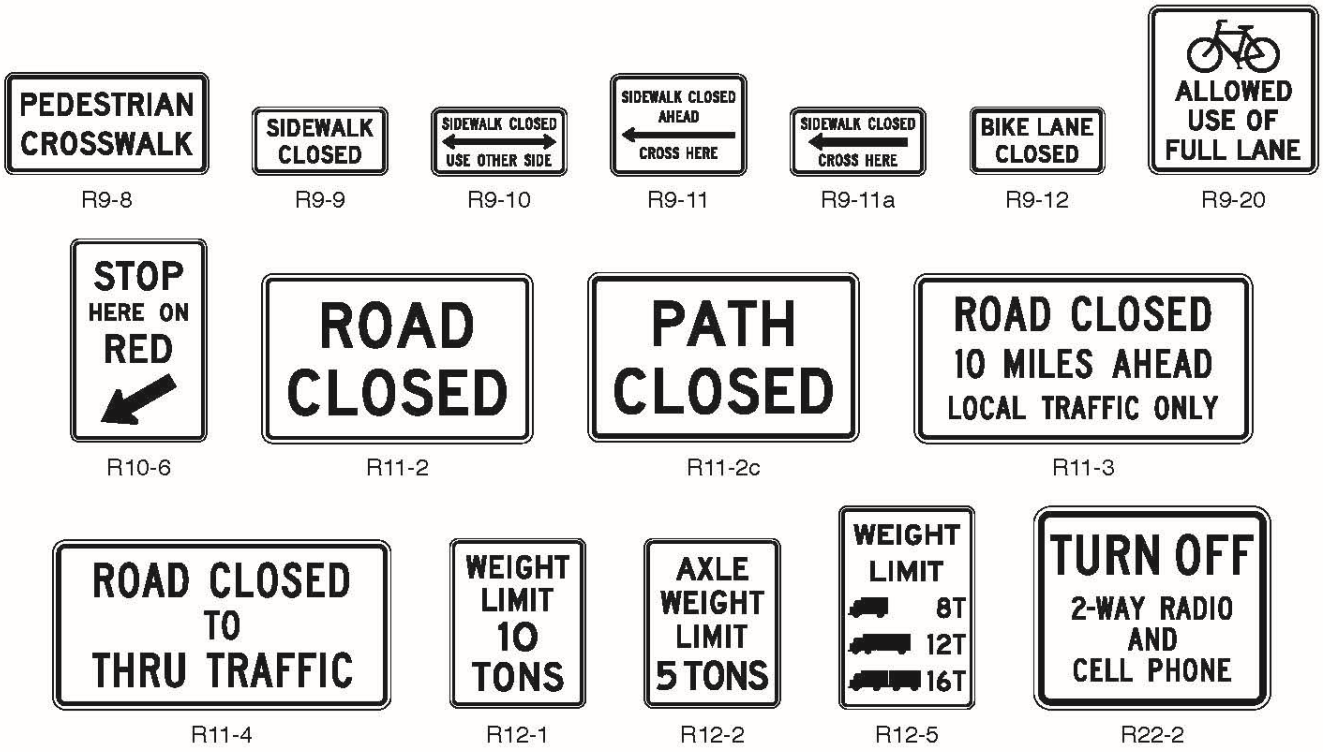
05 A STREET CLOSED (R11-3a) or BRIDGE OUT (R11-3b) sign may be substituted for a R11-3 sign, where applicable.

06 The words BRIDGE OUT, BRIDGE CLOSED, or STREET CLOSED may be substituted for the words ROAD CLOSED on the R11-4 sign where applicable.

Figure 6G-1. Regulatory Signs and Plaques in Temporary Traffic Control Zones (Sheet 1 of 2)

Note: See Chapter 2B for information on the application of these signs.

Figure 6G-1. Regulatory Signs and Plaques in Temporary Traffic Control Zones (Sheet 2 of 2)



Note: See Chapter 2B for information on the application of these signs.

Section 6G.06 Weight Limit Signs (R12-1, R12-2, and R12-5)

Standard:

01 A Weight Limit sign (see Figure 6G-1), which shows the gross weight or axle weight that is permitted on the roadway or bridge, shall be consistent with State or local regulations and shall not be installed without the approval of the authority having jurisdiction over the highway.

02 When weight restrictions are imposed because of the activity in a TTC zone, a marked detour shall be provided for vehicles weighing more than the posted limit.

Section 6G.07 STAY IN LANE Signs (R4-9 and R4-9a)

Option:

01 A STAY IN LANE (R4-9) sign (see Figure 6G-1) may be used where a multi-lane shift has been incorporated as part of the TTC on a highway to direct road users around road work that occupies part of the roadway on a multi-lane highway.

Guidance:

02 A STAY IN LANE TO MERGE POINT (R4-9a) sign (see Figure 6G-1) should be used during late merge operations (see Section 6N.19) to direct traffic to use all available lanes until the merge point is reached.

Section 6G.08 Work Zone and Higher Fines Signs and Plaques

Option:

01 A WORK ZONE (G20-5aP) plaque (see Figure 6G-1) may be mounted above a Speed Limit sign to emphasize that a reduced speed limit is in effect within a TTC zone. An END WORK ZONE SPEED LIMIT (R2-12) sign (see Figure 6G-1) may be installed at the downstream end of the reduced speed limit zone.

Guidance:

02 A BEGIN HIGHER FINES ZONE (R2-10) sign (see Figure 6G-1) should be installed at or near the beginning of a TTC zone where increased fines are imposed for traffic violations, and an END HIGHER FINES ZONE (R2-11) sign (see Figure 6G-1) should be installed at or near the downstream end of the TTC zone.

Table 6G-1. Temporary Traffic Control Zone Regulatory Sign and Plaque Sizes

Sign or Plaque	Sign Designation	Section	Conventional Road	Freeway or Expressway	Minimum
Stop	R1-1	6G.02	30 x 30*	—	—
Stop (on Stop/Slow Paddle)	R1-1	6D.02	18 x 18	—	—
Yield	R1-2	6G.02	36 x 36 x 36*	—	30 x 30 x 30
To Oncoming Traffic (plaque)	R1-2aP	6G.02	36 x 30	48 x 36	24 x 18
Wait on Stop	R1-7	6L.03	24 x 30	24 x 30	—
Wait on Stop - Go on Slow	R1-7a	6L.03	30 x 36	30 x 36	—
Go on Slow	R1-8	6L.03	24 x 30	24 x 30	—
Speed Limit	R2-1	6G.08	24 x 30*	36 x 48	—
Fines Higher (plaque)	R2-6P	6G.08	24 x 18	36 x 24	—
Fines Double (plaque)	R2-6aP	6G.08	24 x 18	36 x 24	—
$XX Fine (plaque)	R2-6bP	6G.08	24 x 18	36 x 24	—
Begin Higher Fines Zone	R2-10	6G.08	24 x 30	36 x 48	—
End Higher Fines Zone	R2-11	6G.08	24 x 30	36 x 48	—
End Work Zone Speed Limit	R2-12	6G.08	24 x 36	36 x 54	—
Movement Prohibition	R3-1,2,3,4	6G.02	24 x 24*	36 x 36	—
Mandatory Movement Lane Control - Turn Only	R3-5	6G.02	30 x 36	—	—
Optional Movement Lane Control - Thru and Turn	R3-6	6G.02	30 x 36	—	—
Right (Left) Lane Must Turn Right (Left)	R3-7	6G.02	30 x 30*	—	—
Advance Intersection Lane Control (2 lanes)	R3-8	6G.02	30 x 30	—	—
Movement Prohibition - No U or Left Turn	R3-18	6G.02	24 x 24*	36 x 36	—
Movement Prohibition - No Straight Through	R3-27	6G.02	24 x 24*	36 x 36	—
Do Not Pass	R4-1	6G.02	24 x 30	36 x 48	—
Pass With Care	R4-2	6G.02	24 x 30	36 x 48	—
Keep Right	R4-7	6G.02	24 x 30	36 x 48	—
Narrow Keep Right	R4-7c	6G.02	18 x 30	—	—
Stay in Lane	R4-9	6G.07	24 x 30	36 x 48	—
Stay In Lane To Merge Point	R4-9a	6G.07	36 x 48	36 x 48	—
Do Not Enter	R5-1	6G.02	30 x 30*	36 x 36	—
Wrong Way	R5-1a	6G.02	36 x 24*	42 x 30	—
One Way	R6-1	6G.02	36 x 12*	48 x 18	—
One Way	R6-2	6G.02	24 x 30*	36 x 48	—
No Parking (symbol)	R8-3	6G.02	24 x 24*	36 x 36	—
Pedestrian Crosswalk	R9-8	6G.09	36 x 18	—	—
Sidewalk Closed	R9-9	6G.10	24 x 12	—	—
Sidewalk Closed, Use Other Side	R9-10	6G.10	24 x 12	—	—
Sidewalk Closed Ahead, Cross Here	R9-11	6G.10	24 x 18	—	—
Sidewalk Closed, Cross Here	R9-11a	6G.10	24 x 12	—	—
Bike Lane Closed	R9-12	6P.01	24 x 12	—	—
Stop Here on Red	R10-6	6L.04	24 x 36	—	—
Road Closed	R11-2, 2a, 2b, 2c	6G.04	48 x 30	—	—
Road Closed - Local Traffic Only	R11-3, 3a, 3b, 4	6G.05	60 x 30	—	—
Weight Limit	R12-1, 2	6G.06	24 x 30	36 x 48	—
Weight Limit	R12-5	6G.06	24 x 36	36 x 48	—
Turn Off 2-Way Radio and Cell Phone	R22-2	6G.11	42 x 36	42 x 36	—
Work Zone (plaque)	G20-5aP	6G.08	24 x 18	30 x 24	—

* See Table 2B-1 for minimum size required for signs facing traffic on multi-lane conventional roads

Notes:

1. Larger signs may be used wherever necessary for greater legibility or emphasis
2. Dimensions are shown in inches and are shown as width x height

Option:

03 Alternate legends such as BEGIN (or END) DOUBLE FINES ZONE may also be used for the R2-10 and R2-11 signs.

04 A FINES HIGHER, FINES DOUBLE, or $XX FINE plaque (see Section 2B.25 and Figure 6G-1) may be mounted below the Speed Limit sign if increased fines are imposed for traffic violations within the TTC zone.

05 Individual signs and plaques for work zone speed limits and higher fines may be combined into a single sign or may be displayed as an assembly of signs and plaques.

Section 6G.09 PEDESTRIAN CROSSWALK Sign (R9-8)

Option:

01 The PEDESTRIAN CROSSWALK (R9-8) sign (see Figure 6G-1) may be used to indicate where a temporary crosswalk has been established.

Standard:

02 If a temporary crosswalk is established, it shall be accessible to pedestrians with disabilities in accordance with Section 6C.03.

Section 6G.10 SIDEWALK CLOSED Signs (R9-9, R9-10, R9-11, and R9-11a)

Guidance:

01 SIDEWALK CLOSED signs (see Figure 6G-1) should be used where pedestrian flow is restricted. Bicyclist/Pedestrian Detour (M4-9a) signs or Pedestrian Detour (M4-9b) signs should be used where pedestrian flow is rerouted (see Section 6I.02).

02 The SIDEWALK CLOSED (R9-9) sign should be installed at the beginning of the closed sidewalk, at the intersections preceding the closed sidewalk, and elsewhere along the closed sidewalk as needed.

03 The SIDEWALK CLOSED, (ARROW) USE OTHER SIDE (R9-10) sign should be installed at the beginning of the restricted sidewalk when a parallel sidewalk exists on the other side of the roadway.

04 The SIDEWALK CLOSED AHEAD, (ARROW) CROSS HERE (R9-11) sign should be used to indicate to pedestrians that sidewalks beyond the sign are closed and to direct them to open crosswalks, sidewalks, or other travel paths.

05 The SIDEWALK CLOSED, (ARROW) CROSS HERE (R9-11a) sign should be installed just beyond the point to which pedestrians are being redirected.

Support:

06 These signs are typically mounted on a detectable barricade to encourage compliance and to communicate with pedestrians that the sidewalk is closed. Printed signs are not useful to many pedestrians with vision disabilities. A barrier or barricade detectable by a person with a vision disability is sufficient to indicate that a sidewalk is closed. If the barrier is continuous with detectable channelizing devices for an alternate route, accessible signing might not be necessary.

Section 6G.11 TURN OFF 2-WAY RADIO AND CELL PHONE Sign (R22-2)

Standard:

01 The TURN OFF 2-WAY RADIO AND CELL PHONE (R22-2) sign (see Figure 6G-1) shall be used to require road users to turn off mobile radio transmitters and cellular telephones where blasting operations occur.

Support:

02 Section 6H.25 contains information about the full sequence of signs for blasting zones and the specific requirements for location of this regulatory sign.

Section 6G.12 Other Regulatory Signs

Option:

01 Regulatory word message signs other than those classified and specified in this Manual and the “Standard Highways Signs” publication (see Section 1A.05) may be developed and used based on engineering judgment to aid the enforcement of other laws or regulations in TTC zones.

Guidance:

02 Special regulatory signs should comply with the general requirements of color, shape, and alphabet size and series. The sign message should be brief, legible, and clear.

CHAPTER 6H. TTC ZONE WARNING SIGNS

Section 6H.01 Warning Sign Function, Design, and Application

Support:

01 TTC zone warning signs (see Figure 6H-1) notify road users of specific situations or conditions on or adjacent to a roadway that might not otherwise be apparent.

Standard:

02 TTC warning signs shall comply with the Standards for warning signs presented in Part 2 and in the FHWA's "Standard Highway Signs" publication (see Section 1A.05).

03 The sizes for TTC warning signs shall be as shown in Table 6H-1.

04 Except as provided in Paragraphs 5-9 of this Section, TTC warning signs shall be diamond-shaped with a black legend and border on an orange background, except for the Grade Crossing Advance Warning (W10-1) sign, which shall have a black legend and border on a yellow background.

Option:

05 Warning signs that are required or recommended in Parts 2 or 7 to have a fluorescent yellow-green background may have that color background in TTC zones.

06 Existing warning signs with a yellow background that are still applicable may remain in place.

07 Warning signs used for TTC incident management situations may have a black legend and border on a fluorescent pink background.

08 Mounting or space considerations may justify a change from the standard diamond shape to a rectangular shape.

09 In emergencies, available warning signs having yellow backgrounds may be used if signs with orange or fluorescent pink backgrounds are not at hand.

Guidance:

10 Where roadway or road user conditions require greater emphasis, larger than standard size warning signs should be used, with the symbol or legend enlarged approximately in proportion to the outside dimensions.

11 Where any part of the roadway is obstructed or closed by work activities or incidents, advance warning signs should be installed to alert road users well in advance of these obstructions or restrictions.

12 Where road users include pedestrians, the provision of supplemental audible information or detectable barriers or barricades should be provided for people with vision disabilities.

Support:

13 Detectable barriers or barricades communicate very clearly to pedestrians who have vision disabilities that they can no longer proceed in the direction that they are traveling.

Option:

14 Advance warning signs may be used singly or in combination.

15 Where distances are not displayed on warning signs as part of the message, a supplemental plaque with the distance legend may be mounted immediately below the sign on the same support.

Section 6H.02 Position of Advance Warning Signs

Guidance:

01 Where highway conditions permit, warning signs should be placed in advance of the transition and activity areas at varying distances depending on roadway type, condition, and posted speed. Table 6B-1 contains information regarding the spacing of advance warning signs. Where a series of two or more advance warning signs is used, the closest sign to the transition and activity areas should be placed approximately 100 feet for low-speed urban streets to 1,000 feet or more for freeways and expressways.

02 Where multiple advance warning signs are needed on the approach to a transition and activity area, the ROAD WORK AHEAD (W20-1) sign should be the first advance warning sign encountered by road users.

Support:

03 Various conditions, such as limited sight distance or obstructions that might require a driver to reduce speed or stop, might require additional advance warning signs.

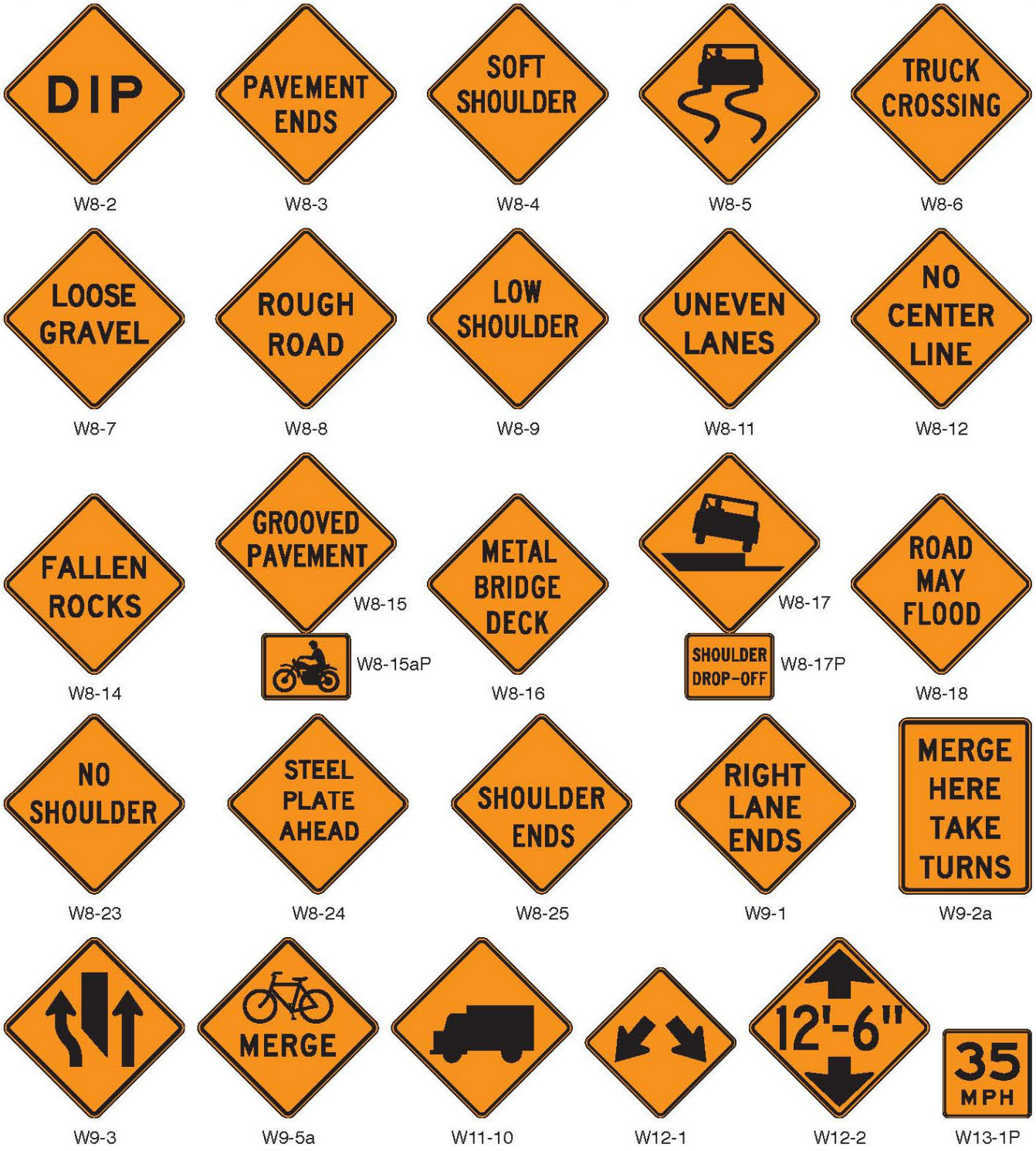
Option:

04 As an alternative to a specific distance on advance warning signs, the word AHEAD may be used.

Figure 6H-1. Warning Signs and Plaques in Temporary Traffic Control Zones (Sheet 1 of 4)

Note: See Chapter 2C for information on the application of these signs.

Figure 6H-1. Warning Signs and Plaques in Temporary Traffic Control Zones (Sheet 2 of 4)



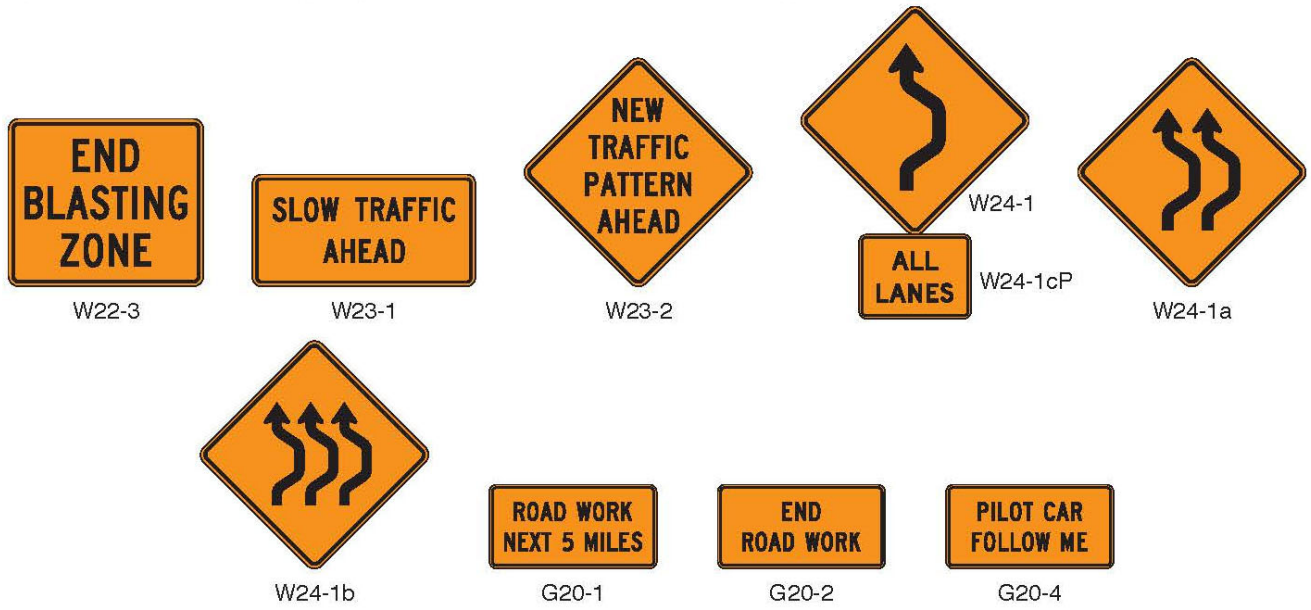
Note: See Chapter 2C for information on the application of these signs.

Figure 6H-1. Warning Signs and Plaques in Temporary Traffic Control Zones (Sheet 3 of 4)

Note: See Chapter 2C for information on the application of these signs.

* An optional STREET WORK word message sign is shown in the "Standard Highway Signs" publication.
** An optional STREET CLOSED word message sign is shown in the "Standard Highway Signs" publication.
*** An optional FLAGGER (W20-7a) word message sign is shown in the "Standard Highway Signs" publication.
**** An optional FRESH TAR word message sign is shown in the "Standard Highway Signs" publication.

Figure 6H-1. Warning Signs and Plaques in Temporary Traffic Control Zones (Sheet 4 of 4)



Note: See Chapter 2C for information on the application of these signs.

Support:

05 At TTC zones on lightly-traveled roads, all of the advance warning signs prescribed for major construction might not be needed.

Option:

06 Utility work, maintenance, or minor construction can occur within the TTC zone limits of a major construction project, and additional warning signs may be needed.

Guidance:

07 Utility, maintenance, and minor construction signing and TTC should be coordinated with appropriate authorities so that road users are not confused or misled by the additional TTC devices.

Section 6H.03 ROAD (STREET) WORK Sign (W20-1)

Guidance:

01 The ROAD (STREET) WORK (W20-1) sign (see Figure 6H-1), which serves as a general warning of obstructions or restrictions, should be located in advance of the work space or any detour, on the road where the work is taking place.

02 Where traffic can enter a TTC zone from a crossroad or a major (high-volume) driveway, an advance warning sign should be used on the crossroad or major driveway.

Option:

03 The legend STREET may be substituted for ROAD and the distance legend may be either XX FEET, XX MILES, or AHEAD.

Section 6H.04 DETOUR Sign (W20-2)

Guidance:

01 The DETOUR (W20-2) sign (see Figure 6H-1) should be used in advance of a road user detour over a different roadway or route.

Option:

02 The distance legend may be either XX FEET, XX MILES, or AHEAD.

Table 6H-1. Temporary Traffic Control Zone Warning Sign and Plaque Sizes (Sheet 1 of 2)

Sign or Plaque	Sign Designation	Section	Conventional Road	Freeway or Expressway	Minimum
Turn and Curve Signs	W1-1,2,3,4	6H.01	36 x 36	48 x 48	30 x 30
Reverse Curve (2 or more lanes)	W1-4b,4c	6H.30	36 x 36	48 x 48	30 x 30
Large Arrow (1-direction)	W1-6	6H.01	48 x 24	60 x 30	–
Chevron Alignment	W1-8	6H.01	18 x 24	30 x 36	–
Stop Ahead	W3-1	6H.01	36 x 36	48 x 48	30 x 30
Yield Ahead	W3-2	6H.01	36 x 36	48 x 48	30 x 30
Signal Ahead	W3-3	6H.01	36 x 36	48 x 48	30 x 30
Be Prepared to Stop	W3-4	6H.01	36 x 36	48 x 48	30 x 30
Reduced Speed Limit Ahead	W3-5	6H.01	36 x 36	48 x 48	30 x 30
XX MPH Speed Zone Ahead	W3-5a	6H.01	36 x 36	48 x 48	30 x 30
Merging Traffic	W4-1,5	6H.01	36 x 36	48 x 48	36 x 36
Lane Ends	W4-2	6H.08	36 x 36	48 x 48	30 x 30
Added Lane	W4-3,6	6H.01	36 x 36	48 x 48	30 x 30
No Merge Area (plaque)	W4-5aP	6H.01	18 x 24	24 x 30	–
Road Narrows	W5-1	6H.01	36 x 36	48 x 48	30 x 30
Narrow Bridge	W5-2	6H.01	36 x 36	48 x 48	30 x 30
One Lane Bridge	W5-3	6H.01	36 x 36	48 x 48	30 x 30
Ramp Narrows	W5-4	6H.10	36 x 36	48 x 48	30 x 30
Divided Highway	W6-1	6H.01	36 x 36	48 x 48	30 x 30
Divided Highway Ends	W6-2	6H.01	36 x 36	48 x 48	30 x 30
Two-Way Traffic	W6-3	6H.16	36 x 36	48 x 48	30 x 30
Narrow Two-Way Traffic	W6-4	6H.17	12 x 18	12 x 18	–
Hill	W7-1	6H.01	36 x 36	48 x 48	30 x 30
Next XX Miles (plaque)	W7-3aP	6H.33	24 x 18	36 x 30	–
Bump	W8-1	6H.01	36 x 36	48 x 48	24 x 24
Dip	W8-2	6H.01	36 x 36	48 x 48	24 x 24
Pavement Ends	W8-3	6H.01	36 x 36	48 x 48	30 x 30
Soft Shoulder	W8-4	6H.26	36 x 36	48 x 48	30 x 30
Slippery When Wet	W8-5	6H.01	36 x 36	48 x 48	30 x 30
Truck Crossing	W8-6	6H.21	36 x 36	48 x 48	30 x 30
Loose Gravel	W8-7	6H.01	36 x 36	48 x 48	30 x 30
Rough Road	W8-8	6H.01	36 x 36	48 x 48	24 x 24
Low Shoulder	W8-9	6H.26	36 x 36	48 x 48	24 x 24
Uneven Lanes	W8-11	6H.27	36 x 36	48 x 48	30 x 30
No Center Line	W8-12	6H.29	36 x 36	48 x 48	30 x 30
Fallen Rocks	W8-14	6H.01	36 x 36	48 x 48	30 x 30
Grooved Pavement	W8-15	6H.01	36 x 36	48 x 48	30 x 30
Motorcycle (plaque)	W8-15aP	6H.34	24 x 18	30 x 24	–
Metal Bridge Deck	W8-16	6H.34	36 x 36	48 x 48	30 x 30
Shoulder Drop Off (symbol)	W8-17	6H.26	36 x 36	48 x 48	30 x 30
Shoulder Drop-Off (plaque)	W8-17P	6H.26	24 x 18	30 x 24	–
Road May Flood	W8-18	6H.01	36 x 36	48 x 48	24 x 24
No Shoulder	W8-23	6H.01	36 x 36	48 x 48	30 x 30
Steel Plate Ahead	W8-24	6H.28	36 x 36	48 x 48	30 x 30
Shoulder Ends	W8-25	6H.01	36 x 36	48 x 48	30 x 30
Lane Ends	W9-1,2	6H.01	36 x 36	48 x 48	30 x 30
Merge Here Take Turns	W9-2a	6N.19	36 x 48	36 x 48	–
Interior Lane Shift Ahead	W9-3	6H.07	36 x 36	48 x 48	30 x 30

Table 6H-1. Temporary Traffic Control Zone Warning Sign and Plaque Sizes (Sheet 2 of 2)

Sign or Plaque	Sign Designation	Section	Conventional Road	Freeway or Expressway	Minimum
Bicycles Merging	W9-5a	6P.01	30 x 30	—	18 x 18
Grade Crossing Advance Warning	W10-1	6H.01	36 dia.	48 Dia.	—
Truck	W11-10	6H.21	36 x 36	48 x 48	24 x 24
Double Arrow	W12-1	6H.01	30 x 30	36 x 36	—
Low Clearance	W12-2	6H.01	36 x 36	48 x 48	30 x 30
Advisory Speed (plaque)	W13-1P	6H.32	18 x 18	24 x 24	18 x 18
On Ramp (plaque)	W13-4P	6H.09	36 x 36	36 x 36	—
No Passing Zone (pennant)	W14-3	6H.01	48 x 48 x 36	64 x 64 x 48	40 x 40 x 30
XX Feet (2-line plaque)	W16-2P	6H.01	24 x 18	30 x 24	—
Road Work (with distance)	W20-1	6H.03	36 x 36	48 x 48	30 x 30
Path Work (with distance)	W20-1b	6P.01	36 x 36	—	30 x 30
Detour (with distance)	W20-2	6H.04	36 x 36	48 x 48	30 x 30
Bike Detour (with distance)	W20-2a	6P.01	36 x 36	—	30 x 30
Road Closed (with distance)	W20-3	6H.05	36 x 36	48 x 48	30 x 30
Path Closed (with distance)	W20-3a	6P.01	36 x 36	—	30 x 30
One Lane Road (with distance)	W20-4	6H.06	36 x 36	48 x 48	30 x 30
Lane(s) Closed (with distance)	W20-5,5a	6H.07	36 x 36	48 x 48	30 x 30
Bike Lane Closed (with distance)	W20-5b	6P.01	36 x 36	—	30 x 30
Flagger (symbol)	W20-7	6H.15	36 x 36	48 x 48	30 x 30
Flagger	W20-7a	6H.15	36 x 36	48 x 48	30 x 30
Slow (on Stop/Slow Paddle)	W20-8	6D.02	18 x 18	—	—
Workers	W21-1,1a	6H.18	36 x 36	48 x 48	30 x 30
Fresh Oil	W21-2	6H.19	36 x 36	48 x 48	30 x 30
Road Machinery Ahead	W21-3	6H.20	36 x 36	48 x 48	30 x 30
Slow Moving Vehicle	W21-4	6N.05	36 x 18	—	—
Shoulder Work	W21-5	6H.22	36 x 36	48 x 48	30 x 30
Shoulder Closed	W21-5a	6H.22	36 x 36	48 x 48	30 x 30
Shoulder Closed (with distance)	W21-5b	6H.22	36 x 36	48 x 48	30 x 30
Survey Crew	W21-6	6H.23	36 x 36	48 x 48	30 x 30
Utility Work (with distance)	W21-7	6H.24	36 x 36	48 x 48	30 x 30
Mowing Ahead	W21-8	6N.05	36 x 36	48 x 48	30 x 30
Blasting Zone Ahead	W22-1	6H.25	36 x 36	48 x 48	30 x 30
End Blasting Zone	W22-3	6H.25	42 x 36	42 x 36	36 x 30
Slow Traffic Ahead	W23-1	6H.11	48 x 24	48 x 24	—
New Traffic Pattern Ahead	W23-2	6H.14	36 x 36	48 x 48	30 x 30
Double Reverse Curve (1 lane)	W24-1	6H.31	36 x 36	48 x 48	30 x 30
Double Reverse Curve (2 lanes)	W24-1a	6H.31	36 x 36	48 x 48	30 x 30
Double Reverse Curve (3 lanes)	W24-1b	6H.31	36 x 36	48 x 48	30 x 30
All Lanes (plaque)	W24-1cP	6H.31	24 x 18	30 x 24	—
Road Work Next XX Miles	G20-1	6H.35	36 x 18	48 x 24	—
End Road Work	G20-2	6H.36	36 x 18	48 x 24	—
Pilot Car Follow Me	G20-4	6H.37	36 x 18	—	—

* See Table 2C-1 for minimum size required for signs facing traffic on multi-lane conventional roads

Notes:

1. Larger signs may be used wherever necessary for greater legibility or emphasis
2. Dimensions are shown in inches and are shown as width x height

Section 6H.05 ROAD (STREET) CLOSED Sign (W20-3)

Guidance:

01 The ROAD (STREET) CLOSED (W20-3) sign (see Figure 6H-1) should be used in advance of the point where a highway is closed to all road users, or to all but local road users.

Option:

02 The legend STREET may be substituted for ROAD and the distance legend may be either XX FEET, XX MILES, or AHEAD.

Section 6H.06 ONE LANE ROAD Sign (W20-4)

Standard:

01 The ONE LANE ROAD (W20-4) sign (see Figure 6H-1) shall be used only in advance of that point where motor vehicle traffic in both directions must use a common single lane (see Section 6E.01).

Option:

02 The distance legend may be either XX FEET, XX MILES, or AHEAD.

Section 6H.07 Lane(s) Closed Signs (W20-5, W20-5a, and W9-3)

Standard:

01 The Lane(s) Closed sign (see Figure 6H-1) shall be used in advance of that point where one or more through lanes of a multi-lane roadway are closed.

02 For a single lane closure, the Lane Closed (W20-5) sign (see Figure 6H-1) shall use the legend RIGHT (LEFT) LANE CLOSED. Where two or more adjacent lanes are closed, the W20-5a sign (see Figure 6H-1) shall use the legend XX RIGHT (LEFT) LANES CLOSED.

Option:

03 The distance legend may be either XX FEET, XX MILES, or AHEAD.

Guidance:

04 The Interior Lane Shift (W9-3) sign (see Figure 6H-1) should be used in advance of that point where work occupies an interior lane(s) and approaching motor vehicle traffic is directed to the right or left of the work zone in the lane(s) by using a shifting taper to route traffic around the closed interior lane(s).

Section 6H.08 Lane Ends Signs (W4-2 and W9-2a)

Option:

01 The Lane Ends (W4-2) sign (see Figure 6H-1) may be used to warn drivers of the reduction in the number of lanes for moving motor vehicle traffic in the direction of travel on a multi-lane roadway.

Guidance:

02 The MERGE HERE TAKE TURNS (W9-2a) sign (see Figure 6H-1) should be used to identify the merge point at which vehicles from alternate lanes take turns merging during Late Merge applications (see Section 6N.19).

Section 6H.09 ON RAMP Plaque (W13-4P)

Guidance:

01 When work is being done on a ramp, but the ramp remains open, the ON RAMP (W13-4P) plaque (see Figure 6H-1) should be used to supplement the advance ROAD WORK sign.

Section 6H.10 RAMP NARROWS Sign (W5-4)

Guidance:

01 The RAMP NARROWS (W5-4) sign (see Figure 6H-1) should be used in advance of the point where work on a ramp reduces the normal width of the ramp along a part or all of the ramp.

Section 6H.11 SLOW TRAFFIC AHEAD Sign (W23-1)

Option:

01 The SLOW TRAFFIC AHEAD (W23-1) sign (see Figure 6I-1) may be used on a shadow vehicle, usually mounted on the rear of the most upstream shadow vehicle, along with other appropriate signs for mobile operations to warn of slow moving work vehicles. A ROAD WORK (W20-1) sign may also be used with the SLOW TRAFFIC AHEAD sign.

Section 6H.12 EXIT OPEN and EXIT CLOSED Signs (E5-2 and E5-2a)

Option:

01 An EXIT OPEN (E5-2) or EXIT CLOSED (E5-2a) sign (see Figure 6I-1) may be used to supplement other warning signs where work is being conducted in the vicinity of an exit ramp and where the exit maneuver for vehicular traffic using the ramp is different from the normal condition.

The EXIT CLOSED panel may be placed horizontally across the interchange/intersection guide signs.

Section 6H.13 EXIT ONLY Sign (E5-3)

Option:

01 An EXIT ONLY (E5-3) sign (see Figure 6I-1) may be used to supplement other warning signs where work is being conducted in the vicinity of an exit ramp and where the exit maneuver for vehicular traffic using the ramp is different from the normal condition.

Section 6H.14 NEW TRAFFIC PATTERN AHEAD Sign (W23-2)

Option:

01 A NEW TRAFFIC PATTERN AHEAD (W23-2) sign (see Figure 6H-1) may be used on the approach to an intersection or along a section of roadway to provide advance warning of a change in traffic patterns, such as revised lane usage, roadway geometry, or signal phasing.

Guidance:

02 To retain its effectiveness, the W23-2 sign should be displayed for up to 2 weeks, and then it should be covered or removed until it is needed again.

Section 6H.15 Flagger Signs (W20-7 and W20-7a)

Guidance:

01 The Flagger (W20-7) sign (see Figure 6H-1) should be used in advance of any point where a flagger is stationed to control road users.

Option:

02 A distance legend may be displayed on a supplemental plaque below the Flagger sign. The sign may be used with appropriate legends or in conjunction with other warning signs, such as the BE PREPARED TO STOP (W3-4) sign (see Figure 6H-1).

03 The FLAGGER (W20-7a) word message sign with a distance legend may be substituted for the Flagger (W20-7) sign.

Section 6H.16 Two-Way Traffic Sign (W6-3)

Guidance:

01 When one roadway of a normally-divided highway is closed, with two-way vehicular traffic maintained on the other roadway, the Two-Way Traffic (W6-3) sign (see Figure 6H-1) should be used at the beginning of the two-way vehicular traffic section and at intervals to remind road users of opposing vehicular traffic.

Section 6H.17 Narrow Two-Way Traffic Sign (W6-4)

Standard:

01 The Narrow Two-Way Traffic (W6-4) sign (see Figure 6H-1) shall be an upright, retroreflective orange-colored sign placed on a flexible support and sized at least 12 inches wide by 18 inches high.

Support:

02 The Narrow Two-Way Traffic (W6-4) sign is intended for mounting only on a flexible support in a series along the center line to separate opposing vehicular traffic on a two-lane, two-way operation.

Standard:

03 Narrow Two-Way Traffic signs shall not be placed within pedestrian crossings.

Section 6H.18 Workers Signs (W21-1 and W21-1a)

Option:

01 A Workers (W21-1) sign (see Figure 6H-1) may be used to alert road users of workers in or near the roadway.

Guidance:

02 In the absence of other warning devices, a Workers sign should be used when workers are in the roadway.

Option:

03 The WORKERS (W21-1a) word message sign may be used as an alternate to the Workers (W21-1) symbol sign.

Section 6H.19 FRESH OIL (TAR) Sign (W21-2)

Guidance:

01 The FRESH OIL (TAR) (W21-2) sign (see Figure 6H-1) should be used to warn road users of the surface treatment.

Section 6H.20 ROAD MACHINERY AHEAD Sign (W21-3)

Option:

01 The ROAD MACHINERY AHEAD (W21-3) sign (see Figure 6H-1) may be used to warn of machinery operating in or adjacent to the roadway.

Section 6H.21 Motorized Traffic Signs (W8-6 and W11-10)

Option:

01 Motorized Traffic (W8-6 and W11-10) signs may be used to alert road users to locations where unexpected travel on the roadway or entries into or departures from the roadway by construction vehicles might occur. The TRUCK CROSSING (W8-6) word message sign may be used as an alternate to the Truck (W11-10) symbol sign (see Figure 6H-1) where there is an established construction vehicle crossing of the roadway.

Support:

02 These locations might be relatively confined or might occur randomly over a segment of roadway.

Section 6H.22 Shoulder Work Signs (W21-5, W21-5a, and W21-5b)

Support:

01 Shoulder Work signs (see Figure 6H-1) warn of maintenance, reconstruction, or utility operations on the highway shoulder where the roadway is unobstructed.

Standard:

02 The Shoulder Work sign shall have the legend SHOULDER WORK (W21-5), RIGHT (LEFT) SHOULDER CLOSED (W21-5a), or RIGHT (LEFT) SHOULDER CLOSED XX FT or AHEAD (W21-5b).

Option:

03 The Shoulder Work sign may be used in advance of the point on a non-limited access highway where there is shoulder work. It may be used singly or in combination with a ROAD WORK NEXT XX MILES or ROAD WORK AHEAD sign.

Guidance:

04 On freeways and expressways, the RIGHT (LEFT) SHOULDER CLOSED XX FT or AHEAD (W21-5b) sign followed by RIGHT (LEFT) SHOULDER CLOSED (W21-5a) sign should be used in advance of the point where the shoulder work occurs and should be preceded by a ROAD WORK AHEAD sign.

Section 6H.23 SURVEY CREW Sign (W21-6)

Guidance:

01 The SURVEY CREW (W21-6) sign (see Figure 6H-1) should be used to warn of surveying crews working in or adjacent to the roadway.

Section 6H.24 UTILITY WORK Sign (W21-7)

Option:

01 The UTILITY WORK (W21-7) sign (see Figure 6H-1) may be used as an alternate to the ROAD (STREET) WORK (W20-1) sign for utility operations on or adjacent to a highway.

Support:

02 Typical examples of where the UTILITY WORK sign is used appear in Figures 6P-4, 6P-6, 6P-10, 6P-15, 6P-18, 6P-21, 6P-22, 6P-26, and 6P-33.

Option:

03 The distance legend may be either XX FEET, XX MILES, or AHEAD.

Section 6H.25 Signs for Blasting Areas

Support:

01 Radio-Frequency (RF) energy can cause the premature firing of electric detonators (blasting caps) used in TTC zones.

Standard:

02 Road users shall be warned where blasting operations occur. A sequence of signs shall be prominently displayed to warn all road users of blasting operations and to direct operators of mobile radio equipment, including cellular telephones, to turn off transmitters in a blasting area. These signs shall be covered or removed when there are no explosives in the area or the area is otherwise secured.

03 The BLASTING ZONE AHEAD (W22-1) sign (see Figure 6H-1) shall be used in advance of any TTC zone where explosives are being used. The TURN OFF 2-WAY RADIO AND CELL PHONE (R22-2) and END BLASTING ZONE (W22-3) signs shall be used in sequence with this sign.

04 The TURN OFF 2-WAY RADIO AND CELL PHONE (R22-2) sign (see Section 6G.11 and Figure 6G-1) shall follow the BLASTING ZONE AHEAD (W22-1) sign and shall be placed at least 1,000 feet before the beginning of the blasting zone.

05 The END BLASTING ZONE (W22-3) sign (see Figure 6H-1) shall be placed a minimum of 1,000 feet past the blasting zone.

Option:

06 The END BLASTING ZONE sign may be placed either with or preceding the END ROAD WORK sign.

Section 6H.26 Shoulder Signs and Plaque (W8-4, W8-9, W8-17, and W8-17P)

Option:

01 The SOFT SHOULDER (W8-4) sign (see Figure 6H-1) may be used to warn of a soft shoulder condition.

02 The LOW SHOULDER (W8-9) sign (see Figure 6H-1) may be used to warn of a shoulder condition where there is an elevation difference of 3 inches or less between the shoulder and the travel lane.

Guidance:

03 The Shoulder Drop-Off (W8-17) sign (see Figure 6H-1) should be used when an unprotected shoulder drop-off, adjacent to the travel lane, exceeds 3 inches in depth for a continuous length along the roadway, based on engineering judgment.

Option:

04 A SHOULDER DROP-OFF (W8-17P) supplemental plaque (see Figure 6H-1) may be mounted below the W8-17 sign.

Section 6H.27 UNEVEN LANES Sign (W8-11)

Guidance:

01 The UNEVEN LANES (W8-11) sign (see Figure 6H-1) should be used during operations that create a difference in elevation between adjacent lanes that are open to travel.

Section 6H.28 STEEL PLATE AHEAD Sign (W8-24)

Option:

01 A STEEL PLATE AHEAD (W8-24) sign (see Figure 6H-1) may be used to warn road users that the presence of a temporary steel plate(s) might make the road surface uneven and might create slippery conditions during wet weather.

Section 6H.29 NO CENTER LINE Sign (W8-12)

Guidance:

01 The NO CENTER LINE (W8-12) sign (see Figure 6H-1) should be used when the work obliterates the center line pavement markings. This sign should be placed at the beginning of the TTC zone and repeated at 2-mile intervals in long TTC zones.

Support:

02 Section 6J.02 contains information regarding temporary markings.

Section 6H.30 Reverse Curve Signs (W1-4 Series)

Guidance:

01 In order to give road users advance notice of a lane shift, a Reverse Curve (W1-4, W1-4b, or W1-4c) sign (see Figure 6H-1) should be used when a lane (or lanes) is being shifted to the left or right. If the design speed of the curves is 30 mph or less, a Reverse Turn (W1-3) sign should be used.

Standard:

02 If a Reverse Curve (or Turn) sign is used, the direction of the reverse curve (or turn) shall be appropriately illustrated. Except as provided in Paragraph 3 of this Section, the number of lanes illustrated on the sign shall be the same as the number of through lanes available to road users.

Option:

03 Where two or more lanes are being shifted, a W1-4 (or W1-3) sign with an ALL LANES (W24-1cP) plaque (see Figure 6H-1) may be used instead of a sign that illustrates the number of lanes.

04 Where more than three lanes are being shifted, the Reverse Curve (or Turn) sign may be rectangular.

Section 6H.31 Double Reverse Curve Signs (W24-1 Series)

Option:

01 The Double Reverse Curve (W24-1, W24-1a, or W24-1b) sign (see Figure 6H-1) may be used where the tangent distance between two reverse curves is less than 600 feet, thus making it difficult for a second Reverse Curve (W1-4 series) sign to be placed between the curves. If the design speed of the curves is 30 mph or less, Double Reverse Turn signs may be used.

Standard:

02 If a Double Reverse Curve (or Turn) sign is used, the direction of the double reverse curve (or turn) shall be appropriately illustrated. Except as provided in Paragraph 3 of this Section, the number of lanes illustrated on the sign shall be the same as the number of through lanes available to road users.

Option:

03 Where two or more lanes are being shifted, a W24-1 (or Double Reverse Turn sign showing one lane) sign with an ALL LANES (W24-1cP) plaque (see Figure 6H-1) may be used instead of a sign that illustrates the number of lanes.

04 Where more than three lanes are being shifted, the Double Reverse Curve (or Turn) sign may be rectangular.

Section 6H.32 Advisory Speed Plaque (W13-1P)

Option:

01 In combination with a warning sign, an Advisory Speed (W13-1P) plaque (see Figure 6H-1) may be used to indicate a recommended speed through the TTC zone.

Standard:

02 The Advisory Speed plaque shall not be used in conjunction with any sign other than a warning sign, nor shall it be used alone. When used with orange TTC zone signs, this plaque shall have a black legend and border on an orange background. Except in emergencies, an Advisory Speed plaque shall not be mounted until the recommended speed is determined by the highway agency.

Support:

03 Warning signs with advisory speed plaques (see Section 2C.59) inform drivers of the recommended operating speed based on temporary conditions within a TTC zone. Examples include narrow lanes, temporary diversion (reverse curves), lane shifts, sight distance restrictions, rough road surface, bumps, low/no shoulder, workers on foot, work vehicles or equipment close to the open travel lane, or other conditions that indicate the need for reduced speed.

04 AASHTO and ITE design documents contain established engineering practices for the determination of the recommended advisory speeds for horizontal curves or locations with limited sight distance.

Section 6H.33 Supplementary Distance Plaque (W7-3aP)

Option:

01 In combination with a warning sign, a Supplementary Distance (W7-3aP) plaque (see Figure 6H-1) with the legend NEXT XX MILES may be used to indicate the length of highway over which a work activity is being conducted, or over which a condition exists in the TTC zone.

02 In long TTC zones, Supplementary Distance plaques with the legend NEXT XX MILES may be placed in combination with warning signs at regular intervals within the zone to indicate the remaining length of highway over which the TTC work activity or condition exists.

Standard:

03 The Supplementary Distance plaque with the legend NEXT XX MILES shall not be used in conjunction with any sign other than a warning sign, nor shall it be used alone. When used with orange TTC zone signs, this plaque shall have a black legend and border on an orange background. The plaque shall be at least 30 x 24 inches in size when used with a sign that is 36 x 36 inches or larger.

Guidance:

04 When used in TTC zones, the Supplementary Distance plaque with the legend NEXT XX MILES should be placed below the initial warning sign designating that, within the approaching zone, a temporary work activity or condition exists.

Section 6H.34 Motorcycle Plaque (W8-15aP)

Option:

01 A Motorcycle (W8-15aP) plaque (see Figure 6H-1) may be mounted below a LOOSE GRAVEL (W8-7) sign, a GROOVED PAVEMENT (W8-15) sign, a METAL BRIDGE DECK (W8-16) sign, or a STEEL PLATE AHEAD (W8-24) sign if the warning is intended to be directed primarily to motorcyclists.

Section 6H.35 ROAD WORK NEXT XX MILES Sign (G20-1)

Guidance:

01 The ROAD WORK NEXT XX MILES (G20-1) sign (see Figure 6H-1) should be installed in advance of TTC zones that are more than 2 miles in length.

Option:

02 The ROAD WORK NEXT XX MILES sign may be mounted on a Type 3 Barricade. The sign may also be used for TTC zones of shorter length.

Standard:

03 The distance displayed on the ROAD WORK NEXT XX MILES sign shall be stated to the nearest whole mile.

Section 6H.36 END ROAD WORK Sign (G20-2)

Guidance:

01 REMOVED

Standard:

For all stationary highway maintenance or construction areas, the END ROAD WORK (G20-2) sign (see Figure 6H-1) shall be placed near the downstream end of the termination area.

Support:

Refer to Wisconsin State Statute 340.01(22e) for definition of highway maintenance or construction area.

Option:

02 The END ROAD WORK sign may be installed on the back of a warning sign facing the opposite direction of road users or on the back of a Type 3 Barricade.

Section 6H.37 PILOT CAR FOLLOW ME Sign (G20-4)

Standard:

01 The PILOT CAR FOLLOW ME (G20-4) sign (see Figure 6H-1) shall be mounted in a conspicuous position on the top or on the rear of a vehicle used for guiding one-way vehicular traffic through or around a TTC zone (see Section 6E.04).

Section 6H.38 Other Warning Signs

Option:

01 Advance warning signs may be used by themselves or with other advance warning signs.

02 Besides the warning signs specifically related to TTC zones, several other warning signs in Part 2 may apply in TTC zones.

03 Word message warning signs other than those classified and specified in this Manual and the "Standard Highway Signs" publication (see Section 1A.05) may be developed and used based on engineering judgment to warn of special conditions in TTC zones.

Standard:

04 Except as provided in Sections 6F.01 and 6H.01, other warning signs that are used in TTC zones shall have black legends and borders on an orange background.

Guidance:

05 Other warning signs should comply with the general requirements of color, shape, and alphabet size and series. The sign message should be brief, legible, and clear.

CHAPTER 6I. TTC ZONE GUIDE SIGNS

Section 6I.01 Guide Signs – General

Support:

01 Guide signs along highways provide road users with information to help them along their way through the TTC zone. The design of guide signs is presented in Part 2.

Guidance:

02 The following guide signs should be used in TTC zones as needed:

A. Standard route markings where temporary route changes are necessary,
B. Directional signs and street name signs, and
C. Special guide signs relating to the condition or work being done.

Standard:

03 If additional temporary guide signs are used in TTC zones, they shall have a black legend and border on an orange background.

Option:

04 Guide signs used in TTC incident management situations may have a black legend and border on a fluorescent pink background.

05 When temporary directional signs and temporary street name signs are used in conjunction with detour routing, these signs may have a black legend and border on an orange background.

06 When permanent directional signs or permanent street name signs are used in conjunction with detour signing, they may have a white legend on a green background (see Sections 2D.35 and 2D.45).

Standard:

07 The sizes for TTC guide signs shall be as shown in Table 6I-1.

Section 6I.02 Detour Signs and Plaques (M4-8P, M4-8a, M4-8bP, M4-9, M4-9a, M4-9b, M4-9c, and M4-10)

Standard:

01 Each detour shall be adequately marked with standard temporary route signs and destination signs.

Option:

02 Detour signs in TTC incident management situations may have a black legend and border on a fluorescent pink background.

03 The Detour Arrow (M4-10) sign (see Figure 6I-1) may be used where a detour route has been established.

04 The DETOUR (M4-8P) plaque (see Figure 6I-1) may be mounted at the top of a route sign assembly to mark a temporary route that detours from a highway, bypasses a section closed by a TTC zone, and rejoins the highway beyond the TTC zone.

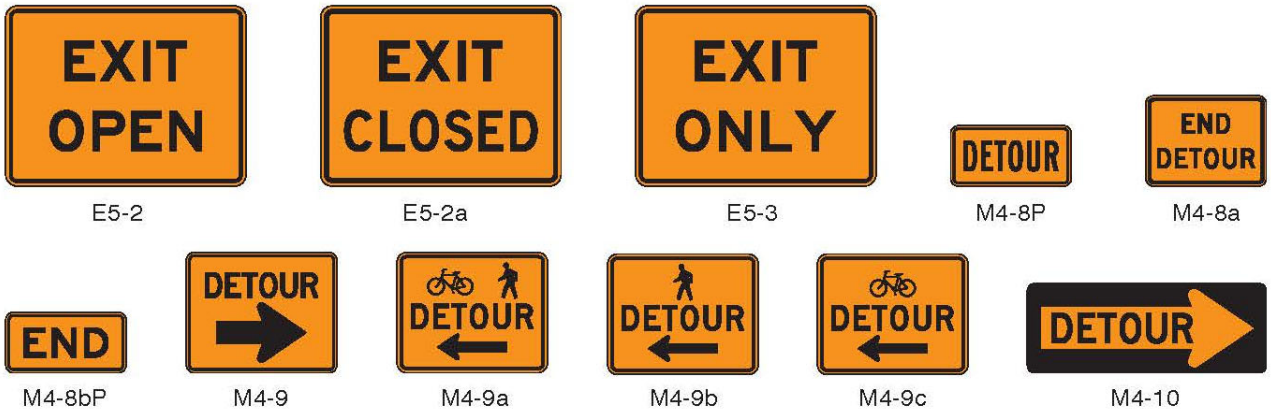
Table 6I-1. Temporary Traffic Control Zone Guide Sign and Plaque Sizes

Sign or Plaque	Sign Designation	Section	Conventional Road	Freeway or Expressway	Minimum
Exit Open	E5-2	6H.12	48 x 36	48 x 36	–
Exit Closed	E5-2a	6H.12	48 x 36	48 x 36	–
Exit Only	E5-3	6H.13	48 x 36	48 x 36	–
Detour	M4-8P	6I.02	24 x 12	30 x 15	–
End Detour	M4-8a	6I.02	24 x 18	24 x 18	–
End (plaque)	M4-8bP	6I.02	24 x 12	24 x 12	–
Detour	M4-9	6I.02	30 x 24	48 x 36	–
Bike/Pedestrian Detour	M4-9a	6I.02	30 x 24	–	–
Pedestrian Detour	M4-9b	6I.02	30 x 24	–	–
Bike Detour (with arrow)	M4-9c	6I.02	30 x 24	–	–
Detour	M4-10	6I.02	48 x 18	–	–

Notes:

1. Larger signs may be used wherever necessary for greater legibility or emphasis
2. Dimensions are shown in inches and are shown as width x height

Figure 6I-1. Exit Open and Closed and Detour Signs and Plaques



Guidance:

05 The Detour Arrow (M4-10) sign should normally be mounted just below the ROAD CLOSED (R11-2, R11-3a, or R11-4) sign. The Detour Arrow sign should include a horizontal arrow pointed to the right or left as required.

06 The DETOUR (M4-9) sign (see Figure 6I-1) should be used for unnumbered highways, for emergency situations, for periods of short durations, or where, over relatively short distances, road users are guided along the detour and back to the desired highway without route signs.

07 A Street Name sign should be placed above, or the street name should be incorporated into, a DETOUR (M4-9) sign to indicate the name of the street being detoured.

Option:

08 The END DETOUR (M4-8a) sign or the END (M4-8bP) plaque (see Figure 6I-1) may be used to indicate that the detour has ended.

Guidance:

09 When the END DETOUR sign is used on a numbered highway, the sign should be mounted above a route sign after the downstream end of the detour.

10 The Pedestrian/Bicyclist Detour (M4-9a) sign (see Figure 6I-1) should be used where a pedestrian/bicyclist detour route has been established because of the closing of a pedestrian/bicycle facility to through traffic.

Standard:

11 If used, the Pedestrian/Bicyclist Detour sign shall have an arrow pointing in the appropriate direction.

Option:

12 The arrow on a Pedestrian/Bicyclist Detour sign may be on the sign face or on a supplemental plaque.

13 The Pedestrian Detour (M4-9b) sign or Bicyclist Detour (M4-9c) sign (see Figure 6I-1) may be used where a pedestrian or a bicyclist detour route (not both) has been established because of the closing of the pedestrian or bicycle facility to through traffic.

Section 6I.03 EXIT CLOSED Panel

Guidance:

01 When an exit ramp is closed, an EXIT CLOSED sign panel with a black legend and border on an orange background should be placed diagonally across the interchange/intersection guide signs.

CHAPTER 6J. TTC ZONE PAVEMENT MARKINGS

Section 6J.01 Pavement Markings in TTC Zones

Support:

01 Pavement markings are installed or existing markings are maintained or enhanced in TTC zones to provide road users with a clearly defined path for travel through the TTC zone in day, night, and twilight periods under both wet and dry pavement conditions.

Guidance:

02 The work should be planned and staged to provide for the placement and removal of the pavement markings in a way that minimizes the disruption to traffic flow approaching and through the TTC zone during the placement and removal process.

Standard:

03 Existing pavement markings shall be maintained in all long-term stationary (see Section 6N.01) TTC zones in accordance with Chapters 3A and 3B, except as otherwise provided for temporary pavement markings in Section 6J.02. Pavement markings shall match the alignment of the markings in place at both ends of the TTC zone. Pavement markings shall be placed along the entire length of any paved detour or temporary roadway prior to the detour or roadway being opened to road users.

Guidance:

04 For long-term stationary operations, pavement markings in the temporary traveled way that are no longer applicable should be removed or obliterated as soon as practical. Pavement marking obliteration should remove the non-applicable pavement marking material, and the obliteration method should minimize pavement scarring.

Standard:

05 Painting over existing pavement markings with black paint or spraying with asphalt shall not be accepted as a substitute for removal or obliteration.

Option:

06 Removable, non-reflective, preformed tape that is approximately the same color as the pavement surface may be used where markings need to be covered temporarily.

Section 6J.02 Temporary Markings

Support:

01 Temporary markings are those pavement markings or devices that are placed within TTC zones to provide road users with a clearly defined path of travel through the TTC zone when the permanent markings are either removed or obliterated during the work activities. Temporary markings are typically needed during the reconstruction of a road while it is open to traffic, such as overlays or surface treatments or where lanes are temporarily shifted on pavement that is to remain in place.

Guidance:

02 Unless justified based on engineering judgment, temporary pavement markings should not remain in place for more than 14 days after the application of the pavement surface treatment or the construction of the final pavement surface on new roadways or over existing pavements.

03 The temporary use of edge lines, channelizing lines, lane-reduction transitions, gore markings, and other longitudinal markings, and the various non-longitudinal markings (such as stop lines, railroad crossings, crosswalks, words, symbols, or arrows) should be in accordance with the State's or highway agency's policy.

Standard:

04 Warning signs, channelizing devices, and delineation shall be used to indicate required road user paths in TTC zones where it is not possible to provide a clear path by pavement markings.

05 Except as otherwise provided in this Section, all temporary pavement markings for no-passing zones shall comply with the requirements of Chapters 3A and 3B. All temporary broken line pavement markings shall use the same cycle length as permanent markings and shall have line segments that are at least 2 feet long.

Guidance:

06 All pavement markings and devices used to delineate road user paths should be reviewed during daytime and nighttime periods.

Option:

07 Half-cycle lengths with a minimum of 2-foot stripes may be used on roadways with severe curvature (see Section 3A.04) for broken line center lines in passing zones and for lane lines.

08 For temporary situations of 14 days or less, for a two- or three-lane road, no-passing zones may be identified by using DO NOT PASS (R4-1), PASS WITH CARE (R4-2), and NO PASSING ZONE (W14-3) signs (see Sections 2B.36, 2B.37, and 2C.53) rather than pavement markings. Also, DO NOT PASS, PASS WITH CARE, and NO PASSING ZONE signs may be used instead of pavement markings on roads with low volumes for longer periods in accordance with the State's or highway agency's policy.

Guidance:

09 If used, the DO NOT PASS, PASS WITH CARE, and NO PASSING ZONE signs should be placed in accordance with Sections 2B.36, 2B.37, and 2C.53.

10 If used, the NO CENTER LINE sign should be placed in accordance with Section 6H.29.

Section 6J.03 Temporary Raised Pavement Markers

Option:

01 Retroreflective or internally illuminated raised pavement markers, or non-retroreflective raised pavement markers supplemented by retroreflective or internally illuminated markers, may be substituted for markings of other types in TTC zones.

Standard:

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

03 If temporary raised pavement markers are used to substitute for broken line segments, a group of at least three retroreflective markers equally spaced at no greater than 6.25 feet shall be installed every 50 feet.

04 If temporary raised pavement markers are used to substitute for solid lines, the markers shall be equally spaced at no greater than 12.5 feet, with retroreflective or internally illuminated units at a spacing no greater than 25 feet.

Option:

05 Temporary raised pavement markers may be used to substitute for broken line segments by using at least two retroreflective markers placed at each end of a segment of 2 to 5 feet in length, using the same cycle length as permanent markings.

Guidance:

06 Raised pavement markers should be considered for use along surfaced detours or temporary roadways, and other changed or new travel-lane alignments.

Option:

07 Retroreflective or internally illuminated raised pavement markers, or non-retroreflective raised pavement markers supplemented by retroreflective or internally illuminated markers, may also be used in TTC zones to supplement markings as prescribed in Chapters 3A and 3B.

Section 6J.04 Delineators

Option:

01 Delineators may be used in TTC zones to indicate the alignment of the roadway and to outline the required vehicle path through the TTC zone.

Standard:

02 When used, delineators shall combine with or supplement other TTC devices. They shall be mounted on crashworthy supports and shall be in accordance with Chapter 3G.

Guidance:

03 Spacing along roadway curves should be as set forth in Section 3G.04 and should be such that several delineators are visible to an approaching driver.

CHAPTER 6K. TTC ZONE CHANNELIZING DEVICES

Section 6K.01 Channelizing Devices – General

Standard:

01 Designs of various channelizing devices shall be as shown in Figure 6K-1. All channelizing devices shall be crashworthy (see definition in Section 1C.02).

Support:

02 The function of channelizing devices is to warn road users of conditions created by work activities in or near the roadway and to guide road users. Channelizing devices include cones, tubular markers, vertical panels, drums, barricades, and longitudinal channelizing devices.

03 Channelizing devices provide for smooth and gradual vehicular traffic flow from one lane to another, onto a bypass or detour, or into a narrower traveled way. They are also used to channelize traffic away from the work space, pavement drop-offs, pedestrian or shared-use paths, bicycle facilities, or opposing directions of vehicular traffic.

Guidance:

04 REMOVED

Standard:

For roadways with a speed limit of 50 mph or greater the maximum spacing of drums shall be 50 feet in tapers and 100 feet in tangent segments.

For roadways with a speed limit of 25 mph to 45 mph the maximum spacing of drums shall be 25 feet in tapers and 50 feet in tangent segments.

For roadways with a speed limit of 20 mph or less the maximum spacing of drums shall not exceed a distance in feet equal to 1 times the speed limit in mph when used for taper channelization, and shall not exceed a distance in feet equal to 2 times the speed limit in mph when used for tangent channelization.

For work on the state highway system, drums shall be used in tapers. The maximum spacing for any other channelizing device used shall be half that used for drums.

Guidance:

05 When channelizing devices have the potential of leading vehicular traffic out of the intended vehicular traffic space as shown in Figure 6P-39, the channelizing devices should be extended a distance in feet of 2 times the speed limit in mph beyond the downstream end of the transition area.

Option:

06 A gap not exceeding 2 inches between the bottom rail and the ground surface may be used to facilitate drainage.

07 Warning lights (see Section 6L.07) may be added to channelizing devices in areas with frequent fog, snow, or severe roadway curvature, or where visual distractions are present.

08 A series of sequential flashing warning lights may be placed on channelizing devices that form a merging taper in order to increase driver detection and recognition of the merging taper.

Support:

09 The flashing rates and patterns for warning lights used on channelizing devices are specified in Section 6L.07.

Standard:

10 The retroreflective material used on channelizing devices shall display a similar color day or night.

11 Except as provided in Paragraph 12 of this Section, information identifying the owner or manufacturer of the channelizing device shall not be displayed on any portion of the device that can be seen by road users approaching the device.

Option:

12 The name and telephone number of the highway agency, contractor, or supplier may be displayed on the non-retroreflective surface of all types of channelizing devices.

Standard:

13 The area containing the name and telephone number shall be non-retroreflective and not over 2 inches in height.

Guidance:

14 Particular attention should be given to maintaining the channelizing devices to keep them clean, visible, and properly positioned at all times.

Standard:

15 Channelizing devices that are no longer serviceable (see definition in Section 1C.02) shall be replaced.

Support:

The ATSSA Quality Guidelines for Temporary Traffic Control Devices or the Wisconsin Work Zone Field Manual can be used to determine the condition of devices.

For more detail regarding WisDOT's use of channelizing devices, see Standard Detail Drawing 15c11 Channelizing Devices.

Section 6K.02 Pedestrian Channelizing Devices

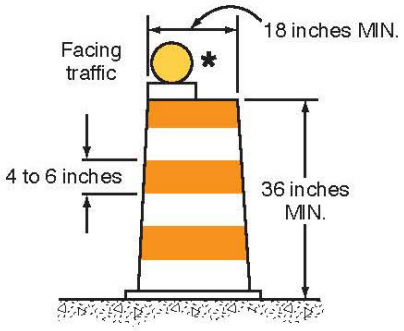
Support:

01 Pedestrian channelizing devices indicate a suitable path of pedestrian travel around or through the work zone.

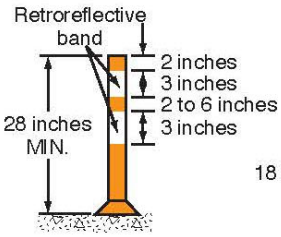
Support:

For more detail regarding WisDOT's use of pedestrian channelizing devices, see Standard Detail Drawing 15d30 Traffic Control, Pedestrian Accommodation.

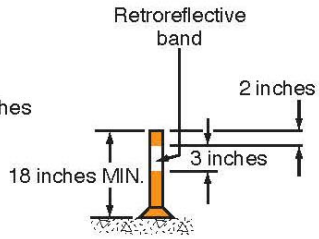
Figure 6K-1. Examples of Channelizing Devices



DRUM

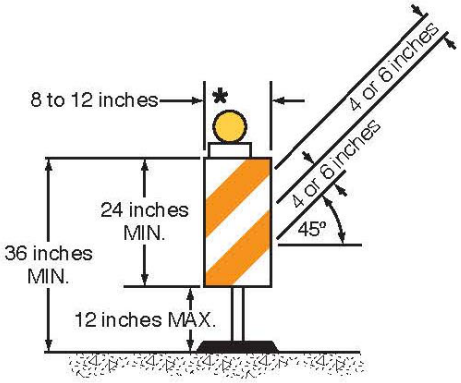


Night and/or freeway
High-speed roadway
(≥ 45 mph)

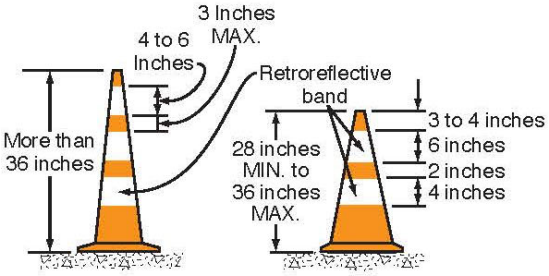


Day and low-speed
roadway (≤ 40 mph)

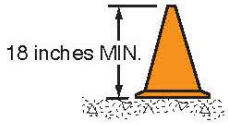
TUBULAR MARKERS



VERTICAL PANEL

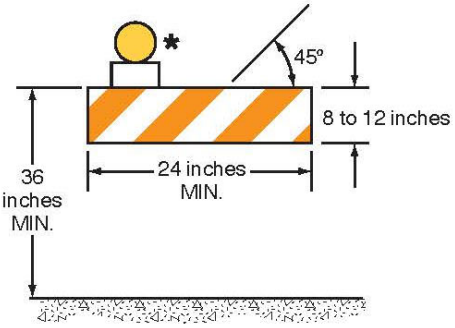


Night and/or freeway
High-speed roadway
(≥ 45 mph)

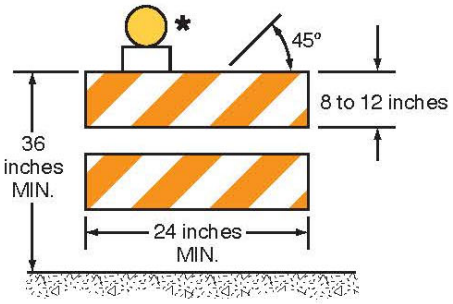


Day and low-speed
roadway (≤ 40 mph)

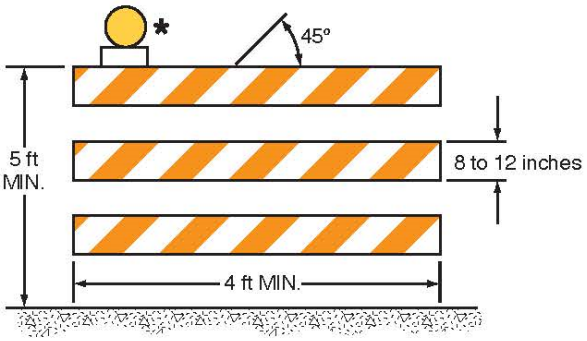
CONES



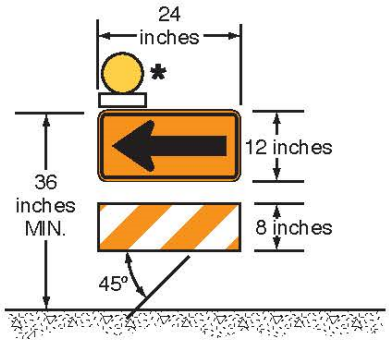
TYPE 1 BARRICADE **



TYPE 2 BARRICADE **



TYPE 3 BARRICADE **



DIRECTION INDICATOR BARRICADE **

* Warning lights (optional)

** Rail stripe widths shall be 6 inches, except that 4-inch wide stripes may be used if rail lengths are less than 36 inches. The sides of barricades facing traffic shall have retroreflective rail faces.

Guidance:

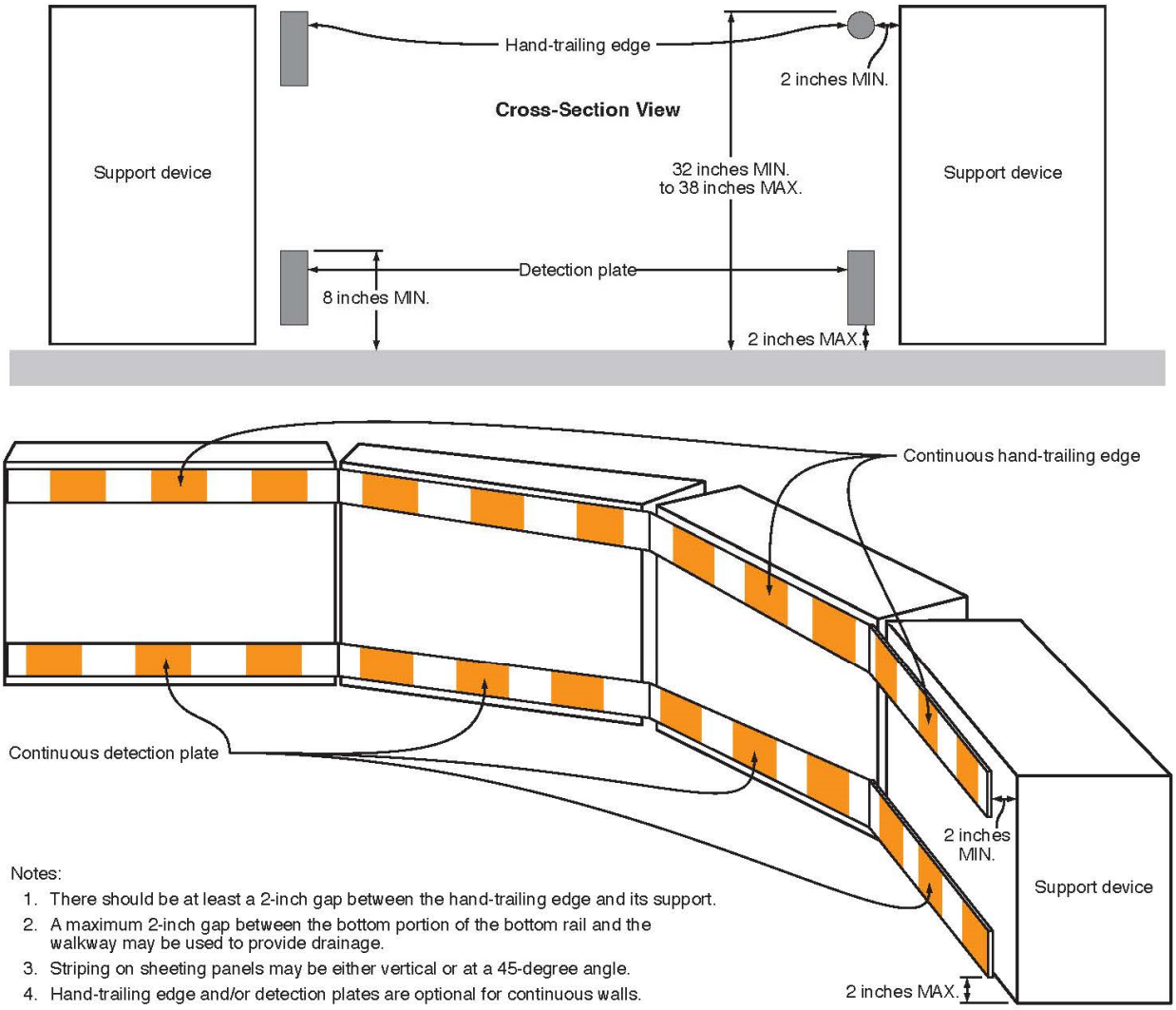
02 Pedestrian channelizing devices should be provided when work activities impact sidewalks or other pedestrian facilities or when the design of the temporary pedestrian facility does not otherwise include accessibility features consistent with the features in the existing pedestrian facility.

03 The pedestrian channelizing devices should be used both to close sidewalks and to delineate an alternate route.

Support:

04 An example of a pedestrian channelizing device is depicted in Figure 6K-2.

Figure 6K-2. Pedestrian Channelizing Device



Standard:

05 Pedestrian channelizing devices shall be crashworthy (see definition in Section 1C.02) when exposed to vehicular traffic.

06 Devices used to channelize pedestrians shall be detectable to users of long canes and visible to pedestrians with vision disabilities.

07 When used as a sidewalk closure, the device shall cover the entire width of the sidewalk.

08 Pedestrian channelizing devices shall have continuous detection plates and hand-trailing edges. The bottom of the detection plate shall be no higher than 2 inches above the walkway. The top edge of the detection plate shall be at least 8 inches above the walkway. The top of the hand-trailing edge shall be no lower than 32 inches and no higher than 38 inches above the walkway. The top surface of the hand-trailing edge shall be smooth to optimize hand trailing. Both the detection plate and the hand-trailing edge shall share a common vertical plane.

Guidance:

09 When pedestrian channelizing devices are combined in a series, the gap between devices should not exceed 1 inch.

Support:

10 The hand-trailing edge is the upper rail on a pedestrian channelizing device, as shown in Figure 6K-2. It is provided to allow pedestrians with vision disabilities to follow the pedestrian channelizing device with their hand. The hand-trailing edge is not a weight-bearing railing.

Guidance:

11 There should be at least a 2-inch gap between the hand-trailing edge and its support.

Standard:

12 When visible to vehicular traffic the detection plate and the hand-trailing edge of the pedestrian channelizing device shall have retroreflective sheeting complying with Paragraph 10 of Section 6K.01.

Guidance:

13 When not visible to vehicular traffic, the pedestrian channelizing device should have a contrasting pattern in alternating light and dark colors to provide visual contrast on the upper surface consisting of a minimum of 6 inches of sheeting or other contrasting materials.

Option:

14 Non-retroreflective materials may be used on the pedestrian side of the pedestrian channelizing device.

15 The sheeting on the pedestrian side of the pedestrian channelizing device may have stripes that are oriented either vertically or at a 45-degree angle.

Support:

16 The contrast of the light and dark stripes on the barricade sheeting assists pedestrians with vision disabilities in following the designated detour.

17 Section 6M.04 also contains information regarding detectable edging for pedestrian channelization.

Option:

18 A continuous wall may be used as a pedestrian channelizing device.

Guidance:

19 When used, a continuous wall should have a lower edge no more than 2 inches above the walkway, should extend a minimum of 32 inches above the walkway, should have a common vertical face, and should have alternating, contrasting sheeting positioned 32 inches above the walkway.

Option:

20 The continuous wall may extend to any height above the 32-inch minimum.

Section 6K.03 Cones

Standard:

01 Cones (see Figure 6K-1) shall be predominantly orange and shall be made of a material that can be struck without causing damage to the impacting vehicle. For daytime and low-speed roadways, cones shall be not less than 18 inches in height. When cones are used on freeways and other high-speed highways or at night on all highways, or when more conspicuous guidance is needed, cones shall be a minimum of 28 inches in height.

For emergency traffic control on the Wisconsin State Highway System or the Interstate Highway system, cones shall be a minimum of 28 inches in height.

02 For nighttime use, cones shall be retroreflectorized or equipped with lighting devices for maximum visibility. Retroreflectorization of cones that are 28 to 36 inches in height shall be provided by a 6-inch wide white band located 3 to 4 inches from the top of the cone and an additional 4-inch wide white band located approximately 2 inches below the 6-inch band.

03 Retroreflectorization of cones that are more than 36 inches in height shall be provided by horizontal, circumferential, alternating orange and white retroreflective stripes that are 4 to 6 inches wide. Each cone shall have a minimum of two orange and two white stripes with the top stripe being orange. Any non-retroreflective spaces between the retroreflective stripes shall not exceed 3 inches in width.

Option:

04 Traffic cones may be used to channelize road users, divide opposing vehicular traffic lanes, divide lanes when two or more lanes are kept open in the same direction, and delineate short-duration maintenance and utility work.

Traffic cones may be used to mark wet pavement markings.

Guidance:

05 Steps should be taken to minimize the possibility of cones being blown over or displaced by wind or moving vehicular traffic.

Option:

06 Cones may be doubled up to increase their weight.

Support:

07 Some cones are constructed with bases that can be filled with ballast. Others have specially weighted bases, or weight such as sandbag rings, that can be dropped over the cones and onto the base to provide added stability.

Guidance:

08 Ballast should be kept to the minimum amount needed.

Section 6K.04 Tubular Markers

Standard:

01 Tubular markers (see Figure 6K-1) shall be predominantly orange for TTC zone applications and shall be not less than 18 inches high and 2 inches wide facing road users. They shall be made of a material that can be struck without causing damage to the impacting vehicle.

02 Tubular markers shall be a minimum of 28 inches in height when they are used on freeways and other high-speed highways, on all highways during nighttime, or whenever more conspicuous guidance is needed.

03 For nighttime use, tubular markers shall be retroreflectorized. Retroreflectorization of tubular markers that have a height of less than 42 inches shall be provided by two 3-inch wide white bands placed a maximum of 2 inches from the top with a maximum of 6 inches between the bands. Retroreflectorization of tubular markers that have a height of 42 inches or more shall be provided by four 4-inch to 6-inch wide alternating orange and white stripes with the top stripe being orange.

Guidance:

04 Tubular markers have less visible area than other devices and should be used only where space restrictions do not allow for the use of other more visible devices.

05 Tubular markers should be stabilized by affixing them to the pavement, by using weighted bases, or by using weights such as sandbag rings that can be dropped over the tubular markers and onto the base to provide added stability. Ballast should be kept to the minimum amount needed.

Option:

06 Tubular markers may be used effectively to divide opposing lanes of road users, divide vehicular traffic lanes when two or more lanes of moving vehicular traffic are kept open in the same direction, and to delineate the edge of a pavement drop off where space limitations do not allow the use of larger devices.

Standard:

07 A tubular marker shall be attached to the pavement to display the minimum 2-inch width to the approaching road users.

Section 6K.05 Vertical Panels

Standard:

01 Vertical panels (see Figure 6K-1) shall have retroreflective striped material that is 8 to 12 inches in width and at least 24 inches in height. They shall have alternating diagonal orange and white retroreflective stripes sloping downward at an angle of 45 degrees in the direction vehicular traffic is to pass.

02 Where the height of the retroreflective material on the vertical panel is 36 inches or more, a stripe width of 6 inches shall be used.

Option:

03 Where the height of the retroreflective material on the vertical panel is less than 36 inches, a stripe width of 4 inches may be used.

04 Where space is limited, vertical panels may be used to channelize vehicular traffic, divide opposing lanes, or replace barricades.

Section 6K.06 Drums

Standard:

01 Drums (see Figure 6K-1) used for road user warning or channelization shall be constructed of lightweight, deformable materials. They shall be a minimum of 36 inches in height and have at least an 18-inch minimum width regardless of orientation. Metal drums shall not be used. The markings on drums shall be horizontal, circumferential, alternating orange and white retroreflective stripes 4 to 6 inches wide. Each drum shall have a minimum of two orange and two white stripes with the top stripe being orange. Any non-retroreflectorized spaces between the horizontal orange and white stripes shall not exceed 3 inches wide. Drums shall have closed tops that will not allow collection of construction debris or other debris.

Support:

02 Drums are highly visible, have good target value, give the appearance of being formidable obstacles and, therefore, command the respect of road users. They are portable enough to be shifted from place to place within a TTC zone in order to accommodate changing conditions, but are generally used in situations where they will remain in place for a prolonged period of time.

Option:

03 Although drums are most commonly used to channelize or delineate road user flow, they may also be used alone or in groups to mark specific locations.

Guidance:

04 Drums should not be weighted with sand, water, or any material to the extent that would make them hazardous to road users or workers when struck. Drums used in regions susceptible to freezing should have drain holes in the bottom so that water will not accumulate and freeze causing a hazard if struck by a road user.

Standard:

05 Ballast shall not be placed on the top of a drum.

Section 6K.07 Type 1, 2, or 3 Barricades

Support:

01 A barricade is a portable or fixed device having from one to three rails with appropriate markings and is used to control road users by closing, restricting, or delineating all or a portion of the right-of-way.

02 As shown in Figure 6K-1, barricades are classified as Type 1, Type 2, or Type 3.

Standard:

03 Stripes on barricade rails shall be alternating orange and white retroreflective stripes sloping downward at an angle of 45 degrees in the direction road users are to pass. Except as provided in Paragraph 4 of this Section, the stripes shall be 6 inches wide.

Option:

04 When rail lengths are less than 36 inches, 4-inch wide stripes may be used.

Standard:

05 The minimum length for Type 1 and Type 2 Barricades shall be 24 inches, and the minimum length for Type 3 Barricades shall be 48 inches. Each barricade rail shall be 8 to 12 inches wide. Barricades used on freeways, expressways, and other high-speed roadways shall have a minimum of 270 square inches of retroreflective area facing road users.

Guidance:

06 Where barricades extend entirely across a roadway, the stripes should slope downward in the direction toward which road users must turn.

07 Where both right and left turns are provided, the barricade stripes should slope downward in both directions from the center of the barricade or barricades.

08 Where no turns are intended, the stripes should be positioned to slope downward toward the center of the barricade or barricades.

09 Barricade rails should be supported in a manner that will allow them to be seen by the road user, and in a manner that provides a stable support that is not easily blown over or displaced.

10 The width of the existing pedestrian facility should be provided for the temporary facility if practical. Traffic control devices and other construction materials and features should not intrude into the usable width of the sidewalk, temporary pathway, or other pedestrian facility. When it is not possible to maintain a minimum width of 60 inches throughout the entire length of the pedestrian pathway, a 60 x 60-inch passing space should be provided at least every 200 feet to allow individuals in wheelchairs to pass.

11 Barricade rail supports should not project into pedestrian circulation routes more than 4 inches from the support between 27 and 80 inches from the surface as described in Section 307 of the U.S. Department of Justice 2010 ADA Standards for Accessible Design, September 15, 2010, 28 CFR 35 and 36, Americans with Disabilities Act of 1990.

Option:

12 For Type 1 Barricades, the support may include other unstriped horizontal rails necessary to provide stability.

Guidance:

13 On high-speed expressways or in other situations where barricades might be susceptible to overturning in the wind, ballasting should be used.

Option:

14 Sandbags may be placed on the lower parts of the frame or the stays of barricades to provide the required ballast.

Support:

15 Type 1 or Type 2 Barricades are intended for use in situations where road user flow is maintained through the TTC zone.

Option:

16 Barricades may be used alone or in groups to mark a specific condition or they may be used in a series for channelizing road users.

17 Type 1 Barricades may be used on conventional roads or urban streets.

Guidance:

18 Type 2 or Type 3 Barricades should be used on freeways and expressways or other high-speed roadways. Type 3 Barricades should be used to close or partially close a road.

Option:

19 Type 3 Barricades used at a road closure may be placed completely across a roadway or from curb to curb.

Guidance:

20 Where provision is made for access of authorized equipment and vehicles, the responsibility for Type 3 Barricades should be assigned to a person who will provide proper closure at the end of each work day.

Support:

21 When a highway is legally closed but access must still be allowed for local road users, barricades usually are not extended completely across the roadway.

Standard:

22 A sign shall be installed with the appropriate legend concerning permissible use by local road users (see Section 6G.05).

Guidance:

23 Adequate visibility of the barricades from both directions should be provided.

Option:

24 Signs may be installed on barricades (see Section 6F.02).

Section 6K.08 Direction Indicator Barricades

Standard:

01 The Direction Indicator Barricade (see Figure 6K-1) shall consist of a One-Direction Large Arrow (W1-6) sign mounted above a diagonal striped, horizontally-aligned, retroreflective rail.

02 The One-Direction Large Arrow (W1-6) sign shall have a black legend and border on an orange background. The stripes on the bottom rail shall be alternating orange and white retroreflective stripes sloping downward at an angle of 45 degrees in the direction road users are to pass. The stripes shall be 4 inches wide. The One-Direction Large Arrow (W1-6) sign shall be 24 x 12 inches. The bottom rail shall have a length of 24 inches and a height of 8 inches.

Option:

03 The Direction Indicator Barricade may be used in tapers, transitions, and other areas where specific directional guidance to drivers is necessary.

Guidance:

04 If used, Direction Indicator Barricades should be used in a series to direct the driver through the transition and into the intended travel lane.

Section 6K.09 Temporary Traffic Barriers as Channelizing Devices

Support:

01 Temporary traffic barriers (see Section 6M.02) are not TTC devices in themselves; however, when placed in a position identical to a line of channelizing devices and marked and/or equipped with appropriate channelization features to provide guidance and warning both day and night, they serve as TTC devices.

Standard:

02 Temporary traffic barriers serving as TTC devices shall comply with requirements for such devices as set forth throughout Part 6.

03 Temporary traffic barriers (see Section 6M.02) shall not be used solely to channelize road users, but also to protect the work space. If used to channelize vehicular traffic, the temporary traffic barrier shall be supplemented with delineation, pavement markings, or channelizing devices for improved daytime and nighttime visibility.

Guidance:

04 Temporary traffic barriers should not be used for a merging taper except in low-speed urban areas.

05 When it is necessary to use a temporary traffic barrier for a merging taper in low-speed urban areas or for a constricted/restricted TTC zone, the taper length should be designed to optimize road user operations considering the available geometric conditions.

Standard:

06 When it is necessary to use a temporary traffic barrier for a merging taper in low-speed urban areas or for a constricted/restricted TTC zone, the taper shall be delineated using channelizing devices, and/or an edge line, and/or delineators on the barrier.

Guidance:

07 When used for channelization, temporary traffic barriers should be of a light color for increased visibility.

Section 6K.10 Longitudinal Channelizing Devices

Support:

01 Longitudinal channelizing devices are lightweight, deformable devices that are highly visible, have good target value, and can be connected together.

Standard:

02 If used singly as Type 1, 2, or 3 barricades, longitudinal channelizing devices shall comply with the general size, color, stripe pattern, retroreflectivity, and placement characteristics established for the devices described in this Chapter.

Guidance:

03 If used to channelize vehicular traffic at night, longitudinal channelizing devices should be supplemented with retroreflective material or delineation for improved nighttime visibility.

Option:

04 Longitudinal channelizing devices may be used instead of a line of cones, drums, or barricades.

05 Longitudinal channelizing devices may be hollow and filled with water as a ballast.

06 Longitudinal channelizing devices may be used for pedestrian traffic control.

Standard:

07 If used for pedestrian traffic control, longitudinal channelizing devices shall be interlocked to delineate or channelize flow. The interlocking devices shall not have gaps that allow pedestrians to stray from the channelizing path.

Guidance:

08 Longitudinal channelizing devices have not met the crashworthy requirements for temporary traffic barriers and should not be used to shield obstacles or provide positive protection for pedestrians or workers.

Section 6K.11 Temporary Lane Separators

Option:

01 Temporary lane separators may be used to channelize road users, to divide opposing vehicular traffic lanes, and to divide lanes when two or more lanes are open in the same direction.

Standard:

02 Temporary lane separators shall consist of a longitudinal base component with a maximum height of 4 inches and a maximum width of 1 foot. The longitudinal base shall have sloping sides in order to facilitate crossover by emergency vehicles. One or more types of channelizing devices, such as tubular markers, vertical panels, or a Narrow Two-Way Traffic (W6-4) sign (see Section 6H.17) mounted on flexible supports, shall be affixed to the longitudinal base.

03 Channelizing devices affixed to the longitudinal base of a temporary lane separator shall be retroreflectorized to provide nighttime visibility.

Guidance:

04 A temporary lane separator should be stabilized by affixing it to the pavement in a manner suitable to its design, while allowing the unit to be intentionally moved from place to place within the TTC zone in order to accommodate changing conditions.

05 Temporary Lane Separators should not be used to shield obstacles or provide positive protection for pedestrians or workers because these devices have not met the crashworthy requirements for temporary traffic barriers.

Standard:

06 At pedestrian crossing locations, temporary lane separators shall have an opening or be shortened to provide a pathway that is at least 60 inches wide for crossing pedestrians.

Section 6K.12 Other Channelizing Devices

Option:

01 Channelizing devices other than those described in this Chapter may be used in special situations based on an engineering study.

Guidance:

02 Other channelizing devices should comply with the general size, color, stripe pattern, retroreflection, and placement characteristics established for the devices described in this Chapter.

CHAPTER 6L. OTHER TTC ZONE TRAFFIC CONTROL DEVICES

Section 6L.01 Temporary Traffic Control Signals

Standard:

01 Temporary traffic control signals (see Section 4D.11) used to control road user movements through TTC zones and in other TTC situations shall comply with the applicable provisions of Part 4.

Support:

02 Temporary traffic control signals are typically used in TTC zones such as temporary haul road crossings; temporary one-way operations along a one-lane, two-way highway; temporary one-way operations on bridges, reversible lanes, and intersections.

Standard:

03 A temporary traffic control signal that is used to control traffic through a one-lane, two-way section of roadway shall comply with the provisions of Section 4O.02.

Guidance:

04 When temporary traffic control signals are used, conflict monitors typical of traditional traffic control signal operations should be used.

Support:

05 Where pedestrians are detoured to a temporary traffic control signal, an accessible pedestrian signal (see Chapter 4K) provides information in non-visual formats (such as audible tones and/or speech messages, and vibrating surfaces) so that a pedestrian with vision disabilities can know when to cross the street along the alternate route.

Option:

06 Temporary traffic control signals may be portable or temporarily mounted on fixed supports.

Guidance:

07 Temporary traffic control signals should only be used in situations where temporary traffic control signals are preferable to other means of traffic control, such as changing the work staging or work zone size to eliminate one-way vehicular traffic movements, using flaggers to control one-way or crossing movements, using STOP or YIELD signs, and using warning devices alone.

Support:

08 Factors related to the design and application of temporary traffic control signals include the following:

A. Safety and road user needs;
B. Work staging and operations;
C. The feasibility of using other TTC strategies (for example, flaggers, providing space for two lanes, or detouring road users, including bicyclists and pedestrians);
D. Sight distance restrictions;
E. Human factors considerations (for example, lack of driver familiarity with temporary traffic control signals);
F. Road-user volumes including roadway and intersection capacity;
G. Affected side streets and driveways;
H. Vehicle speeds;
I. The placement of other TTC devices;
J. Parking;
K. Turning restrictions;
L. Pedestrians;
M. The nature of adjacent land uses (such as residential or commercial);
N. Legal authority;
O. Signal phasing and timing requirements;
P. Full-time or part-time operation;
Q. Actuated, fixed-time, or manual operation;
R. Power failures or other emergencies;
S. Inspection and maintenance needs;
T. Need for detailed placement, timing, and operation records; and
U. Operation by contractors or by others.

09 Although temporary traffic control signals can be mounted on trailers or lightweight portable supports, fixed supports offer superior resistance to displacement or damage by severe weather, vehicle impact, and vandalism.

Guidance:

10 Other TTC devices should be used to supplement temporary traffic control signals, including warning and regulatory signs, pavement markings, and channelizing devices.

11 Temporary traffic control signals not in use should be covered or removed.

12 If a temporary traffic control signal is located within ½ mile of an adjacent traffic control signal, consideration should be given to interconnected operation.

Standard:

13 Temporary traffic control signals shall not be located within 200 feet of a grade crossing unless the temporary traffic control signal is provided with preemption in accordance with Sections 4F.18, 4F.19, and 8D.09, or unless a uniformed officer or flagger is provided at the crossing to prevent vehicles from stopping within the crossing.

Section 6L.02 Automated Flagger Assistance Devices – General

Support:

01 Automated Flagger Assistance Devices (AFADs) enable a flagger(s) to be positioned out of the lane of traffic and are used to control road users through TTC zones. These devices are designed to be remotely operated either by a single flagger at one end of the TTC zone or at a central location, or by separate flaggers near each device's location.

02 There are two types of AFADs:

A. An AFAD (see Section 6L.03) that uses a remotely controlled STOP/SLOW sign on either a trailer or a movable cart system to alternately control right-of-way.
B. An AFAD (see Section 6L.04) that uses remotely controlled red and yellow lenses and a gate arm to alternately control right-of-way.

03 AFADs might be appropriate for short-term and intermediate-term activities (see Section 6N.01). Typical applications include TTC activities such as, but not limited to:

A. Bridge maintenance,
B. Haul road crossings, and
C. Pavement patching.

Standard:

04 AFADs shall only be used in situations where there is only one lane of approaching traffic in the direction to be controlled.

05 When used at night, the AFAD location shall be illuminated in accordance with Section 6D.06.

Guidance:

06 AFADs should not be used for long-term stationary work (see Section 6N.01).

Standard:

07 Because AFADs are not traffic control signals, they shall not be used as a substitute for or a replacement for a continuously operating temporary traffic control signal as described in Section 6L.01.

08 AFADs shall meet the crashworthy (see definition in Section 1C.02) performance criteria contained in Section 6A.04.

Guidance:

09 If used, AFADs should be located in advance of one-lane, two-way tapers and downstream from the point where approaching traffic is to stop in response to the device.

Standard:

10 If used, AFADs shall be placed so that all of the signs and other items controlling traffic movement are readily visible to the driver of the initial approaching vehicle with advance warning signs alerting other approaching traffic to be prepared to stop.

11 If used, an AFAD shall be operated only by a flagger (see Section 6D.01) who has been trained on the operation of the AFAD. The flagger(s) operating the AFAD(s) shall not leave the AFAD(s) unattended at any time while the AFAD(s) is being used.

12 The use of AFADs shall conform to one of the following methods:

A. An AFAD at each end of the TTC zone (Method 1), or
B. An AFAD at one end of the TTC zone and a flagger at the opposite end (Method 2).

13 Except as provided in Paragraph 14 of this Section, two flaggers shall be used when using either Method 1 or Method 2.

Option:

14 A single flagger may simultaneously operate two AFADs (Method 1) or may operate a single AFAD on one end of the TTC zone while being the flagger at the opposite end of the TTC zone (Method 2) if both of the following conditions are present:

A. The flagger has an unobstructed view of the AFAD(s), and
B. The flagger has an unobstructed view of approaching traffic in both directions.

Guidance:

15 When an AFAD is used, the advance warning signing should include a ROAD WORK AHEAD (W20-1) sign, a ONE LANE ROAD (W20-4) sign, and a BE PREPARED TO STOP (W3-4) sign.

Standard:

16 When the AFAD is not in use, the signs associated with the AFAD, both at the AFAD location and in advance, shall be removed or covered.

Guidance:

17 A State or local agency that elects to use AFADs should adopt a policy, based on engineering judgment, governing AFAD applications. The policy should also consider more detailed and/or more restrictive requirements for AFAD use, such as the following:

A. Conditions applicable for the use of Method 1 and Method 2 AFAD operation,
B. Volume criteria,
C. Maximum distance between AFADs,
D. Conflicting lenses/indications monitoring requirements,
E. Fail-safe procedures,
F. Additional signing and pavement markings,
G. Application consistency,
H. Larger signs or lenses to increase visibility, and
I. Use of backplates.

Section 6L.03 STOP/SLOW Automated Flagger Assistance Devices

Standard:

01 A STOP/SLOW Automated Flagger Assistance Device (AFAD) shall include a STOP/SLOW sign that alternately displays the STOP (R1-1) face and the SLOW (W20-8) face of a STOP/SLOW paddle (see Figure 6L-1).

02 The AFAD's STOP/SLOW sign shall have an octagonal shape, shall be fabricated of rigid material, and shall be mounted with the bottom of the sign a minimum of 6 feet above the pavement on an appropriate support. The size of the STOP/SLOW sign shall be at least 24 x 24 inches with letters at least 8 inches high. The background of the STOP face shall be red with white letters and border. The background of the SLOW face shall be diamond-shaped and orange with black letters and border. Both faces of the STOP/SLOW sign shall be retroreflectorized.

03 The AFAD's STOP/SLOW sign shall have a means to positively lock, engage, or otherwise maintain the sign assembly in a stable condition when set in the STOP or SLOW position.

04 The AFAD's STOP/SLOW sign shall be supplemented with active conspicuity devices by incorporating either:

A. White or red flashing lights within the STOP face and white or yellow flashing lights within the SLOW face meeting the provisions contained in Section 6D.02; or
B. A Stop Beacon (see Section 4S.05) mounted a maximum of 24 inches above the STOP face and a Warning Beacon (see Section 4S.03) mounted a maximum of 24 inches above, below, or to the side of the SLOW face. The Stop Beacon shall not be flashed or illuminated when the SLOW face is displayed, and the Warning Beacon shall not be flashed or illuminated when the STOP face is

displayed. Except for the mounting locations, the beacons shall comply with the provisions of Chapter 4S.

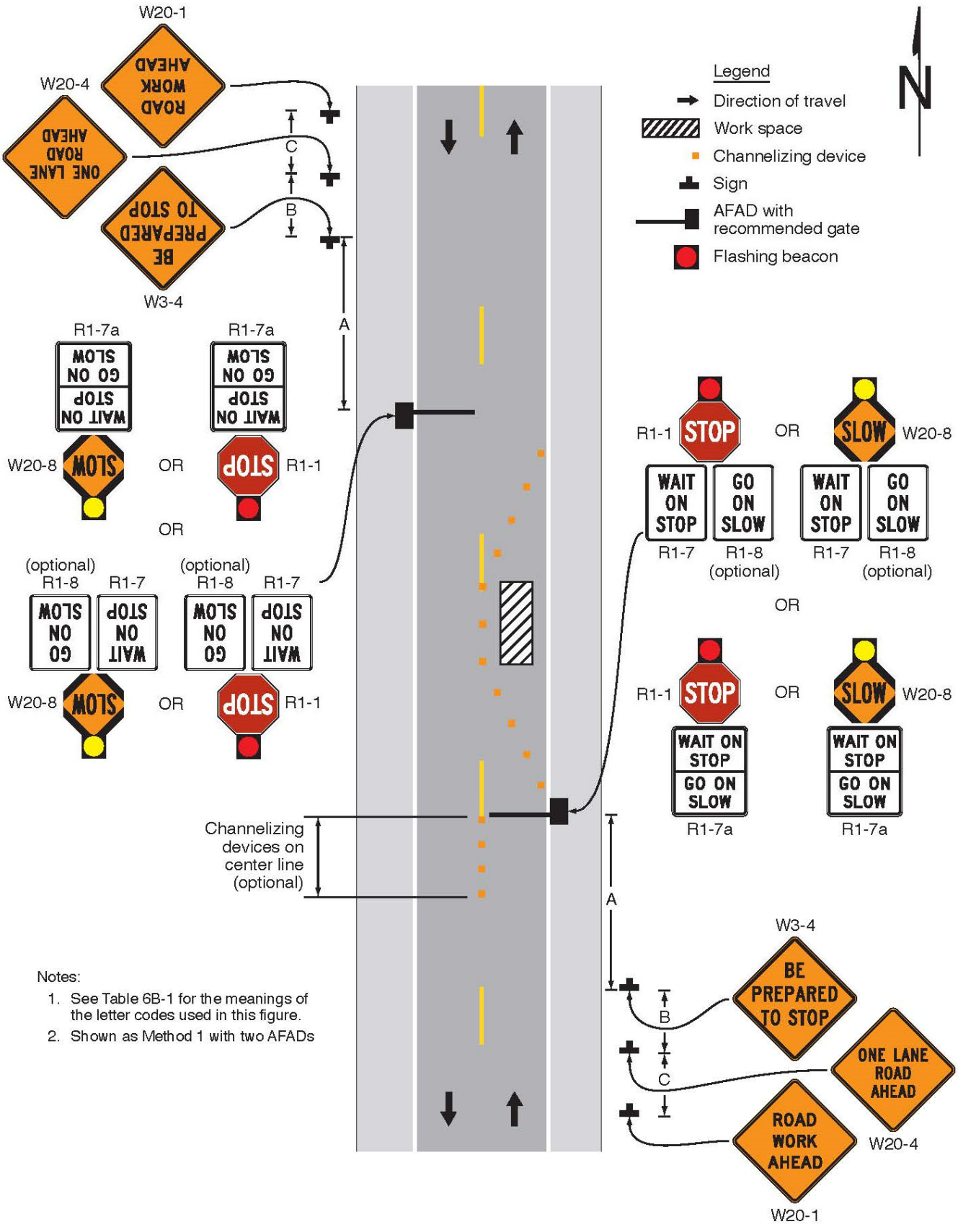
Option:

05 Type B warning light(s) (see Section 6L.07) or strobe lights may be used in lieu of the Warning Beacon during the display of the SLOW face of the AFAD's STOP/SLOW sign.

Standard:

06 If Type B warning lights or strobe lights are used in lieu of a Warning Beacon, they shall flash continuously when the SLOW face is displayed and shall not be flashed or illuminated when the STOP face is displayed.

Figure 6L-1. Example of the Use of a STOP/SLOW Automated Flagger Assistance Device (AFAD)



Notes:

1. See Table 6B-1 for the meanings of the letter codes used in this figure.
2. Shown as Method 1 with two AFADs

Option:

07 The faces of the AFAD's STOP/SLOW sign may include louvers to improve the stability of the device in windy or other adverse environmental conditions.

Standard:

08 If louvers are used, the louvers shall be designed such that the full sign face is visible to approaching traffic at a distance of 50 feet or greater.

Guidance:

09 The STOP/SLOW AFAD should include a gate arm that descends to a down position across the approach lane of traffic when the STOP face is displayed and then ascends to an upright position when the SLOW face is displayed.

Option:

10 In lieu of a stationary STOP/SLOW sign with a separate gate arm, the STOP/SLOW sign may be attached to a mast arm that physically blocks the approach lane of traffic when the STOP face is displayed and then moves to a position that does not block the approach lane when the SLOW face is displayed.

Standard:

11 Gate arms, if used, shall be fully retroreflectorized on both sides, and shall have vertical alternating red and white stripes at 16-inch intervals measured horizontally as shown in Figure 8D-1. When the arm is in the down position blocking the approach lane:

A. The minimum vertical aspect of the arm and sheeting shall be 2 inches, and
B. The end of the arm shall reach at least to the center of the lane being controlled.

12 A WAIT ON STOP (R1-7) sign (see Figure 6L-1) shall be displayed to road users approaching the AFAD.

Option:

13 A GO ON SLOW (R1-8) sign (see Figure 6L-1) may also be displayed to road users approaching the AFAD.

14 The WAIT ON STOP/ GO ON SLOW (R1-7a) sign (see Figure 6L-1) may also be used to display both messages to approaching road users.

Standard:

15 The GO ON SLOW sign, if used, and the WAIT ON STOP sign shall be positioned on the same support structure as the AFAD or immediately adjacent to the AFAD such that they are in the same direct line of view of approaching traffic as the sign faces of the AFAD.

16 To inform road users to stop, the AFAD shall display the STOP face and the red or white lights, if used, within the STOP face shall flash or the Stop Beacon shall flash. To inform road users to proceed, the AFAD shall display the SLOW face and the yellow or white lights, if used, within the SLOW face shall flash or the Warning Beacon or the Type B warning lights shall flash.

17 If STOP/SLOW AFADs are used to control traffic in a one-lane, two-way TTC zone, safeguards shall be incorporated to prevent the flagger(s) from simultaneously displaying the SLOW face at each end of the TTC zone. Additionally, the flagger(s) shall not display the AFAD's SLOW face until all oncoming vehicles have cleared the one-lane portion of the TTC zone.

Section 6L.04 Red/Yellow Lens Automated Flagger Assistance Devices

Standard:

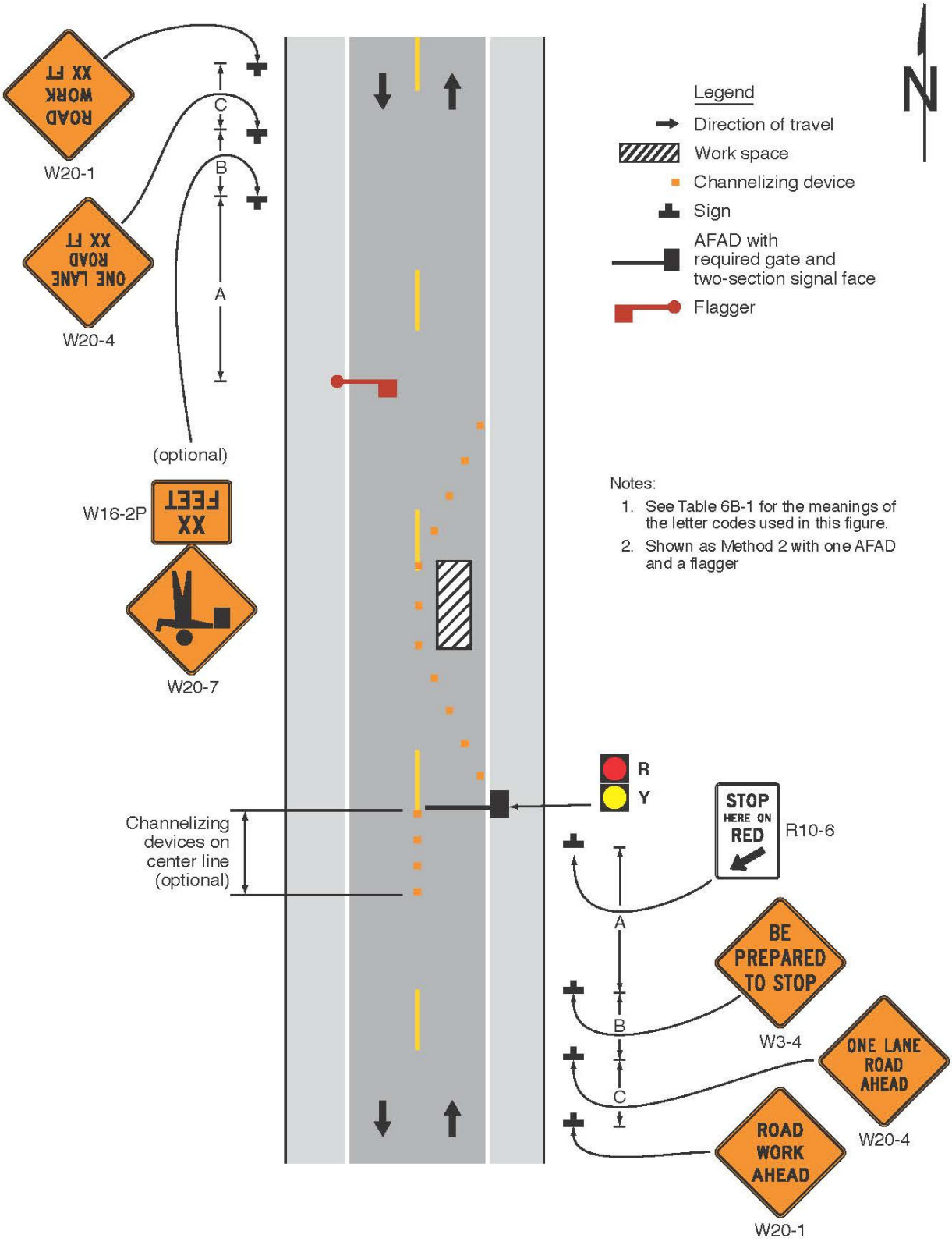
01 A Red/Yellow Lens Automated Flagger Assistance Device (AFAD) shall alternately display a steadily illuminated CIRCULAR RED lens and a flashing CIRCULAR YELLOW lens to control traffic without the need for a flagger in the immediate vicinity of the AFAD or on the roadway (see Figure 6L-2).

02 Red/Yellow Lens AFADs shall have at least one set of CIRCULAR RED and CIRCULAR YELLOW lenses that are 12 inches in diameter. Unless otherwise provided in this Section, the lenses and their arrangement, CIRCULAR RED on top and CIRCULAR YELLOW below, shall comply with the applicable provisions for traffic signal indications in Part 4. If the set of lenses is post-mounted, the bottom of the housing (including brackets) shall be at least 7 feet above the pavement. If the set of lenses is located over any portion of the highway that can be used by motor vehicles, the bottom of the housing (including brackets) shall be at least 15 feet above the pavement.

Option:

03 Additional sets of CIRCULAR RED and CIRCULAR YELLOW lenses, located over the roadway or on the left-hand side of the approach and operated in unison with the primary set, may be used to improve visibility and/or conspicuity of the AFAD.

Figure 6L-2. Example of the Use of a Red/Yellow Lens Automated Flagger Assistance Device (AFAD)



Standard:

04 A Red/Yellow Lens AFAD shall include a gate arm that descends to a down position across the approach lane of traffic when the steady CIRCULAR RED lens is illuminated and then ascends to an upright position when the flashing CIRCULAR YELLOW lens is illuminated. The gate arm shall be fully retroreflectorized on both sides, and shall have vertical alternating red and white stripes at 16-inch intervals measured horizontally as shown in Figure 8D-1. When the arm is in the down position blocking the approach lane:

A. The minimum vertical aspect of the arm and sheeting shall be 2 inches, and
B. The end of the arm shall reach at least to the center of the lane being controlled.

05 A Stop Here On Red (R10-6 or R10-6a) sign (see Section 2B.59) shall be installed on the right-hand side of the approach at the point at which drivers are expected to stop when the steady CIRCULAR RED lens is illuminated (see Figure 6L-2).

06 To inform road users to stop, the AFAD shall display a steadily illuminated CIRCULAR RED lens and the gate arm shall be in the down position. To inform road users to proceed, the AFAD shall display a flashing CIRCULAR YELLOW lens and the gate arm shall be in the upright position.

07 If Red/Yellow Lens AFADs are used to control traffic in a one-lane, two-way TTC zone, safeguards shall be incorporated to prevent the flagger(s) from actuating a simultaneous display of a flashing CIRCULAR YELLOW lens at each end of the TTC zone. Additionally, the flagger shall not actuate the AFAD's display of the flashing CIRCULAR YELLOW lens until all oncoming vehicles have cleared the one-lane portion of the TTC zone.

08 A change interval shall be provided as the transition between the display of the flashing CIRCULAR YELLOW indication and the display of the steady CIRCULAR RED indication. During the change interval, the CIRCULAR YELLOW lens shall be steadily illuminated. The gate arm shall remain in the upright position during the display of the steadily illuminated CIRCULAR YELLOW change interval.

09 A change interval shall not be provided between the display of the steady CIRCULAR RED indication and the display of the flashing CIRCULAR YELLOW indication.

Guidance:

10 *The steadily illuminated CIRCULAR YELLOW change interval should have a duration of at least 5 seconds, unless a different duration, within the range of durations recommended by Section 4F.17, is justified by engineering judgment.*

Section 6L.05 Portable Changeable Message Signs

Support:

01 Portable changeable message signs (PCMS) are TTC devices installed for temporary use with the flexibility to display a variety of messages. In most cases, portable changeable message signs follow the same provisions for design and application as those given for changeable message signs in Chapter 2L. The information in this Section describes situations where the provisions for portable changeable message signs differ from those given in Chapter 2L.

02 Portable changeable message signs are used most frequently on high-density urban freeways, but have applications on all types of highways where highway alignment, road user routing problems, or other pertinent conditions require advance warning and information.

03 Portable changeable message signs have a wide variety of applications in TTC zones including: roadway, lane, or ramp closures; incident management; width restriction information; speed control or reductions; advisories on work scheduling; road user management and diversion; warning of adverse conditions or special events; and other operational control.

04 The primary purpose of portable changeable message signs in TTC zones is to advise the road user of unexpected situations. Portable changeable message signs are particularly useful as they are capable of:

A. Conveying complex messages,
B. Displaying real time information about conditions ahead, and
C. Providing information to assist road users in making decisions prior to the point where actions must be taken.

05 Some typical applications include the following:

A. Where the speed of vehicular traffic is expected to drop substantially;

B. Where significant queuing and delays are expected;
C. Where adverse environmental conditions are present;
D. Where there are changes in alignment or surface conditions;
E. Where advance notice of ramp, lane, or roadway closures is needed;
F. Where crash or incident management is needed; and/or
G. Where changes in the road user pattern occur.

Guidance:

06 The components of a portable changeable message sign should include: a message sign, control systems, a power source, and mounting and transporting equipment. The front face of the sign should be covered with a protective material.

Standard:

07 Portable changeable message signs shall comply with the applicable design and application principles established in Chapter 2A. Portable changeable message signs shall display only traffic operational, regulatory, warning, and guidance information, and shall not be used for advertising messages.

Support:

08 Section 2L.02 contains information regarding overly simplistic or vague messages that is also applicable to portable changeable message signs.

Standard:

09 The colors used for legends on portable changeable message signs shall comply with those shown in Table 2A-2.

Support:

10 Section 2L.04 contains information regarding the luminance, luminance contrast, and contrast orientation that is also applicable to portable changeable message signs.

Guidance:

11 Portable changeable message signs should be visible from ½ mile under both day and night conditions.

Support:

12 Section 2B.21 contains information regarding the design of portable changeable message signs that are used to display speed limits that change based on operational conditions, or are used to display the speed at which approaching drivers are traveling.

Guidance:

13 A portable changeable message sign should be limited to three lines of eight characters per line or should consist of a full matrix display.

14 Except as provided in Paragraph 15 of this Section, the letter height used for portable changeable message sign messages should be a minimum of 18 inches.

Option:

15 For portable changeable message signs mounted on service patrol trucks or other incident response vehicles, a letter height as short as 10 inches may be used. Shorter letter sizes may also be used on a portable changeable message sign used on low speed facilities provided that the message is legible from at least 650 feet.

16 The portable changeable message sign may vary in size.

Guidance:

17 Messages on a portable changeable message sign should consist of no more than two phases, and a phase should consist of no more than three lines of text. Each phase should be capable of being understood by itself, regardless of the order in which it is read. Messages should be centered within each line of legend. If more than one portable changeable message sign is simultaneously legible to road users, then only one of the signs should display a sequential message at any given time.

Support:

18 Road users have difficulties in reading messages displayed in more than two phases on a typical three-line portable changeable message sign.

Standard:

19 Except when being used to simulate an Arrow Board display (see Section 6L.06), techniques of message display such as animation, rapid flashing, dissolving, exploding, scrolling, traveling horizontally or vertically across the face of the sign, or other dynamic elements shall not be used.

Guidance:

20 When a message is divided into two phases, the display time for each phase should be at least 2 seconds, and the sum of the display times for both of the phases should be a maximum of 8 seconds.

21 All messages should be designed with consideration given to the principles provided in this Section and also taking into account the following:

A. The message should be as brief as possible and should contain three thoughts (with each thought preferably shown on its own line) that convey:
   1. The problem or situation that the road user will encounter ahead,
   2. The location of or distance to the problem or situation, and
   3. The recommended driver action.

B. If more than two phases are needed to display a message, additional portable changeable message signs should be used. When multiple portable changeable message signs are needed, they should be placed on the same side of the roadway and they should be separated from each other by a distance of at least 1,000 feet on freeways and expressways, and by a distance of at least 500 feet on other types of highways.

Standard:

22 When the word messages shown in Tables 1D-1 or 1D-2 need to be abbreviated on a portable changeable message sign, the provisions described in Section 1D.08 shall be followed.

23 In order to maintain legibility, portable changeable message signs shall automatically adjust their brightness under varying light conditions.

24 The control system shall include a display screen upon which messages can be reviewed before being displayed on the message sign. The control system shall be capable of maintaining memory when power is unavailable.

25 Portable changeable message signs shall be equipped with a power source and a battery back-up to provide continuous operation when failure of the primary power source occurs.

26 The mounting of portable changeable message signs on a trailer, a large truck, or a service patrol truck shall be such that the bottom of the message sign shall be a minimum of 7 feet above the roadway in urban areas and 5 feet above the roadway in rural areas when it is in the operating mode.

Guidance:

27 Portable changeable message signs should be used as a supplement to and not as a substitute for conventional signs and pavement markings.

28 When portable changeable message signs are used for route diversion, they should be placed far enough in advance of the diversion to allow road users ample opportunity to perform necessary lane changes, to adjust their speed, or to exit the affected highway.

29 Portable changeable message signs should be sited and aligned to provide maximum legibility and to allow time for road users to respond appropriately to the portable changeable message sign message.

30 Portable changeable message signs should be placed off the shoulder of the roadway and behind a traffic barrier, if practicable. Where a traffic barrier is not available to shield the portable changeable message sign, it should be placed off the shoulder and outside of the clear zone. If a portable changeable message sign has to be placed on the shoulder of the roadway or within the clear zone, it should be delineated with retroreflective TTC devices.

31 When portable changeable message signs are used in TTC zones, they should display only TTC messages.

32 When portable changeable message signs are not being used to display TTC messages, they should be relocated such that they are outside of the clear zone or shielded behind a traffic barrier and turned away from traffic. If relocation or shielding is impracticable, they should be delineated with retroreflective TTC devices.

33 Portable changeable message sign trailers should be delineated on a permanent basis by affixing retroreflective material, known as conspicuity material, in a continuous line on the face of the trailer as seen by oncoming road users.

Section 6L.06 Arrow Boards

Standard:

01 An arrow board shall be a sign with a matrix of elements capable of either flashing or sequential displays. This sign shall provide additional warning and directional information to assist in merging and controlling road users through or around a TTC zone.

Guidance:

02 An arrow board in the arrow or chevron mode should be used to advise approaching traffic of a lane closure along major multi-lane roadways in situations involving heavy traffic volumes, high speeds, and/or limited sight distances, or at other locations and under other conditions where road users are less likely to expect such lane closures.

03 If used, an arrow board should be used in combination with appropriate signs, channelizing devices, or other TTC devices.

04 An arrow board should be placed on the shoulder of the roadway or, if practicable, farther from the traveled lane. It should be delineated with retroreflective TTC devices. When an arrow board is not being used, it should be removed; if not removed, it should be shielded; or if the previous two options are not feasible, it should be delineated with retroreflective TTC devices.

Standard:

05 Arrow boards shall meet the minimum size, legibility distance, number of elements, and other specifications shown in Figure 6L-3.

Support:

06 Type A arrow boards are appropriate for use on low-speed urban streets. Type B arrow boards are appropriate for intermediate-speed facilities and for maintenance or mobile operations on high-speed roadways. Type C arrow boards are intended to be used on high-speed, high-volume motor vehicle traffic control projects. Type D arrow boards are intended for use on vehicles authorized by the State or local agency.

Standard:

07 Type A, B, and C arrow boards shall have solid rectangular appearances. A Type D arrow board shall conform to the shape of the arrow.

08 All arrow boards shall be finished in non-reflective black. The arrow board shall be mounted on a vehicle, a trailer, or other suitable support.

Guidance:

09 The minimum mounting height, measured vertically from the bottom of the board to the roadway below it or to the elevation of the near edge of the roadway, of an arrow board should be 7 feet, except on vehicle-mounted arrow boards, which should be as high as practicable.

10 A vehicle-mounted arrow board should be provided with remote controls.

Standard:

11 Arrow board elements shall be capable of at least a 50 percent dimming from full brilliance. The dimmed mode shall be used for nighttime operation of arrow boards.

Guidance:

12 Full brilliance should be used for daytime operation of arrow boards.

Standard:

13 The arrow board shall have suitable elements capable of the various operating modes. The color presented by the elements shall be yellow.

Guidance:

14 If an arrow board consisting of a bulb matrix is used, the elements should be recess-mounted or equipped with an upper hood of not less than 180 degrees.

Standard:

15 The minimum element on-time shall be 50 percent for the flashing mode, with equal intervals of 25 percent for each sequential phase. The flashing rate shall be not less than 25 or more than 40 flashes per minute.

16 An arrow board shall have the following three mode selections:

A. A Flashing Arrow, Sequential Arrow, or Sequential Chevron mode;
B. A flashing Double Arrow mode; and
C. A flashing Caution or Alternating Diamond mode.

17 An arrow board in the arrow or chevron mode shall be used only for stationary or moving lane closures on multi-lane roadways.

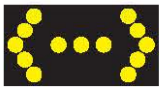
18 For shoulder work, for blocking the shoulder, for roadside work near the shoulder, or for temporarily closing one lane on a two-lane, two-way roadway, an arrow board shall be used only in the caution mode.

Guidance:

19 For a stationary lane closure, the arrow board should be located on the shoulder at the beginning of the merging taper.

20 Where the shoulder is narrow, the arrow board should be located in the closed lane.

Figure 6L-3. Advance Warning Arrow Board Display Specifications

Operating Mode	Display (Type C arrow board illustrated)
1. At least one of the three following modes shall be provided:	(right arrow shown; left is similar)
Flashing Arrow	 Merge Right
Sequential Arrow	 Merge Right
Sequential Chevron	 Merge Right
2. The following mode shall be provided: Flashing Double Arrow	 Merge Right or Left
3. At least one of the following modes shall be provided: Flashing Caution or Alternating Diamond Caution	 Flashing Caution or Flashing Caution or Alternating Diamond Caution

Arrow Board Type	Minimum Size	Minimum Legibility Distance	Minimum Number of Elements
A	48 x 24 inches	1/2 mile	12
B	60 x 30 inches	3/4 mile	13
C	96 x 48 inches	1 mile	15
D	None*	1/2 mile	12

*Length of arrow equals 48 inches, width of arrowhead equals 24 inches

Standard:

21 When arrow boards are used to close multiple lanes, a separate arrow board shall be used for each closed lane.

Guidance:

22 When arrow boards are used to close multiple lanes, if the first arrow board is placed on the shoulder, the second arrow board should be placed in the first closed lane at the upstream end of the second merging taper (see Figure 6P-37). When the first arrow board is placed in the first closed lane, the second arrow board should be placed in the second closed lane at the downstream end of the second merging taper.

23 For mobile operations where a lane is closed, the arrow board should be located to provide adequate separation from the work operation to allow for appropriate reaction by approaching drivers.

Standard:

24 A vehicle displaying an arrow board shall be equipped with high-intensity rotating, flashing, oscillating, or strobe lights.

25 Arrow boards shall only be used to indicate a lane closure. Arrow boards shall not be used to indicate a lane shift.

Option:

26 A portable changeable message sign may be used to simulate an arrow board display.

Section 6L.07 Flashing Beacons and Warning Lights

Guidance:

01 Lighting devices should be provided in TTC zones based on engineering judgment.

Option:

02 Flashing beacons (see Chapter 4S) and/or warning lights may be used to supplement retroreflectorized signs, barriers, and channelizing devices.

Support:

03 Type A, Type B, Type C, and Type D 360-degree warning lights are portable, powered, yellow, lens-directed, enclosed lights.

Standard:

04 Warning lights shall comply with the provisions in Chapter 13 of the publication entitled, "Equipment and Materials Standards of the Institute of Transportation Engineers," 1998, Institute of Transportation Engineers.

05 When warning lights are used, they shall be mounted on signs or channelizing devices in a manner that, if hit by an errant vehicle, they will not be likely to penetrate the windshield.

Guidance:

06 The maximum spacing for warning lights should be identical to the channelizing device spacing requirements.

Support:

07 The light weight and portability of warning lights are advantages that make these devices useful as supplements to the retroreflectorization on signs and channelizing devices. The flashing lights are effective in attracting road users' attention.

Option:

08 Warning lights may be used in either a steady-burn or flashing mode.

Standard:

09 Warning lights shall flash when placed on channelizing devices used alone or in a cluster to warn of a condition.

10 Except for the sequential flashing warning lights discussed in Paragraph 12 of this Section, warning lights placed on channelizing devices used in a series to channelize road users shall be steady-burn.

11 Except for the sequential flashing warning lights that are described in Paragraph 12 of this Section, flashing warning lights shall not be used for delineation, as a series of flashers fails to identify the desired vehicle path.

12 If a series of sequential flashing warning lights is used on channelizing devices that form a merging taper, the successive flashing of the lights shall occur from the upstream end of the merging taper to the downstream end of the merging taper in order to identify the desired vehicle path. Each flashing warning light in the sequence shall be flashed at a rate of not less than 55 or more than 75 times per minute.

13 Type A Low-Intensity Flashing warning lights, Type C Steady-Burn warning lights, and Type D 360-degree Steady-Burn warning lights shall be maintained so as to be capable of being visible on a clear night from a distance of 3,000 feet. Type B High-Intensity Flashing warning lights shall be maintained so as to be capable of being visible on a sunny day when viewed without the sun directly on or behind the device from a distance of 1,000 feet.

14 Warning lights shall have a minimum mounting height of 30 inches to the bottom of the lens.

Support:

15 Type A Low-Intensity Flashing warning lights are used to warn road users during nighttime hours that they are approaching or proceeding in a potentially hazardous area.

Option:

16 Type A warning lights may be mounted on channelizing devices.

Support:

17 Type B High-Intensity Flashing warning lights are used to warn road users during both daylight and nighttime hours that they are approaching a potentially hazardous area.

Option:

18 Type B warning lights are designed to operate 24 hours per day and may be mounted on advance warning signs or on independent supports.

19 Type C Steady-Burn warning lights and Type D 360-degree Steady-Burn warning lights may be used during nighttime hours to delineate the edge of the traveled way.

Guidance:

20 When used to delineate a curve, Type C and Type D 360-degree warning lights should only be used on devices on the outside of the curve, and not on the inside of the curve.

Section 6L.08 High-Level Warning Devices (Flag Trees)

Option:

01 A high-level warning device (flag tree) may supplement other TTC devices in TTC zones.

Support:

02 A high-level warning device is designed to be seen over the top of typical passenger cars. A typical high-level warning device is shown in Figure 6F-1.

Standard:

03 A high-level warning device shall consist of a minimum of two flags with or without a Type B high-intensity flashing warning light. The distance from the roadway to the bottom of the lens of the light and to the lowest point of the flag material shall be not less than 8 feet. The flag shall be 16 inches square or larger and shall be orange or fluorescent red-orange in color.

Option:

04 An appropriate warning sign may be mounted below the flags.

Support:

05 High-level warning devices are most commonly used in high-density road user situations to warn road users of short-term operations.

CHAPTER 6M. OTHER TTC ZONE DESIGN FEATURES AND SAFETY DEVICES

Section 6M.01 General

Support:

01 Although certain devices and design features, such as lighting, barriers, dividers, crash cushions, and screens, are sometimes used in TTC zones to supplement traffic control devices or enhance traffic operations or safety for road users, they are not considered to be traffic control devices. The following Sections describe the most commonly used devices and design features. Section 1D.04 contains additional information about these devices and design features.

Section 6M.02 Positive Protection and Temporary Traffic Barriers

Support:

01 Temporary traffic barriers, including portable or movable barriers, are devices designed to help prevent penetration by vehicles while minimizing injuries to vehicle occupants, and to protect workers, bicyclists, and pedestrians.

Guidance:

02 Except as otherwise required, at a minimum, longitudinal traffic barriers and/or other positive protection devices should be considered in work zone situations that place workers at increased risk from motorized traffic, and where positive protection devices offer the highest potential for improved safety for workers and road users.

Support:

03 Considerations for positive protection include, but are not limited to, the following circumstances:

A. Work zones that provide workers no means of escape from motorized traffic such as tunnels or bridges;
B. Long-term stationary work zones of two weeks or more resulting in substantial worker exposure to motorized traffic;
C. Projects with anticipated operating speeds of 45 mph or greater, especially when combined with high traffic volumes;
D. Work operations that place workers, pedestrians, or bicyclists close to travel lanes open to traffic; and
E. Roadside hazards, such as drop-offs or unfinished bridge decks, that will remain in place overnight or longer.

04 Work zone setups vary depending on the nature of the positive protection used.

05 23 CFR Part 630.1108(a) contains additional requirements for certain projects.

Option:

06 Temporary traffic barriers may be used to separate two-way vehicular traffic.

Standard:

07 Temporary traffic barriers shall be supplemented with standard delineation, pavement markings, or channelizing devices for improved daytime and nighttime visibility if they are used to channelize vehicular traffic. The delineation color shall match the applicable pavement marking color.

08 Temporary traffic barriers, including their end treatments, shall be crashworthy (see definition in Section 1C.02).

09 Short intermittent segments of temporary traffic barrier shall not be used because they nullify the containment and redirective capabilities of the temporary traffic barrier, increase the potential for serious injury both to vehicle occupants and pedestrians, and encourage the presence of blunt leading ends. Adjacent temporary traffic barrier segments shall be properly connected in order to provide the overall strength required for the temporary traffic barrier to perform properly.

Option:

10 Steady-burn warning lights (see Section 6L.07) may be mounted on temporary traffic barrier installations.

Support:

11 Temporary traffic barrier includes portable concrete, portable steel, or movable barrier which can all be moved laterally and/or longitudinally when needed and/or from site to site. More specific information on the use of temporary traffic barriers is contained in Chapters 8 and 9 of "Roadside Design Guide," 4th Edition, 2011, AASHTO.

Section 6M.03 Temporary Raised Islands

Standard:

01 Temporary raised islands shall be used only in combination with pavement striping and other suitable channelizing devices.

Option:

02 A temporary raised island may be used to separate vehicular traffic flows in two-lane, two-way operations on roadways having a vehicular traffic volume range of 4,000 to 15,000 average daily traffic (ADT) and on freeways having a vehicular traffic volume range of 22,000 ADT to 60,000 ADT.

03 Temporary raised islands also may be used in other than two-lane, two-way operations where physical separation of vehicular traffic from the TTC zone is not required.

Guidance:

04 Temporary raised islands should have the basic dimensions of 4 inches high by at least 12 inches wide and have rounded or chamfered corners.

05 The temporary raised islands should not be designed in such a manner that they would cause a motorist to lose control of the vehicle if the vehicle inadvertently strikes the temporary raised island. If struck, pieces of the island should not be dislodged to the extent that they could penetrate the occupant compartment or involve other vehicles.

Standard:

06 At pedestrian crossing locations, temporary raised islands shall have an opening or be shortened to provide at least a 60-inch wide passageway for the crossing pedestrian.

Section 6M.04 Detectable Edging for Pedestrians

Support:

01 Individual channelizing devices, tape or rope used to connect individual devices, other discontinuous barriers and devices, and pavement markings are not detectable by persons with vision disabilities and are incapable of providing detectable path guidance on temporary or realigned sidewalks or other pedestrian facilities.

Guidance:

02 A continuously-detectable edging should be provided throughout the length of a temporary pedestrian facility such that it can be followed by pedestrians using long canes for guidance. This edging should extend at least 8 inches above the surface of the sidewalk or pathway, with the bottom of the edging a maximum of 2 inches above the surface. This edging should be continuous throughout the length of the facility except for gaps at locations where pedestrians or vehicles will be turning or crossing. This edging should consist of a prefabricated or formed-in-place curbing or other continuous device that is placed along the edge of the sidewalk or walkway. This edging should be firmly attached to the ground or to other devices. Adjacent sections of this edging should be interconnected such that the edging is not displaced by pedestrian or vehicular traffic or work operations, and such that it does not constitute a hazard to pedestrians, workers, or other road users.

Support:

03 Examples of detectable edging for pedestrians include:

A. Prefabricated lightweight sections of plastic, metal, or other suitable materials that are interconnected and fixed in place to form a continuous edge.
B. Prefabricated lightweight sections of plastic, metal, or other suitable materials that are interconnected, fixed in place, and placed at ground level to provide a continuous connection between channelizing devices located at intervals along the edge of the sidewalk or walkway.
C. Sections of lumber interconnected and fixed in place to form a continuous edge.
D. Formed-in-place asphalt or concrete curb.
E. Prefabricated concrete curb sections that are interconnected and fixed in place to form a continuous edge.
F. Continuous temporary traffic barrier or longitudinal channelizing barricades placed along the edge of the sidewalk or walkway that provides a pedestrian edging at ground level.
G. Chain link or other fencing equipped with a continuous bottom rail.

Guidance:

04 Detectable pedestrian edging should be orange, white, or yellow and should match the color of the adjacent channelizing devices or traffic control devices, if any are present.

Section 6M.05 Crash Cushions

Support:

01 Crash cushions are systems that mitigate the effects of errant vehicles that strike obstacles, either by smoothly decelerating the vehicle to a stop when hit head-on, or by redirecting the errant vehicle. The two types of crash cushions that are used in TTC zones are stationary crash cushions and truck-mounted attenuators. Crash cushions in TTC zones help protect the drivers from the exposed ends of barriers, fixed objects, shadow vehicles, and other obstacles. Specific information on the use of crash cushions can be found in "Roadside Design Guide," 4th Edition, 2011, AASHTO.

Standard:

02 Crash cushions shall be crashworthy (see definition in Section 1C.02). They shall also be designed for each application to stop or redirect errant vehicles under prescribed conditions. Crash cushions shall be periodically inspected to verify that they have not been hit or damaged. Damaged crash cushions shall be promptly repaired or replaced to maintain their crashworthiness.

Support:

03 Stationary crash cushions are used in the same manner as permanent highway installations to protect drivers from the exposed ends of barriers, fixed objects, and other obstacles.

Standard:

04 Stationary crash cushions shall be designed for the specific application intended.

05 Truck-mounted attenuators shall be energy-absorbing devices attached to the rear of shadow trailers or trucks and shall be used in accordance with the manufacturer's specifications. If used, the shadow vehicle with the attenuator shall be located in advance of the work area, workers, or equipment to reduce the severity of rear-end crashes from errant vehicles.

Support:

06 Trucks or trailers are often used as shadow vehicles to protect workers or work equipment from errant vehicles. These shadow vehicles are normally equipped with flashing arrows, changeable message signs, and/or high-intensity rotating, flashing, oscillating, or strobe lights and are located properly in advance of the workers and/or equipment that they are protecting. However, these shadow vehicles might themselves cause injuries to occupants of the errant vehicles if they are not equipped with truck-mounted attenuators.

Guidance:

07 The shadow truck should be positioned a sufficient distance in advance of the workers or equipment being protected so that there will be sufficient distance, but not so much so that errant vehicles will travel around the shadow truck and strike the protected workers and/or equipment.

Support:

08 Chapter 9 of "Roadside Design Guide," 4th Edition, 2011, AASHTO contains additional information regarding the use of shadow vehicles.

Section 6M.06 Rumble Strips

Support:

01 Transverse rumble strips consist of intermittent, narrow, transverse areas of rough-textured or slightly-raised or depressed road surface that extend across the travel lanes to alert drivers to unusual vehicular traffic conditions. Through noise and vibration they attract the driver's attention to such features as unexpected changes in alignment and to conditions requiring a stop.

02 Longitudinal rumble strips consist of a series of rough-textured or slightly-raised or depressed road surfaces located along the shoulder to alert road users that they are leaving the travel lanes.

Standard:

03 If it is desirable to use a color other than the color of the pavement for a longitudinal rumble strip, the color of the rumble strip shall be the same color as the longitudinal line the rumble strip supplements.

04 If the color of a transverse rumble strip used within a travel lane is not the color of the pavement, the color of the rumble strip shall be white, black, or orange.

Option:

05 Intervals between transverse rumble strips may be reduced as the distance to the approached conditions is diminished in order to convey an impression that a closure speed is too fast and/or that an action is imminent. A sign warning drivers of the onset of rumble strips may be placed in advance of any transverse rumble strip installation.

Guidance:

06 Transverse rumble strips should be placed transverse to vehicular traffic movement. They should not adversely affect overall pavement skid resistance under wet or dry conditions.

07 In urban areas, even though a closer spacing might be warranted, transverse rumble strips should be designed in a manner that does not promote unnecessary braking or erratic steering maneuvers by road users.

08 Transverse rumble strips should not be placed on sharp horizontal or vertical curves.

09 Rumble strips should not be placed through pedestrian crossings or on bicycle routes.

10 Transverse rumble strips should not be placed on roadways used by bicyclists unless a minimum clear path of 4 feet is provided at each edge of the roadway or on each paved shoulder.

11 Longitudinal rumble strips should not be placed on the shoulder of a roadway that is used by bicyclists unless a minimum clear path of 4 feet is also provided on the shoulder.

Section 6M.07 Screens

Support:

01 Screens are used to block the road users' view of activities that can be distracting. Screens might improve safety and motor vehicle traffic flow where volumes approach the roadway capacity because they discourage gawking and reduce headlight glare from oncoming motor vehicle traffic.

Guidance:

02 Screens should not be mounted where they could adversely restrict road user visibility and sight distance and adversely affect the operation of vehicles.

Option:

03 Screens may be mounted on the top of temporary traffic barriers that separate two-way motor vehicle traffic.

Guidance:

04 Design of screens should be in accordance with Chapter 9 of "Roadside Design Guide," 4th Edition, 2011, AASHTO.

Section 6M.08 Lighting for Night Work

Support:

01 Utility, maintenance, or construction activities on highways are frequently conducted during nighttime periods when vehicular traffic volumes are lower. Large construction projects are sometimes operated on a double-shift basis requiring night work (see Section 6N.18).

Guidance:

02 When nighttime work is being performed, floodlights should be used to illuminate the work area, equipment crossings, and other areas.

03 When used, floodlighting should be installed in a manner that minimizes glare to approaching road users, flaggers, or workers.

04 The adequacy of the floodlight placement and elimination of potential glare should be determined by driving through and observing the floodlighted area from each direction on all approaching roadways after the initial floodlight setup, at night, and periodically. Lighting should be sufficient so as to give road users the capability to identify a worker as a person. Care should be taken to minimize the potential for shadows to conceal workers within the work area.

Support:

05 Desired illumination levels vary depending upon the nature of the task involved. An average horizontal luminance of 5 foot-candles can be adequate for general activities. Tasks requiring high levels of precision and extreme care can require an average horizontal luminance of 20 foot-candles.

Standard:

06 Except in emergency situations, flagger stations shall be illuminated at night.

CHAPTER 6N. TYPES OF TEMPORARY TRAFFIC CONTROL ZONE ACTIVITIES

Section 6N.01 Work Duration

Support:

01 Work duration is a major factor in determining the number and types of devices used in TTC zones. The duration of a TTC zone is defined relative to the length of time a work operation occupies a spot location.

Standard*:*

02 The five categories of work duration and their time at a location shall be defined as follows:

- **A. Long-term stationary is work that occupies a location more than 3 days.**
- **B. Intermediate-term stationary is work that occupies a location more than one daylight period up to 3 days, or nighttime work lasting more than 1 hour.**
- **C. Short-term stationary is daytime work that occupies a location for more than 1 hour within a single daylight period.**
- **D. Short duration is work that occupies a location up to 1 hour.**
- **E. Mobile is work that moves intermittently or continuously.**

Support:

03 At long-term stationary TTC zones, there is ample time to install and realize benefits from the full range of TTC procedures and devices that are available for use. Larger channelizing devices, temporary roadways, and temporary traffic barriers are frequently used.

Standard:

04 Since long-term operations extend into nighttime, retroreflective and/or illuminated devices shall be used in long-term stationary TTC zones.

Support:

05 In intermediate-term stationary TTC zones, it might not be feasible or practical to use procedures or devices that would be desirable for long-term stationary TTC zones, such as altered pavement markings, temporary traffic barriers, and temporary roadways. The increased time to place and remove these devices in some cases could significantly lengthen the project, thus increasing exposure time.

Standard:

06 Since intermediate-term operations extend into nighttime, retroreflective and/or illuminated devices shall be used in intermediate-term stationary TTC zones.

Support:

07 Most maintenance and utility operations are short-term stationary work.

08 As compared to stationary operations, mobile and short-duration operations are activities that might involve different treatments. Devices having greater mobility might be necessary such as signs mounted on trucks. Devices that are larger, more imposing, or more visible can be used effectively and economically. The mobility of the TTC zone is important.

Guidance:

09 Safety in short-duration or mobile operations should not be compromised by using fewer devices simply because the operation will frequently change its location.

Support:

10 During short-duration work, it often takes longer to set up and remove the TTC zone than to perform the work. Workers face hazards in setting up and taking down the TTC zone. Also, since the work time is short, delays affecting road users are significantly increased when additional devices are installed and removed.

Option:

11 Considering these factors, simplified control procedures may be warranted for short-duration work. A reduction in the number of devices may be offset by the use of other more dominant devices such as high-intensity rotating, flashing, oscillating, or strobe lights on work vehicles.

Support:

12 Mobile operations often involve frequent short stops for activities such as litter cleanup, pothole patching, or utility operations, and are similar to short-duration operations.

Option:

13 Flags and/or channelizing devices may additionally be used and moved periodically to keep them near the mobile work area.

14 Flaggers may be used for mobile operations that often involve frequent short stops.

Support:

15 Mobile operations also include work activities where workers and equipment move along the road without stopping, usually at slow speeds. The advance warning area moves with the work area.

Guidance:

16 When mobile operations are being performed, a shadow vehicle equipped with an arrow board or a sign should follow the work vehicle, especially when vehicular traffic speeds or volumes are high. Where feasible, warning signs should be placed along the roadway and moved periodically as work progresses.

17 To avoid high-volume conditions, consideration should be given to scheduling mobile operations work during off-peak hours.

18 REMOVED

Standard:

If there are mobile operations on a high-speed travel lane of a multi-lane divided highway, arrow boards and truck/trailer-mounted attenuators shall be used.

Standard:

19 Mobile operations shall have appropriate devices on the equipment (that is, high-intensity rotating, flashing, oscillating, or strobe lights, signs, or special lighting), or shall use a separate vehicle with appropriate warning devices. Although vehicle hazard warning lights are permitted to be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights, they shall not be used instead of these devices.

Option:

20 For mobile operations that move at speeds of less than 3 mph, mobile signs or stationary signing that is periodically retrieved and repositioned in the advance warning area may be used.

Support:

21 A rolling roadblock is a method of TTC used to slow or stop traffic as a means of temporarily removing traffic from a roadway segment downstream of the road block. The rolling roadblock closes all lanes of traffic by using pacing vehicles to create a gap so that construction activities can be performed. Rolling roadblocks are used where long-term road closures using TTC devices are not needed. A rolling roadblock consists of one blocking/pacing vehicle per lane of traffic, a clearing vehicle, and an advance warning vehicle. The rolling roadblock is normally performed by law enforcement officers during off-peak hours.

Section 6N.02 Location of Work

Support:

01 Chapter 6C and Sections 6M.04 and 6N.04 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.

02 The choice of TTC needed for a TTC zone depends upon where the work is located. As a general rule, the closer the work is to road users (including bicyclists and pedestrians), the greater the number of TTC devices that are needed. Procedures are described later in this Chapter for establishing TTC zones in the following locations:

A. Outside the shoulder,
B. On the shoulder with no encroachment,
C. On the shoulder with minor encroachment,
D. Within the median, and
E. Within the traveled way.

Standard:

03 When the work space is within the traveled way, except for short-duration and mobile operations, advance warning shall provide a general message that work is taking place and shall supply information about highway conditions. TTC devices shall clearly delineate the path roadway users are to follow through the TTC zone.

Section 6N.03 Modifications To Fulfill Special Needs

Support:

01 The typical applications in Chapter 6P illustrate commonly encountered situations in which TTC devices are employed.

Option:

02 Other devices may be added to supplement the devices provided in the typical applications, and device spacing may be adjusted to provide additional reaction time. When conditions are less complex than those depicted in the typical applications, fewer devices may be needed.

Guidance:

03 When conditions are more complex, typical applications should be modified by giving particular attention to the provisions set forth in Chapter 6A and by incorporating appropriate devices and practices from the following list:

- *A. Additional devices:*
  1. *Signs*
  2. *Arrow boards*
  3. *More channelizing devices at closer spacing (see Section 6M.04 for information regarding detectable edging for pedestrians)*
  4. *Temporary raised pavement markers*
  5. *High-level warning devices*
  6. *Portable changeable message signs*
  7. *Temporary traffic control signals (including accessible pedestrian signals where not otherwise required)*
  8. *Temporary traffic barriers*
  9. *Crash cushions*
  10. *Screens*
  11. *Rumble strips*
  12. *More delineation*
- *B. Upgrading of devices:*
  1. *A full complement of standard pavement markings*
  2. *Brighter and/or wider pavement markings*
  3. *Larger and/or brighter signs*
  4. *Channelizing devices with greater conspicuity*
  5. *Temporary traffic barriers in place of channelizing devices*
- *C. Improved geometrics at detours or crossovers*
- *D. Increased distances:*
  1. *Longer advance warning area*
  2. *Longer tapers*
- *E. Lighting:*
  1. *Temporary roadway lighting*
  2. *Steady-burn lights used with channelizing devices*
  3. *Flashing lights for isolated hazards*
  4. *Illuminated signs*
  5. *Floodlights*
- *F. Pedestrian routes and temporary facilities*
- *G. Bicycle diversions and temporary facilities*

Section 6N.04 Work Affecting Pedestrian and Bicycle Facilities

Support:

01 It is not uncommon, particularly in urban areas, that road work and the associated TTC will affect existing pedestrian or bicycle facilities. It is essential that the needs of all road users, including pedestrians with disabilities, are considered in TTC zones.

02 In addition to specific provisions identified in Sections 6N.05 through 6N.13, there are a number of provisions that might be applicable for all of the types of activities identified in this Chapter.

Guidance:

03 Where pedestrian or bicyclist usage is high, the typical applications should be modified by giving particular attention to the provisions set forth in Chapter 6C, this Chapter, Sections 6K.02 and 6M.04, and in other Sections of Part 6 related to accessibility and detectability provisions in TTC zones.

04 Pedestrians should be separated from the worksite by appropriate devices that maintain the accessibility and detectability for pedestrians with disabilities.

05 Bicyclists and pedestrians should not be exposed to unprotected excavations, open utility access, overhanging equipment, or other such conditions.

06 Except for short-term and mobile operations, when a highway shoulder is occupied, a SHOULDER WORK (W21-5) sign should be placed in advance of the activity area. When work is performed on a paved shoulder 8 feet or more in width, channelizing devices should be placed on a taper having a length that conforms to the requirements of a shoulder taper. Signs should be placed such that they do not narrow any existing pedestrian passages to less than 48 inches.

07 Pedestrian detours should be avoided since pedestrians rarely observe them and the cost of providing accessibility and detectability might outweigh the cost of maintaining a continuous route. Whenever possible, work should be done in a manner that does not create a need to detour pedestrians from existing routes or crossings.

Standard:

08 Where pedestrian routes are closed, alternate pedestrian routes shall be provided.

09 When existing pedestrian facilities are disrupted, closed, or relocated in a TTC zone, the temporary facilities shall be detectable and shall include accessibility features consistent with the features present in the existing pedestrian facility.

Guidance:

10 The continuity of a bikeway should be maintained through the TTC zone if practical.

Support:

11 The continuity of a bikeway through the TTC zone is particularly important where bicyclists have been traveling on a shoulder, bicycle lane, or shared-use path adjacent to a general-purpose lane (having a speed limit greater than or equal to 35 miles per hour) and there would be a significant safety concern if bicyclists were to share that general-purpose lane through the TTC zone.

12 On roadways which are not bikeways but where bicyclists (when present) typically share lanes with motor vehicle traffic, the TTC plan and Typical Applications for general traffic will usually be adequate for bicyclists as well.

13 In order to maintain room for bicycle lanes through the TTC zone on a multi-lane roadway, one or more travel lanes could be closed.

Guidance:

14 If a bikeway detour is unavoidable, it should be as short and direct as practical.

15 On-road bicyclists should not be directed onto a path or sidewalk intended for pedestrian use except where such a path or sidewalk is a shared-use path, or where no practical alternative is available (such as might be the case on a bridge in the course of a rehabilitation project).

16 If a portion of a bikeway is to be closed due to construction activities and the detoured bikeway follows a complex path not in the original bikeway corridor, then a full detour plan should be developed and implemented. The TTC for the detour of the bikeway should include all necessary advance warning (W21 series) signs, detour (W4-9 series) signs, and any other TTC devices necessary to guide bicyclists along the detour route.

Support:

17 Figures 6P-47 through 6P-51 provide examples and contain additional information for accommodating bicycles through or around typical TTC zones.

Option*:*

18 If an on-street bikeway had a wide travel lane or lanes in which bicyclists traveled side by side with motor vehicles prior to construction, and construction activities reduce the lane width(s) to less than 14 feet through the TTC zone, then the BICYCLISTS ALLOWED USE OF FULL LANE (R9-20) sign may be used.

Standard:

19 The minimum TTC sign and plaque sizes for shared-use paths shall conform to those shown in Table 9A-1. The minimum TTC sign and plaque sizes for on-street bikeways shall conform to Chapters 6G, 6H, and 6I.

Section 6N.05 Work Outside of the Shoulder

Support:

01 When work is being performed beyond the shoulders, but within the right-of-way, little or no TTC might be needed. TTC generally is not needed where work is confined to an area 15 feet or more from the edge of the traveled way. However, TTC is appropriate where distracting situations exist, such as vehicles parked on the shoulder, vehicles accessing the worksite via the highway, and equipment traveling on or crossing the roadway to perform the work operations (for example, mowing). A typical application for work beyond the shoulder is shown in Figure 6P-1.

Guidance:

02 Where the situations described in Paragraph 1 of this Section exist, a single warning sign, such as ROAD WORK AHEAD (W20-1), should be used. If the equipment travels on the roadway, the equipment should be equipped with appropriate flags, high-intensity rotating, flashing, oscillating, or strobe lights, and/or a SLOW MOVING VEHICLE (W21-4) sign.

03 If work vehicles are on the shoulder, a SHOULDER WORK (W21-5) sign should be used.

04 A general warning sign like ROAD MACHINERY AHEAD (W21-3) should be used if workers and equipment must occasionally move onto the shoulder.

Option:

05 For mowing operations, the sign MOWING AHEAD (W21-8) may be used.

06 Where the activity is spread out over a distance of more than 2 miles, the SHOULDER WORK (W21-5) sign may be repeated every 1 mile.

07 A supplementary plaque with the message NEXT XX MILES (W7-3aP) may be used.

Section 6N.06 Work on the Shoulder with No Encroachment

Support:

01 The provisions of this Section apply to short-term through long-term stationary operations.

Standard:

02 When paved shoulders having a width of 8 feet or more are closed, at least one advance warning sign shall be used. In addition, channelizing devices shall be used to close the shoulder in advance to delineate the beginning of the work space and direct motor vehicle traffic to remain within the traveled way.

Guidance:

03 When paved shoulders having a width of 8 feet or more are closed on freeways and expressways, road users should be warned about potential disabled vehicles that cannot get off the traveled way. An initial general warning sign, such as ROAD WORK AHEAD (W20-1), should be used, followed by a RIGHT or LEFT SHOULDER CLOSED (W21-5a) sign. Where the downstream end of the shoulder closure extends beyond the distance that can be perceived by road users, a supplementary plaque bearing the message NEXT XX FEET (W16-4P) or MILES (W7-3aP) should be placed below the SHOULDER CLOSED (W21-5a) sign. On multi-lane, divided highways, signs advising of shoulder work or the condition of the shoulder should be placed only on the side of the affected shoulder.

04 When an improved shoulder is closed on a high-speed roadway, it should be treated as a closure of a portion of the road system because road users expect to be able to use it in emergencies. Road users should be given ample advance warning that shoulders are closed for use as refuge areas throughout a specified length of the approaching TTC zone. The sign(s) should read SHOULDER CLOSED (W21-5a) with distances indicated. The work space on the shoulder should be closed off by a taper or channelizing devices with a length of ⅓ L using the formulas in Tables 6B-3 and 6B-4.

05 When the shoulder is not occupied but work has adversely affected its condition, the LOW SHOULDER (W8-9) or SOFT SHOULDER (W8-4) sign should be used, as appropriate.

06 Where the condition extends over a distance in excess of 1 mile, the sign should be repeated at 1-mile intervals.

Option:

07 In addition, a supplementary plaque bearing the message NEXT XX MILES (W7-3aP) may be used.

Support:

08 Temporary traffic barriers might be needed to inhibit encroachment of errant vehicles into the work space and to protect workers.

Standard:

09 When used for shoulder work, arrow boards shall operate only in the caution mode.

Support:

10 A typical application for stationary work operations on shoulders is shown in Figure 6P-3. A typical application for short-duration or mobile work on shoulders is shown in Figure 6P-4. A typical application for work on freeway shoulders is shown in Figure 6P-5.

Section 6N.07 Work on the Shoulder with Minor Encroachment

Support:

01 Chapter 6C and Sections 6M.04 and 6N.04 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.

Guidance:

02 When work takes up part of a lane, vehicular traffic volumes, vehicle mix (buses, trucks, cars, and bicycles), speed, and capacity should be analyzed to determine whether the affected lane should be closed. Unless the lane encroachment permits a remaining lane width of 10 feet, the lane should be closed.

03 Truck off-tracking should be considered when determining whether the minimum lane width of 10 feet is adequate.

Option:

04 A lane width of 9 feet may be used for short-term stationary work on low-volume, low-speed roadways when vehicular traffic does not include longer and wider heavy commercial vehicles.

Support:

05 Figure 6P-6 illustrates a method for handling vehicular traffic where the stationary or short-duration work space encroaches slightly into the traveled way.

Section 6N.08 Work Within the Median

Support:

01 Chapter 6C and Sections 6M.04 and 6N.04 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.

Guidance:

02 If work in the median of a divided highway is within 15 feet from the edge of the traveled way for either direction of travel, TTC should be used through the use of advance warning signs and channelizing devices.

Section 6N.09 Work Within the Traveled Way of a Two-Lane Highway

Support:

01 Chapter 6C and Sections 6M.04 and 6N.04 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.

02 Detour signs are used to direct road users onto another roadway. At diversions, road users are directed onto a temporary roadway or alignment placed within or adjacent to the right-of-way. Typical applications for detouring or diverting road users on two-lane highways are shown in Figures 6P-7, 6P-8, and 6P-9. Figure 6P-7 illustrates the controls around an area where a section of roadway has been closed and a diversion has been constructed. Channelizing devices and pavement markings are used to indicate the transition to the temporary roadway.

Guidance:

03 When a detour is long, Detour (M4-8, M4-9) signs should be installed to remind and reassure road users periodically that they are still successfully following the detour.

04 When an entire roadway is closed, as illustrated in Figure 6P-8, a detour should be provided and road users should be warned in advance of the closure, which in this example is a closure 10 miles from the intersection. If local road users are allowed to use the roadway up to the closure, the ROAD CLOSED AHEAD, LOCAL TRAFFIC

ONLY (R11-3a) sign should be used. The portion of the road open to local road users should have adequate signing, marking, and delineation.

05 Detours should be signed so that road users will be able to traverse the entire detour route and back to the original roadway as shown in Figure 6P-9.

Support:

06 Techniques for controlling vehicular traffic under one-lane, two-way conditions are described in Section 6E.01.

Option:

07 Flaggers may be used as shown in Figure 6P-10.

08 STOP/YIELD sign control may be used on roads with low traffic volumes as shown in Figure 6P-11.

09 A temporary traffic control signal may be used as shown in Figure 6P-12.

Section 6N.10 Work Within the Traveled Way of an Urban Street

Support:

01 Chapter 6C and Sections 6M.04 and 6N.04 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.

02 In urban TTC zones, decisions are needed on how to control vehicular traffic, such as how many lanes are required, whether any turns need to be prohibited at intersections, on whether to maintain parking lanes or spaces during work within the adjacent lane, and how to maintain access to business, industrial, and residential areas.

03 Pedestrian traffic needs separate attention. Chapter 6C contains information regarding pedestrian movements near TTC zones.

Standard:

04 If the TTC zone affects the movement of bicyclists, adequate access to the roadway or shared-use paths shall be provided (see Part 9).

05 Where transit stops are affected or relocated because of work activity, both pedestrian and vehicular access to the affected or relocated transit stops shall be provided.

Guidance:

06 If a designated bicycle route is closed because of the work being done, a signed alternate route should be provided. Bicyclists should not be directed onto the path used by pedestrians.

07 Worksites within the intersection should be protected against inadvertent pedestrian incursion by providing detectable channelizing devices.

Support:

08 Utility work takes place both within and outside the roadway to construct and maintain services such as power, gas, light, water, or telecommunications. Operations often involve intersections, since that is where many of the network junctions occur. The work force is usually small, only a few vehicles are involved, and the number and types of TTC devices placed in the TTC zone is usually minimal.

Guidance:

09 As discussed under short-duration projects, however, the reduced number of devices in utility TTC zones should be offset by the use of high-visibility devices, such as high-intensity rotating, flashing, oscillating, or strobe lights on work vehicles or high-level warning devices.

Support:

10 Figures 6P-6, 6P-10, 6P-15, 6P-18, 6P-21, 6P-22, 6P-23, 6P-26, and 6P-33 are examples of typical applications for utility operations. Other typical applications might apply as well.

Section 6N.11 Work Within the Traveled Way of a Multi-Lane, Non-Access Controlled Highway

Support:

01 Chapter 6C and Sections 6M.04 and 6N.04 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.

02 Work on multi-lane (two or more lanes of moving motor vehicle traffic in one direction) highways is divided into right-lane closures, left-lane closures, interior-lane closures, multiple-lane closures, and closures on five-lane roadways.

Standard:

03 When a lane is closed on a multi-lane road for other than a mobile operation, a transition area containing a merging taper shall be used.

Guidance:

04 When justified by an engineering study, temporary traffic barriers (see Section 6K.09) should be used to prevent incursions of errant vehicles into hazardous areas or work space.

Support:

05 Figure 6P-34 illustrates a lane closure in which temporary traffic barriers are used.

Option:

06 When the right-hand lane is closed, TTC similar to that shown in Figure 6P-33 may be used for undivided or divided four-lane roads.

Guidance:

07 If morning and evening peak hour vehicular traffic volumes in the two directions are uneven and the greater volume is on the side where the work is being done in the right-hand lane, consideration should be given to closing the inside lane for opposing vehicular traffic and making the lane available to the side with heavier vehicular traffic, as shown in Figure 6P-31.

08 If the larger vehicular traffic volume changes to the opposite direction at a different time of the day, the TTC should be changed to allow two lanes for opposing vehicular traffic by moving the devices from the opposing lane to the center line. When it is necessary to create a temporary center line that is not consistent with the pavement markings, channelizing devices should be used and closely spaced.

Option:

09 When closing a left-hand lane on a multi-lane undivided road, as vehicular traffic flow permits, the two interior lanes may be closed, as shown in Figure 6P-30, to provide drivers and workers additional lateral clearance and to provide access to the work space.

Standard:

10 When only the left-hand lane is closed on undivided roads, channelizing devices shall be placed along the center line as well as along the adjacent lane.

Guidance:

11 When an interior lane is closed, an adjacent lane should also be considered for closure to provide additional space for vehicles and materials and to facilitate the movement of equipment within the work space.

12 When multiple lanes in one direction are closed, a capacity analysis should be made to determine the number of lanes needed to accommodate motor vehicle traffic needs. Vehicular traffic should be moved over one lane at a time. As shown in Figure 6P-37, the tapers should be separated by a distance of 2L, with L being determined by the formulas in Tables 6B-3 and 6B-4.

Option:

13 If operating speeds are 40 mph or less and the space approaching the work area does not permit moving traffic over one lane at a time, a single continuous taper may be used.

Standard:

14 When a directional roadway is closed, inapplicable WRONG WAY signs and markings, and other existing traffic control devices at intersections within the temporary two-lane, two-way operations section shall be covered, removed, or obliterated.

Option:

15 When half the road is closed on an undivided highway, both directions of vehicular traffic may be accommodated as shown in Figure 6P-32. When both interior lanes are closed, temporary traffic controls may be used as provided in Figure 6P-30. When a roadway must be closed on a divided highway, a median crossover may be used (see Section 6N.15).

Support:

16 TTC for lane closures on five-lane roads is similar to other multi-lane undivided roads. Figure 6P-32 can be adapted for use on five-lane roads. Figure 6P-35 can be used on a five-lane road for short duration and mobile operations.

Section 6N.12 Work Within the Traveled Way at an Intersection

Support:

01 Chapter 6C and Sections 6M.04 and 6N.04 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.

02 The typical applications for intersections are classified according to the location of the work space with respect to the intersection area (as defined by the extension of the curb or edge lines). The three classifications are near side, far side, and in-the-intersection. Work spaces often extend into more than one portion of the intersection. For example, work in one quadrant often creates a near-side work space on one street and a far-side work space on the cross street. In such instances, an appropriate TTC plan is obtained by combining features shown in two or more of the intersection and pedestrian typical applications.

03 TTC zones in the vicinity of intersections might block movements and interfere with normal road user flows. Such conflicts frequently occur at more complex signalized intersections having such features as traffic signal heads over particular lanes, lanes allocated to specific movements, multiple signal phases, signal detectors for actuated control, and accessible pedestrian signals and detectors.

Guidance:

04 The effect of the work upon signal operation should be considered, and temporary corrective actions should be taken, if necessary, such as revising signal phasing and/or timing to provide adequate capacity, maintaining or adjusting signal detectors, and relocating signal heads to provide adequate visibility as described in Part 4.

Standard:

05 When work will occur near an intersection where operational, capacity, or pedestrian accessibility problems are anticipated, the highway agency having jurisdiction shall be contacted.

Guidance:

06 For work at an intersection, advance warning signs, devices, and markings should be used on all cross streets, as appropriate. The typical applications depict urban intersections on arterial streets. Where the posted speed limit, the off-peak 85th-percentile speed prior to the work starting, or the anticipated speed exceeds 40 mph, additional warning signs should be used in the advance warning area.

07 Pedestrian crossings near TTC sites should be separated from the worksite by appropriate barriers that maintain the accessibility and detectability for pedestrians with disabilities.

Support:

08 Near-side work spaces, as depicted in Figure 6P-21, are simply handled as a midblock lane closure. A problem that might occur with near-side lane closure is a reduction in capacity, which during certain hours of operation could result in congestion and back-ups.

Option:

09 When near-side work spaces are used, a mandatory turn lane may be used for through vehicular traffic.

10 Where space is restricted in advance of near-side work spaces, as with short block spacings, two warning signs may be used in the advance warning area, and a third action-type warning or a regulatory sign (such as Keep Left) may be placed within the transition area.

Support:

11 Far-side work spaces, as depicted in Figures 6P-22 through 6P-25, involve additional treatment because road users typically enter the activity area by straight-through and left-turn or right-turn movements.

Guidance:

12 When a lane through an intersection must be closed on the far side, it should also be closed on the near-side approach to preclude merging movements within the intersection.

Option:

13 If there are a significant number of vehicles turning from a near-side lane that is closed on the far side, the near-side lane may be converted to a mandatory turn lane.

Support:

14 Figures 6P-26 and 6P-27 provide guidance on applicable procedures for work performed within the intersection.

Option:

15 If the work is within the intersection, any of the following strategies may be used:

A. A small work space so that road users can move around it, as shown in Figure 6P-26;
B. Flaggers or uniformed law enforcement officers to direct road users, as shown in Figure 6P-27;
C. Work in stages so the work space is kept to a minimum; and
D. Road closures or upstream diversions to reduce road user volumes.

Guidance:

16 Depending on road user conditions, a flagger(s) and/or a uniformed law enforcement officer(s) should be used to control road users.

Support:

17 Figures 6P-52 through 6P-54 provide guidance on applicable procedures for work performed within a circular intersection.

Section 6N.13 Work Within the Traveled Way of a Freeway or Expressway

Support:

01 Special conditions encountered where vehicular traffic must be moved through or around TTC zones on high-speed, high-volume roadways can pose challenges to the TTC. Although the general principles outlined in other Sections of this Manual are applicable to all types of highways, high-speed, access-controlled highways need special planning and attention in order to accommodate vehicular traffic while also protecting road users and workers. The traffic volumes, vehicle mix (buses, trucks, cars, and bicycles, if permitted), and speed of vehicles on these facilities require that careful TTC procedures be implemented, for example, to induce critical merging maneuvers well in advance of work spaces and in a manner that creates minimum turbulence and delay in the vehicular traffic stream.

02 When the roadway capacity is reduced as a result of lane closures, the demand might exceed the available capacity and result in either a lengthy stopped or slow moving queue of vehicles that might extend past the normal signs used in the typical advance warning area.

Guidance:

03 An assessment of the expected queue length should be a part of the TTC plan design process and adjustments to the sign spacing and number of signs as well as the possibility of using more conspicuous devices should be considered to increase the distance and conspicuity of the advance warning area.

Support:

04 One strategy often employed to mitigate the extended queue issue is to work during off peak hours or at night. When the work is limited to night hours, increased use of warning lights, illumination of work spaces, and intelligent advance warning systems might be necessary.

05 TTC for a typical lane closure where a queue is not anticipated to accumulate on a divided highway is shown in Figures 6P-33 and 6P-34. Temporary traffic controls for short duration and mobile operations on freeways are shown in Figure 6P-35. A typical application for shifting vehicular traffic lanes around a work space is shown in Figure 6P-36. TTC for multiple and interior lane closures on a freeway is shown in Figures 6P-37 and 6P-38.

Guidance:

06 The method for closing an interior lane when the open lanes have the capacity to carry vehicular traffic should be as shown in Figure 6P-37. When the capacity of the other lanes is needed, the method shown in Figure 6P-38 should be used.

Section 6N.14 Two-Lane, Two-Way Traffic on One Roadway of a Normally Divided Highway

Support:

01 Two-lane, two-way operation on one roadway of a normally divided highway is a typical procedure that requires special consideration in the planning, design, and work phases, because unique operational problems (for example, increasing the risk of head-on crashes) can arise with the two-lane, two-way operation.

Standard:

02 When two-lane, two-way traffic control must be maintained on one roadway of a normally divided highway, opposing vehicular traffic shall be separated with either temporary traffic barriers (concrete safety-shape or approved alternate), channelizing devices, Narrow Two-Way Traffic (W6-4) signs on flexible

supports (see Section 6H.17), or a temporary raised island throughout the length of the two-way operation. The use of markings and complementary signing, by themselves, shall not be used.

Support:

03 Figure 6P-39 shows the procedure for two-lane, two-way operation. Treatments for entrance and exit ramps within the two-way roadway segment of this type of work are shown in Figures 6P-40 and 6P-41.

Section 6N.15 Crossovers

Guidance:

01 The following are considered good guiding principles for the design of crossovers:

A. Tapers for lane drops should be separated from the crossovers, as shown in Figure 6P-39.
B. Crossovers should be designed for speeds no lower than 10 mph below the posted speed, the off-peak 85th-percentile speed prior to the work starting, or the anticipated operating speed of the roadway, unless unusual site conditions require that a lower design speed be used.
C. A good array of channelizing devices, delineators, and full-length, properly placed pavement markings should be used to provide drivers with a clearly defined travel path.
D. The design of the crossover should accommodate all vehicular traffic, including trucks and buses.

Support:

02 Temporary traffic barriers and the excessive use of TTC devices cannot compensate for poor geometric and roadway cross-section design of crossovers.

Section 6N.16 Interchanges

Guidance:

01 Access to interchange ramps on limited-access highways should be maintained even if the work space is in the lane adjacent to the ramps. Access to exit ramps should be clearly marked and delineated with channelizing devices. For long-term projects, conflicting pavement markings should be removed and new ones placed. Early coordination with officials having jurisdiction over the affected cross streets and providing emergency services should occur before ramp closings.

Option:

02 If access is not possible, ramps may be closed by using signs and Type 3 Barricades. As the work space changes, the access area may be changed, as shown in Figure 6P-42. A TTC zone in the exit ramp may be handled as shown in Figure 6P-43.

03 When a work space interferes with an entrance ramp, a lane may need to be closed on the freeway (see Figure 6P-44). A TTC zone in the entrance ramp may require shifting ramp vehicular traffic (see Figure 6P-44).

Section 6N.17 Work in the Vicinity of a Grade Crossing

Standard:

01 When grade crossings exist either within or in the vicinity of a TTC zone, lane restrictions, flagging, or other operations shall not create conditions where vehicles can be queued across the tracks. If the queuing of vehicles across the tracks cannot be avoided, a uniformed law enforcement officer or flagger shall be provided at the crossing to prevent vehicles from stopping on the tracks, even if automatic warning devices are in place.

Support:

02 Figure 6P-46 shows work in the vicinity of a grade crossing.

03 Section 8A.13 contains additional information regarding TTC zones in the vicinity of grade crossings.

Guidance:

04 Early coordination with the railroad company or transit agency should occur before work starts.

Section 6N.18 Work During Nighttime Hours

Support:

01 Section 6A.05 contains additional information regarding considerations for conducting work operations during nighttime hours.

Guidance:

02 Considering the safety issues inherent to night work, consideration should be given to enhancing traffic controls (see Section 6N.03) to provide added visibility and driver guidance, and increased protection for workers.

03 In addition to the enhancements listed in Section 6N.03, consideration should be given to providing additional lights and retroreflective markings to workers, work vehicles, and equipment.

Option:

04 Where reduced traffic volumes at night make it feasible, the entire roadway may be closed by detouring traffic to alternate facilities, thus removing the traffic risk from the activity area.

Guidance:

05 Consideration should be given to stationing uniformed law enforcement officers and lighted patrol cars at night work locations where there is a concern that high speeds or impaired drivers might result in undue risks for workers or other drivers.

Standard:

06 Except in emergencies, temporary lighting shall be provided at all flagger stations used during nighttime work.

Support:

07 Desired illumination levels vary depending upon the nature of the task involved. An average horizontal luminance of 5 foot-candles can be adequate for general activities. An average horizontal luminance of 10 foot-candles can be adequate for activities around equipment. Tasks requiring high levels of precision and extreme care can require an average horizontal luminance of 20 foot-candles.

Section 6N.19 Late Merge

Support:

01 The Late Merge is designed to use all available lanes until the merge point is reached at the lane closure taper rather than merging as soon as possible into the open lane. The Late Merge addresses many of the challenges that are associated with traffic operations in advance of lane closures at TTC zones such as queue length, capacity, and driver satisfaction.

Option:

02 Late Merge systems may consist of static or portable changeable message signs.

Guidance:

03 Static Late Merge signing (see Figure 6N-1) should consist of the STAY IN LANE TO MERGE POINT (R4-9a) sign (see Section 6G.07) and the MERGE HERE TAKE TURNS (W9-2a) sign (see Figure 6H.08).

Option:

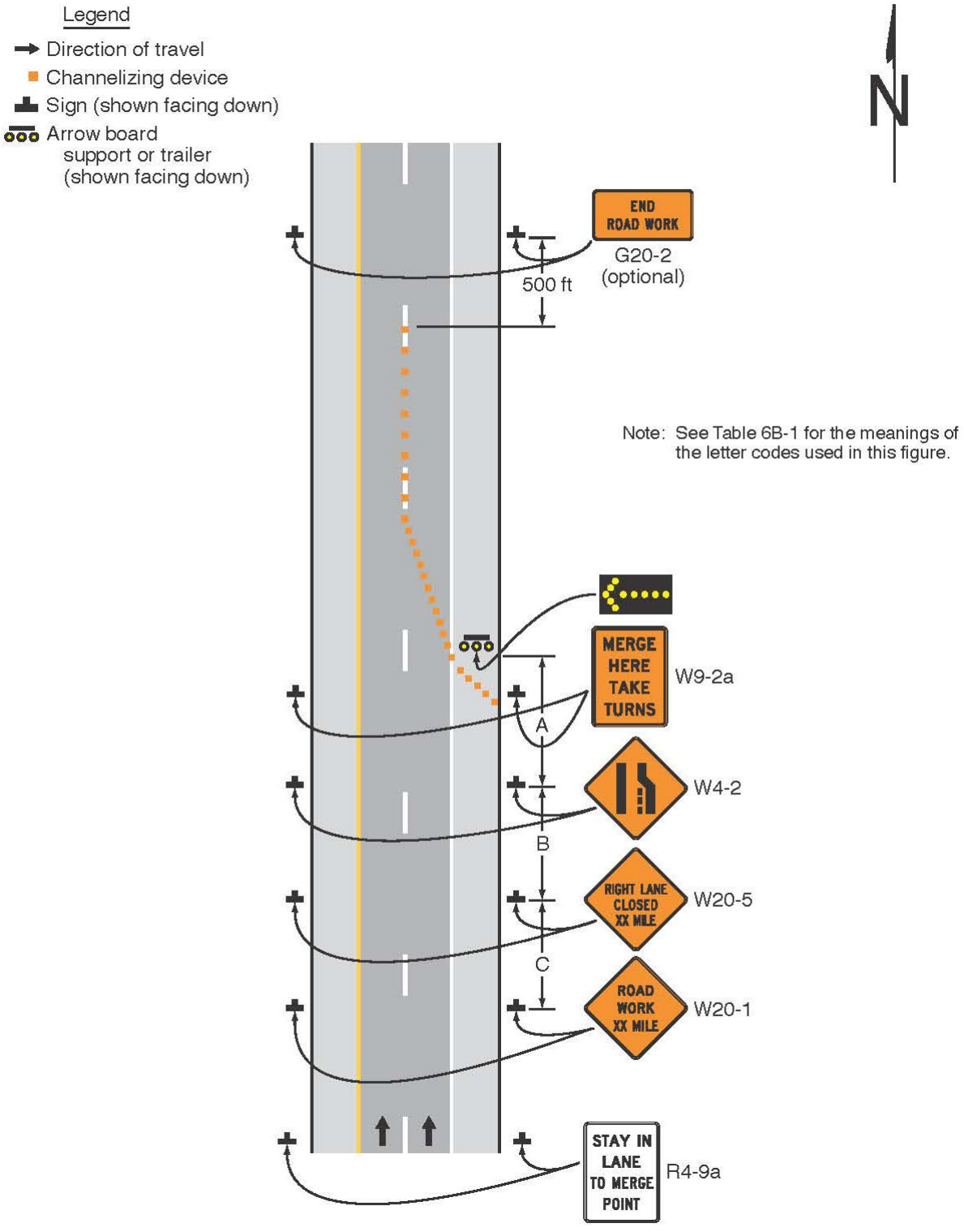
04 The following messages may be used on changeable message signs at an upstream location during the Late Merge application:

A. "STAY IN LANE/MERGE AHEAD"
B. "STAY IN LANE/MERGE AHEAD XX MILES"
C. "USE BOTH LANES/TO MERGE POINT"
D. "USE BOTH LANES/STOPPED TRAFFIC AHEAD
E. "SLOW TRAFFIC AHEAD/USE BOTH LANES"

05 The following messages ~~are typically~~may be used on changeable message signs at the merge point during the Late Merge application:

A. "MERGE HERE/TAKE TURNS"

Figure 6N-1. Late Merge



Late Merge Signing

CHAPTER 6O. CONTROL OF TRAFFIC THROUGH TRAFFIC INCIDENT MANAGEMENT AREAS

Section 6O.01 General

Support:

01 The National Incident Management System (NIMS) requires the use of the Incident Command System (ICS) at traffic incident management scenes.

02 A traffic incident is an emergency road user occurrence, a natural disaster, or other unplanned event that affects or impedes the normal flow of traffic.

03 A traffic incident management area is an area of a highway where temporary traffic controls are installed, as authorized by a public authority or the official having jurisdiction of the roadway, in response to a road user incident, natural disaster, hazardous material spill, or other unplanned incident. It is a type of TTC zone and extends from the first warning device (such as a sign, light, or cone) to the last TTC device or to a point where vehicles return to the original lane alignment and are clear of the incident.

04 Traffic incidents can be divided into three general classes of duration, each of which has unique traffic control characteristics and needs. These classes are:

A. Major—expected duration of more than 2 hours,
B. Intermediate—expected duration of 30 minutes to 2 hours, and
C. Minor—expected duration under 30 minutes.

05 The primary functions of TTC at a traffic incident management area are to inform road users of the incident and to provide guidance information on the path to follow through the incident area. Alerting road users and establishing a well-defined path to guide road users through the incident area will serve to protect the incident responders and those involved in working at the incident scene and will aid in moving road users expeditiously past or around the traffic incident, will reduce the likelihood of secondary traffic crashes, and will preclude unnecessary use of the surrounding local road system. Examples include a stalled vehicle blocking a lane, a traffic crash blocking the traveled way, a hazardous material spill along a highway, and natural disasters such as floods and severe storm damage.

Guidance:

06 In order to reduce response time for traffic incidents, highway agencies, appropriate public safety agencies (law enforcement, fire and rescue, emergency communications, emergency medical, and other emergency management), and private sector responders (towing and recovery and hazardous materials contractors) should mutually plan for occurrences of traffic incidents along the major and heavily traveled highway and street system.

07 On-scene responder organizations should train their personnel in TTC practices for accomplishing their tasks in and near traffic and in the requirements for traffic incident management contained in this Manual. On-scene responders should take measures to move the incident off the traveled roadway or to provide for appropriate warning. All on-scene responders and news media personnel should constantly be aware of their visibility to oncoming traffic and wear high-visibility apparel. Planning and training should include incorporation of estimated time durations to clear the event as part of their initial incident estimate. When events are deemed as probable Major Traffic Incidents that could generate prolonged lane or road closures, notification of all affected agencies should be initiated as part of the initial incident report that is provided to the emergency communications center who would then be responsible for making notifications to appropriate state, regional, and local agencies and resources for the purpose of ramping up and responding as quickly as possible thus facilitating a more rapid transition from emergency TTC to an MUTCD-compliant TTC zone when warranted.

08 Emergency vehicles arriving at an incident should be positioned in a manner that attempts to protect both the responders performing their duties and road users traveling through the incident scene, while minimizing, to the extent practical, disruption of the adjacent traffic flow. Emergency vehicle positions should optimize traffic flow through the incident scene. All emergency vehicles that subsequently arrive should be positioned in a manner that does not interfere with the established temporary traffic flow.

09 Responders arriving at a traffic incident should estimate the magnitude of the traffic incident, the expected time duration of the traffic incident, and the expected vehicle queue length, and then should set up the appropriate temporary traffic controls for these estimates.

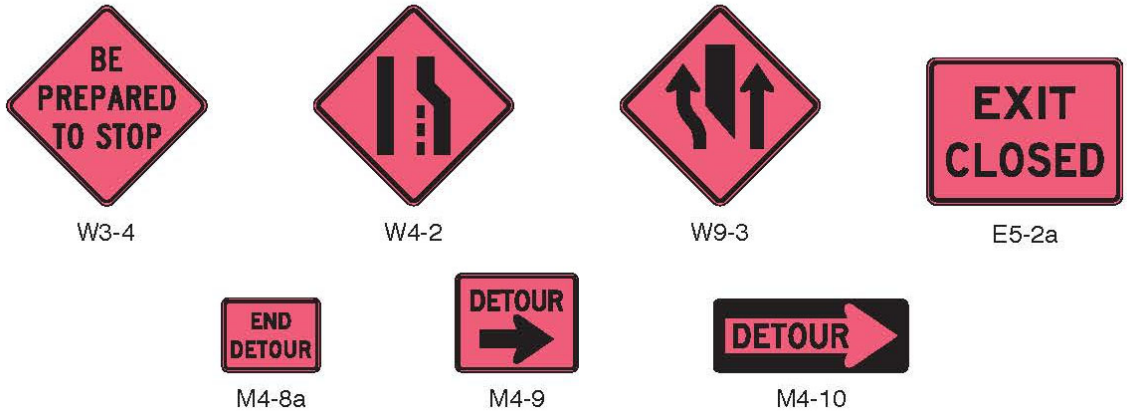
Option:

10 Warning and guide signs used for TTC traffic incident management situations may have a black legend and border on a fluorescent pink background (see Figure 6O-1).

Support:

11 While some traffic incidents might be anticipated and planned for, emergencies and disasters might pose more severe and unpredictable problems. The ability to quickly install proper temporary traffic controls might greatly reduce the effects of an incident, such as secondary crashes or excessive traffic delays. An essential part of fire, rescue, spill clean-up, highway agency, and enforcement activities is the proper control of road users through the traffic incident management area in order to protect responders, victims, and other personnel at the site. These operations might need corroborating legislative authority for the implementation and enforcement of appropriate road user regulations, parking controls, and speed zoning. It is desirable for these statutes to provide sufficient flexibility in the authority for, and implementation of, TTC to respond to the needs of changing conditions found in traffic incident management areas.

Figure 6O-1. Examples of Traffic Incident Management Area Signs



Option:

12 For traffic incidents, particularly those of an emergency nature, TTC devices on hand may be used for the initial response as long as they do not themselves create unnecessary additional hazards.

Support:

13 The establishment, maintenance, and prompt removal of lane diversions can be effectively managed by interagency planning that includes representatives of highway and public safety agencies.

Guidance:

14 All traffic control devices needed to set up the TTC at a traffic incident should be available so that they can be readily deployed for all major and intermediate traffic incidents. The TTC should include the proper traffic diversions, tapered lane closures, and upstream warning devices to alert traffic approaching the queue and to encourage early diversion to an appropriate alternative route.

15 Attention should be paid to the upstream end of the traffic queue such that warning is given to road users approaching the back of the queue.

16 If manual traffic control is needed, it should be provided by qualified flaggers or uniformed law enforcement officers.

Option:

17 If flaggers are used to provide traffic control for an incident management situation, the flaggers may use appropriate traffic control devices that are readily available or that can be brought to the traffic incident scene on short notice.

Guidance:

18 When light sticks or flares are used to establish the initial traffic control at incident scenes, channelizing devices (see Section 6K.01) should be installed as soon thereafter as practical.

Option:

19 The light sticks or flares may remain in place if they are being used to supplement the channelizing devices.

Guidance:

20 The light sticks, flares, and channelizing devices should be removed after the incident is terminated.

Section 6O.02 Major Traffic Incidents

Support:

01 Major traffic incidents are typically traffic incidents involving hazardous materials, fatal traffic crashes involving numerous vehicles, and other natural or man-made disasters. These traffic incidents typically involve closing all or part of a roadway facility for a period exceeding 2 hours.

Guidance:

02 If the traffic incident is anticipated to last more than 24 hours, applicable procedures and devices set forth in other Chapters of Part 6 should be used.

Support:

03 A road closure can be caused by a traffic incident such as a road user crash that blocks the traveled way. Road users are usually diverted through lane shifts or detoured around the traffic incident and back to the original roadway. A combination of traffic engineering and enforcement preparations is needed to determine the detour route, and to install, maintain, or operate, and then to remove the necessary traffic control devices when the detour is terminated. Large trucks are a significant concern in such a detour, especially when detouring them from a controlled-access roadway onto local or arterial streets.

04 During traffic incidents, large trucks might need to follow a route separate from that of automobiles because of bridge, weight, clearance, or geometric restrictions. Also, vehicles carrying hazardous material might need to follow a different route from other vehicles.

05 Some traffic incidents such as hazardous material spills might require closure of an entire highway. Through road users must have adequate guidance around the traffic incident. Maintaining good public relations is desirable. The cooperation of the news media in publicizing the existence of, and reasons for, traffic incident management areas and their TTC can be of great assistance in keeping road users and the general public well informed.

Section 6O.03 Intermediate Traffic Incidents

Support:

01 Intermediate traffic incidents typically affect travel lanes for a time period of 30 minutes to 2 hours, and usually require traffic control on the scene to divert road users past the blockage. Full roadway closures might be needed for short periods during traffic incident clearance to allow traffic incident responders to accomplish their tasks.

Section 6O.04 Minor Traffic Incidents

Support:

01 Minor traffic incidents are typically disabled vehicles and minor crashes that result in lane closures of less than 30 minutes. On-scene responders are typically law enforcement and towing companies, and occasionally highway agency service patrol vehicles.

02 Diversion of traffic into other lanes is often not needed or is needed only briefly. It is not generally possible or practical to set up a lane closure with traffic control devices for a minor traffic incident. Traffic control is the responsibility of on-scene responders.

Guidance:

03 When a minor traffic incident blocks a travel lane, the vehicles involved in the incident should be moved from the blocked lane to the shoulder as quickly as possible.

Section 6O.05 Use of Emergency-Vehicle Lighting

Support:

01 The use of emergency-vehicle lighting (such as high-intensity rotating, flashing, oscillating, or strobe lights) is essential, especially in the initial stages of a traffic incident, for the safety of emergency responders and persons involved in the traffic incident, as well as road users approaching the traffic incident. Emergency-vehicle lighting, however, provides warning only and provides no effective traffic control. The use of too many lights at an incident scene can be distracting and can create confusion for approaching road users, especially at night. Road users approaching the traffic incident from the opposite direction on a divided facility are often distracted by emergency-

vehicle lighting and slow their vehicles to look at the traffic incident posing a hazard to themselves and others traveling in their direction.

02 The use of emergency-vehicle lighting can be reduced if good traffic control has been established at a traffic incident scene. This is especially true for major traffic incidents that might involve a number of emergency vehicles. If good traffic control is established through placement of advance warning signs and traffic control devices to divert or detour traffic, then public safety agencies can perform their tasks on scene with minimal emergency-vehicle lighting.

Guidance:

03 Public safety agencies should examine their policies on the use of emergency-vehicle lighting, especially after a traffic incident scene is secured, with the intent of reducing the use of this lighting as much as possible while not endangering those at the scene. Special consideration should be given to reducing or extinguishing forward facing emergency-vehicle lighting, especially on divided roadways, to reduce distractions to oncoming road users.

04 Because the glare from floodlights or vehicle headlights can impair the nighttime vision of approaching road users, any floodlights or vehicle headlights that are not needed for illumination, or to provide notice to other road users of an incident response vehicle being in an unexpected location, should be turned off at night.

CHAPTER 6P. TYPICAL APPLICATIONS

Section 6P.01 Typical Applications

Support:

01 Chapter 6N contains discussions of typical TTC activities. Section 6A.02 contains discussions on development of TTC plans for the various activities. This Chapter presents typical applications for a variety of situations commonly encountered. While not every situation is addressed, the information illustrated can generally be adapted to a broad range of conditions. In many instances, an appropriate TTC plan is achieved by combining features from various typical applications. For example, work at an intersection might present a near-side TTC zone for one street and a far-side TTC zone for the other street. These treatments are found in two different typical applications, while a third typical application shows how to handle pedestrian crosswalk closures.

02 In general, the procedures illustrated represent minimum solutions for the situations depicted. Except for the notes (which are clearly classified using headings as being Standard, Guidance, Option, or Support), the information presented in the typical applications can generally be regarded as Guidance.

For more detail regarding WisDOT's typical traffic control device layouts, see Standard Detail Drawings 15D.

Option:

03 TTC plans may deviate from the typical applications described in this Chapter to allow for conditions and requirements of a particular site or jurisdiction.

04 Other devices may be added to supplement the devices and device spacing may be adjusted to provide additional reaction time or delineation. Fewer devices may be used based on field conditions.

Support:

05 Figures and tables found throughout Part 6 provide information for the development of TTC plans.

06 Table 6P-1 is an index of the 54 typical applications. In the printed version, the typical applications are shown on the right-hand page with notes on the facing page to the left. In the electronic version, the notes are shown on the page preceding the figure. The legend for the symbols used in the typical applications is provided in Table 6P-2. In many of the typical applications, sign spacings and other dimensions are indicated by letters using the criteria provided in Table 6B-1. The formulas for determining taper lengths are provided in Table 6B-4.

07 Most of the typical applications show TTC devices for only one direction.

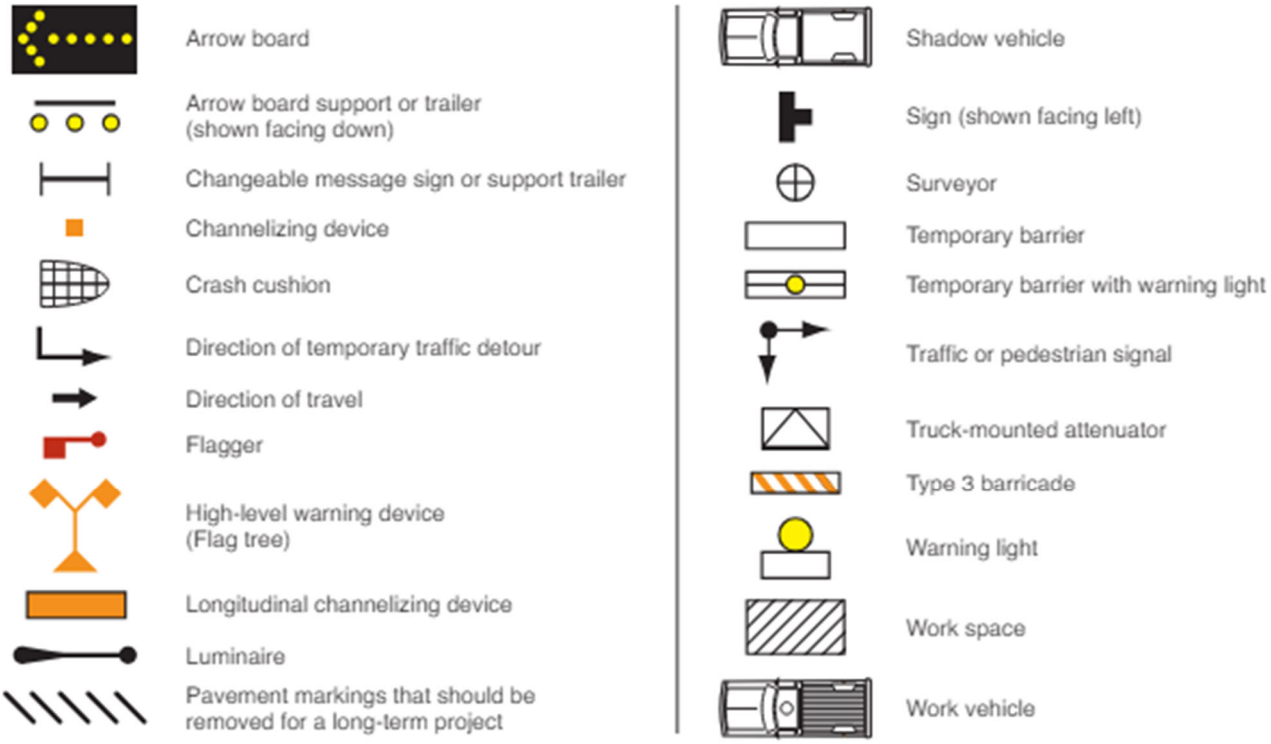
Table 6P-1. Index to Typical Applications (Sheet 1 of 2)

Typical Application Description	Typical Application Number
Work Outside of the Shoulder (see Section 6N.05)	
Work Beyond the Shoulder	TA-1
Blasting Zone	TA-2
Work on the Shoulder (see Sections 6N.06 and 6N.07)	
Work on the Shoulders	TA-3
Short-Duration or Mobile Operation on a Shoulder	TA-4
Shoulder Closure on a Freeway	TA-5
Shoulder Work with Minor Encroachment	TA-6
Work within the Traveled Way of a Two-Lane Highway (see Section 6N.09)	
Road Closed with a Diversion	TA-7
Roads Closed with an Off-Site Detour	TA-8
Overlapping Routes with a Detour	TA-9
Lane Closure on a Two-Lane Road Using Flaggers	TA-10
Lane Closure on a Two-Lane Road with Low Traffic Volumes	TA-11
Lane Closure on a Two-Lane Road Using Traffic Control Signals	TA-12
Temporary Road Closure	TA-13
Haul Road Crossing	TA-14
Work in the Center of a Road with Low Traffic Volumes	TA-15
Surveying Along the Center Line of a Road with Low Traffic Volumes	TA-16
Mobile Operations on a Two-Lane Road	TA-17
Work within the Traveled Way of an Urban Street (see Section 6N.10)	
Lane Closure on a Minor Street	TA-18
Detour for One Travel Direction	TA-19
Detour for a Closed Street	TA-20
Work within the Traveled Way at an Intersection and on Sidewalks (see Section 6N.12)	
Lane Closure on the Near Side of an Intersection	TA-21
Right-Hand Lane Closure on the Far Side of an Intersection	TA-22
Left-Hand Lane Closure on the Far Side of an Intersection	TA-23
Half Road Closure on the Far Side of an Intersection	TA-24
Multiple Lane Closures at an Intersection	TA-25
Closure in the Center of an Intersection	TA-26
Closure at the Side of an Intersection	TA-27
Sidewalk Detour or Diversion	TA-28
Crosswalk Closures and Pedestrian Detours	TA-29
Work within the Traveled Way of a Multi-Lane, Non-Access Controlled Highway (see Section 6N.11)	
Interior Lane Closure on a Multi-Lane Street	TA-30
Lane Closure on a Street with Uneven Directional Volumes	TA-31
Half Road Closure on a Multi-Lane, High-Speed Highway	TA-32
Stationary Lane Closure on a Divided Highway	TA-33
Lane Closure with a Temporary Traffic Barrier	TA-34
Mobile Operation on a Multi-Lane Road	TA-35

Table 6P-1. Index to Typical Applications (Sheet 2 of 2)

Typical Application Description	Typical Application Number
Work within the Traveled Way of a Freeway or Expressway (see Section 6N.13)	
Lane Shift on a Freeway	TA-36
Double Lane Closure on a Freeway	TA-37
Interior Lane Closure on a Freeway	TA-38
Median Crossover on a Freeway	TA-39
Median Crossover for an Entrance Ramp	TA-40
Median Crossover for an Exit Ramp	TA-41
Work in the Vicinity of an Exit Ramp	TA-42
Partial Exit Ramp Closure	TA-43
Work in the Vicinity of an Entrance Ramp	TA-44
Temporary Reversible Lane Using Movable Barriers	TA-45
Work in the Vicinity of a Grade Crossing (see Section 6N.17)	
Work in the Vicinity of a Grade Crossing	TA-46
Work in the Vicinity of Bicycle Lanes and Shared Use Paths (see Section 6N.04)	
Bicycle Lane Closure without a Detour	TA-47
Bicycle Lane Closure with an On-Road Detour	TA-48
Shared-Use Path Closure with a Diversion	TA-49
On-Road Detour for a Shared-Use Path	TA-50
Paved Shoulder Closure with a Bicycle Diversion onto a Temporary Path	TA-51
Work in the Traveled Way of Roundabouts	
Short-Term or Short-Duration Work in a Circular Intersection	TA-52
Flagging Operation on a Single-Lane Circular Intersection	TA-53
Inside Lane Closure on a Multi-Lane Circular Intersection	TA-54

Table 6P-2. Meaning of Symbols on Typical Application Diagrams



Notes for Figure 6P-1—Typical Application 1

Work Beyond the Shoulder

Guidance:

1. *If the work space is in the median of a divided highway, an advance warning sign should also be placed on the left-hand side of the directional roadway.*

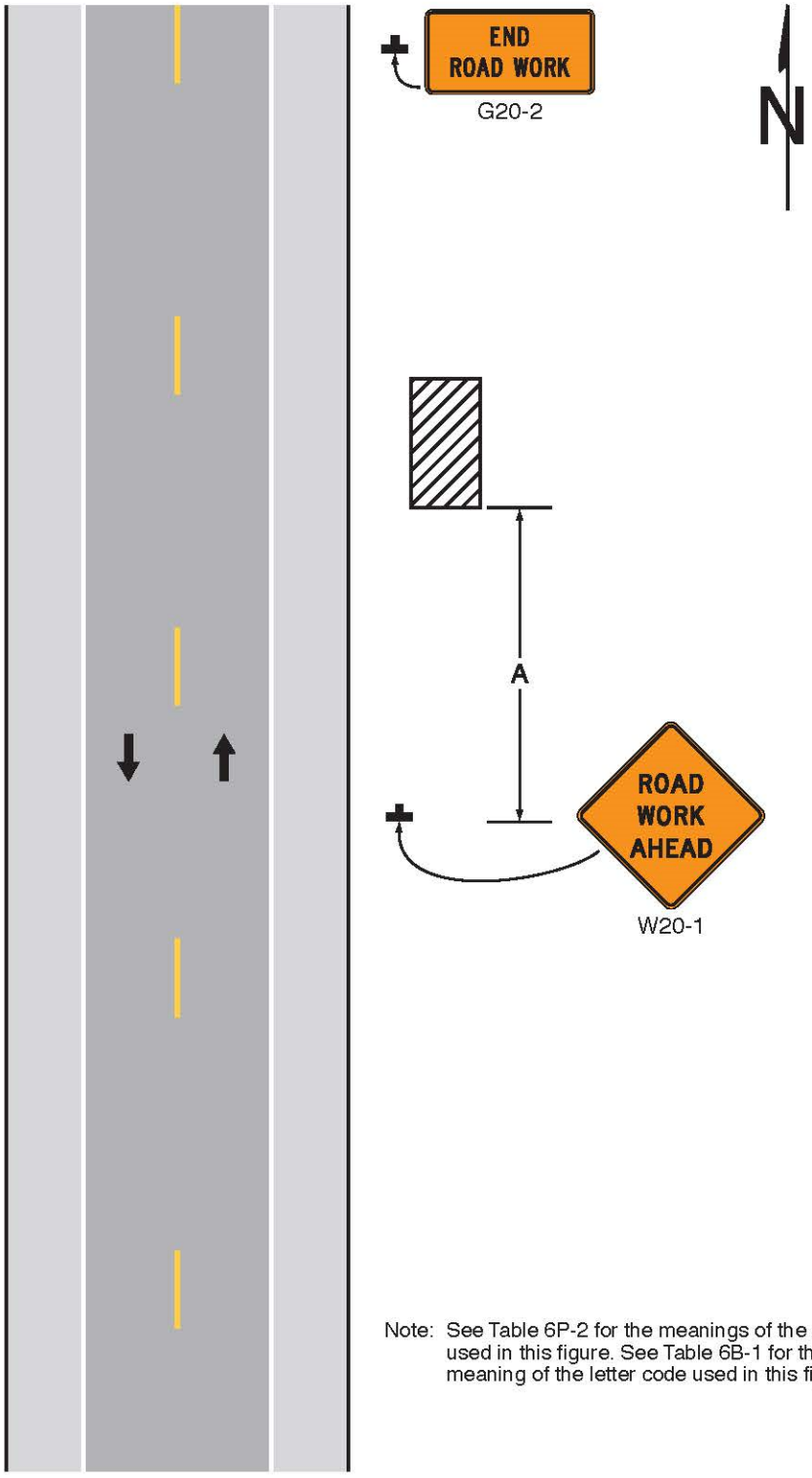
Option:

2. The ROAD WORK AHEAD sign may be replaced with other appropriate signs such as the SHOULDER WORK sign. The SHOULDER WORK sign may be used for work adjacent to the shoulder.
3. The ROAD WORK AHEAD sign may be omitted where the work space is behind a barrier, more than 24 inches behind the curb, or 15 feet or more from the edge of any roadway.
4. For short-term, short duration or mobile operation, all signs and channelizing devices may be eliminated if a vehicle with activated high-intensity rotating, flashing, oscillating, or strobe lights is used.
5. Vehicle hazard warning signals may be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights.

Standard:

6. **Vehicle hazard warning signals shall not be used instead of the vehicle's high-intensity rotating, flashing, oscillating, or strobe lights.**

Figure 6P-1. Work Beyond the Shoulder (TA-1)



Note: See Table 6P-2 for the meanings of the symbols used in this figure. See Table 6B-1 for the meaning of the letter code used in this figure.

Typical Application 1

Notes for Figure 6P-2—Typical Application 2

Blasting Zone

Standard:

1. **Whenever blasting caps are used within 1,000 feet of a roadway, the signing shown shall be used.**
2. **The signs shall be covered or removed when there are no explosives in the area or the area is otherwise secure.**
3. **Whenever a side road intersects the roadway between the BLASTING ZONE AHEAD sign and the END BLASTING ZONE sign, or a side road is within 1,000 feet of any blasting cap, similar signing, as on the mainline, shall be installed on the side road.**
4. **Prior to blasting, the blaster in charge shall determine whether road users in the blasting zone will be endangered by the blasting operation. If there is danger, road users shall not be permitted to pass through the blasting zone during blasting operations.**

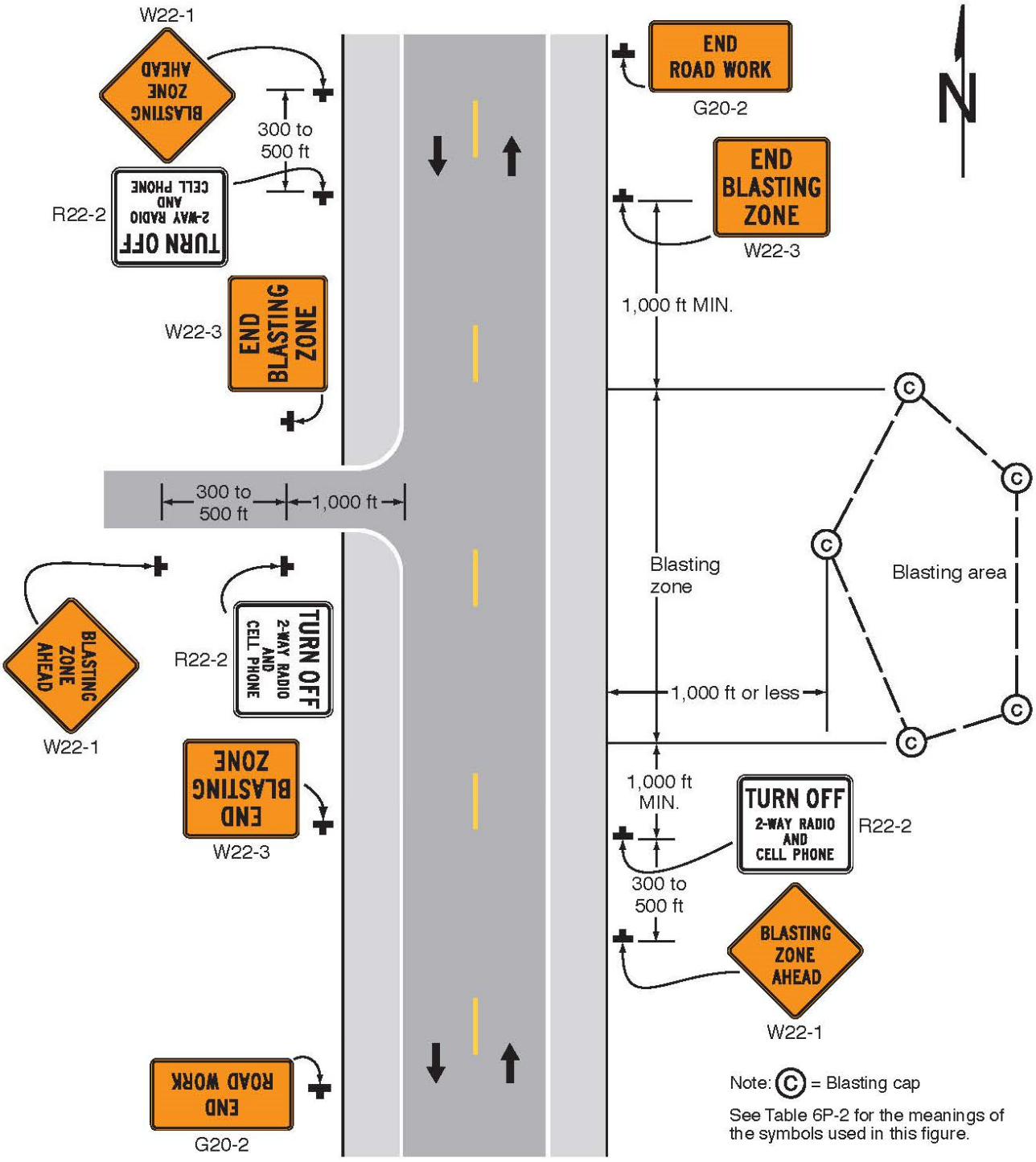
Guidance:

5. *On a divided highway, the signs should be mounted on both sides of the directional roadways.*

Support:

Wisconsin State Statute 340.01(22e) requires END ROAD WORK signs to be used to mark the end of all stationary highway maintenance or construction areas.

Figure 6P-2. Blasting Zone (TA-2)



Typical Application 2

Notes for Figure 6P-3—Typical Application 3

Work on the Shoulders

Guidance:

1. *A SHOULDER WORK sign should be placed on the left-hand side of the roadway for a divided or one-way street only if the left-hand shoulder is affected.*

Option:

2. Positive protection devices may be used per Section 6M.02.
3. The Workers symbol signs may be used instead of SHOULDER WORK signs.
4. The SHOULDER WORK sign on an intersecting roadway may be omitted where drivers emerging from that roadway will encounter another advance warning sign prior to this activity area.
5. For short duration operations of 60 minutes or less, all signs and channelizing devices may be eliminated if a vehicle with activated high-intensity rotating, flashing, oscillating, or strobe lights is used.
6. Vehicle hazard warning signals may be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights.

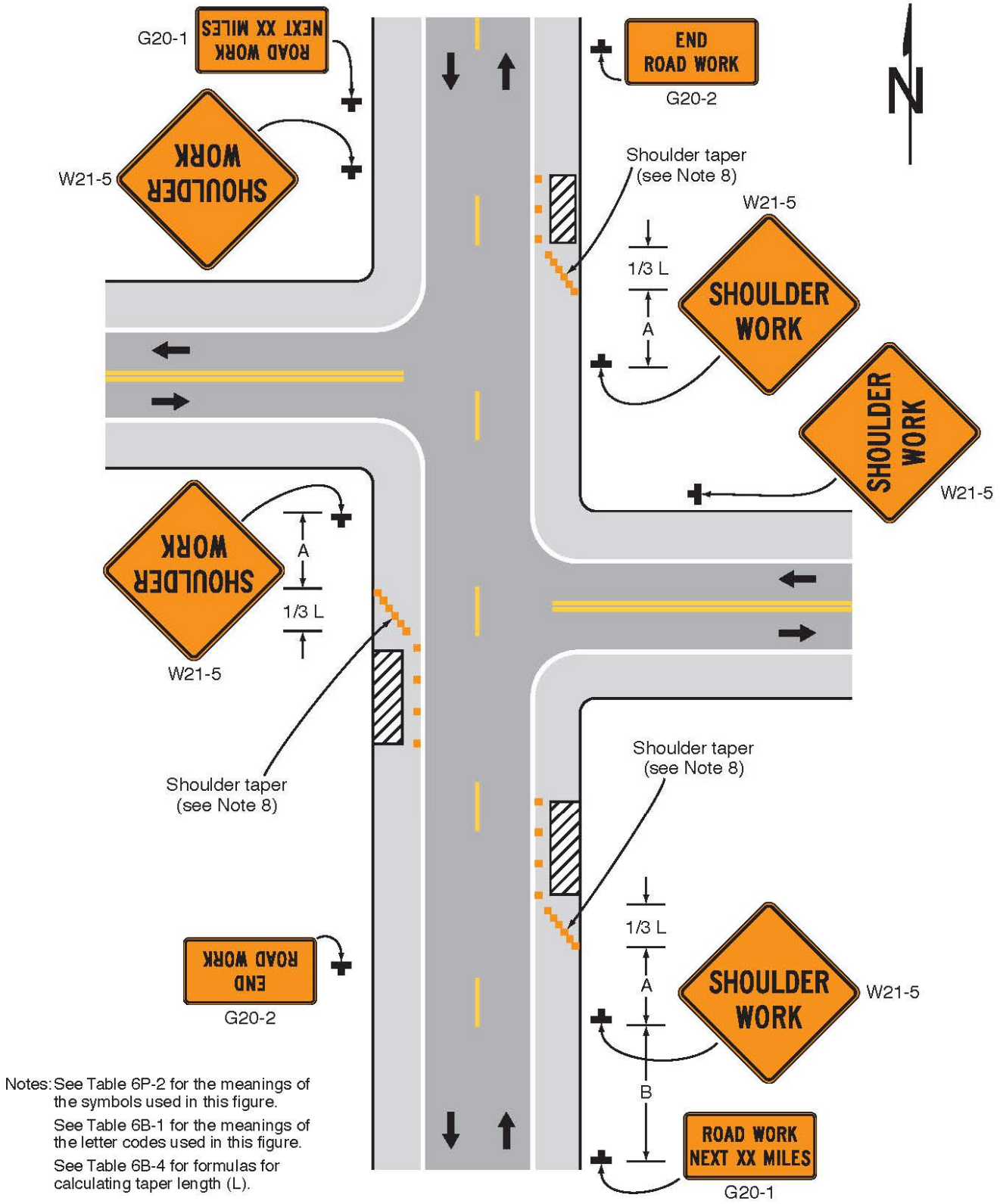
Standard:

7. **Vehicle hazard warning signals shall not be used instead of the vehicle's high-intensity rotating, flashing, oscillating, or strobe lights.**
8. **When paved shoulders having a width of 8 feet or more are closed, at least one advance warning sign shall be used. In addition, channelizing devices shall be used to close the shoulder in advance to delineate the beginning of the work space and to direct vehicular traffic to remain within the traveled way.**

Support:

Wisconsin State Statute 340.01(22e) requires END ROAD WORK signs to be used to mark the end of all stationary highway maintenance or construction areas.

Figure 6P-3. Work on the Shoulders (TA-3)



Notes: See Table 6P-2 for the meanings of the symbols used in this figure.

See Table 6B-1 for the meanings of the letter codes used in this figure.

See Table 6B-4 for formulas for calculating taper length (L).

Typical Application 3

Notes for Figure 6P-4 —Typical Application 4

Short-Duration or Mobile Operation on a Shoulder

Guidance:

1. *In those situations where multiple work locations within a limited distance make it practicable to place stationary signs, the distance between the advance warning sign and the work should not exceed 5 miles.*
2. *In those situations where the distance between the advance signs and the work is 2 miles to 5 miles, a Supplemental Distance plaque should be used with the ROAD WORK AHEAD sign.*

Option:

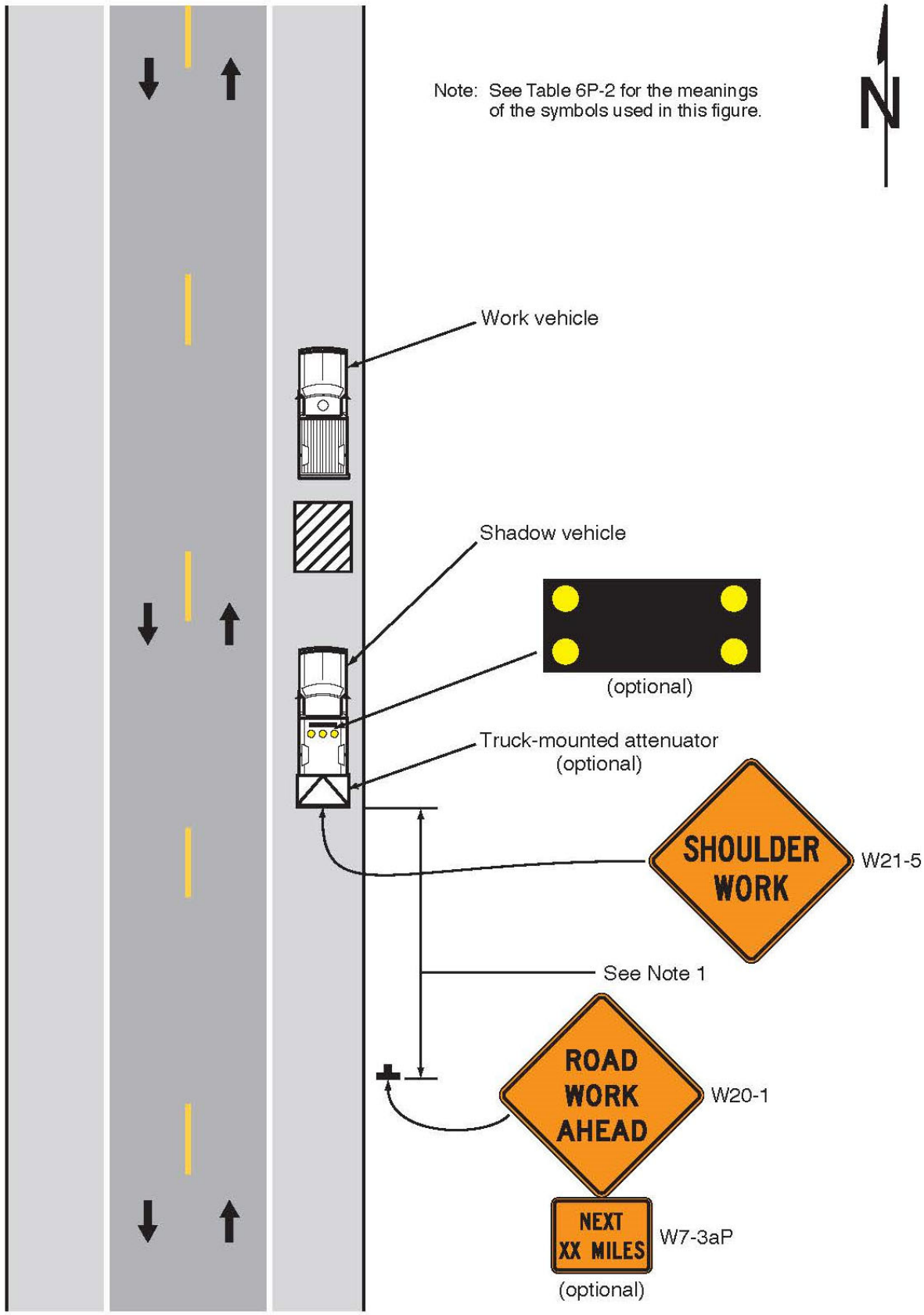
3. Additional positive protection devices may be used per Section 6M.02.
4. The ROAD WORK NEXT XX MILES sign may be used instead of the ROAD WORK AHEAD sign if the work locations occur over a distance of more than 2 miles.
5. Stationary warning signs may be omitted for short duration or mobile operations if the work vehicle displays high-intensity rotating, flashing, oscillating, or strobe lights.
6. Vehicle hazard warning signals may be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights.

Standard:

7. **Vehicle hazard warning signals shall not be used instead of the vehicle's high-intensity rotating, flashing, oscillating, or strobe lights.**
8. **If an arrow board is used for an operation on the shoulder, the caution mode shall be used.**
9. **Vehicle-mounted signs shall be mounted in a manner such that they are not obscured by equipment or supplies. Sign legends on vehicle-mounted signs shall be covered or turned from view when work is not in progress.**

If the work or work vehicles encroach into the travel lane, a truck or trailer-mounted attenuator shall be used on the shadow vehicle.

Figure 6P-4. Short-Duration or Mobile Operation on a Shoulder (TA-4)



Typical Application 4

Notes for Figure 6P-5 —Typical Application 5

Shoulder Closure on a Freeway

Guidance:

1. *RIGHT (LEFT) SHOULDER CLOSED signs should be used on limited-access highways where there is no opportunity for disabled vehicles to pull off the roadway.*
2. *If drivers cannot see a pull-off area beyond the closed shoulder, information regarding the length of the shoulder closure should be provided in feet or miles, as appropriate.*
3. *The use of a temporary traffic barrier should be based on engineering judgment.*

Standard:

4. Temporary traffic barriers, if used, shall comply with the provisions of Section 6M.02.

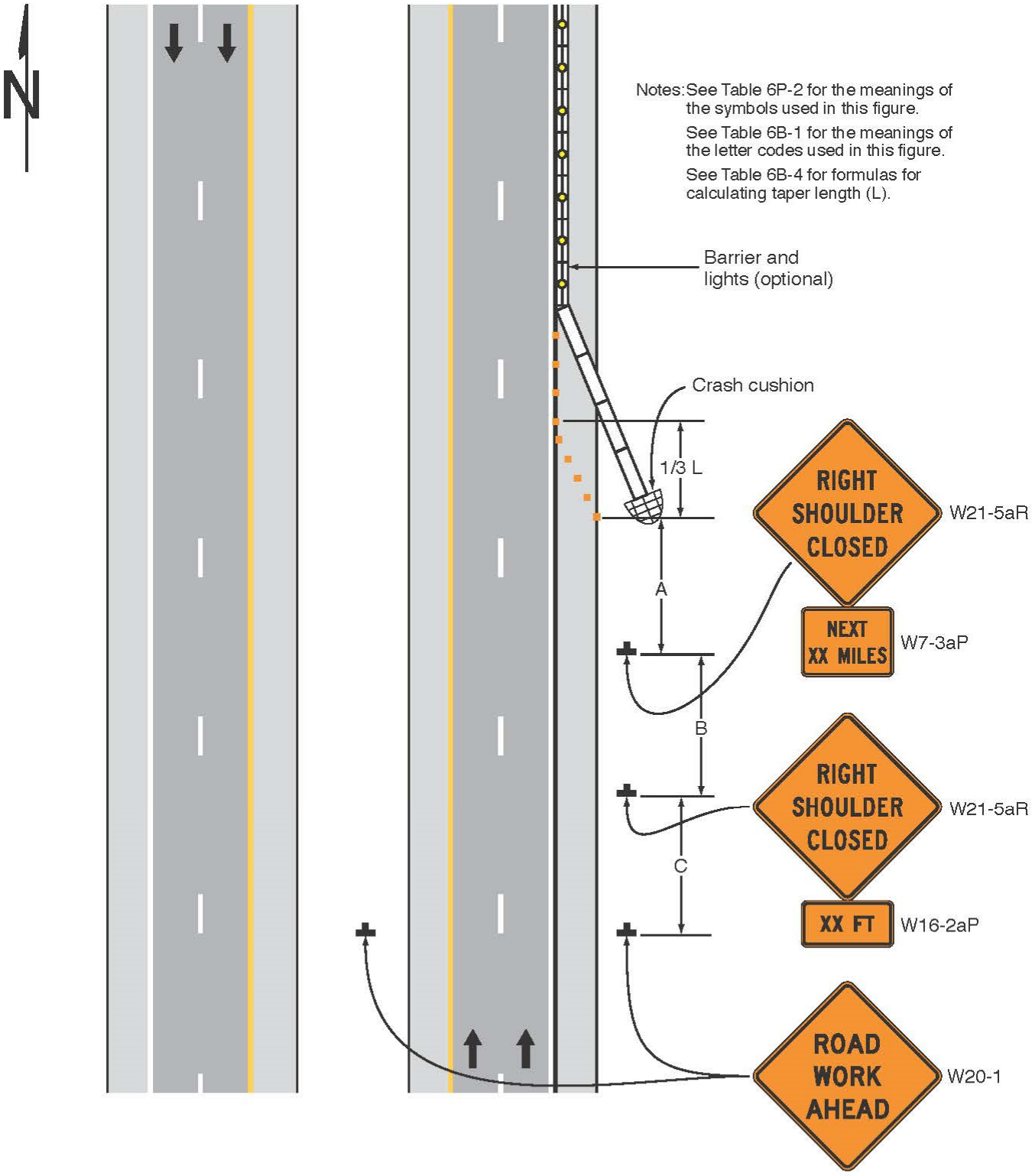
Option:

5. The barrier shown in this typical application is an example of one method that may be used to close a shoulder of a long-term project.
6. The warning lights shown on the barrier may be used.

Support:

Wisconsin State Statute 340.01(22e) requires END ROAD WORK signs to be used to mark the end of all stationary highway maintenance or construction areas.

Figure 6P-5. Shoulder Closure on a Freeway (TA-5)



Typical Application 5

Notes for Figure 6P-6 —Typical Application 6

Shoulder Work with Minor Encroachment

Guidance:

1. *All lanes should be a minimum of 10 feet in width as measured to the near face of the channelizing devices.*
2. *The treatment shown should be used on a minor road having low speeds. For higher-speed traffic conditions, a lane closure should be used.*

Option:

3. Additional positive protection devices may be used per Section 6M.02.
4. For short-term use on low-volume, low-speed roadways with vehicular traffic that does not include longer and wider heavy commercial vehicles, a minimum lane width of 9 feet may be used.
5. Where the opposite shoulder is suitable for carrying vehicular traffic and of adequate width, lanes may be shifted by use of closely-spaced channelizing devices, provided that the minimum lane width of 10 feet is maintained.
6. Additional advance warning may be appropriate, such as a ROAD NARROWS sign.
7. Temporary traffic barriers may be used along the work space.
8. The shadow vehicle may be omitted if a taper and channelizing devices are used.
9. A truck-mounted attenuator may be used on the shadow vehicle.
10. For short-duration work, the taper and channelizing devices may be omitted if a shadow vehicle with activated high-intensity rotating, flashing, oscillating, or strobe lights is used.
11. Vehicle hazard warning signals may be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights.

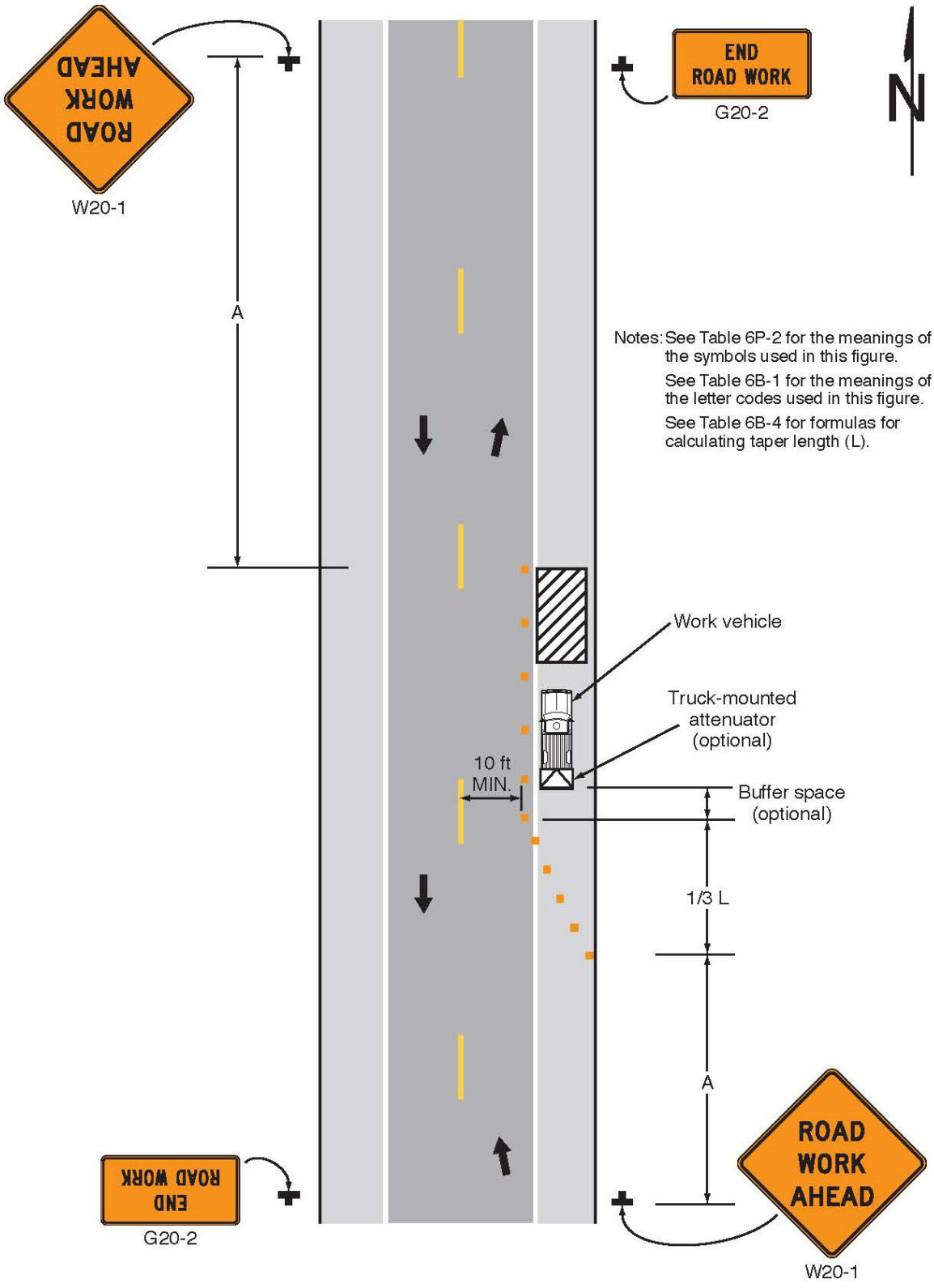
Standard:

12. **Vehicle-mounted signs shall be mounted in a manner such that they are not obscured by equipment or supplies. Sign legends on vehicle-mounted signs shall be covered or turned from view when work is not in progress.**
13. **Shadow and work vehicles shall display high-intensity rotating, flashing, oscillating, or strobe lights.**
14. **Vehicle hazard warning signals shall not be used instead of the vehicle's high-intensity rotating, flashing, oscillating, or strobe lights.**

Support:

Wisconsin State Statute 340.01(22e) requires END ROAD WORK signs to be used to mark the end of all stationary highway maintenance or construction areas.

Figure 6P-6. Shoulder Work with Minor Encroachment (TA-6)



Typical Application 6

Notes for Figure 6P-7 —Typical Application 7

Road Closure with a Diversion

Support:

1. Signs and object markers are shown for one direction of travel only.

Standard:

2. **Devices similar to those depicted shall be placed for the opposite direction of travel.**
3. **Pavement markings no longer applicable to the traffic pattern of the roadway shall be removed or obliterated before any new traffic patterns are open to traffic.**
4. **Temporary traffic barriers and end treatments shall be crashworthy.**

Guidance:

5. *If the tangent distance along the temporary diversion is more than 600 feet, a Reverse Curve sign, left first, should be used instead of the Double Reverse Curve sign, and a second Reverse Curve sign, right first, should be placed in advance of the second reverse curve back to the original alignment.*
6. *When the tangent section of the diversion is more than 600 feet, and the diversion has sharp curves with recommended speeds of 30 mph or less, Reverse Turn signs should be used.*
7. *Where the temporary pavement and old pavement are different colors, the temporary pavement should start on the tangent of the existing pavement and end on the tangent of the existing pavement.*
8. *Delineators or channelizing devices should be used along the diversion.*

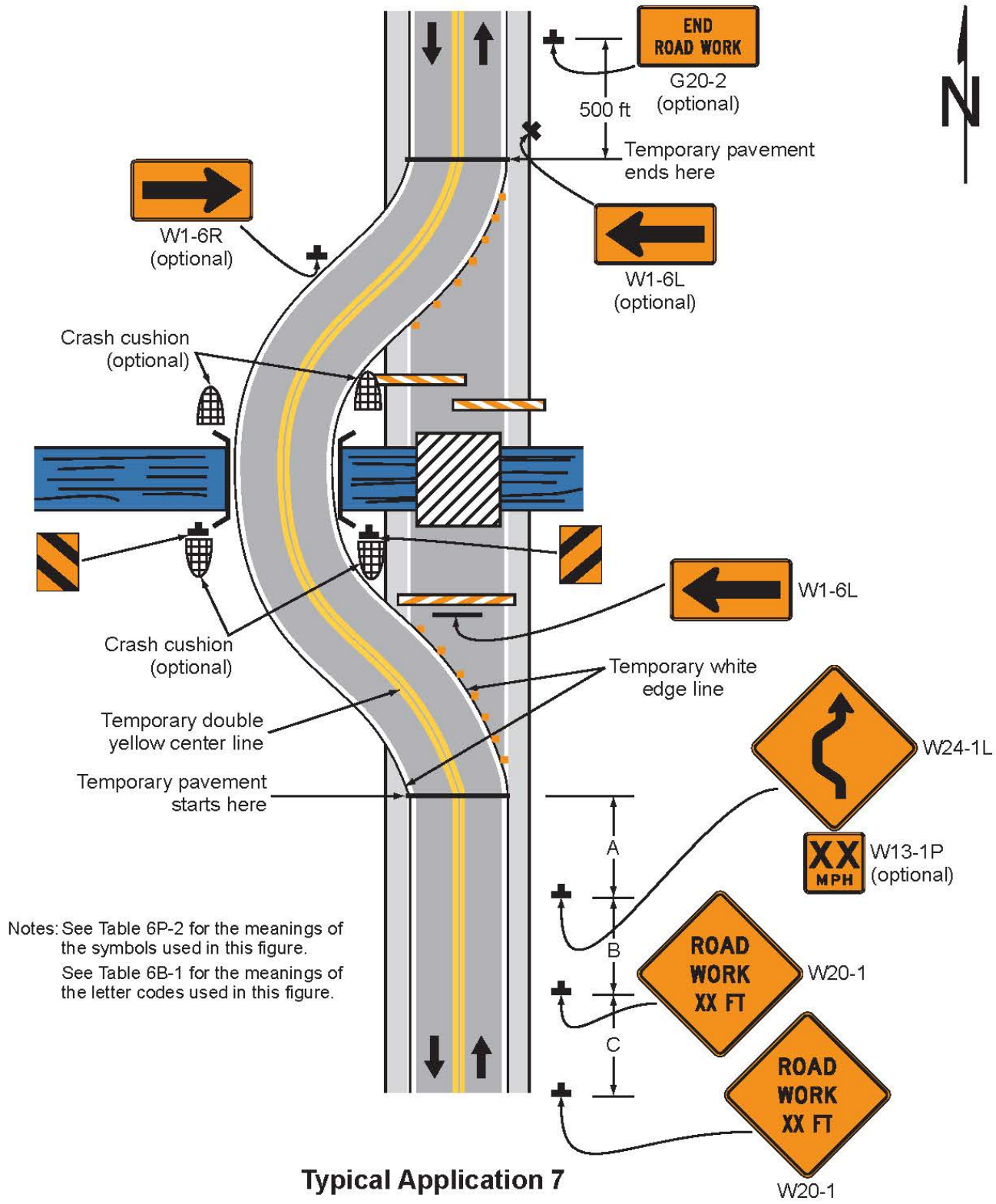
Option:

9. Flashing warning lights and/or flags may be used to call attention to the warning signs.
10. On sharp curves, large arrow signs may be used in addition to other advance warning signs.

Support:

Wisconsin State Statute 340.01(22e) requires END ROAD WORK signs to be used to mark the end of all stationary highway maintenance or construction areas.

Figure 6P-7. Road Closure with a Diversion (TA-7)



Notes: See Table 6P-2 for the meanings of the symbols used in this figure.

See Table 6B-1 for the meanings of the letter codes used in this figure.

Typical Application 7

Notes for Figure 6P-8 —Typical Application 8

Road Closure with an Off-Site Detour

Guidance:

1. *Regulatory traffic control devices should be modified as needed for the duration of the detour.*

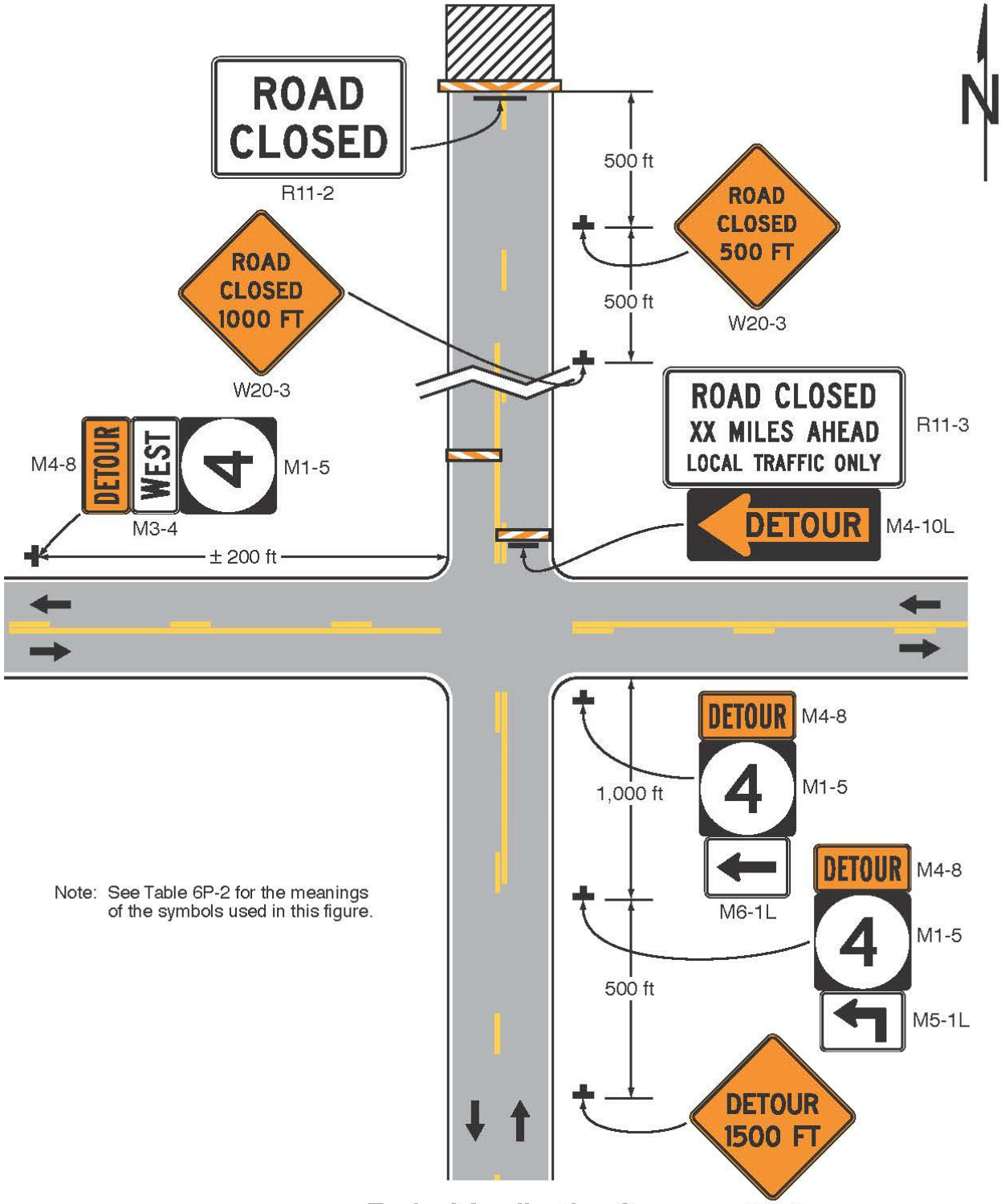
Option:

2. If the road is opened for some distance beyond the intersection and/or there are significant origin/destination points beyond the intersection, the ROAD CLOSED and DETOUR signs on Type 3 Barricades may be located at the edge of the traveled way.
3. A Route Sign Directional assembly may be placed on the far left corner of the intersection to augment or replace the one shown on the near right corner.
4. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
5. Cardinal direction plaques may be used with route signs.

The M4-9 sign may be used for the Detour Arrow sign in lieu of the M4-10 sign.

The W20-2 may use alternate legend DETOUR AHEAD.

Figure 6P-8. Road Closure with an Off-Site Detour (TA-8)



Note: See Table 6P-2 for the meanings of the symbols used in this figure.

Typical Application 8

Notes for Figure 6P-9 —Typical Application 9

Overlapping Routes with a Detour

Support:

1. TTC devices are shown for one direction of travel only.

Standard:

2. Devices similar to those depicted shall be placed for the opposite direction of travel.

Guidance:

3. STOP or YIELD signs displayed to side roads should be installed as needed along the temporary route.

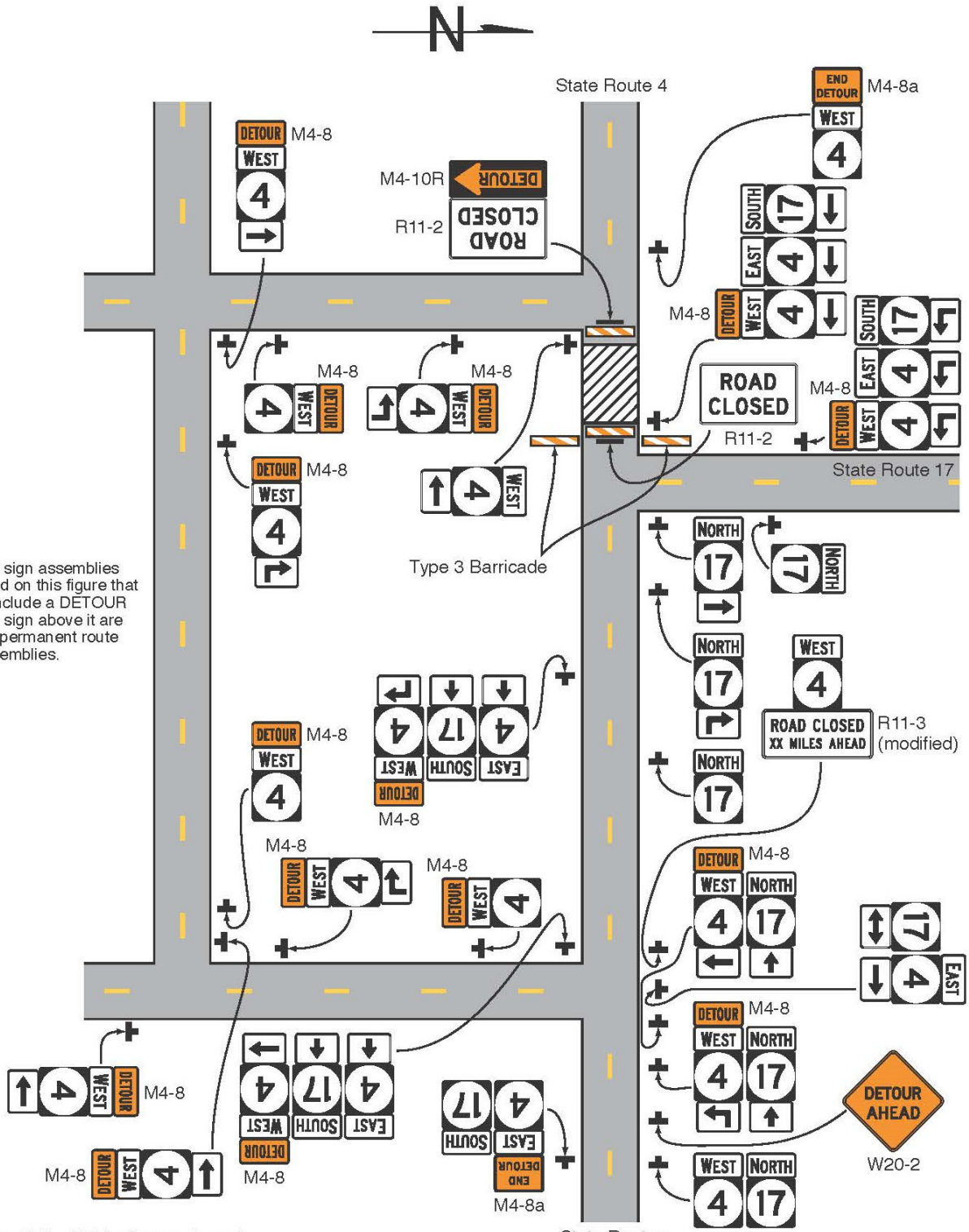
Option:

4. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
5. Flashing warning lights may be used on the Type 3 Barricades.
6. Cardinal direction plaques may be used with route signs.

The M4-9 sign may be used for the Detour Arrow sign in lieu of the M4-10 sign.

The END DETOUR (M4-8a) sign may be omitted.

Figure 6P-9. Overlapping Routes with a Detour (TA-9)



Note:
All route sign assemblies illustrated on this figure that do not include a DETOUR auxiliary sign above it are existing permanent route sign assemblies.

Notes: See Table 6P-2 for the meanings of the symbols used in this figure.

See Figures 2D-4 through 2D-6 for the sign codes for the route signs and the directional and arrow auxiliary signs associated with them.

Typical Application 9

Notes for Figure 6P-10 —Typical Application 10

Lane Closure on a Two-Lane Road Using Flaggers

Option:

1. Positive protection devices may be used per Section 6M.02.
2. For low-volume situations with short TTC zones on straight roadways where the flagger is visible to road users approaching from both directions, a single flagger, positioned to be visible to road users approaching from both directions, may be used (see Chapter 6D).
3. The ROAD WORK AHEAD and the END ROAD WORK signs may be omitted for short-duration operations.
4. Flashing warning lights and/or flags may be used to call attention to the advance warning signs. A BE PREPARED TO STOP sign may be added to the sign series.
5. Automated Flagger Assistance Devices (see Section 6L.02) may be used in situations where there is only one lane of approaching traffic in the direction to be controlled.

Guidance:

6. *The buffer space should be extended so that the two-way traffic taper is placed before a horizontal (or crest vertical) curve to provide adequate sight distance for the flagger and a queue of stopped vehicles.*

Standard:

7. **At night, flagger stations shall be illuminated, except in emergencies.**

Guidance:

8. *When used, the BE PREPARED TO STOP sign should be located between the Flagger sign and the ONE LANE ROAD sign.*
9. *When a grade crossing exists within or upstream of the transition area and it is anticipated that queues resulting from the lane closure might extend through the grade crossing, the TTC zone should be extended so that the transition area precedes the grade crossing.*
10. *When a grade crossing equipped with active warning devices exists within the activity area, provisions should be made for keeping flaggers informed as to the activation status of these warning devices.*
11. *When a grade crossing exists within the activity area, drivers operating on the left-hand side of the normal center line should be provided with comparable warning devices as for drivers operating on the right-hand side of the normal center line.*
12. *Early coordination with the railroad company or transit agency should occur before work starts.*

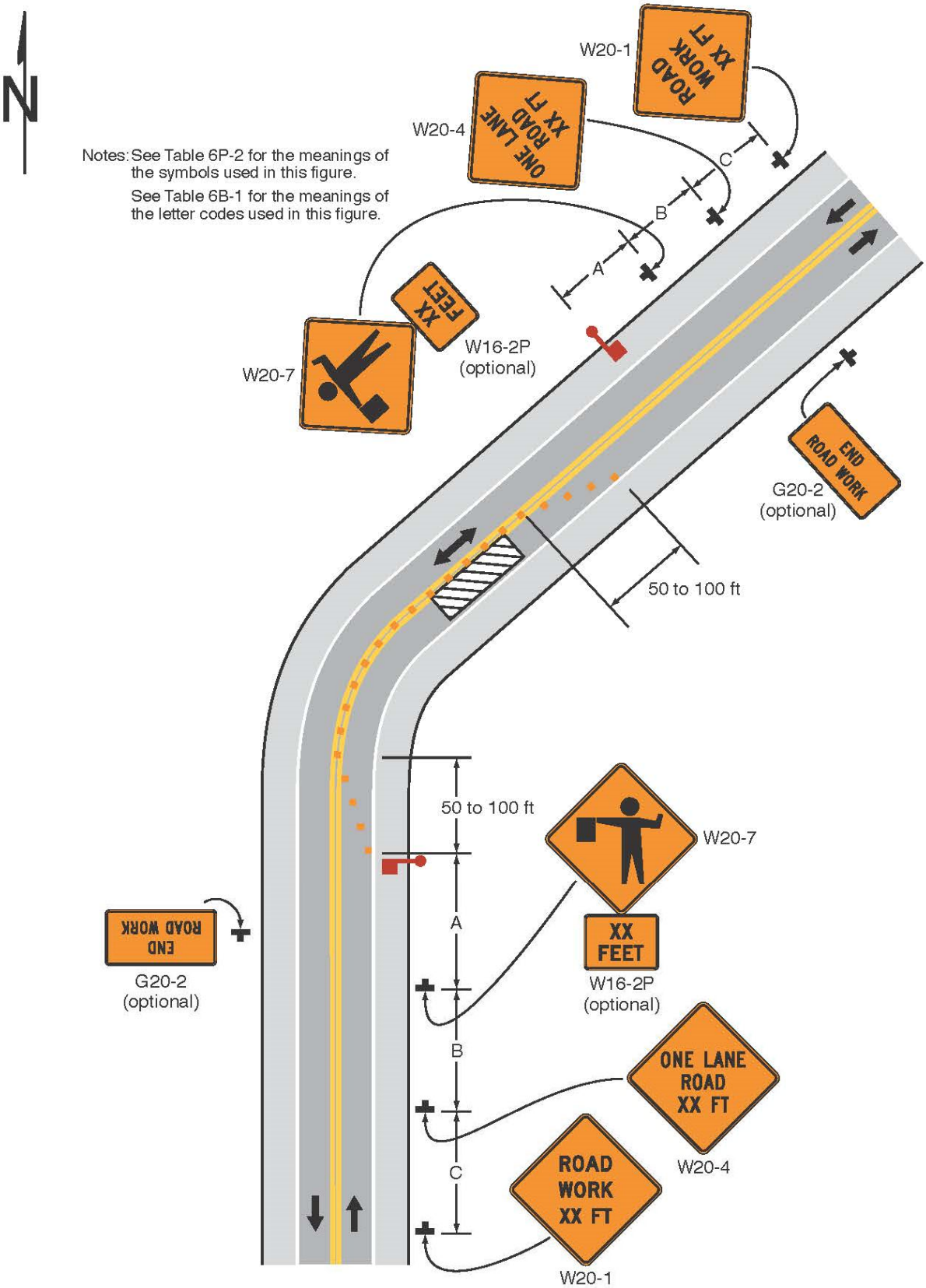
Option:

13. A flagger or a uniformed law enforcement officer may be used at the grade crossing to minimize the probability that vehicles are stopped within 15 feet of the grade crossing, measured from both sides of the outside rails.

Support:

Wisconsin State Statute 340.01(22e) requires END ROAD WORK signs to be used to mark the end of all stationary highway maintenance or construction areas.

Figure 6P-10. Lane Closure on a Two-Lane Road Using Flaggers (TA-10)



Typical Application 10

Notes for Figure 6P-11 —Typical Application 11

Lane Closure on a Two-Lane Road with Low Traffic Volumes

Option:

1. Positive protection devices may be used per Section 6M.02.
2. This TTC zone application may be used as an alternate to the TTC application shown in Figure 6P-10 (using flaggers) when the following conditions exist:
   a. Vehicular traffic volume is such that sufficient gaps exist for vehicular traffic that must yield.
   b. Road users from both directions are able to see approaching vehicular traffic through and beyond the worksite and have sufficient visibility of approaching vehicles.
3. The Type B flashing warning lights may be placed on the ROAD WORK AHEAD and the ONE LANE ROAD AHEAD signs whenever a night lane closure is necessary.

Standard:

If STOP signs are used at one-lane, two-way sites, both directions shall be stopped.

On low-volume State Trunk Highways, Connecting Highways, or any other roadways declared as through highways, STOP signs shall be used to control traffic at a one-lane, two-way TTC zone when drivers are able to see the other end of the one-lane, two-way operation and have sufficient visibility of approaching vehicles.

Option:

At one-lane, two-way sites on State Trunk Highways, Connecting Highways, or other roadways declared as thorough highways, flaggers, automated flagger devices controlled by flaggers, temporary traffic control signals, may be used as appropriate for conditions at the site, based on engineering judgment.

Support:

Wisconsin State Statute 340.01(22e) requires END ROAD WORK signs to be used to mark the end of all stationary highway maintenance or construction areas.

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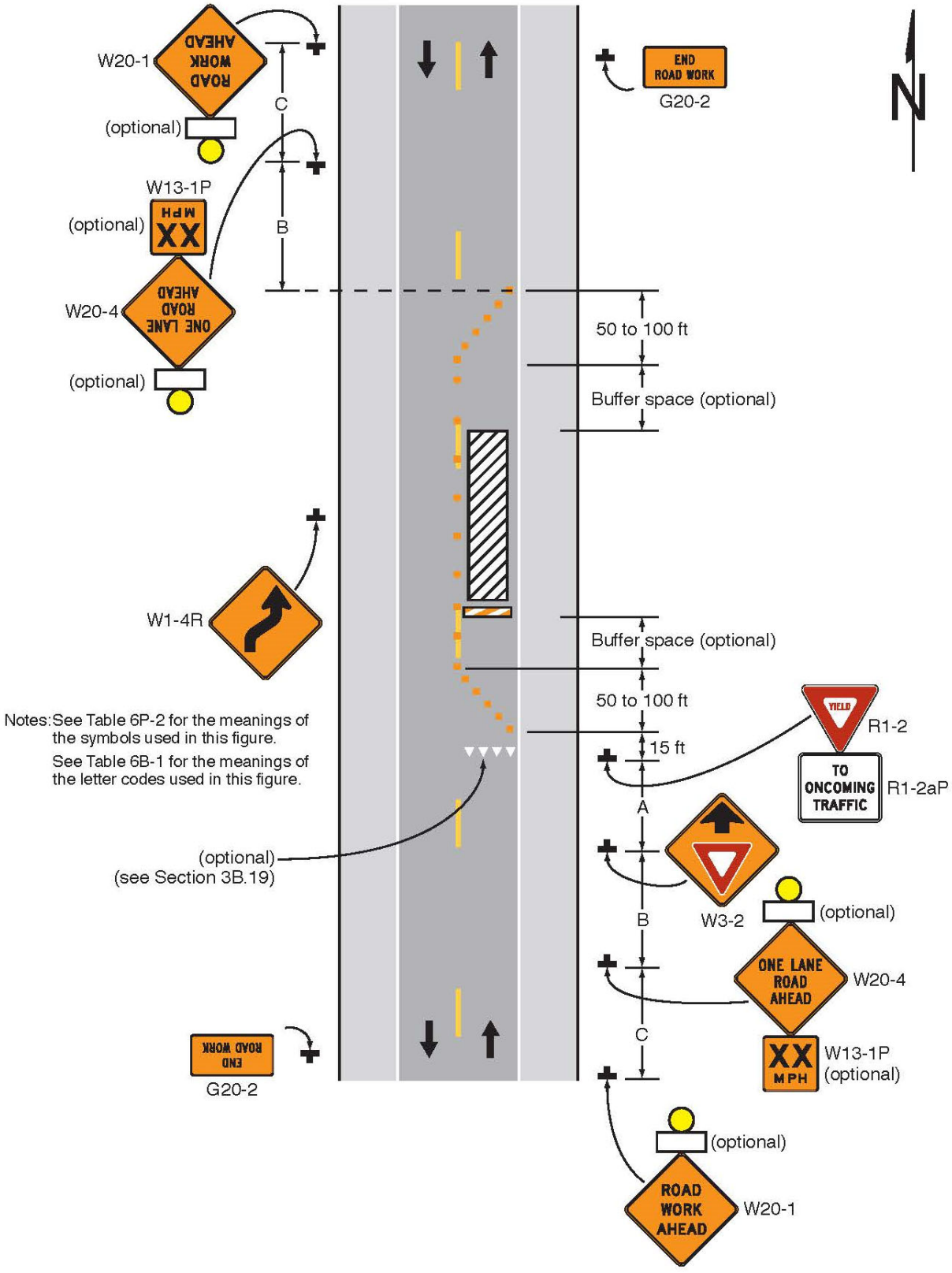
Figure 6P-11. Lane Closure on a Two-Lane Road with Low Traffic Volumes (TA-11)



Notes: See Table 6P-2 for the meanings of the symbols used in this figure.
See Table 6B-1 for the meanings of the letter codes used in this figure.

Typical Application 11

Notes for Figure 6P-12 —Typical Application 12

Lane Closure on a Two-Lane Road Using Temporary Traffic Control Signals

Standard:

1. **Temporary traffic control signals shall be installed and operated in accordance with the provisions of Part 4. Temporary traffic control signals shall meet the physical display and operational requirements of conventional traffic control signals.**
2. **Temporary traffic control signal timing shall be established by authorized officials. Durations of red clearance intervals shall be adequate to clear the one-lane section of conflicting vehicles.**
3. **When the temporary traffic control signal is changed to the flashing mode, either manually or automatically, red signal indications shall be flashed to both approaches.**
4. **Stop lines shall be installed with temporary traffic control signals for long-term closures. Existing conflicting pavement markings and raised pavement marker reflectors between the activity area and each stop line shall be removed. After the temporary traffic control signal is removed, the stop lines and other temporary pavement markings shall be removed and the permanent pavement markings restored.**
5. **Safeguards shall be incorporated to avoid the possibility of conflicting signal indications at each end of the TTC zone.**

Guidance:

6. *Where no-passing lines are not already in place, they should be added.*
7. *Adjustments in the location of the advance warning signs should be made as needed to accommodate the horizontal or vertical alignment of the roadway, recognizing that the distances shown for sign spacings are minimums. Adjustments in the height of the signal heads should be made as needed to conform to the vertical alignment.*

Option:

8. Positive protection devices may be used per Section 6M.02.
9. Flashing warning lights shown on the ROAD WORK AHEAD and the ONE LANE ROAD AHEAD signs may be used.

Standard orange flags may be used in conjunction with the SIGNAL AHEAD (W3-3) sign.

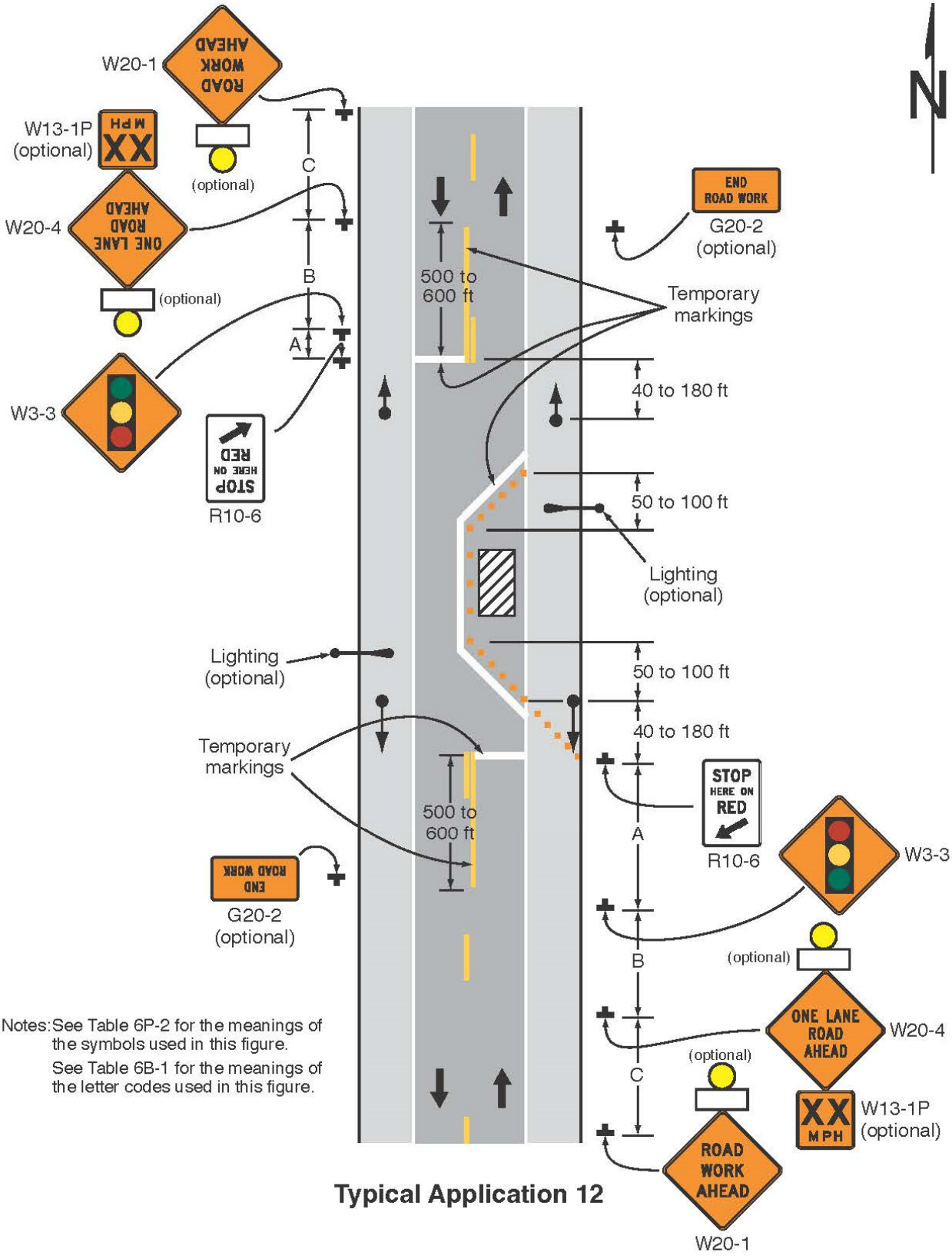
10. Removable pavement markings may be used.

Support:

11. Temporary traffic control signals are preferable to flaggers for long-term projects and other activities that would require flagging at night.
12. The maximum length of activity area for one-way operation under temporary traffic control signal control is determined by the capacity required to handle the peak demand.

Wisconsin State Statute 340.01(22e) requires END ROAD WORK signs to be used to mark the end of all stationary highway maintenance or construction areas.

Figure 6P-12. Lane Closure on a Two-Lane Road Using Temporary Traffic Control Signals (TA-12)



Notes: See Table 6P-2 for the meanings of the symbols used in this figure.
See Table 6B-1 for the meanings of the letter codes used in this figure.

Typical Application 12

Notes for Figure 6P-13 —Typical Application 13

Temporary Road Closure

Support:

1. Conditions represented are a planned closure not exceeding 20 minutes during the daytime.

Standard:

2. A flagger or uniformed law enforcement officer shall be used for this application. The flagger, if used for this application, shall follow the procedures provided in Sections 6D.05 and 6D.06.

Guidance:

3. The uniformed law enforcement officer, if used for this application, should follow the procedures provided in Sections 6D.05 and 6D.06.

Option:

4. A BE PREPARED TO STOP sign may be added to the sign series.
5. Positive protection devices may be used per Section 6M.02.
6. Automated Flagger Assistance Devices (see Section 6L.02) may be used in situations where there is only one lane of approaching traffic in the direction to be controlled.

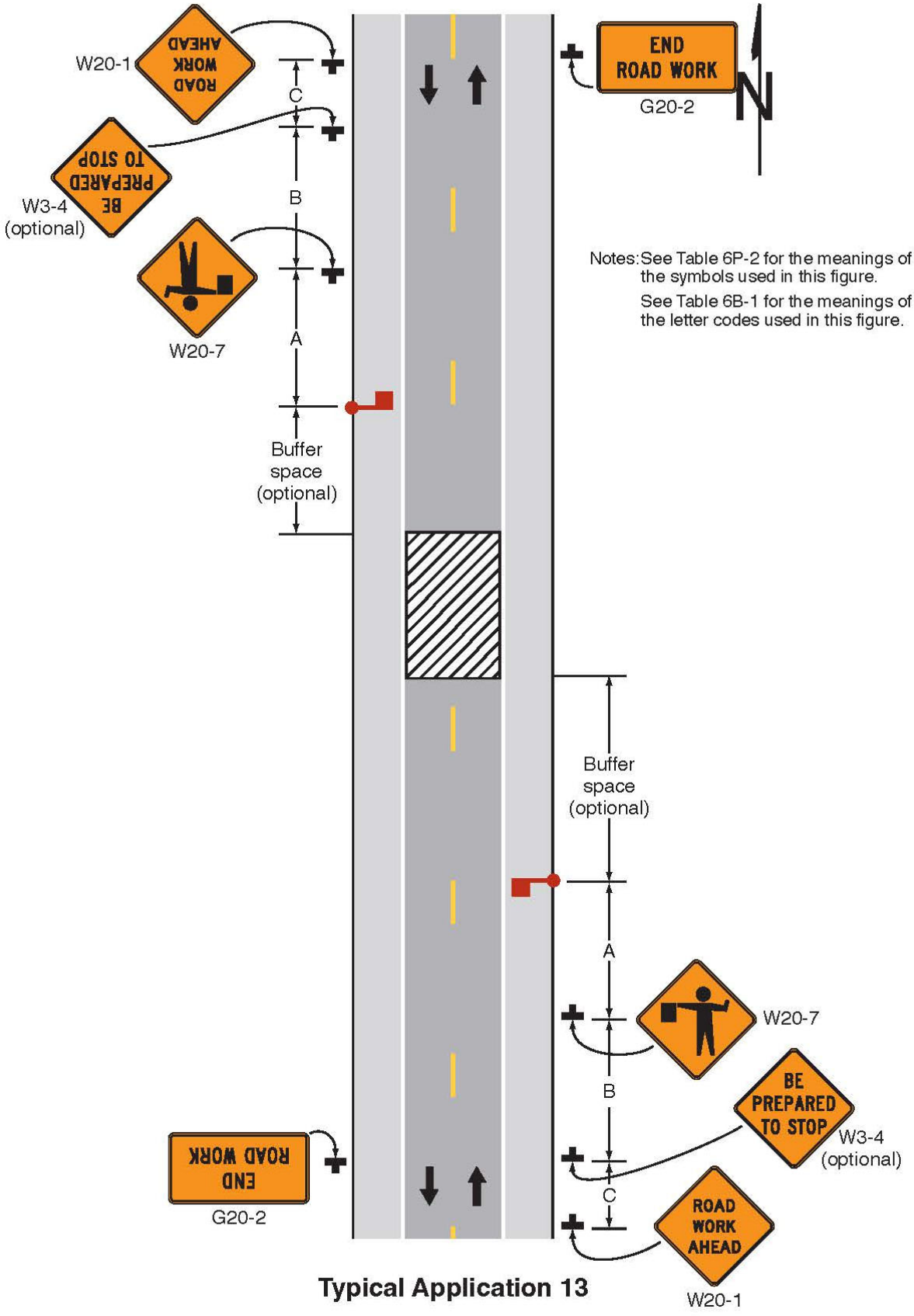
Guidance:

7. When used, the BE PREPARED TO STOP sign should be located before the Flagger symbol sign.

Support:

Wisconsin State Statute 340.01(22e) requires END ROAD WORK signs to be used to mark the end of all stationary highway maintenance or construction areas.

Figure 6P-13. Temporary Road Closure (TA-13)



Typical Application 13

Notes for Figure 6P-14 —Typical Application 14

Haul Road Crossing

Guidance:

1. *Floodlights should be used to illuminate haul road crossings where existing light is inadequate.*
2. *Where no-passing lines are not already in place, they should be added.*

Standard:

3. **The traffic control method selected shall be used in both directions.**

Flagging Method

4. **When a road used exclusively as a haul road is not in use, the haul road shall be closed with Type 3 Barricades and the Flagger symbol signs covered.**
5. **The flagger shall follow the procedures provided in Sections 6D.05 and 6D.06.**
6. **At night, flagger stations shall be illuminated, except in emergencies.**

Signalized Method

7. **When a road used exclusively as a haul road is not in use, the haul road shall be closed with Type 3 Barricades. The signals shall either:**
   a. **Flash yellow on the main road and flash red on the haul road or be covered, and the Signal Ahead and STOP HERE ON RED signs shall be covered or hidden from view; or**
   b. **Display green on the main road and steady red on the haul road, but only if actuated signal operation is used such that green is always displayed to the main road except when a vehicle is detected on the haul road.**
8. **The temporary traffic control signals shall control both the highway and the haul road and shall meet the physical display and operational requirements of conventional traffic control signals as described in Part 4. Traffic control signal timing shall be established by authorized officials.**
9. **Stop lines shall be used on existing highways with temporary traffic control signals.**
10. **Existing conflicting pavements markings between the stop lines shall be removed. After the temporary traffic control signal is removed, the stop lines and other temporary pavement markings shall be removed and the permanent pavement markings restored.**

Option:

Flagging Method

11. Automated Flagger Assistance Devices (see Section 6L.02) may be used in situations where there is only one lane of approaching traffic in the direction to be controlled.

Guidance:

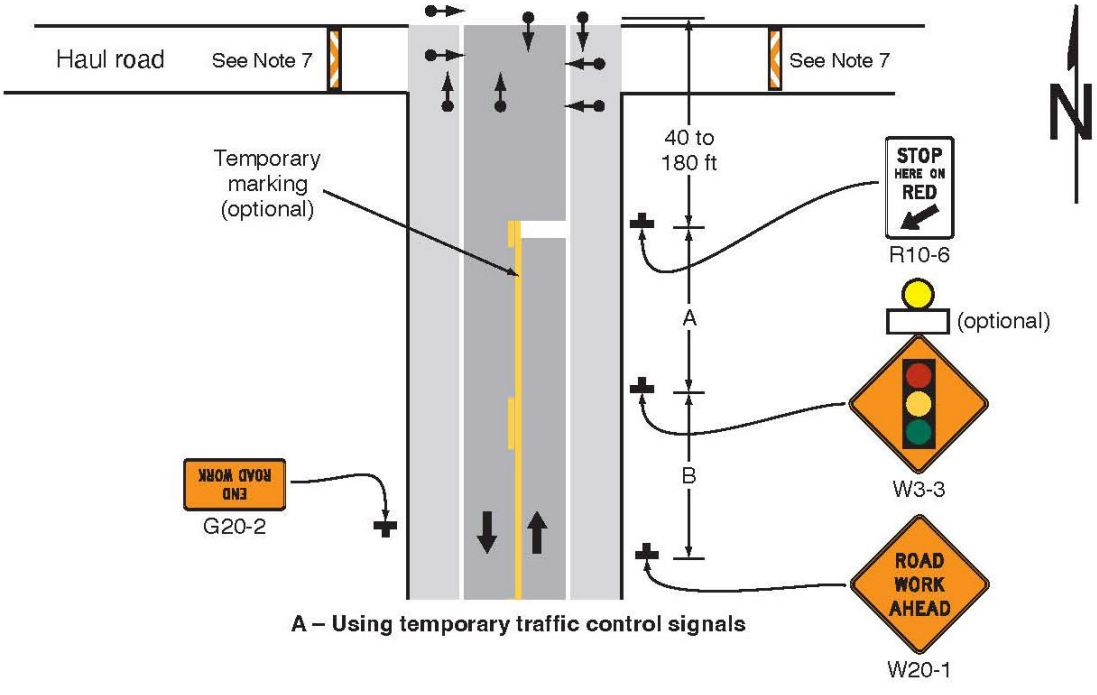
Signalized Method

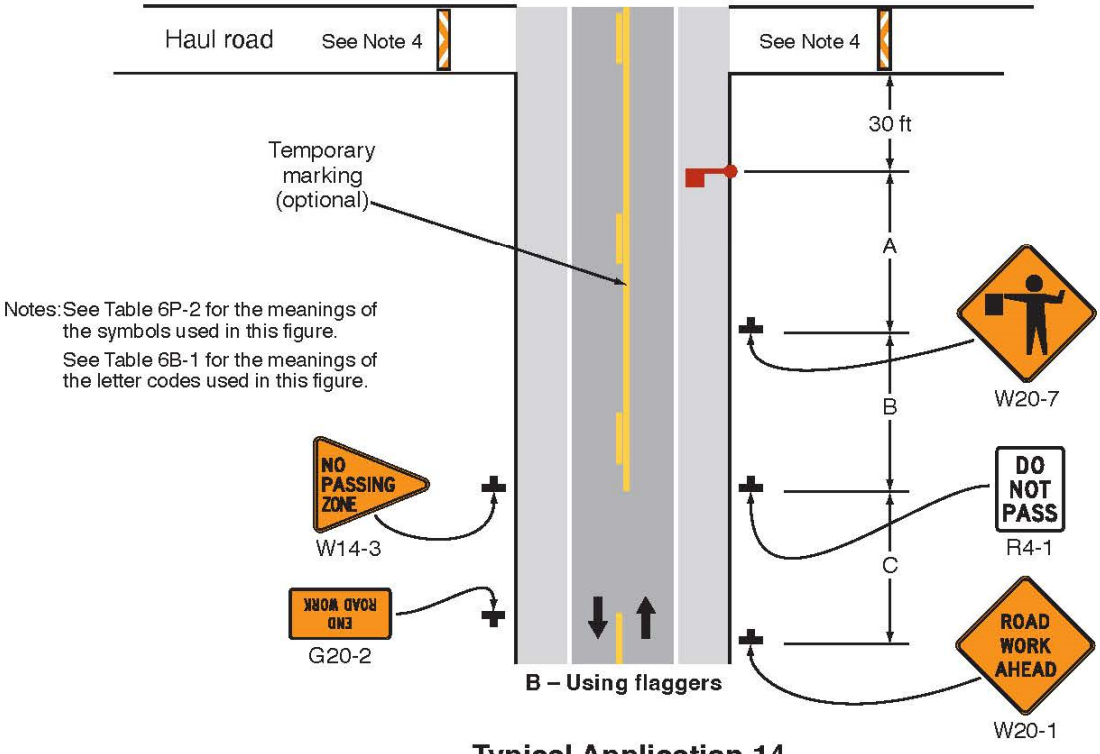
12. *If actuated signal operation is used (see Item b in Note 7 above) and pedestrian facilities, such as sidewalks, are present in the area of the haul road crossing, then consideration should be given to providing pedestrian actuation capability at the temporary traffic control signal to accommodate any pedestrians who might be depending upon a pedestrian phase to cross the main road.*

Support:

Wisconsin State Statute 340.01(22e) requires END ROAD WORK signs to be used to mark the end of all highway maintenance or construction areas.

Figure 6P-14. Haul Road Crossing (TA-14)





Notes: See Table 6P-2 for the meanings of the symbols used in this figure.
See Table 6B-1 for the meanings of the letter codes used in this figure.

Typical Application 14

Notes for Figure 6P-15 —Typical Application 15
Work in the Center of a Road with Low Traffic Volumes

Guidance:

1. *The lanes on either side of the center work space should have a minimum width of 10 feet as measured from the near edge of the channelizing devices to the edge of the pavement or the outside edge of the paved shoulder.*

Option:

2. Positive protection devices may be used per Section 6M.02.
3. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
4. If the closure continues overnight, warning lights may be used on the channelizing devices.
5. A lane width of 9 feet may be used for short-term stationary work on low-volume, low-speed roadways when motor vehicle traffic does not include longer and wider heavy commercial vehicles.
6. A work vehicle displaying high-intensity rotating, flashing, oscillating, or strobe lights may be used instead of the channelizing devices forming the tapers or the high-level warning devices.
7. Vehicle hazard warning signals may be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights.

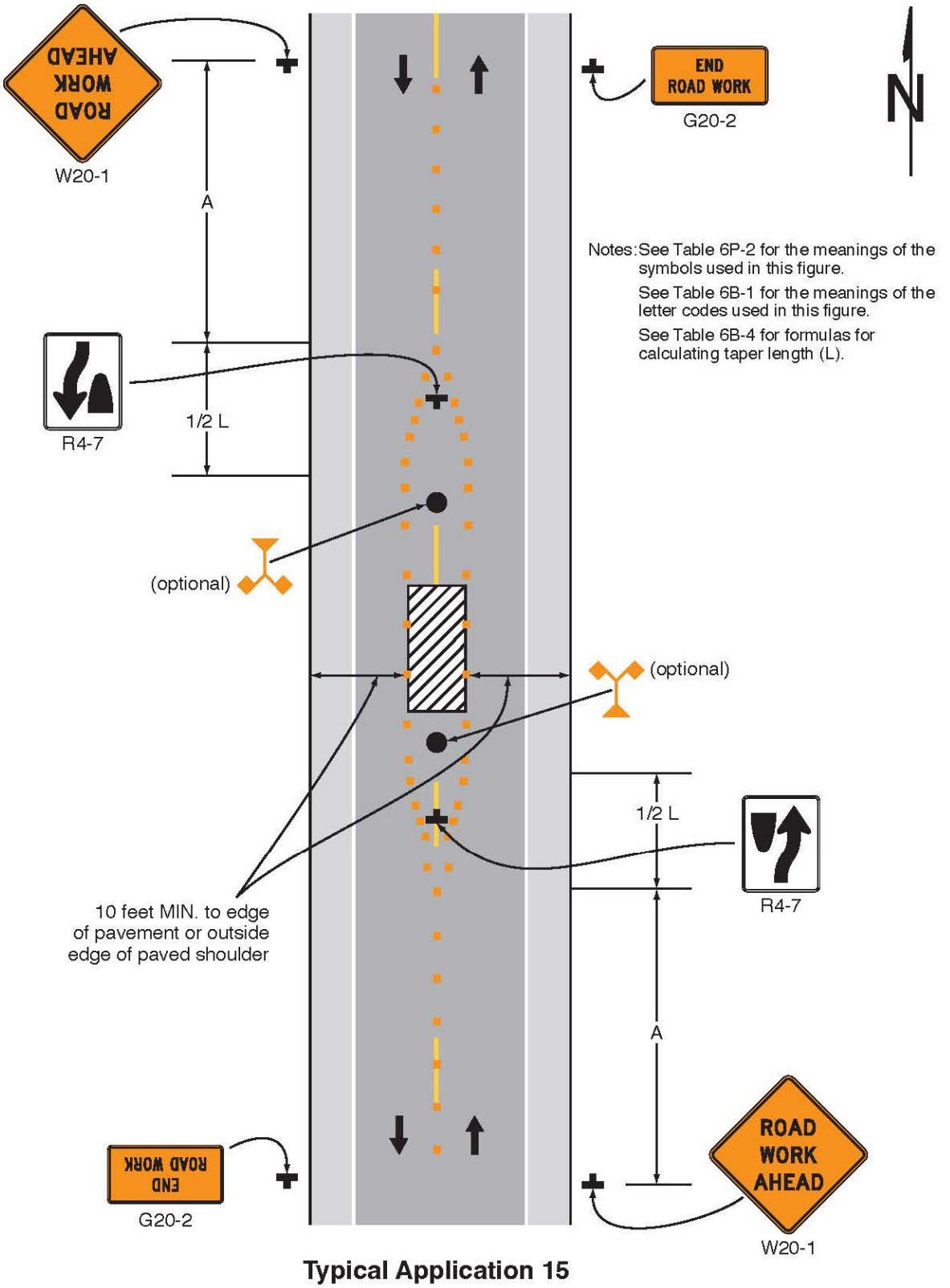
Standard:

8. **Vehicle hazard warning signals shall not be used instead of the vehicle's high-intensity rotating, flashing, oscillating, or strobe lights.**

Support:

Wisconsin State Statute 340.01(22e) requires END ROAD WORK signs to be used to mark the end of all stationary highway maintenance or construction areas.

Figure 6P-15. Work in the Center of a Road with Low Traffic Volumes (TA-15)



Typical Application 15

Notes for Figure 6P-16 —Typical Application 16

Surveying Along the Center Line of a Road with Low Traffic Volumes

Guidance:

1. *The lanes on either side of the center work space should have a minimum width of 10 feet as measured from the near edge of the channelizing devices to the edge of the pavement or the outside edge of the paved shoulder.*
2. *Cones should be placed 6 to 12 inches on either side of the center line.*
3. *A flagger should be used to warn workers who cannot watch road users.*

Standard:

4. **For surveying on the center line of a high-volume road, one lane shall be closed using the information illustrated in Figure 6P-10.**

Option:

5. A high-level warning device may be used to protect a surveying device, such as a target on a tripod.
6. Cones may be omitted for a cross-section survey.
7. ROAD WORK AHEAD signs may be used in place of the SURVEY CREW signs.
8. Flags may be used to call attention to the advance warning signs.
9. If the work is along the shoulder, the flagger may be omitted.
10. For a survey along the edge of the road or along the shoulder, cones may be placed along the edge line.
11. A BE PREPARED TO STOP sign may be added to the sign series.
12. Automated Flagger Assistance Devices (see Section 6L.02) may be used in situations where there is only one lane of approaching traffic in the direction to be controlled.

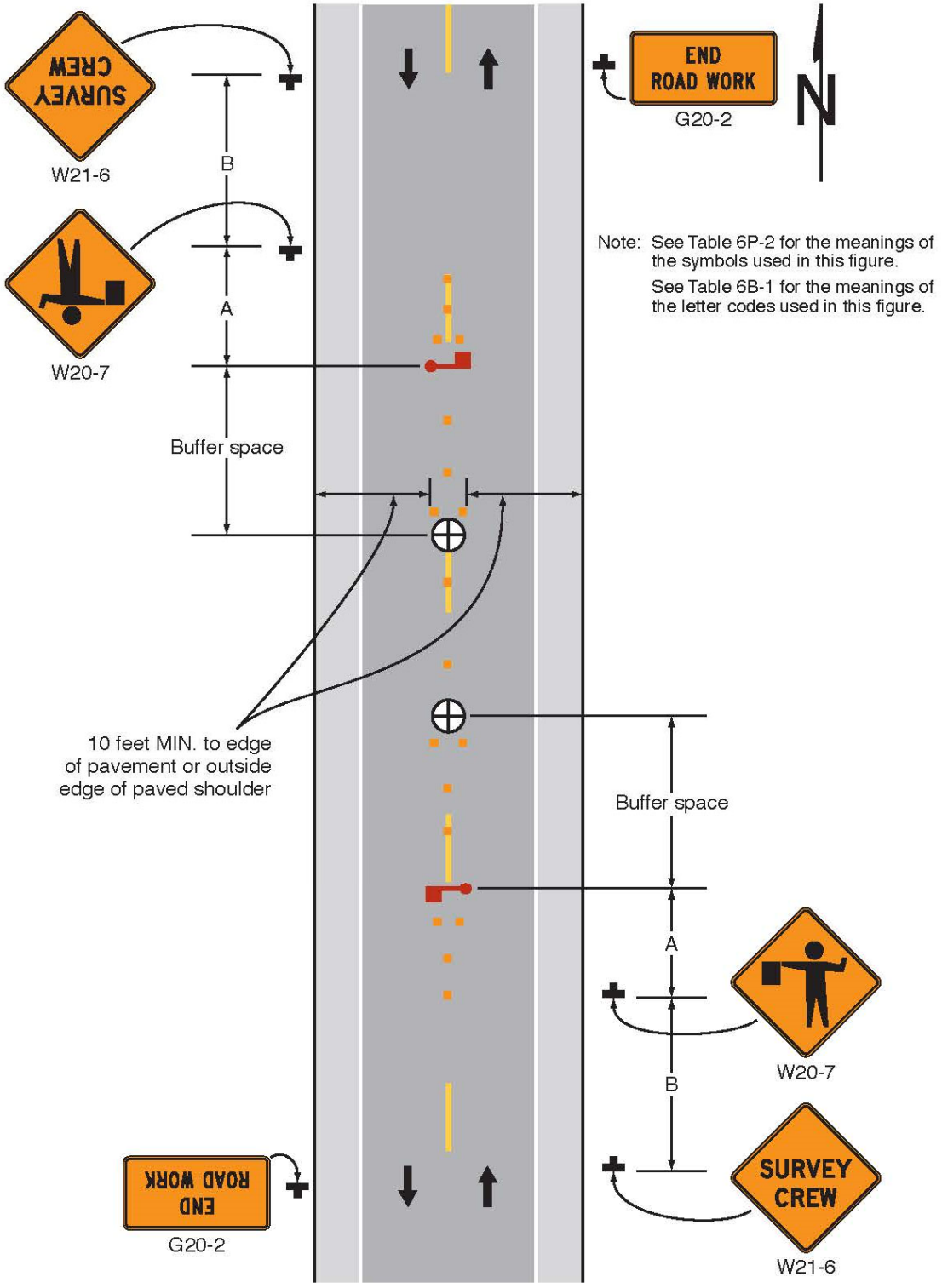
Guidance:

13. *When used, the BE PREPARED TO STOP sign should be located before the Flagger symbol sign.*

Support:

Wisconsin State Statute 340.01(22e) requires END ROAD WORK signs to be used to mark the end of all stationary highway maintenance or construction areas.

Figure 6P-16. Surveying Along the Center Line of a Road with Low Traffic Volumes (TA-16)



Typical Application 16

Notes for Figure 6P-17 —Typical Application 17

Mobile Operations on a Two-Lane Road

Standard:

1. **Vehicle-mounted signs shall be mounted in a manner such that they are not obscured by equipment or supplies. Sign legends on vehicle-mounted signs shall be covered or turned from view when work is not in progress.**
2. **Shadow and work vehicles shall display high-intensity rotating, flashing, oscillating, or strobe lights.**
3. **If an arrow board is used, it shall be used in the caution mode.**

Guidance:

4. *Where practical and when needed, the work and shadow vehicles should pull over periodically to allow vehicular traffic to pass.*
5. *Whenever adequate stopping sight distance exists to the rear, the shadow vehicle should maintain the minimum distance from the work vehicle and proceed at the same speed. The shadow vehicle should slow down in advance of vertical or horizontal curves that restrict sight distance.*
6. *The shadow vehicles should also be equipped with two high-intensity flashing lights mounted on the rear, adjacent to the sign.*

Option:

7. Positive protection devices may be used per Section 6M.02.
8. The distance between the work and shadow vehicles may vary according to terrain, paint drying time, and other factors.
9. Additional shadow vehicles to warn and reduce the speed of oncoming or opposing vehicular traffic may be used. Law enforcement vehicles may be used for this purpose.
10. A truck-mounted attenuator may be used on the work vehicle.
11. If the work and shadow vehicles cannot pull over to allow vehicular traffic to pass frequently, a DO NOT PASS sign may be placed on the rear of the vehicle blocking the lane.

Support:

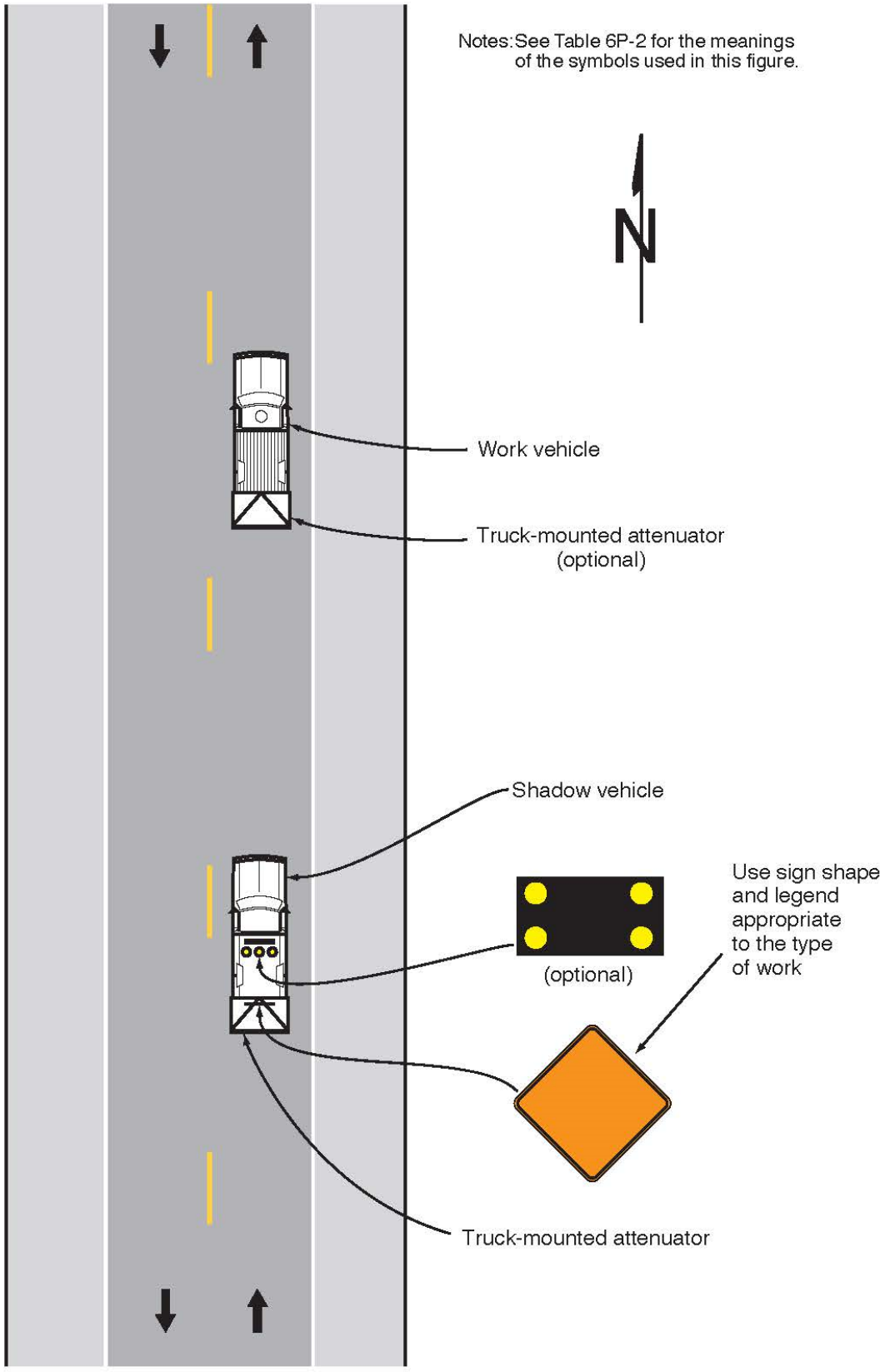
12. Shadow vehicles are used to warn motor vehicle traffic of the operation ahead.

Standard:

13. **Vehicle hazard warning signals shall not be used instead of the vehicle's high-intensity rotating, flashing, oscillating, or strobe lights.**

A truck or trailer-mounted attenuator shall be used on the shadow vehicle.

Figure 6P-17. Mobile Operations on a Two-Lane Road (TA-17)



Typical Application 17

Notes for Figure 6P-18 —Typical Application 18

Lane Closure on a Minor Street

Standard:

1. **This TTC shall be used only for low-speed facilities having low traffic volumes.**

Option:

2. Where the work space is short, where road users can see the roadway beyond, and where volume is low, vehicular traffic may be self-regulating.

Standard:

3. **Where vehicular traffic cannot effectively self-regulate, one or two flaggers shall be used as illustrated in Figure 6P-10.**

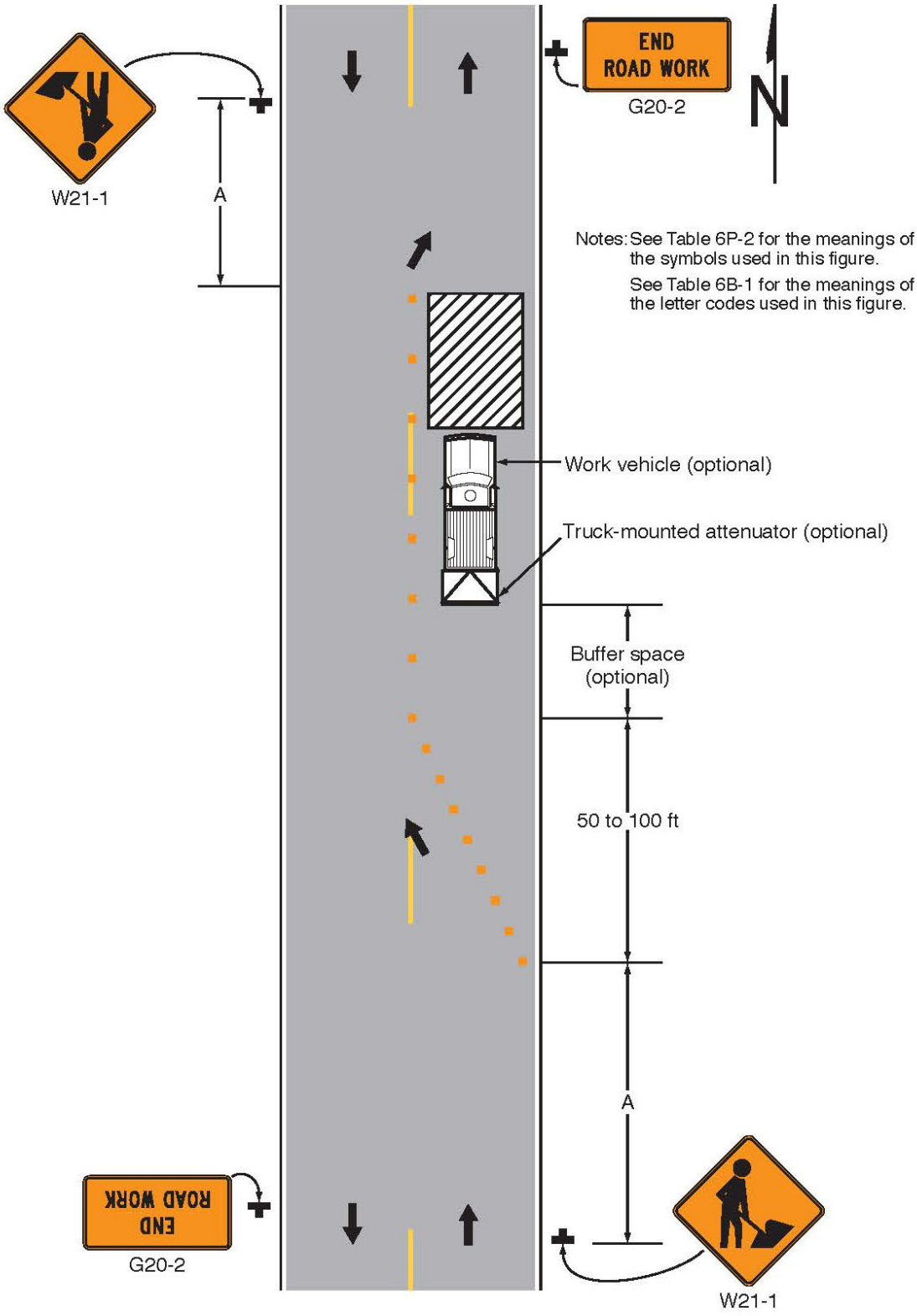
Option:

4. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
5. A truck-mounted attenuator may be used on the work vehicle and the shadow vehicle.
6. Positive protection devices may be used per Section 6M.02.

Support:

Wisconsin State Statute 340.01(22e) requires END ROAD WORK signs to be used to mark the end of all stationary highway maintenance or construction areas.

Figure 6P-18. Lane Closure on a Minor Street (TA-18)



Typical Application 18

Notes for Figure 6P-19 —Typical Application 19

Detour for One Travel Direction

Guidance:

1. *This plan should be used for streets without posted route numbers.*
2. *On multi-lane streets, Detour signs with an Advance Turn Arrow should be used in advance of a turn.*

Option:

3. The STREET CLOSED legend may be used in place of ROAD CLOSED.
4. Additional DO NOT ENTER signs may be used at intersections with intervening streets.
5. Warning lights may be used on Type 3 Barricades.
6. Detour signs may be located on the far side of intersections.
7. A Street Name sign may be mounted with the Detour sign. The Street Name sign may be either white on green or black on orange.

The M4-9 sign may be used for the Detour Arrow sign in lieu of the M4-10 sign.

The END DETOUR (M4-8a) sign may be omitted.

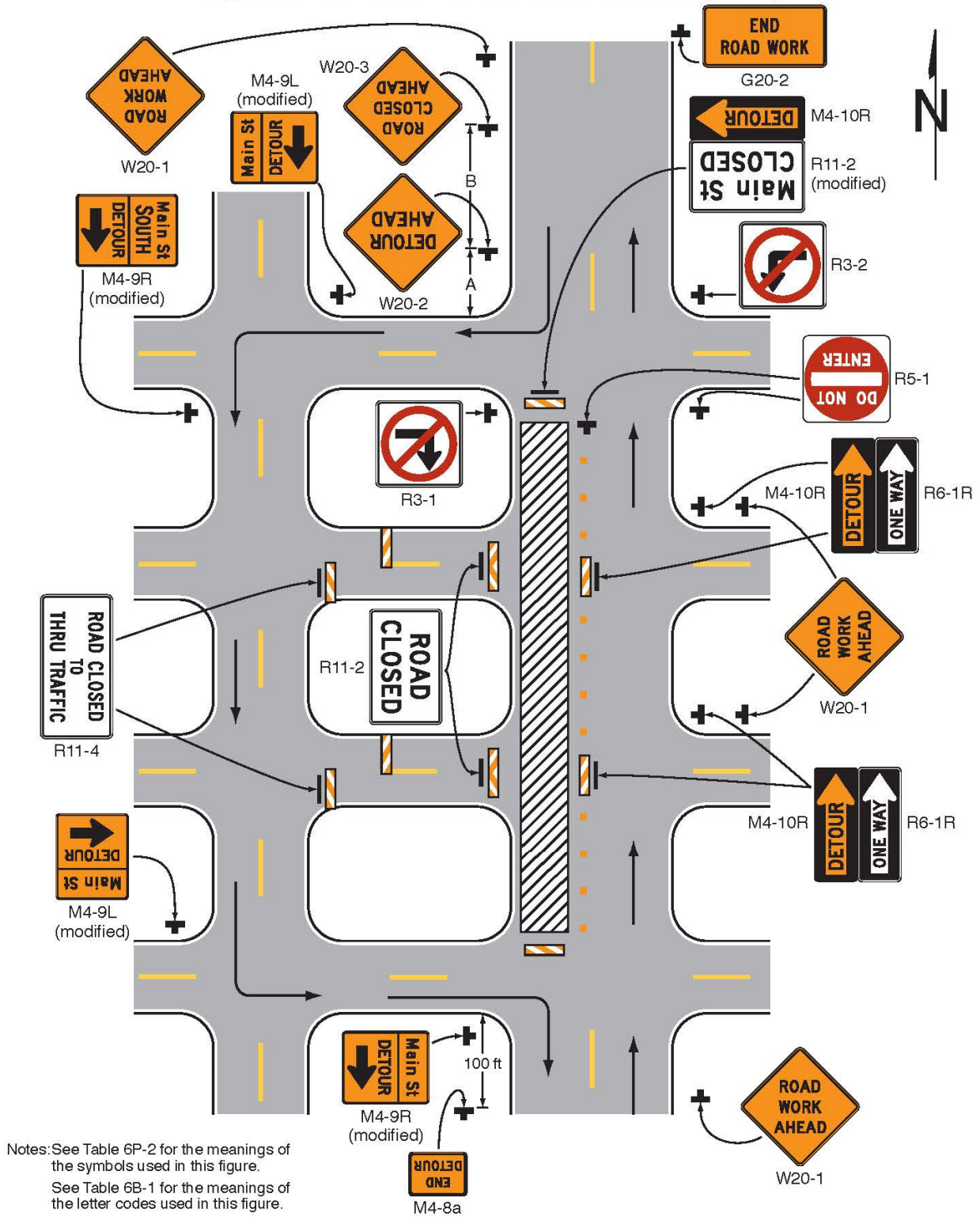
Standard:

8. **When used, the Street Name sign shall be placed above the Detour sign.**

Support:

Wisconsin State Statute 340.01(22e) requires END ROAD WORK signs to be used to mark the end of all stationary highway maintenance or construction areas.

Figure 6P-19. Detour for One Travel Direction (TA-19)



Notes: See Table 6P-2 for the meanings of the symbols used in this figure.
See Table 6B-1 for the meanings of the letter codes used in this figure.

Typical Application 19

Notes for Figure 6P-20 —Typical Application 20

Detour for a Closed Street

Guidance:

1. *This plan should be used for streets without posted route numbers.*
2. *On multi-lane streets, Detour signs with an Advance Turn Arrow should be used in advance of a turn.*

Option:

3. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
4. Flashing warning lights may be used on Type 3 Barricades.
5. Detour signs may be located on the far side of intersections. A Detour sign with an advance arrow may be used in advance of a turn.
6. A Street Name sign may be mounted with the Detour sign. The Street Name sign may be either white on green or black on orange.

The M4-9 sign may be used for the Detour Arrow sign in lieu of the M4-10 sign.

The END DETOUR (M4-8a) sign may be omitted.

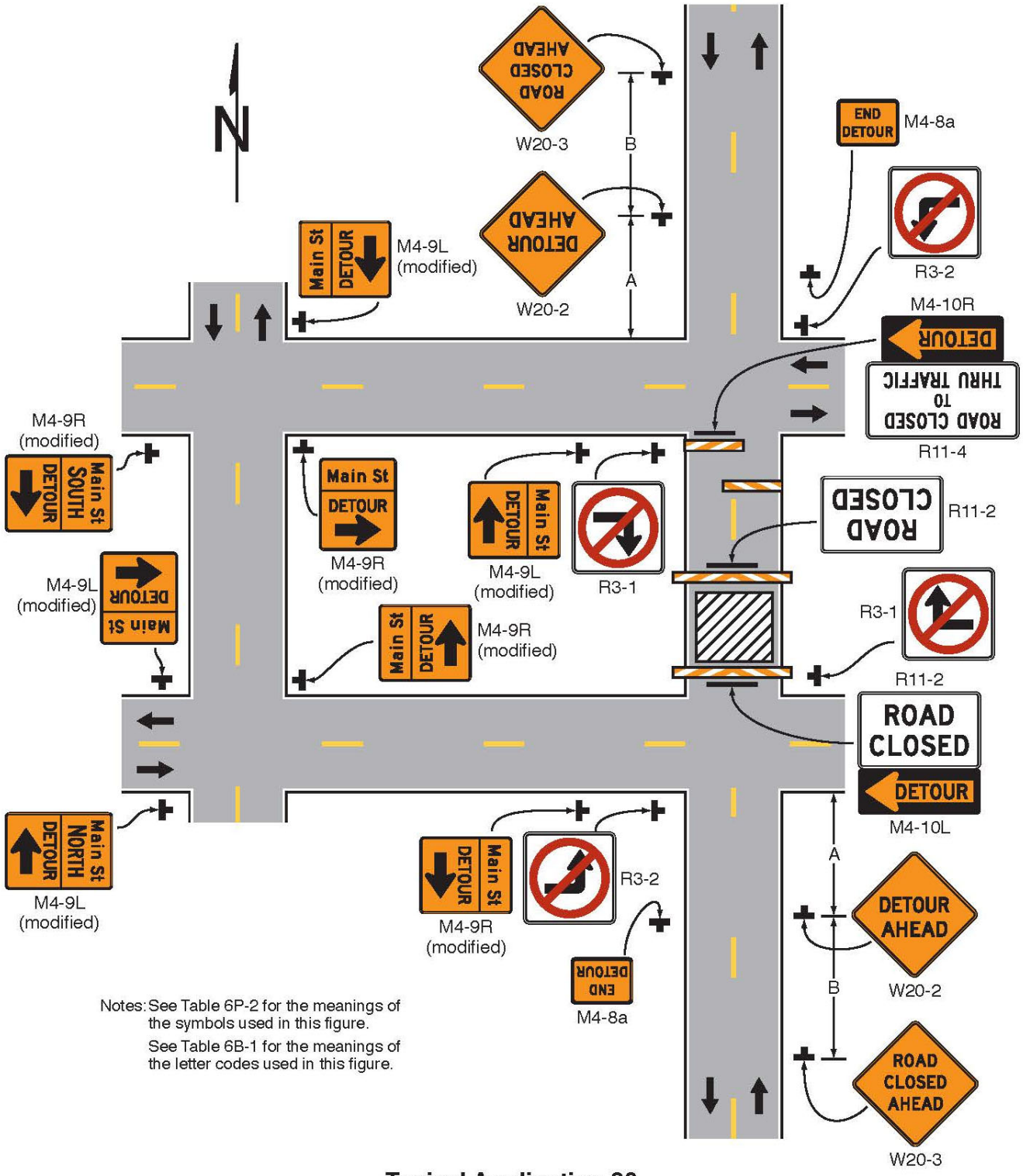
Standard:

7. When used, the Street Name sign shall be placed above the Detour sign.

Support:

8. Figure 6P-9 contains the information for detouring a numbered highway.

Figure 6P-20. Detour for a Closed Street (TA-20)



Notes: See Table 6P-2 for the meanings of the symbols used in this figure.

See Table 6B-1 for the meanings of the letter codes used in this figure.

Typical Application 20

Notes for Figure 6P-21 —Typical Application 21

Lane Closure on the Near Side of an Intersection

Standard:

1. **The merging taper shall direct vehicular traffic into either the right-hand or left-hand lane, but not both.**

Guidance:

2. *In this typical application, a left taper should be used so that right-turn movements will not impede through motor vehicle traffic. However, the reverse should be true for left-turn movements.*
3. *If the work space extends across a crosswalk, the crosswalk should be closed using the information and devices shown in Figure 6P-29.*

Option:

4. Positive protection devices may be used per Section 6M.02.
5. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
6. A shadow vehicle with a truck-mounted attenuator may be used.
7. A work vehicle with high-intensity rotating, flashing, oscillating, or strobe lights may be used with the high-level warning device.
8. Vehicle hazard warning signals may be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights.

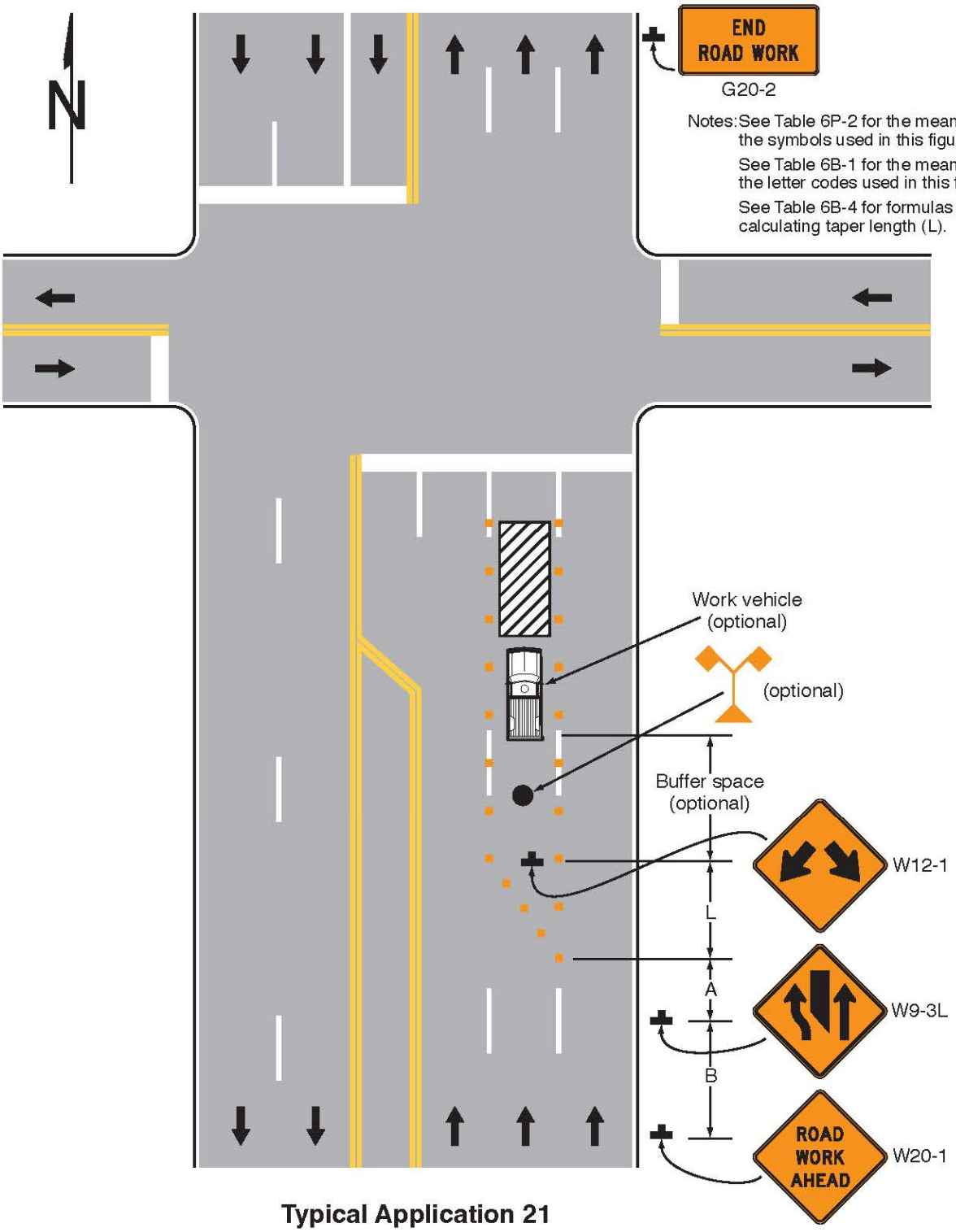
Standard:

9. **Vehicle hazard warning signals shall not be used instead of the vehicle's high-intensity rotating, flashing, oscillating, or strobe lights.**

Support:

Wisconsin State Statute 340.01(22e) requires END ROAD WORK signs to be used to mark the end of all stationary highway maintenance or construction areas.

Figure 6P-21. Lane Closure on the Near Side of an Intersection (TA-21)



Typical Application 21

Notes for Figure 6P-22 —Typical Application 22

Right-Hand Lane Closure on the Far Side of an Intersection

Guidance:

1. *If the work space extends across a crosswalk, the crosswalk should be closed using the information and devices shown in Figure 6P-29.*

Option:

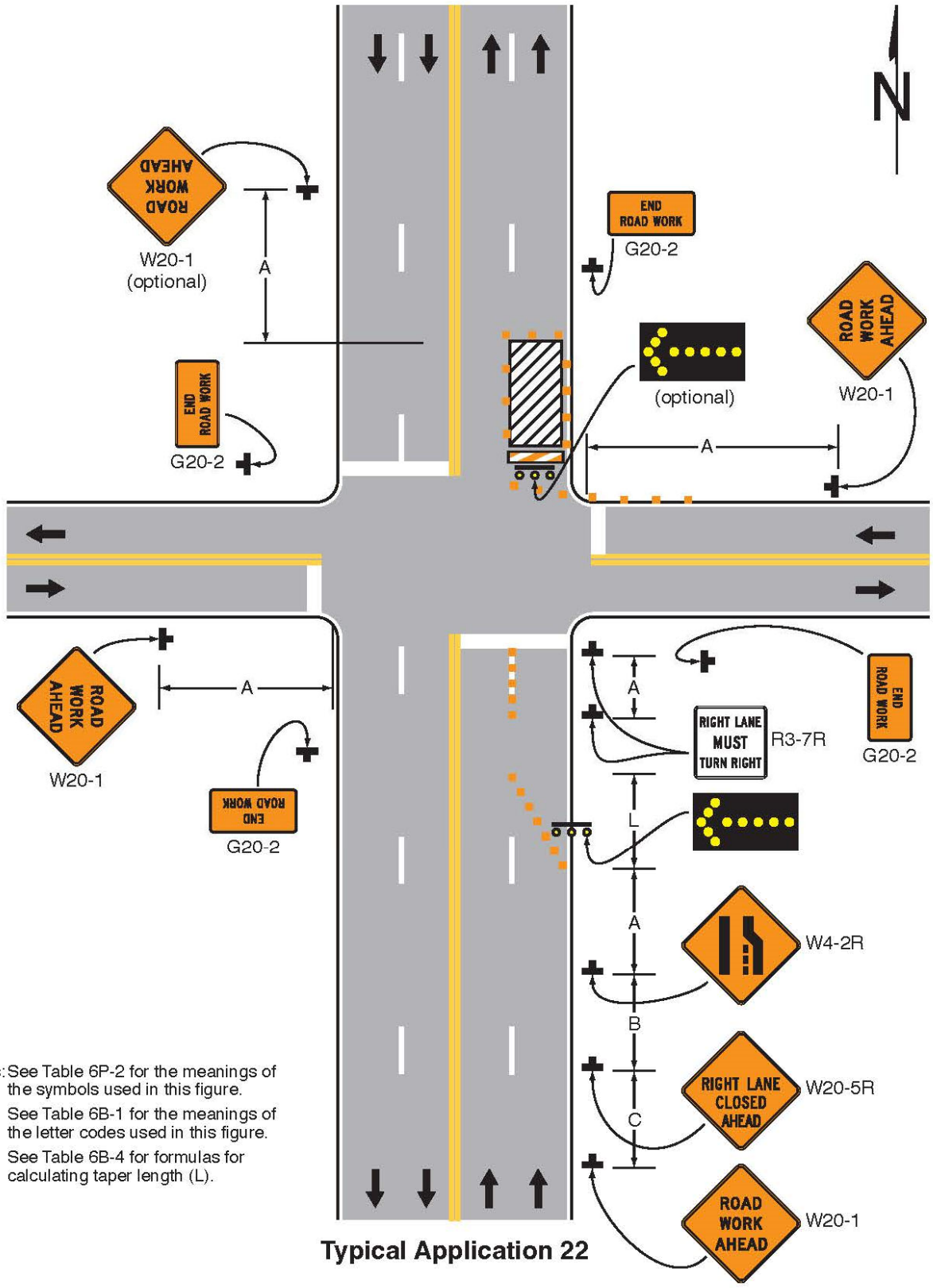
2. Positive protection devices may be used per Section 6M.02.
3. When the normal procedure of closing on the near side of the intersection any lane that is not carried through the intersection results in the closure of a right-hand lane having significant right-turn movements, then the right-hand lane may be restricted to right turns only, requiring through traffic to use the left lane.
4. For intersection approaches reduced to a single lane, left-turn movements may be prohibited to maintain capacity for through vehicular traffic.
5. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
6. Where the turning radius is large, it may be possible to create a right-turn island using channelizing devices or pavement markings.
7. If dimension “A” is not available to create a temporary right-turn lane, continuous channelizers may be installed from the end of the taper to the intersection and, as a result, the RIGHT LANE MUST TURN RIGHT signs would not be installed.

Support:

8. By first closing off the right-hand lane and then reopening it as a turn bay, the capacity of the through lane is preserved by separating the right-turning vehicles from the through vehicles.

Wisconsin State Statute 340.01(22e) requires END ROAD WORK signs to be used to mark the end of all stationary highway maintenance or construction areas.

Figure 6P-22. Right-Hand Lane Closure on the Far Side of an Intersection (TA-22)



Notes: See Table 6P-2 for the meanings of the symbols used in this figure.

See Table 6B-1 for the meanings of the letter codes used in this figure.

See Table 6B-4 for formulas for calculating taper length (L).

Typical Application 22

Notes for Figure 6P-23 —Typical Application 23
Left-Hand Lane Closure on the Far Side of an Intersection

Guidance:

1. *If the work space extends across a crosswalk, the crosswalk should be closed using the information and devices shown in Figure 6P-29.*

Option:

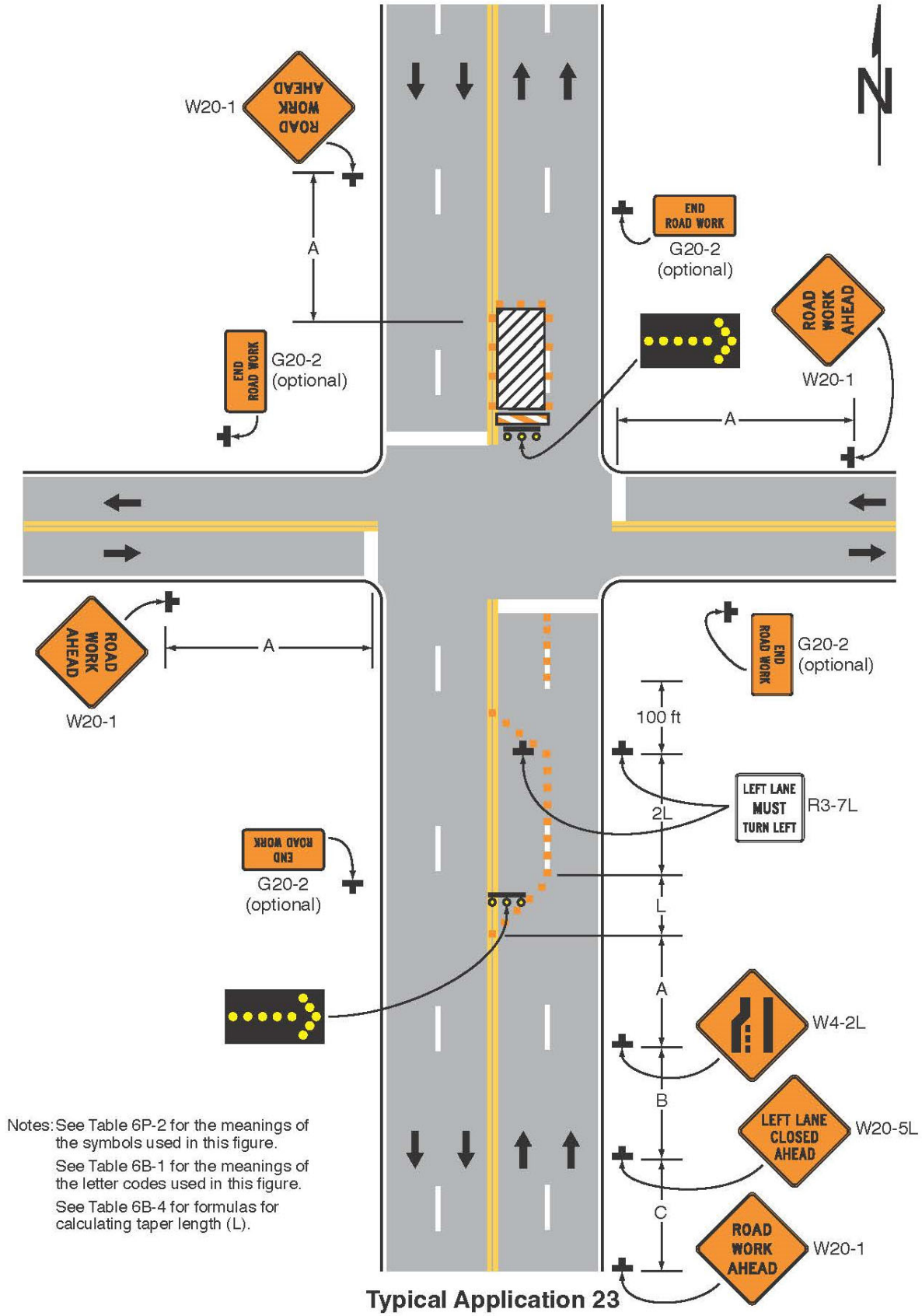
2. Positive protection devices may be used per Section 6M.02.
3. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
4. When the normal procedure of closing on the near side of the intersection any lane that is not carried through the intersection results in the closure of a left-hand lane having significant left-turn movements, then the left-hand lane may be reopened as a turn bay for left turns only, as shown.

Support:

5. By first closing off the left-hand lane and then reopening it as a turn bay, the left-turn bay allows storage of turning vehicles so that the movement of through traffic is not impeded. A left-turn bay that is long enough to accommodate all turning vehicles during a traffic signal cycle will provide the maximum benefit for through traffic. Also, an island is created with channelizing devices that allows the LEFT LANE MUST TURN LEFT sign to be repeated on the left adjacent to the lane that it controls.

Wisconsin State Statute 340.01(22e) requires END ROAD WORK signs to be used to mark the end of all stationary highway maintenance or construction areas.

Figure 6P-23. Left-Hand Lane Closure on the Far Side of an Intersection (TA-23)



Notes: See Table 6P-2 for the meanings of the symbols used in this figure.

See Table 6B-1 for the meanings of the letter codes used in this figure.

See Table 6B-4 for formulas for calculating taper length (L).

Typical Application 23

Notes for Figure 6P-24 —Typical Application 24

Half Road Closure on the Far Side of an Intersection

Guidance:

1. *If the work space extends across a crosswalk, the crosswalk should be closed using the information and devices shown in Figure 6P-29.*
2. *When turn prohibitions are implemented, two turn prohibition signs should be used, one on the near side and, space permitting, one on the far side of the intersection.*

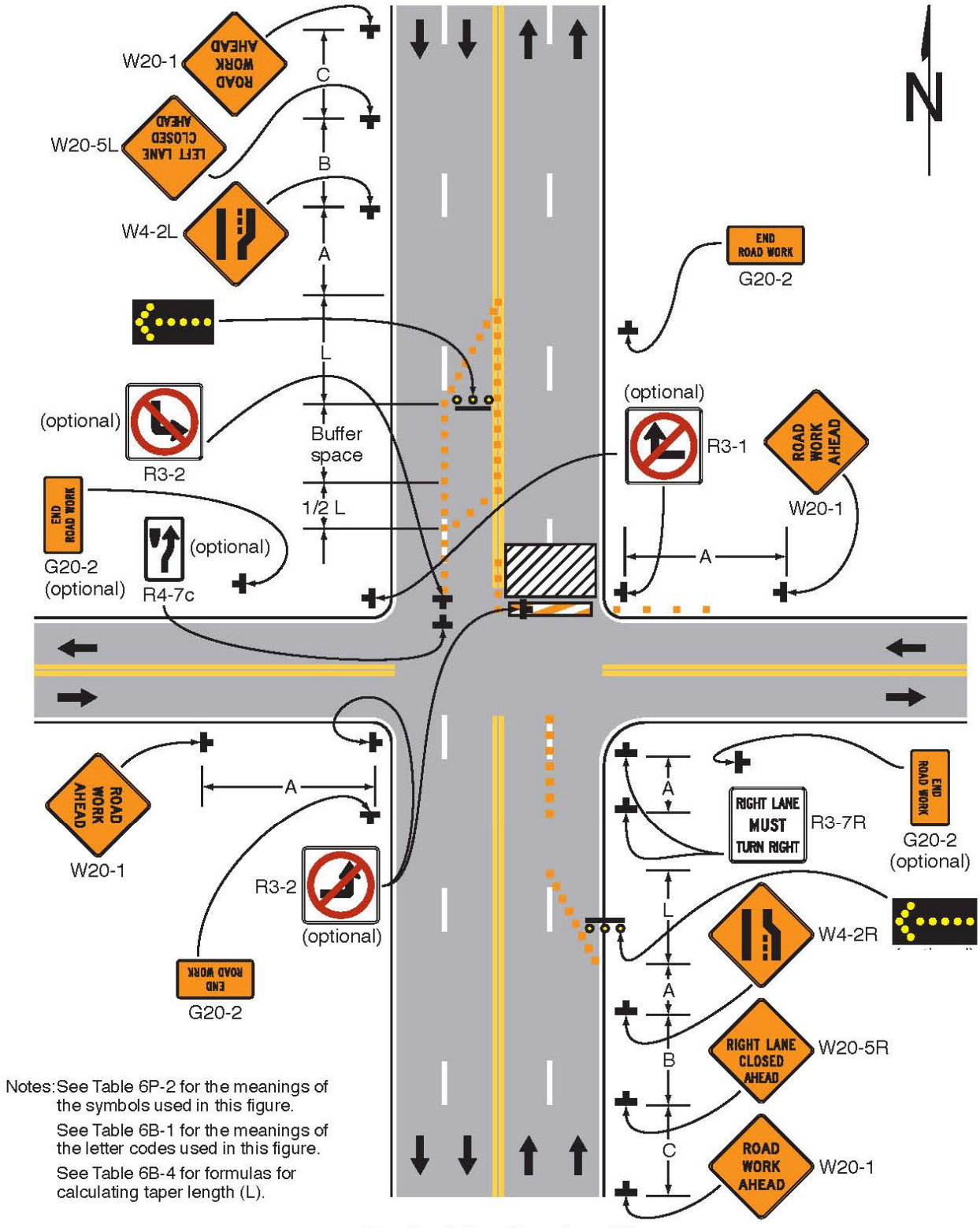
Option:

3. Positive protection devices may be used per Section 6M.02.
4. A buffer space may be used between opposing directions of vehicular traffic as shown in this application.
5. When the normal procedure of closing on the near side of the intersection any lane that is not carried through the intersection results in the closure of a right-hand lane having significant right-turn movements, then the right-hand lane may be restricted to right turns only, requiring through traffic to use the left lane.
6. Where the turning radius is large, a right-turn island using channelizing devices or pavement markings may be used.
7. If there is insufficient space to place the back-to-back Keep Right sign and No Left Turn symbol signs at the end of the row of channelizing devices separating opposing vehicular traffic flows, the No Left Turn symbol sign may be placed on the right and the Keep Right sign may be omitted.
8. For intersection approaches reduced to a single lane, left-turn movements may be prohibited to maintain capacity for through vehicular traffic.
9. Flashing warning lights and/or flags may be used to call attention to advance warning signs.
10. Temporary pavement markings may be used to delineate the travel path through the intersection.
11. If dimension “A” is not available to create a temporary right-turn lane, continuous channelizers may be installed from the end of the taper to the intersection and, as a result, the RIGHT LANE MUST TURN RIGHT signs would not be installed.

Support:

Wisconsin State Statute 340.01(22e) requires END ROAD WORK signs to be used to mark the end of all stationary highway maintenance or construction areas.

Figure 6P-24. Half Road Closure on the Far Side of an Intersection (TA-24)



Notes: See Table 6P-2 for the meanings of the symbols used in this figure.

See Table 6B-1 for the meanings of the letter codes used in this figure.

See Table 6B-4 for formulas for calculating taper length (L).

Typical Application 24

Notes for Figure 6P-25 —Typical Application 25

Multiple Lane Closures at an Intersection

Guidance:

1. *If the work space extends across a crosswalk, the crosswalk should be closed using the information and devices shown in Figure 6P-29.*

Support:

2. The normal procedure is to close on the near side of the intersection any lane that is not carried through the intersection, as shown.

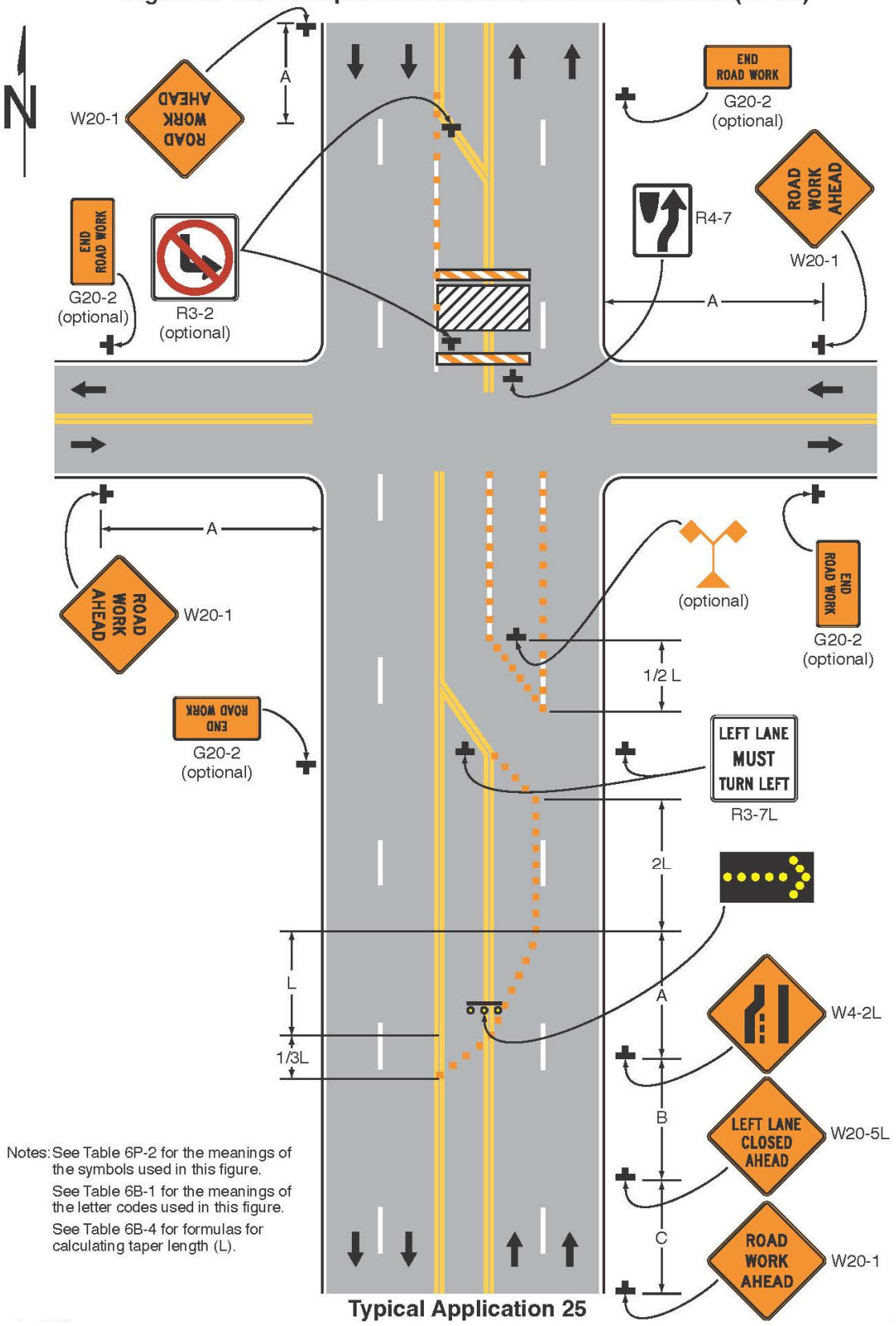
Option:

3. Positive protection devices may be used per Section 6M.02.
4. If the left-turn movement that normally uses the closed turn bay is small and/or the gaps in opposing vehicular traffic are frequent, left turns may be permitted on that approach.
5. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.

Support:

Wisconsin State Statute 340.01(22e) requires END ROAD WORK signs to be used to mark the end of all stationary highway maintenance or construction areas.

Figure 6P-25. Multiple Lane Closures at an Intersection (TA-25)



Notes: See Table 6P-2 for the meanings of the symbols used in this figure.

See Table 6B-1 for the meanings of the letter codes used in this figure.

See Table 6B-4 for formulas for calculating taper length (L).

Typical Application 25

Notes for Figure 6P-26 —Typical Application 26

Closure in the Center of an Intersection

Guidance:

1. *All lanes should be a minimum of 10 feet in width as measured to the near face of the channelizing devices.*

Option:

2. A high-level warning device may be placed in the work space, if there is sufficient room.
3. For short-term use on low-volume, low-speed roadways with vehicular traffic that does not include longer and wider heavy commercial vehicles, a minimum lane width of 9 feet may be used.
4. Flashing warning lights and/or flags may be used to call attention to advance warning signs.
5. Left turns may be prohibited as required by geometric conditions, such as where the streets are so narrow that it might be physically impossible to turn left, especially for large vehicles.
6. For short-duration work operations, the channelizing devices may be eliminated if a vehicle displaying high-intensity rotating, flashing, oscillating, or strobe lights is positioned in the work space.
7. Vehicle hazard warning signals may be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights.

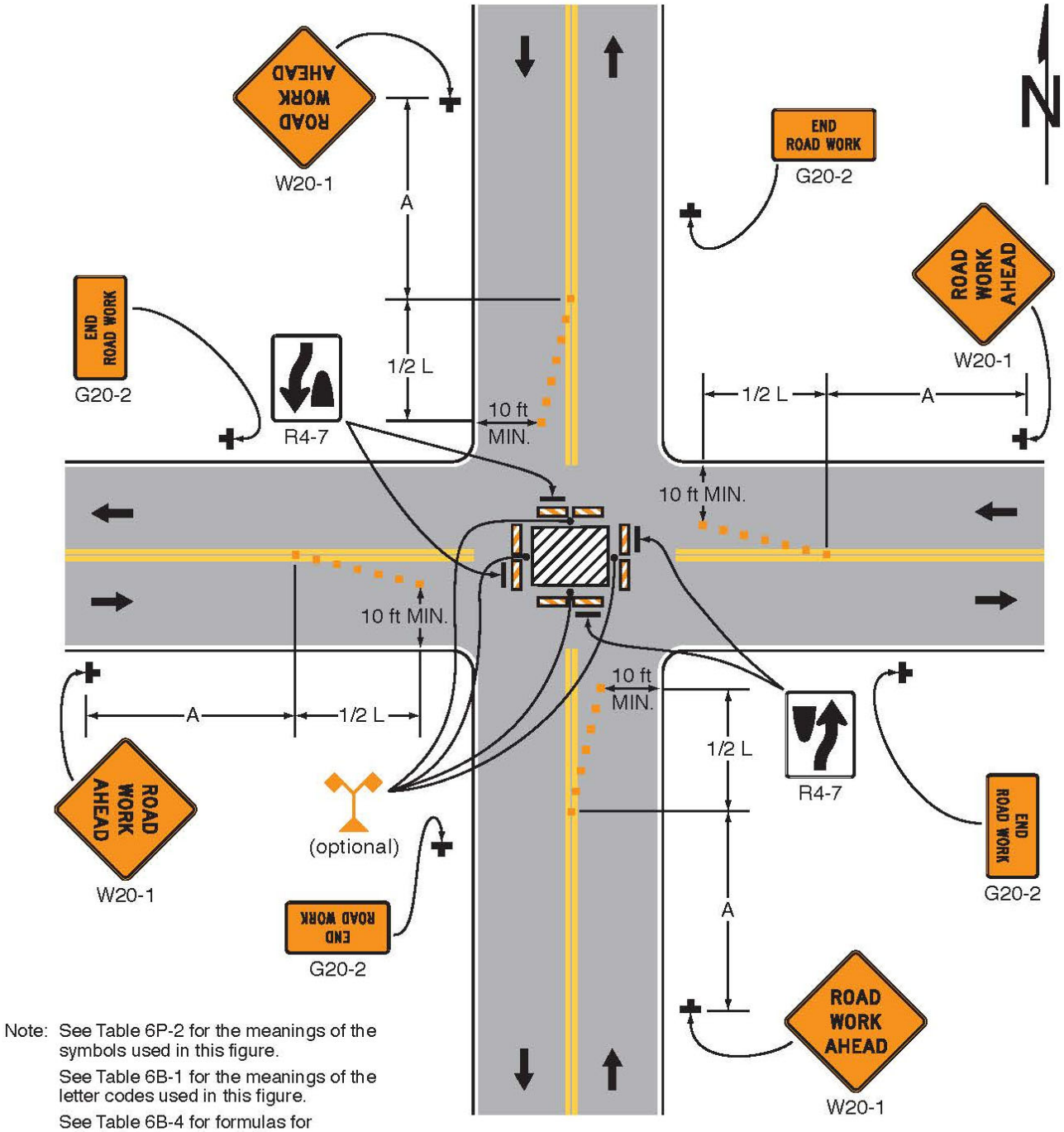
Standard:

8. **Vehicle hazard warning signals shall not be used instead of the vehicle's high-intensity rotating, flashing, oscillating, or strobe lights.**

Support:

Wisconsin State Statute 340.01(22e) requires END ROAD WORK signs to be used to mark the end of all stationary highway maintenance or construction areas.

Figure 6P-26. Closure in the Center of an Intersection (TA-26)



Note: See Table 6P-2 for the meanings of the symbols used in this figure.

See Table 6B-1 for the meanings of the letter codes used in this figure.

See Table 6B-4 for formulas for calculating taper length (L).

Typical Application 26

Notes for Figure 6P-27 —Typical Application 27

Closure at the Side of an Intersection

Guidance:

1. *The situation depicted can be simplified by closing one or more of the intersection approaches. If this cannot be done, and/or when capacity is a problem, through vehicular traffic should be directed to other roads or streets.*
2. *Depending on road user conditions, flagger(s) or uniformed law enforcement officer(s) should be used to direct road users within the intersection.*

Standard:

3. At night, flagger stations shall be illuminated, except in emergencies.

Option:

4. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
5. For short-duration work operations, the channelizing devices may be eliminated if a vehicle displaying high-intensity rotating, flashing, oscillating, or strobe lights is positioned in the work space.
6. A BE PREPARED TO STOP sign may be added to the sign series.

Guidance:

7. *When used, the BE PREPARED TO STOP sign should be located before the Flagger symbol sign.*
8. *ONE LANE ROAD AHEAD signs should also be used to provide adequate advance warning.*

Support:

9. Turns may be prohibited as required by vehicular traffic conditions, such as where the streets are so narrow that it might be physically impossible to make certain turns, especially for large vehicles.

Option:

10. Positive protection devices may be used per Section 6M.02.
11. Vehicle hazard warning signals may be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights.

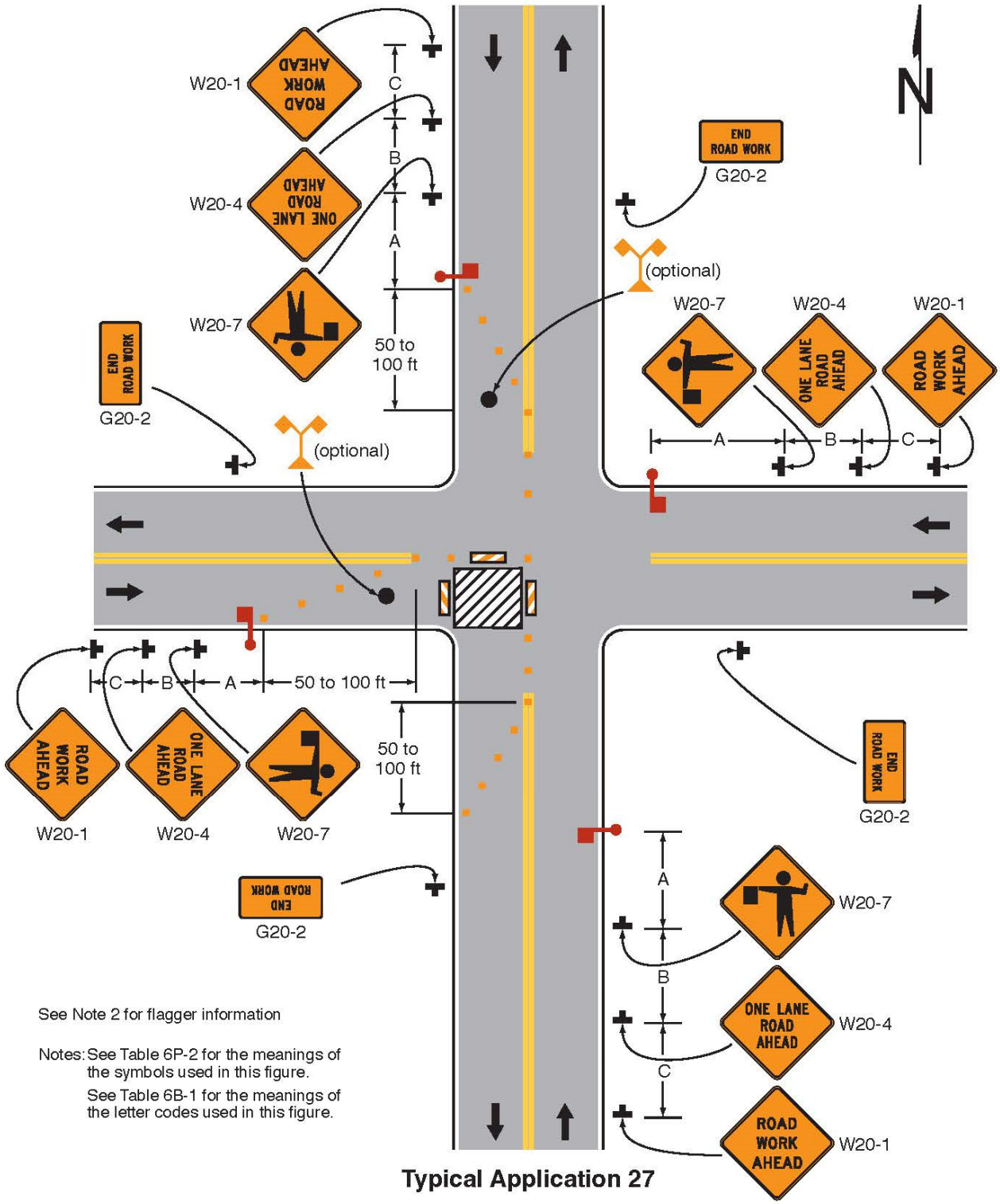
Standard:

12. Vehicle hazard warning signals shall not be used instead of the vehicle's high-intensity rotating, flashing, oscillating, or strobe lights.

Support:

Wisconsin State Statute 340.01(22e) requires END ROAD WORK signs to be used to mark the end of all stationary highway maintenance or construction areas.

Figure 6P-27. Closure at the Side of an Intersection (TA-27)



See Note 2 for flagger information

Notes: See Table 6P-2 for the meanings of the symbols used in this figure.

See Table 6B-1 for the meanings of the letter codes used in this figure.

Typical Application 27

Notes for Figure 6P-28 —Typical Application 28

Sidewalk Detour or Diversion

Standard:

1. **When existing pedestrian facilities are disrupted, closed, or relocated in a TTC zone, the temporary facilities shall be detectable and include accessibility features consistent with the features present in the existing pedestrian facility. A pedestrian channelizing device (see Figure 6K-2) that is detectable by a person with a vision disability traveling with the aid of a long cane shall be placed across the full width of the closed sidewalk.**
2. **When used, temporary ramps shall provide a 12:1 (8.33%) or flatter slope, with a slip-resistant surface. The ramp landing area shall provide a 48-inch x 48-inch minimum area with a 2% or flatter cross-slope.**
3. **When used, Longitudinal Channelizing Devices used for temporary pedestrian routes shall comply with Section 6K.02.**
4. **Temporary traffic barriers, if used, shall comply with the provisions of Section 6M.02.**
5. **SIDEWALK CLOSED CROSS HERE signs shall include audible information devices to provide adequate communication to pedestrians with vision disabilities.**
6. **Audible information devices shall be provided where midblock sidewalk closings and changed crosswalk areas cause inadequate communication to be provided to pedestrians with vision disabilities.**

Guidance:

7. *The surface of an alternate pathway should meet the requirements of the U.S. Department of Justice 2010 ADA Standards for Accessible Design, September 15, 2010, 28 CFR 35 and 36, Americans with Disabilities Act of 1990.*
8. *The protective requirements of a TTC situation have priority in determining the need for temporary traffic barriers and their use in this situation should be based on engineering judgment.*

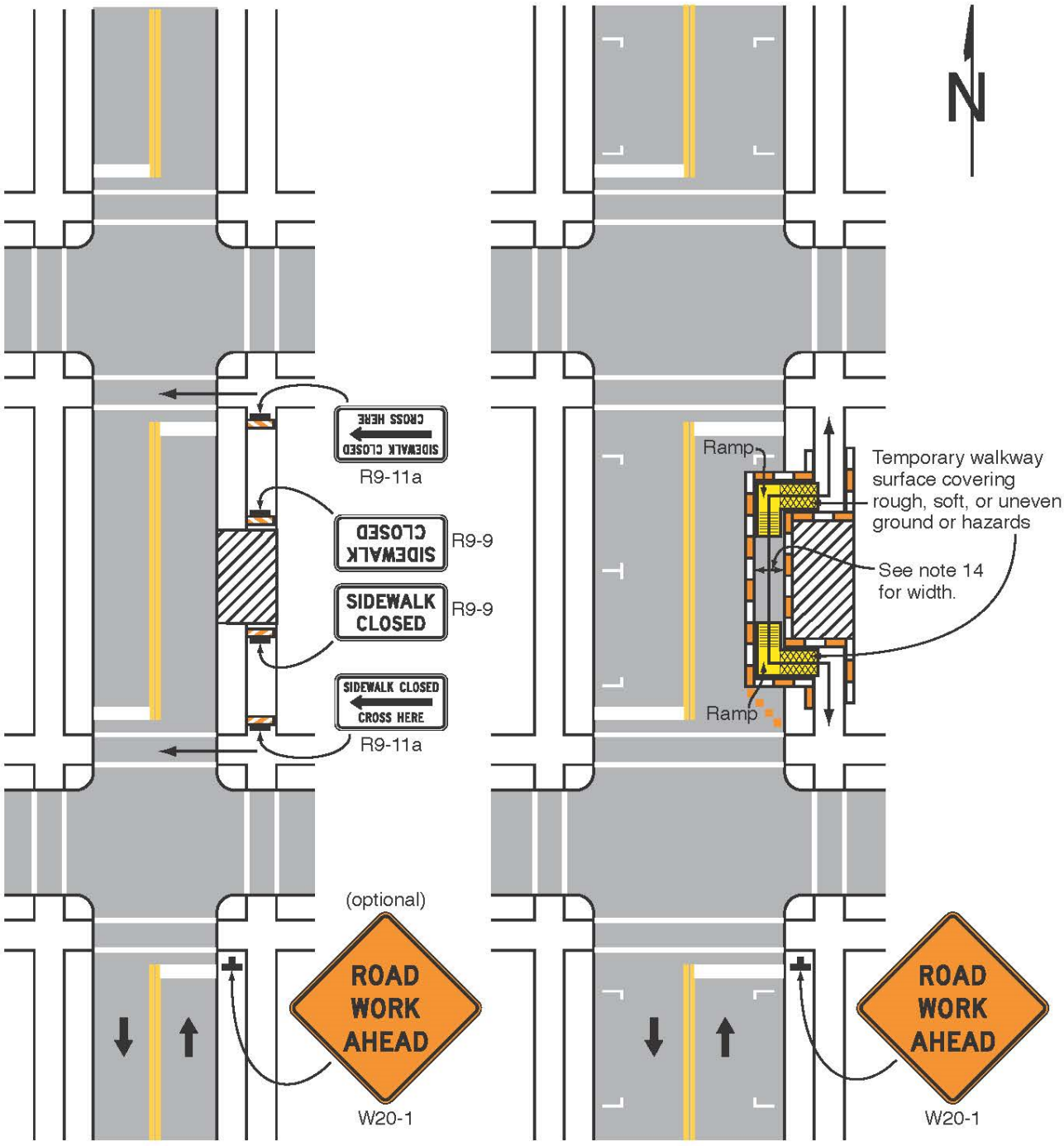
Option:

9. Street lighting may be considered.
10. Only the TTC devices related to pedestrians are shown. Other devices, such as lane closure signing or ROAD NARROWS signs, may be used to control vehicular traffic.
11. For nighttime closures, Type A Flashing warning lights may be used on barricades that support signs and close sidewalks.
12. Type C Steady-Burn or Type D 360-degree Steady-Burn warning lights may be used on channelizing devices separating the temporary sidewalks from vehicular traffic flow.
13. Signs, such as KEEP RIGHT (LEFT), may be placed along a temporary sidewalk to guide or direct pedestrians.
14. The width of the alternate pedestrian route may be 48 inches with a passing area of 60 inches every 200 feet.

Support:

Wisconsin State Statute 340.01(22e) requires END ROAD WORK signs to be used to mark the end of all stationary highway maintenance or construction areas.

Figure 6P-28. Sidewalk Detour or Diversion (TA-28)



Typical Application 28

Note: SeeTable 6P-2 for the meanings of the symbols used in this figure.

Notes for Figure 6P-29 —Typical Application 29

Crosswalk Closures and Pedestrian Detours

Standard:

1. **When crosswalks or other pedestrian facilities are closed or relocated, temporary facilities shall be detectable and shall include accessibility features consistent with the features present in the existing pedestrian facility.**
2. **Curb parking shall be prohibited for at least 50 feet in advance of the midblock crosswalk.**
3. **SIDEWALK CLOSED CROSS HERE signs shall include audible information devices to provide adequate communication to pedestrians with vision disabilities.**
4. **Audible information devices shall be provided where midblock sidewalk closings and changed crosswalk areas cause inadequate communication to be provided to pedestrians with vision disabilities.**

Guidance:

4. Pedestrian traffic signal displays controlling closed crosswalks should be covered or deactivated.

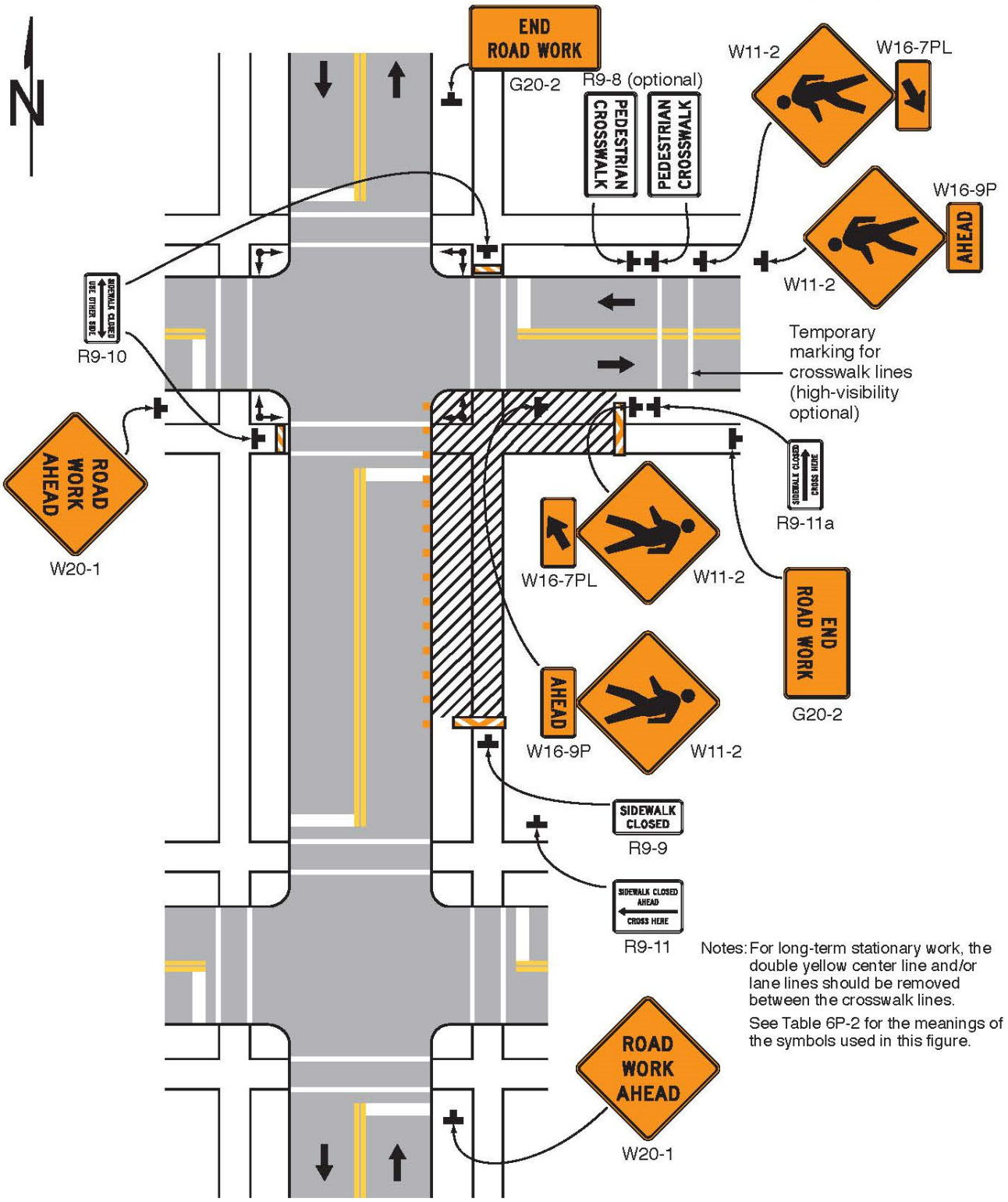
Option:

6. Street lighting may be considered.
7. Only the TTC devices related to pedestrians are shown. Other devices, such as lane closure signing or ROAD NARROWS signs, may be used to control vehicular traffic.
8. For nighttime closures, Type A Flashing warning lights may be used on barricades supporting signs and closing sidewalks.
9. Type C Steady-Burn or Type D 360-degree Steady-Burn warning lights may be used on channelizing devices separating the work space from vehicular traffic.
10. In order to maintain the systematic use of the fluorescent yellow-green background for pedestrian, bicycle, and school warning signs in a jurisdiction, the fluorescent yellow-green background for pedestrian, bicycle, and school warning signs may be used in TTC zones.
11. Positive protection devices may be used per Section 6M.02.

Support:

Wisconsin State Statute 340.01(22e) requires END ROAD WORK signs to be used to mark the end of all stationary highway maintenance or construction areas.

Figure 6P-29. Crosswalk Closures and Pedestrian Detours (TA-29)



Notes: For long-term stationary work, the double yellow center line and/or lane lines should be removed between the crosswalk lines.

See Table 6P-2 for the meanings of the symbols used in this figure.

Typical Application 29

Notes for Figure 6P-30 —Typical Application 30

Interior Lane Closure on a Multi-Lane Street

Guidance:

1. *This information applies to low-speed, low-volume urban streets. Where speed or volume is higher, additional signing such as LEFT LANE CLOSED XX FT should be used between the signs shown.*

Option:

2. Positive protection devices may be used per Section 6M.02.
3. Shadow vehicles with a truck-mounted attenuator may be used.

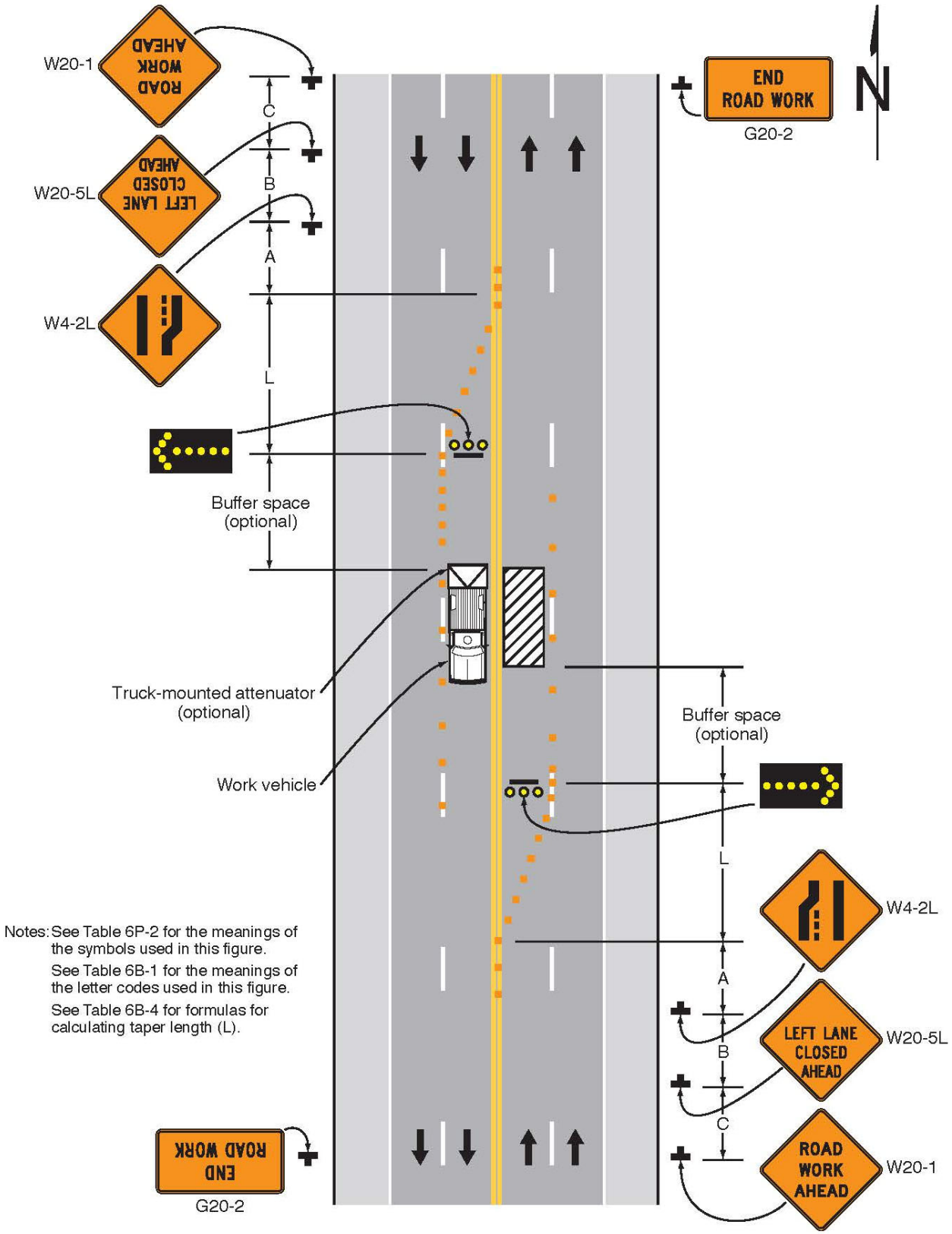
Support:

5. The closure of the adjacent interior lane in the opposing direction might not be necessary, depending upon the activity being performed and the work space needed for the operation.

Support:

Wisconsin State Statute 340.01(22e) requires END ROAD WORK signs to be used to mark the end of all stationary highway maintenance or construction areas.

Figure 6P-30. Interior Lane Closure on a Multi-Lane Street (TA-30)



Typical Application 30

Notes for Figure 6P-31 —Typical Application 31

Lane Closure on a Street with Uneven Directional Volumes

Standard:

1. **The illustrated information shall be used only when the vehicular traffic volume indicates that two lanes of vehicular traffic shall be maintained in the direction of travel for which one lane is closed.**

Option:

2. The procedure may be used during a peak period of vehicular traffic and then changed to provide two lanes in the other direction for the other peak.

Guidance:

3. *For high speeds, a LEFT LANE CLOSED XX FT sign should be added for vehicular traffic approaching the lane closure, as shown in Figure 6P-32.*
4. *Conflicting pavement markings should be removed for long-term projects. For short-term and intermediate-term projects where this is impracticable, the channelizing devices in the area where the pavement markings conflict should be placed at a maximum spacing of ½ S feet where S is the speed in mph. Temporary markings should be installed where needed.*
5. *If the lane shift has curves with recommended speeds of 30 mph or less, Reverse Turn signs should be used.*
6. *Where the shifted section is long, a Reverse Curve sign should be used to show the initial shift and a second sign should be used to show the return to the normal alignment.*
7. *If the tangent distance along the temporary diversion is less than 600 feet, the Double Reverse Curve sign should be used at the location of the first Two Lane Reverse Curve sign. The second Two Lane Reverse Curve sign should be omitted.*

Standard:

8. **Except as provided in Note 11 below, the number of lanes illustrated on the Reverse Curve or Double Reverse Curve signs shall be the same as the number of through lanes available to road users, and the direction of the reverse curves shall be appropriately illustrated.**

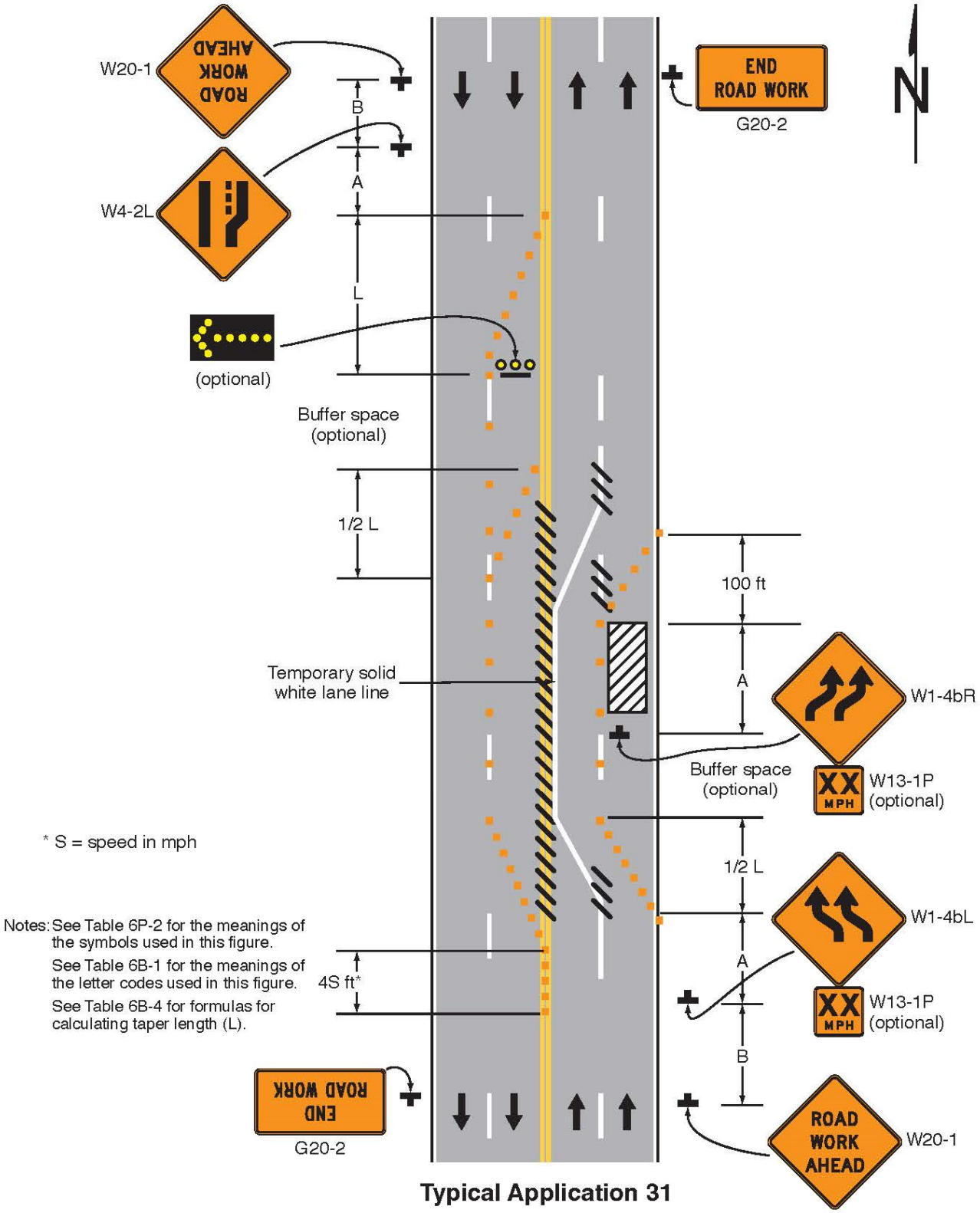
Option:

9. Positive protection devices may be used per Section 6M.02.
10. A longitudinal buffer space may be used in the activity area to separate opposing vehicular traffic.
11. Where two or more lanes are being shifted, a Reverse Curve (or Reverse Turn) sign with an ALL LANES plaque (see Figure 6H-1) may be used instead of a sign that illustrates the number of lanes.
12. Where more than three lanes are being shifted, the Reverse Curve (or Turn) sign may be rectangular.
13. A work vehicle or a shadow vehicle may be equipped with a truck-mounted attenuator.

Support:

Wisconsin State Statute 340.01(22e) requires END ROAD WORK signs to be used to mark the end of all stationary highway maintenance or construction areas.

Figure 6P-31. Lane Closure on a Street with Uneven Directional Volumes (TA-31)



Typical Application 31

Notes for Figure 6P-32 —Typical Application 32

Half Road Closure on a Multi-Lane, High-Speed Highway

Standard:

1. **Pavement markings no longer applicable shall be removed or obliterated as soon as practical. Except for intermediate-term and short-term situations, temporary markings shall be provided to clearly delineate the temporary travel path. For short-term and intermediate-term situations where it is not feasible to remove and restore pavement markings, channelization shall be made dominant by using a very close device spacing.**

Guidance:

2. *When paved shoulders having a width of 8 feet or more are closed, channelizing devices should be used to close the shoulder in advance of the merging taper to direct vehicular traffic to remain within the traveled way.*
3. *Where channelizing devices are used instead of pavement markings, the maximum spacing should be ½ S feet where S is the speed in mph.*
4. *If the tangent distance along the temporary diversion is less than 600 feet, a Double Reverse Curve sign should be used instead of the first Reverse Curve sign, and the second Reverse Curve sign should be omitted.*

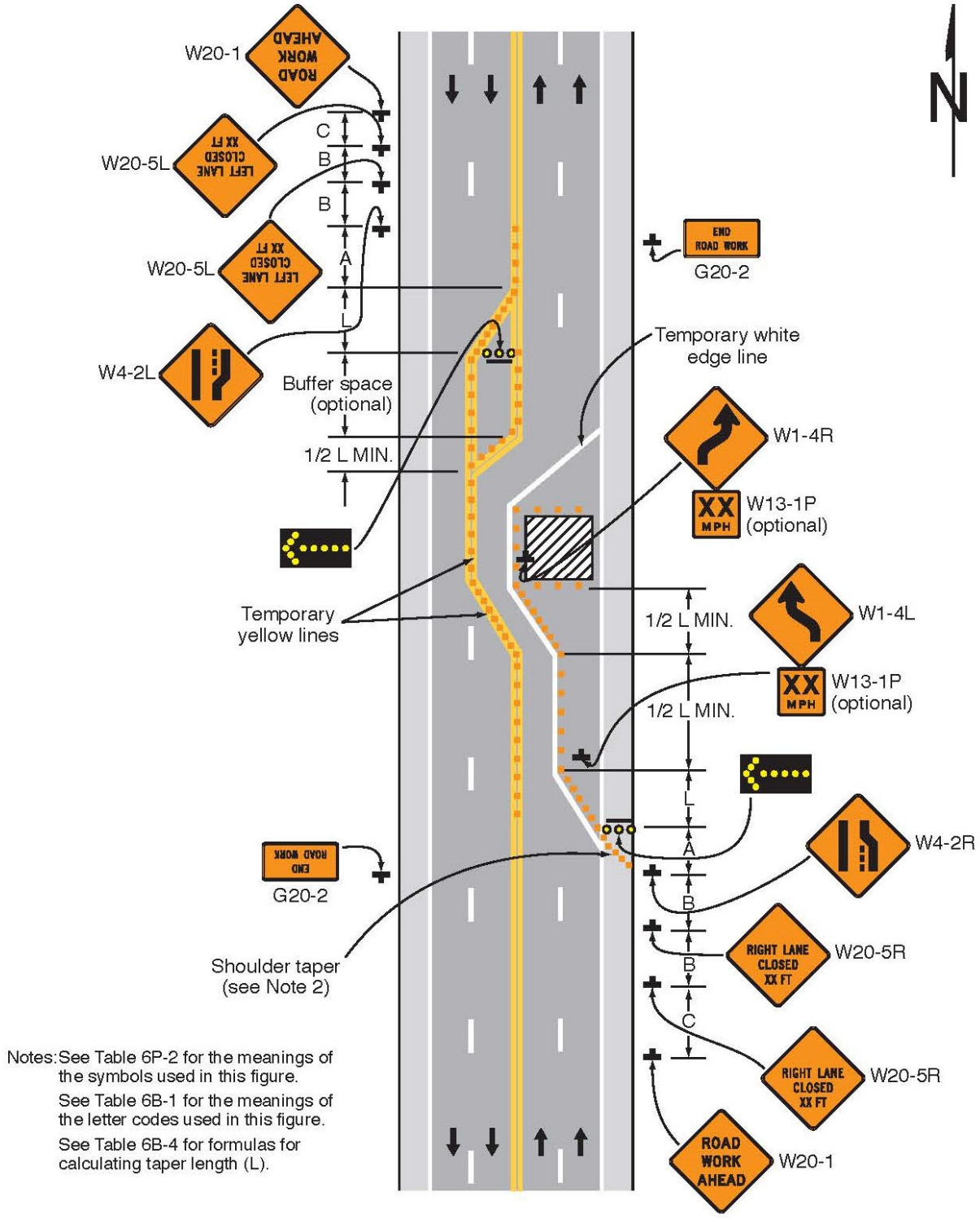
Option:

5. Positive protection devices may be used per Section 6M.02.
6. Warning lights may be used to supplement channelizing devices at night.
7. A truck-mounted attenuator may be used on the work vehicle and/or the shadow vehicle.

Support:

Wisconsin State Statute 340.01(22e) requires END ROAD WORK signs to be used to mark the end of all stationary highway maintenance or construction areas.

Figure 6P-32. Half Road Closure on a Multi-Lane, High-Speed Highway (TA-32)



Notes: See Table 6P-2 for the meanings of the symbols used in this figure.

See Table 6B-1 for the meanings of the letter codes used in this figure.

See Table 6B-4 for formulas for calculating taper length (L).

Typical Application 32

Notes for Figure 6P-33 —Typical Application 33

Stationary Lane Closure on a Divided Highway

Standard:

1. **This information also shall be used when work is being performed in the lane adjacent to the median on a divided highway. In this case, the LEFT LANE CLOSED signs and the corresponding Lane Ends signs shall be substituted.**
2. **When a side road intersects the highway within the TTC zone, additional TTC devices shall be placed as needed.**

Guidance:

3. *When paved shoulders having a width of 8 feet or more are closed, channelizing devices should be used to close the shoulder in advance of the merging taper to direct vehicular traffic to remain within the traveled way.*

Option:

4. A truck-mounted attenuator may be used on the work vehicle and/or shadow vehicle.
5. Positive protection devices may be used per Section 6M.02.

Support:

6. Where conditions permit, restricting all vehicles, equipment, workers, and their activities to one side of the roadway might be advantageous.

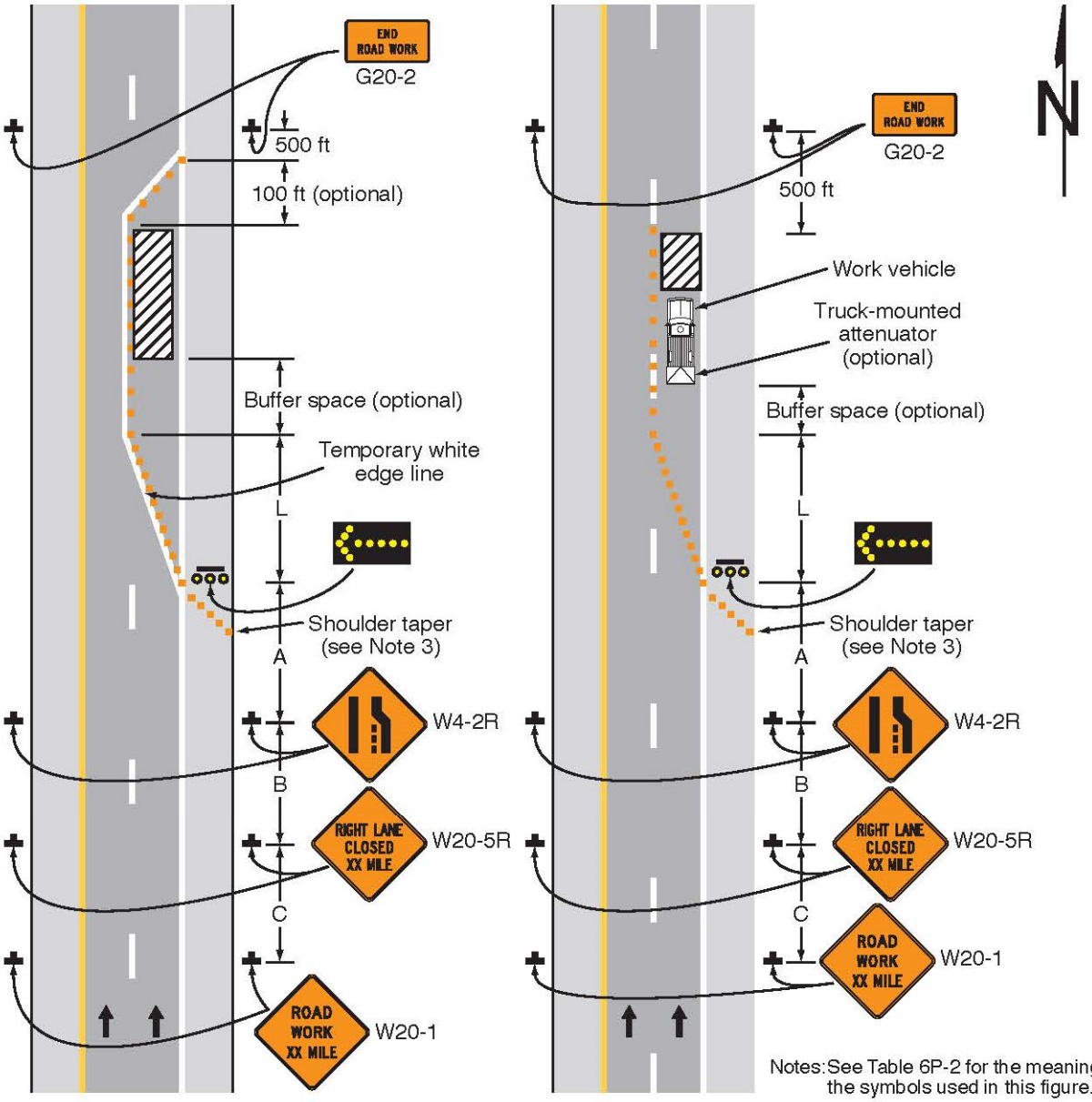
Standard:

7. **An arrow board shall be used when a freeway lane is closed. When more than one freeway lane is closed, a separate arrow board shall be used for each closed lane.**

Support:

Wisconsin State Statute 340.01(22e) requires END ROAD WORK signs to be used to mark the end of all stationary highway maintenance or construction areas.

Figure 6P-33. Stationary Lane Closure on a Divided Highway (TA-33)



Notes: See Table 6P-2 for the meanings of the symbols used in this figure.

See Table 6B-1 for the meanings of the letter codes used in this figure.

See Table 6B-4 for formulas for calculating taper length (L).

Typical Application 33

Notes for Figure 6P-34 —Typical Application 34

Lane Closure with a Temporary Traffic Barrier

Standard:

1. **This information also shall be used when work is being performed in the lane adjacent to the median on a divided highway. In this case, the LEFT LANE CLOSED signs and the corresponding Lane Ends signs shall be substituted.**

Guidance:

2. *For long-term lane closures on facilities with permanent edge lines, a temporary edge line should be installed from the upstream end of the merging taper to the downstream end of the downstream taper, and conflicting pavement markings should be removed.*
3. *The use of a barrier should be based on engineering judgment.*

Standard:

4. **Temporary traffic barriers, if used, shall comply with the provisions of Section 6M.02.**
5. **The barrier shall not be placed along the merging taper. The lane shall first be closed using channelizing devices and pavement markings.**

Option:

6. Type C Steady-Burn warning lights may be placed on channelizing devices and the barrier parallel to the edge of pavement for nighttime lane closures.
7. The barrier shown in this typical application is an example of one method that may be used to close a lane for a long-term project. If the work activity permits, a movable barrier may be used and relocated to the shoulder during non-work periods or peak-period vehicular traffic conditions, as appropriate.

Standard:

8. **If a movable barrier is used, the temporary white edge line shown in the typical application shall not be used. During the period when the right-hand lane is opened, the sign legends and the channelization shall be changed to indicate that only the shoulder is closed, as illustrated in Figure 6P-5. The arrow board, if used, shall be placed at the downstream end of the shoulder taper and shall display the caution mode.**

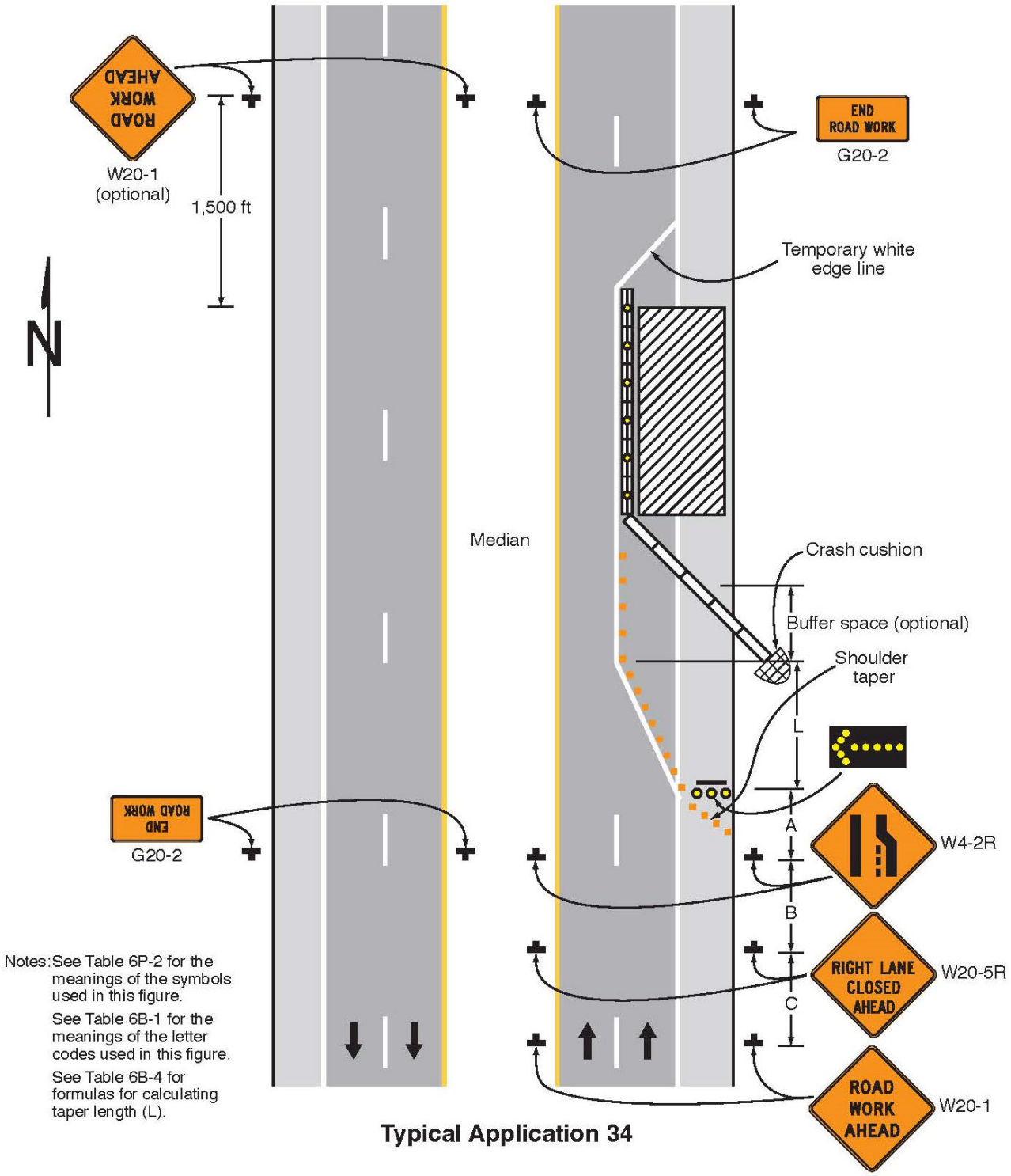
Guidance:

9. *If a movable barrier is used, the shift should be performed in the following manner. When closing the lane, the lane should be initially closed with channelizing devices placed along a merging taper using the same information employed for a stationary lane closure. The lane closure should then be extended with the movable-barrier transfer vehicle moving with vehicular traffic. When opening the lane, the movable-barrier transfer vehicle should travel against vehicular traffic from the termination area to the transition area. The merging taper should then be removed using the same information employed for a stationary lane closure.*

Support:

Wisconsin State Statute 340.01(22e) requires END ROAD WORK signs to be used to mark the end of all stationary highway maintenance or construction areas.

Figure 6P-34. Lane Closure with a Temporary Traffic Barrier (TA-34)



Notes: See Table 6P-2 for the meanings of the symbols used in this figure.

See Table 6B-1 for the meanings of the letter codes used in this figure.

See Table 6B-4 for formulas for calculating taper length (L).

Typical Application 34

Notes for Figure 6P-35 —Typical Application 35

Mobile Operation on a Multi-Lane Road

Standard:

1. **Arrow boards shall, as a minimum, be Type B, with a size of 60 x 30 inches.**
2. **Vehicle-mounted signs shall be mounted in a manner such that they are not obscured by equipment or supplies. Sign legends on vehicle-mounted signs shall be covered or turned from view when work is not in progress.**
3. **Shadow and work vehicles shall display high-intensity rotating, flashing, oscillating, or strobe lights.**
4. **An arrow board shall be used when a freeway lane is closed. When more than one freeway lane is closed, a separate arrow board shall be used for each closed lane.**

Guidance:

5. *Vehicles used for these operations should be made highly visible with appropriate equipment, such as flags, signs, or arrow boards.*
6. *Shadow Vehicle 1 should be equipped with an arrow board and truck-mounted attenuator.*
7. *Shadow Vehicle 2 should be equipped with an arrow board. An appropriate lane closure sign should be placed on Shadow Vehicle 2 so as not to obscure the arrow board.*
8. *Shadow Vehicle 2 should travel at a varying distance from the work operation so as to provide adequate sight distance for vehicular traffic approaching from the rear.*
9. *The spacing between the work vehicles and the shadow vehicles, and between each shadow vehicle, should be minimized to deter road users from driving in between.*

The roll ahead distance recommended by the truck or trailer mounted attenuator manufacturer should be used to space Shadow Vehicle 1 in back of the work vehicle. The length of the work area should be minimized to the degree possible.

10. *Work should normally be accomplished during off-peak hours.*
11. *When the work vehicle occupies an interior lane (a lane other than the far right or far left) of a directional roadway having a right-hand shoulder 10 feet or more in width, Shadow Vehicle 2 should drive on the right-hand shoulder with a sign indicating that work is taking place in the interior lane.*

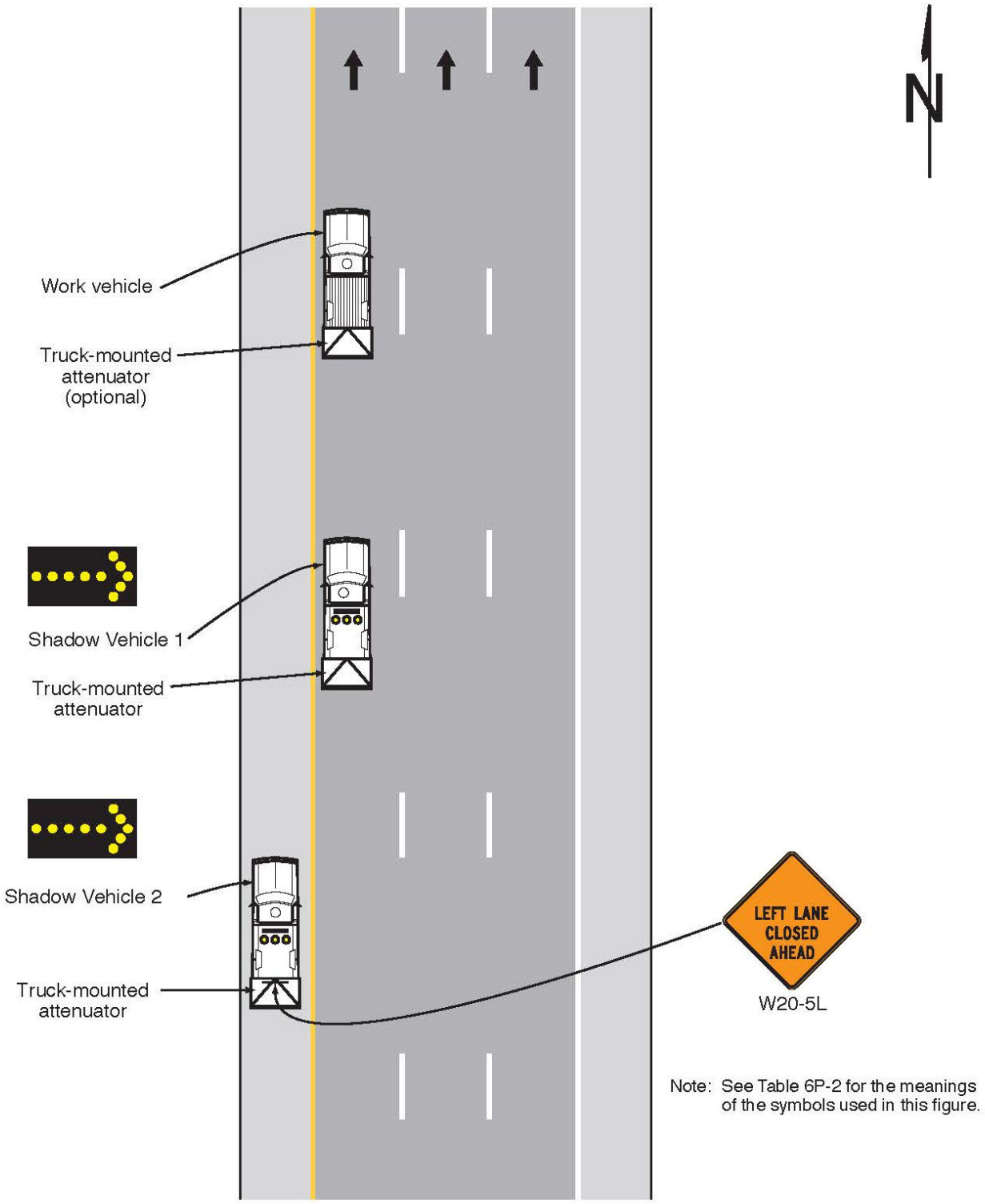
Option:

12. REMOVED
13. Positive protection devices may be used per Section 6M.02.
14. On high-speed roadways, a third shadow vehicle (not shown) may be used with Shadow Vehicle 1 in the closed lane, Shadow Vehicle 2 straddling the edge line, and Shadow Vehicle 3 on the shoulder.
15. Where adequate shoulder width is not available, Shadow Vehicle 3 may also straddle the edge line.

Standard:

A truck or trailer mounted attenuator shall be used on Shadow Vehicle 2 if it encroaches into the travel lane.

Figure 6P-35. Mobile Operation on a Multi-Lane Road (TA-35)



Typical Application 35

Notes for Figure 6P-36 —Typical Application 36

Lane Shift on a Freeway

Guidance:

1. *The lane shift should be used when the work space extends into either the right-hand or left-hand lane of a divided highway and it is impracticable, for capacity reasons, to reduce the number of available lanes.*

Support:

2. When a lane shift is accomplished by using (1) geometry that meets the design speed at which the permanent highway was designed, (2) full normal cross-section (full lane width and full shoulders), and (3) complete pavement markings, then only the initial general work-zone warning sign is required.

Guidance:

3. *When the conditions in Note 2 above are not met, the information shown in the typical application should be employed and the provisions in Notes 4 through 17 below are applicable.*

Standard:

4. **Temporary traffic barriers, if used, shall comply with the provisions of Section 6M.02.**
5. **The barrier shall not be placed along the shifting taper. The lane shall first be shifted using channelizing devices and pavement markings.**

Guidance:

6. *A warning sign should be used to show the changed alignment.*

Standard:

7. **Except as provided in Note 8 below, the number of lanes illustrated on the Reverse Curve signs shall be the same as the number of through lanes available to road users, and the direction of the reverse curves shall be appropriately illustrated.**

Option:

8. Where two or more lanes are being shifted, a W1-4 (or W1-3) sign with an ALL LANES (W24-1cP) plaque (see Figure 6H-1) may be used instead of a sign that illustrates the number of lanes.
9. Where more than three lanes are being shifted, the Reverse Curve (or Turn) sign may be rectangular.

Guidance:

10. *Where the shifted section is longer than 600 feet, one set of Reverse Curve signs should be used to show the initial shift and a second set should be used to show the return to the normal alignment. If the tangent distance along the temporary diversion is less than 600 feet, a Double Reverse Curve sign should be used instead of the first Reverse Curve sign, and the second Reverse Curve sign should be omitted.*
11. *If a STAY IN LANE sign is used, then solid white lane lines should be used.*

Standard:

12. **The minimum width of the shoulder lane shall be 10 feet.**
13. **For long-term stationary work, existing conflicting pavement markings shall be removed and temporary markings shall be installed before traffic patterns are changed.**

Option:

14. For short-term stationary work, lanes may be delineated by channelizing devices or removable pavement markings instead of temporary markings.

Guidance:

15. *If the shoulder cannot adequately accommodate trucks, trucks should be directed to use the travel lanes.*
16. *The use of a barrier should be based on engineering judgment.*

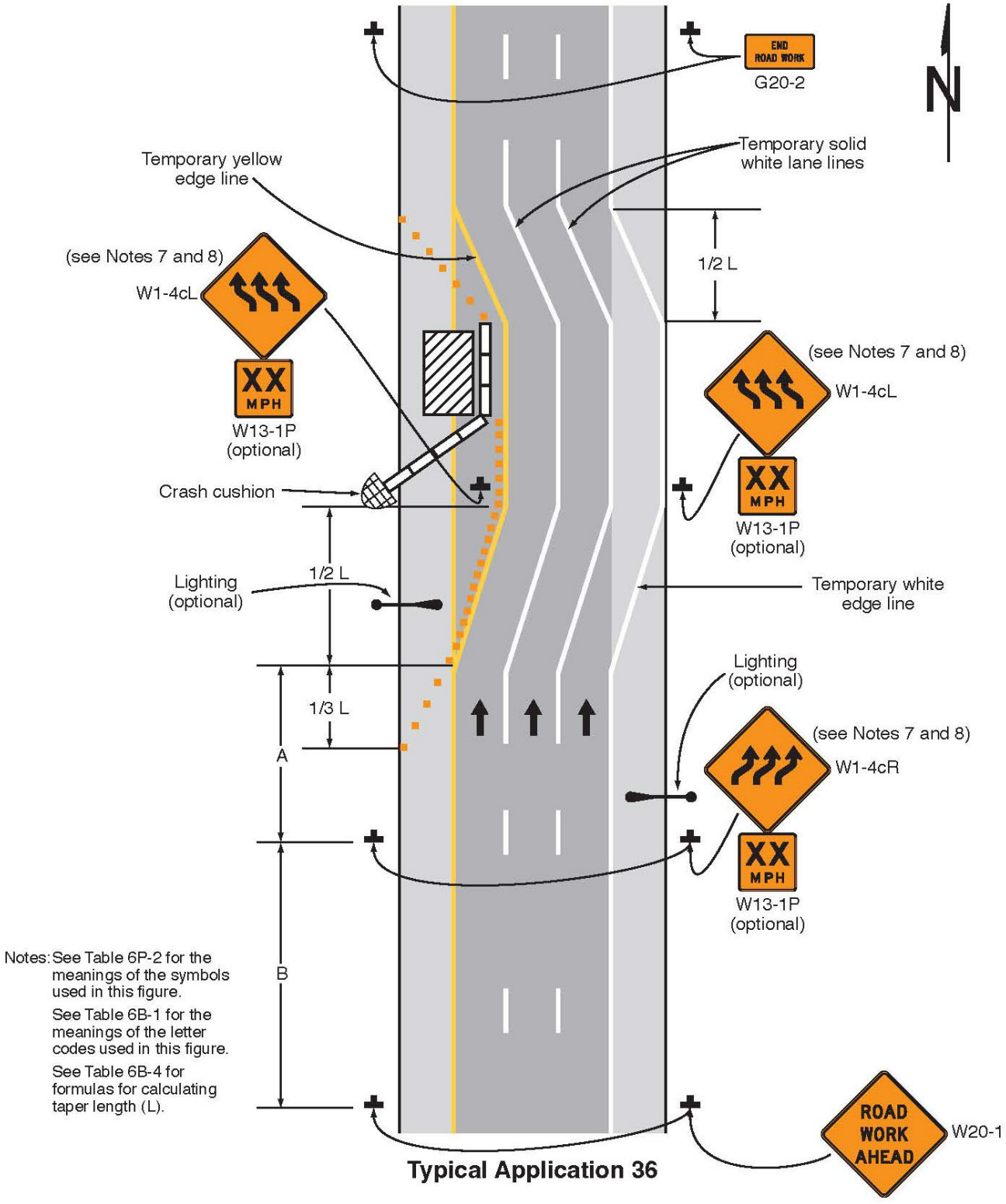
Option:

17. Type C Steady-Burn warning lights may be placed on channelizing devices and the barrier parallel to the edge of the pavement for nighttime lane closures.

Support:

Wisconsin State Statute 340.01(22e) requires END ROAD WORK signs to be used to mark the end of all stationary highway maintenance or construction areas.

Figure 6P-36. Lane Shift on a Freeway (TA-36)



Notes: See Table 6P-2 for the meanings of the symbols used in this figure.

See Table 6B-1 for the meanings of the letter codes used in this figure.

See Table 6B-4 for formulas for calculating taper length (L).

Typical Application 36

Notes for Figure 6P-37 —Typical Application 37

Double Lane Closure on a Freeway

Standard:

1. **An arrow board shall be used when a freeway lane is closed. When more than one freeway lane is closed, a separate arrow board shall be used for each closed lane.**

Guidance:

2. *Ordinarily, the preferred position for the second arrow board is in the closed exterior lane at the upstream end of the second merging taper. However, the second arrow board should be placed in the closed interior lane at the downstream end of the second merging taper in the following situations:*
   a. *When a shadow vehicle is used in the interior closed lane, and the second arrow board is mounted on the shadow vehicle;*
   b. *If alignment or other conditions create any confusion as to which lane is closed by the second arrow board; and*
   c. *When the first arrow board is placed in the closed exterior lane at the downstream end of the first merging taper (the alternative position when the shoulder is narrow).*

Option:

3. Flashing warning lights and/or flags may be used to call attention to the initial warning signs.
4. A truck-mounted attenuator may be used on the shadow vehicle.
5. Positive protection devices may be used per Section 6M.02.
6. If a paved shoulder having a minimum width of 10 feet and sufficient strength is available, the left-hand and adjacent interior lanes may be closed and vehicular traffic carried around the work space on the right-hand lane and a right-hand shoulder.

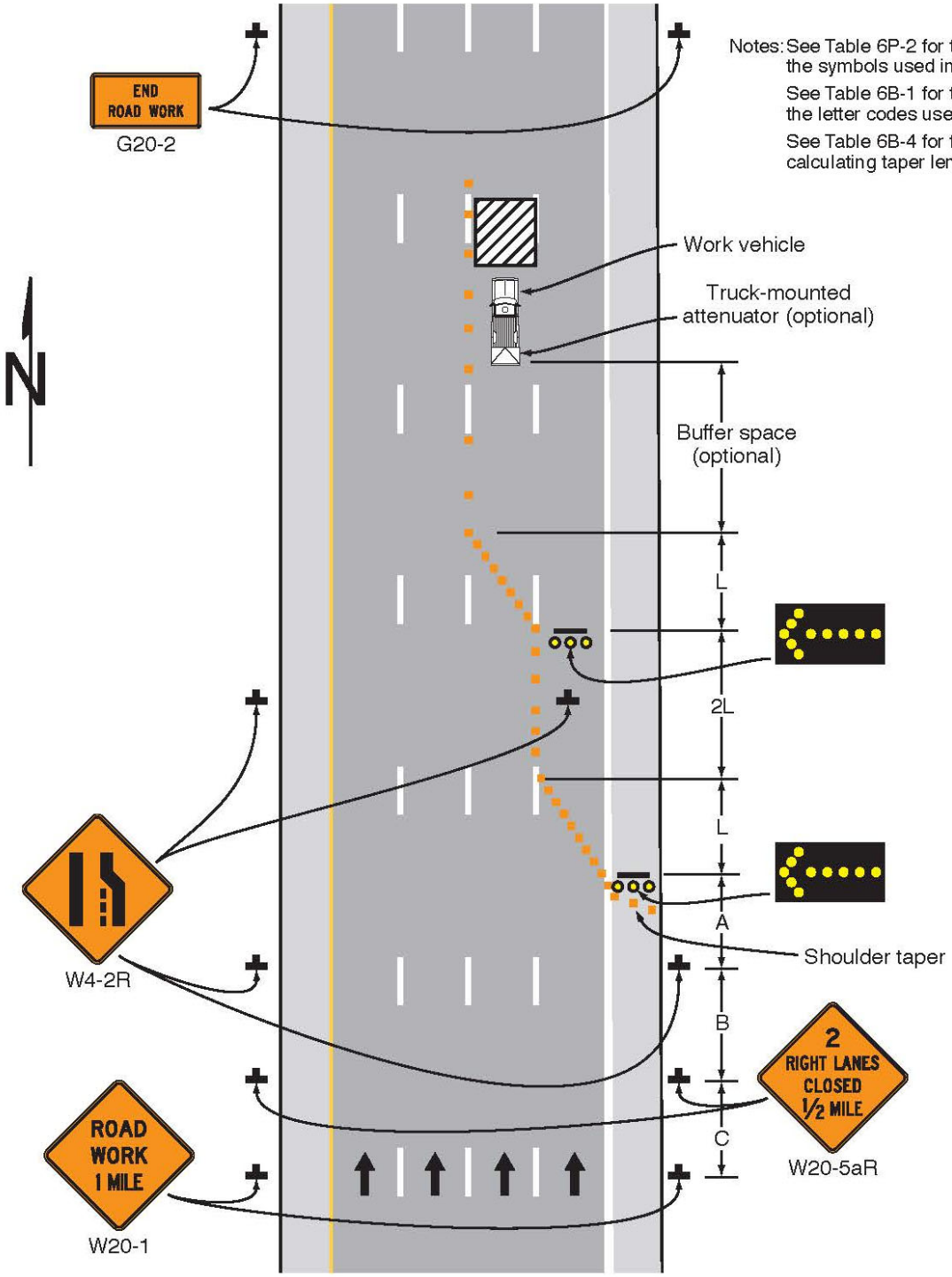
Guidance:

7. *When a shoulder lane is used that cannot adequately accommodate trucks, trucks should be directed to use the normal travel lanes.*

Support:

Wisconsin State Statute 340.01(22e) requires END ROAD WORK signs to be used to mark the end of all stationary highway maintenance or construction areas.

Figure 6P-37. Double Lane Closure on a Freeway (TA-37)



Typical Application 37

Notes for Figure 6P-38 —Typical Application 38

Interior Lane Closure on a Freeway

Standard:

1. **An arrow board shall be used when a freeway lane is closed. When more than one freeway lane is closed, a separate arrow board shall be used for each closed lane.**
2. **If temporary traffic barriers are installed, they shall comply with the provisions and requirements in Section 6M.02.**
3. **The barrier shall not be placed along the shifting taper. The lane shall first be shifted using channelizing devices and pavement markings.**
4. **For long-term stationary work, existing conflicting pavement markings shall be removed and temporary markings shall be installed before traffic patterns are changed.**

Guidance:

5. *For a long-term closure, a barrier should be used to provide additional safety to the operation in the closed interior lane. A buffer space should be used at the upstream end of the closed interior lane.*
6. *An arrow board displaying an arrow pointing to the right should be placed on the left-hand shoulder at the beginning of the taper.*
7. *For long-term use, the broken lane lines should be made solid white in the two-lane section.*

Option:

8. As an alternative to initially closing the left-hand lane, as shown in the typical application, the right-hand lane may be closed in advance of the interior lane closure with appropriate channelization and signs. The Interior Lane Shift Ahead symbol sign may be mirrored to indicate a right lane shift.
9. A short, single row of channelizing devices in advance of the vehicular traffic split to restrict vehicular traffic to their respective lanes may be added.
10. DO NOT PASS signs may be used.
11. If a paved shoulder having a minimum width of 10 feet and sufficient strength is available, the left-hand and center lanes may be closed and motor vehicle traffic carried around the work space on the right-hand lane and a right-hand shoulder.
12. A work vehicle with a truck-mounted attenuator may be used within the closed interior lane between the buffer space and the work area.
13. Positive protection devices may be used per Section 6M.02.

Guidance:

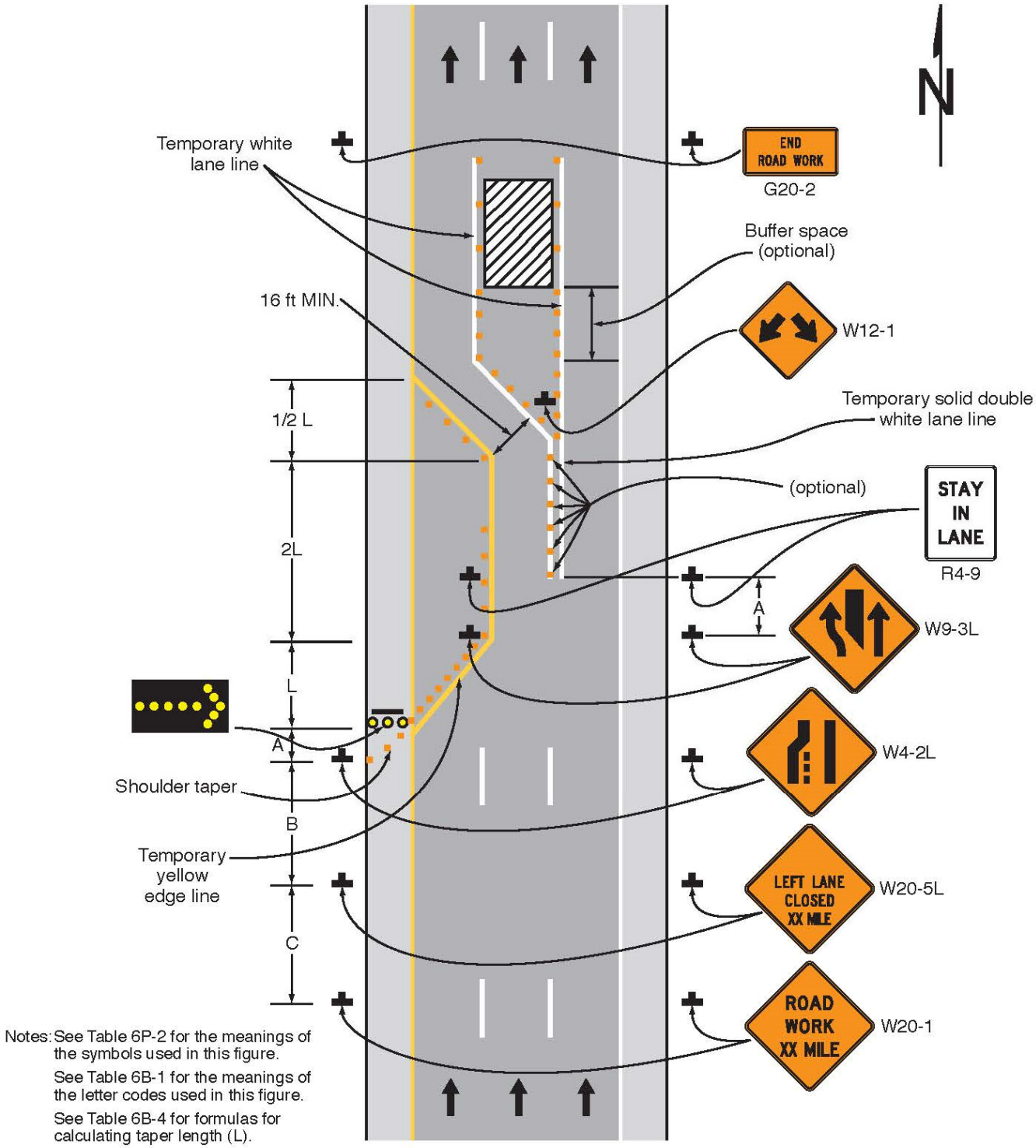
14. *When a shoulder lane is used that cannot adequately accommodate trucks, trucks should be directed to use the normal travel lanes.*

This typical application presents challenges for drivers and work area limitations that are not conducive of many work activities. In those cases, two lanes of traffic should be closed.

Support:

Wisconsin State Statute 340.01(22e) requires END ROAD WORK signs to be used to mark the end of all stationary highway maintenance or construction areas.

Figure 6P-38. Interior Lane Closure on a Freeway (TA-38)



Notes: See Table 6P-2 for the meanings of the symbols used in this figure.

See Table 6B-1 for the meanings of the letter codes used in this figure.

See Table 6B-4 for formulas for calculating taper length (L).

Typical Application 38

Notes for Figure 6P-39 —Typical Application 39

Median Crossover on a Freeway

Standard:

1. **Channelizing devices or temporary traffic barriers shall be used to separate opposing vehicular traffic.**
2. **An arrow board shall be used when a freeway lane is closed. When more than one freeway lane is closed, a separate arrow board shall be used for each closed lane.**

Guidance:

2. *For long-term work on high-speed, high-volume highways, consideration should be given to using a temporary traffic barrier to separate opposing vehicular traffic.*

Option:

4. When a temporary traffic barrier is used to separate opposing vehicular traffic, the Two-Way Traffic, DO NOT PASS, KEEP RIGHT, and DO NOT ENTER signs may be eliminated.
5. The alignment of the crossover may be designed as a reverse curve.

Guidance:

6. *When the crossover follows a curved alignment, the design criteria contained in the "AASHTO Green Book – A Policy On Geometric Design of Highways and Streets," 7th Edition, 2018 AASHTO should be used.*
7. *When channelizing devices have the potential of leading vehicular traffic out of the intended traffic space, the channelizing devices should be extended a distance in feet of 2 times the speed limit in mph beyond the downstream end of the transition area as depicted.*
8. *Where channelizing devices are used, the Two-Way Traffic signs should be repeated every 1 mile.*

Option:

9. NEXT XX MILES Supplemental Distance plaques may be used with the Two-Way Traffic signs, where XX is the distance to the downstream end of the two-way section.

Support:

10. When the distance is sufficiently short that road users entering the section can see the downstream end of the section, they are less likely to forget that there is opposing vehicular traffic.
11. The sign legends for the four pairs of signs approaching the lane closure for the non-crossover direction of travel are not shown. They are similar to the series shown for the crossover direction, except that the left-hand lane is closed.

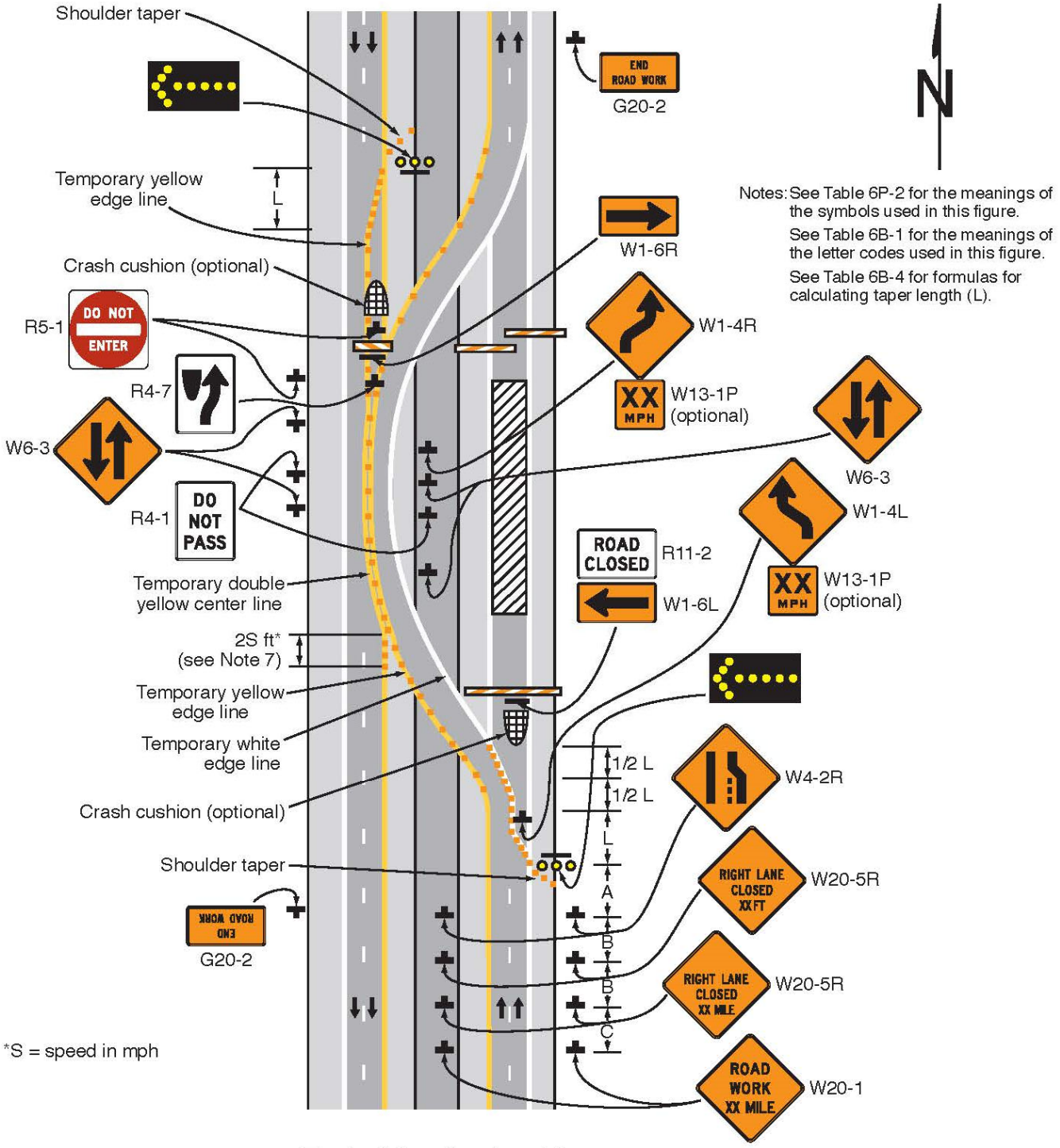
Option:

12. Positive protection devices may be used per Section 6M.02.

Support:

Wisconsin State Statute 340.01(22e) requires END ROAD WORK signs to be used to mark the end of all stationary highway maintenance or construction areas.

Figure 6P-39. Median Crossover on a Freeway (TA-39)



Typical Application 39

Notes for Figure 6P-40 —Typical Application 40

Median Crossover for an Entrance Ramp

Guidance:

1. *The typical application illustrated should be used for carrying an entrance ramp across a closed directional roadway of a divided highway.*
2. *A temporary acceleration lane should be used to facilitate merging.*
3. *When used, the YIELD or STOP sign should be located far enough forward to provide adequate sight distance of oncoming mainline vehicular traffic to select an acceptable gap, but should not be located so far forward that motorists will be encouraged to stop in the path of the mainline traffic. If needed, yield or stop lines should be installed across the ramp to indicate the point at which road users should yield or stop. Also, a longer acceleration lane should be provided beyond the sign to reduce the gap size needed.*

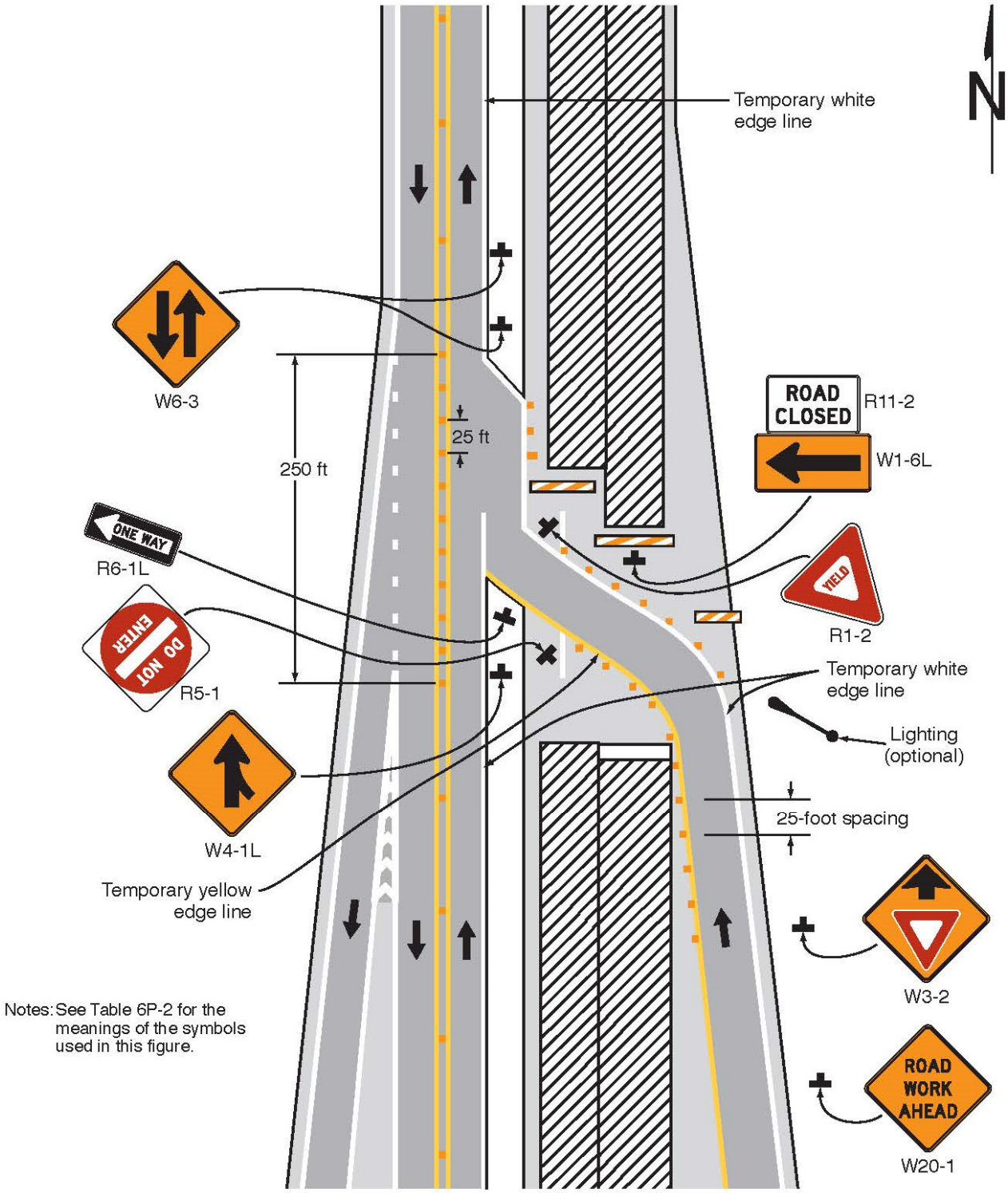
Option:

4. Positive protection devices may be used per Section 6M.02.
5. If vehicular traffic conditions allow, the ramp may be closed.
6. A broken edge line may be carried across the temporary entrance ramp to assist in defining the through vehicular traffic lane.
7. When a temporary traffic barrier is used to separate opposing vehicular traffic, the Two-Way Traffic signs and the DO NOT ENTER signs may be eliminated.

Support:

Wisconsin State Statute 340.01(22e) requires END ROAD WORK signs to be used to mark the end of all stationary highway maintenance or construction areas.

Figure 6P-40. Median Crossover for an Entrance Ramp (TA-40)



Notes: See Table 6P-2 for the meanings of the symbols used in this figure.

Typical Application 40

Notes for Figure 6P-41 —Typical Application 41

Median Crossover for an Exit Ramp

Guidance:

1. *This typical application should be used for carrying an exit ramp across a closed directional roadway of a divided highway. The design criteria contained in the "AASHTO Green Book – A Policy On Geometric Design of Highways and Streets," 7th Edition, 2018, AASHTO should be used for determining the curved alignment.*
2. *The guide signs should indicate that the ramp is open, and where the temporary ramp is located. Conversely, if the ramp is closed, guide signs should indicate that the ramp is closed.*
3. *When the exit is closed, a black-on-orange EXIT CLOSED sign panel should be placed diagonally across the interchange/intersection guide signs and channelizing devices should be placed to physically close the ramp.*
4. *In the situation (not shown) where channelizing devices are placed along the mainline roadway, the devices' spacing should be reduced in the vicinity of the off ramp to emphasize the opening at the ramp itself. Channelizing devices and/or temporary pavement markings should be placed on both sides of the temporary ramp where it crosses the median and the closed roadway.*
5. *Advance guide signs providing information related to the temporary exit should be relocated or duplicated adjacent to the temporary roadway.*

Standard:

6. **A temporary EXIT sign shall be located in the temporary gore. For better visibility, it shall be mounted a minimum of 7 feet from the pavement surface to the bottom of the sign.**

Option:

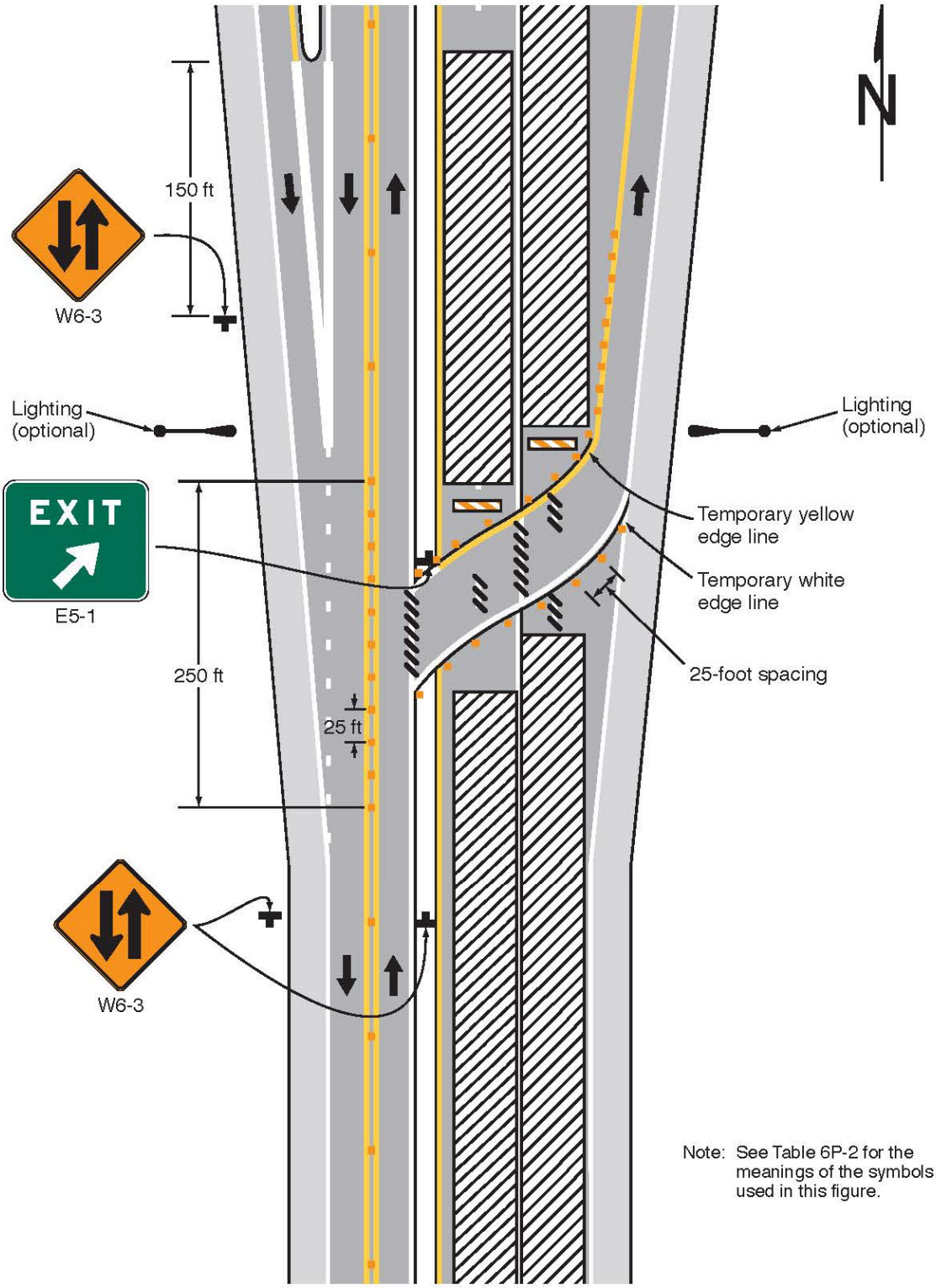
7. Positive protection devices may be used per Section 6M.02.
8. Guide signs referring to the exit may need to be relocated to the median.
9. The temporary EXIT sign placed in the temporary gore may be either black on orange or white on green.
10. In some instances, a temporary deceleration lane may be useful in facilitating the exiting maneuver.
11. When a temporary traffic barrier is used to separate opposing vehicular traffic, the Two-Way Traffic signs may be omitted.

The EXIT CLOSED panel may be placed horizontally across the interchange/intersection guide signs.

Support:

Wisconsin State Statute 340.01(22e) requires END ROAD WORK signs to be used to mark the end of all stationary highway maintenance or construction areas.

Figure 6P-41. Median Crossover for an Exit Ramp (TA-41)



Note: See Table 6P-2 for the meanings of the symbols used in this figure.

Typical Application 41

Notes for Figure 6P-42 —Typical Application 42

Work in the Vicinity of an Exit Ramp

Guidance:

1. *The guide signs should indicate that the ramp is open, and where the temporary ramp is located. However, if the ramp is closed, guide signs should indicate that the ramp is closed.*
2. *When the exit ramp is closed, a black-on-orange EXIT CLOSED sign panel should be placed diagonally across the interchange/intersection guide signs.*
3. *The design criteria contained in the "AASHTO Green Book – A Policy On Geometric Design of Highways and Streets," 7th Edition, 2018, AASHTO should be used for determining the alignment.*

Standard:

4. **A temporary EXIT sign shall be located in the temporary gore. For better visibility, it shall be mounted a minimum of 7 feet from the pavement surface to the bottom of the sign.**

Option:

5. Positive protection devices may be used per Section 6M.02.
6. The temporary EXIT sign placed in the temporary gore may be either black on orange or white on green.
7. An alternative procedure that may be used is to channelize exiting vehicular traffic onto the right-hand shoulder and close the lane as necessary.

Standard:

8. **An arrow board shall be used when a freeway lane is closed. When more than one freeway lane is closed, a separate arrow board shall be used for each closed lane.**

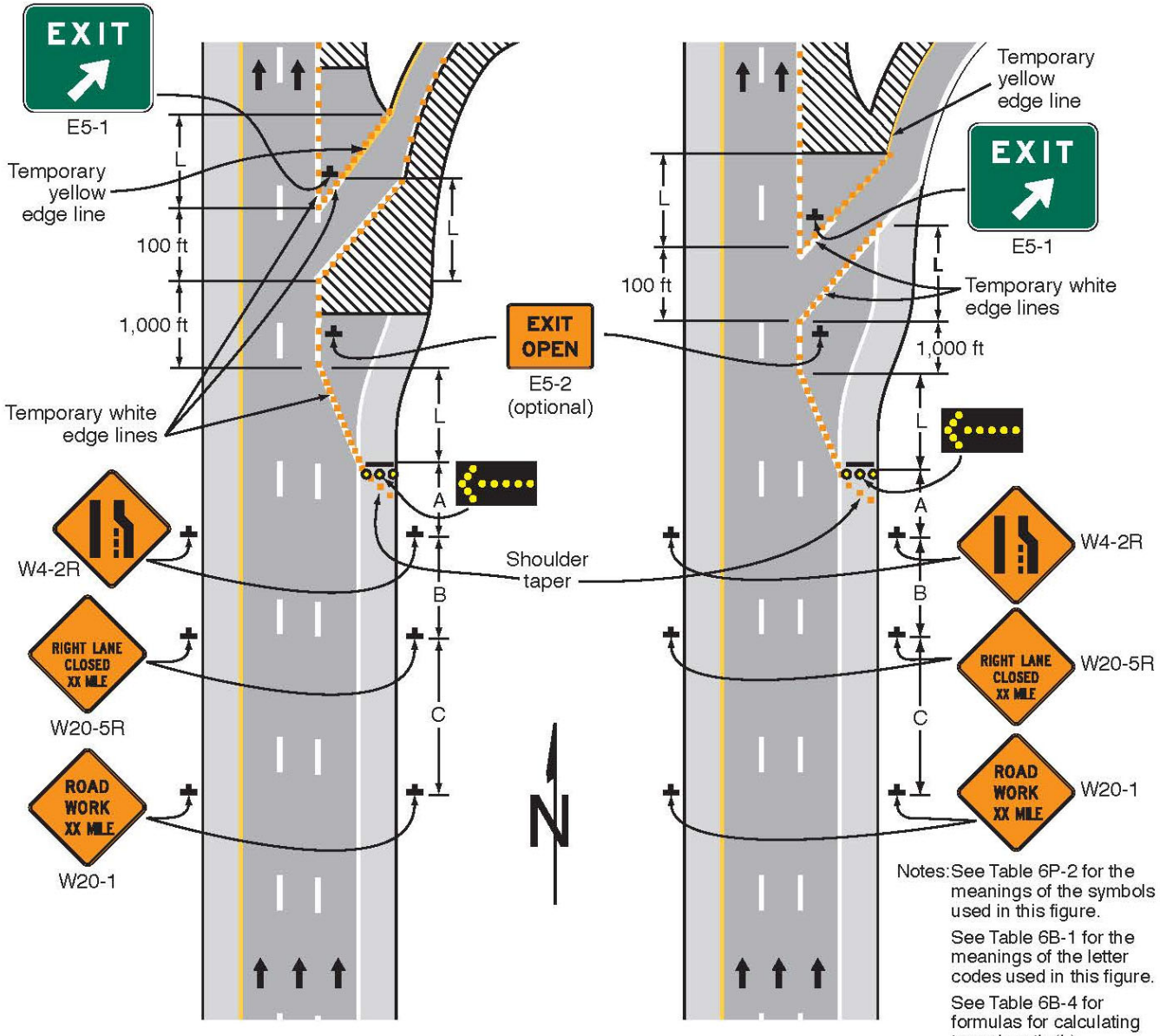
Option:

The EXIT CLOSED panel may be placed horizontally across the interchange/intersection guide signs.

Support:

Wisconsin State Statute 340.01(22e) requires END ROAD WORK signs to be used to mark the end of all stationary highway maintenance or construction areas.

Figure 6P-42. Work in the Vicinity of an Exit Ramp (TA-42)



Notes: See Table 6P-2 for the meanings of the symbols used in this figure.

See Table 6B-1 for the meanings of the letter codes used in this figure.

See Table 6B-4 for formulas for calculating taper length (L).

Typical Application 42

Notes for Figure 6P-43 —Typical Application 43

Partial Exit Ramp Closure

Guidance:

1. *Truck off-tracking should be considered when determining whether the minimum lane width of 10 feet is adequate (see Section 6N.07).*

Option:

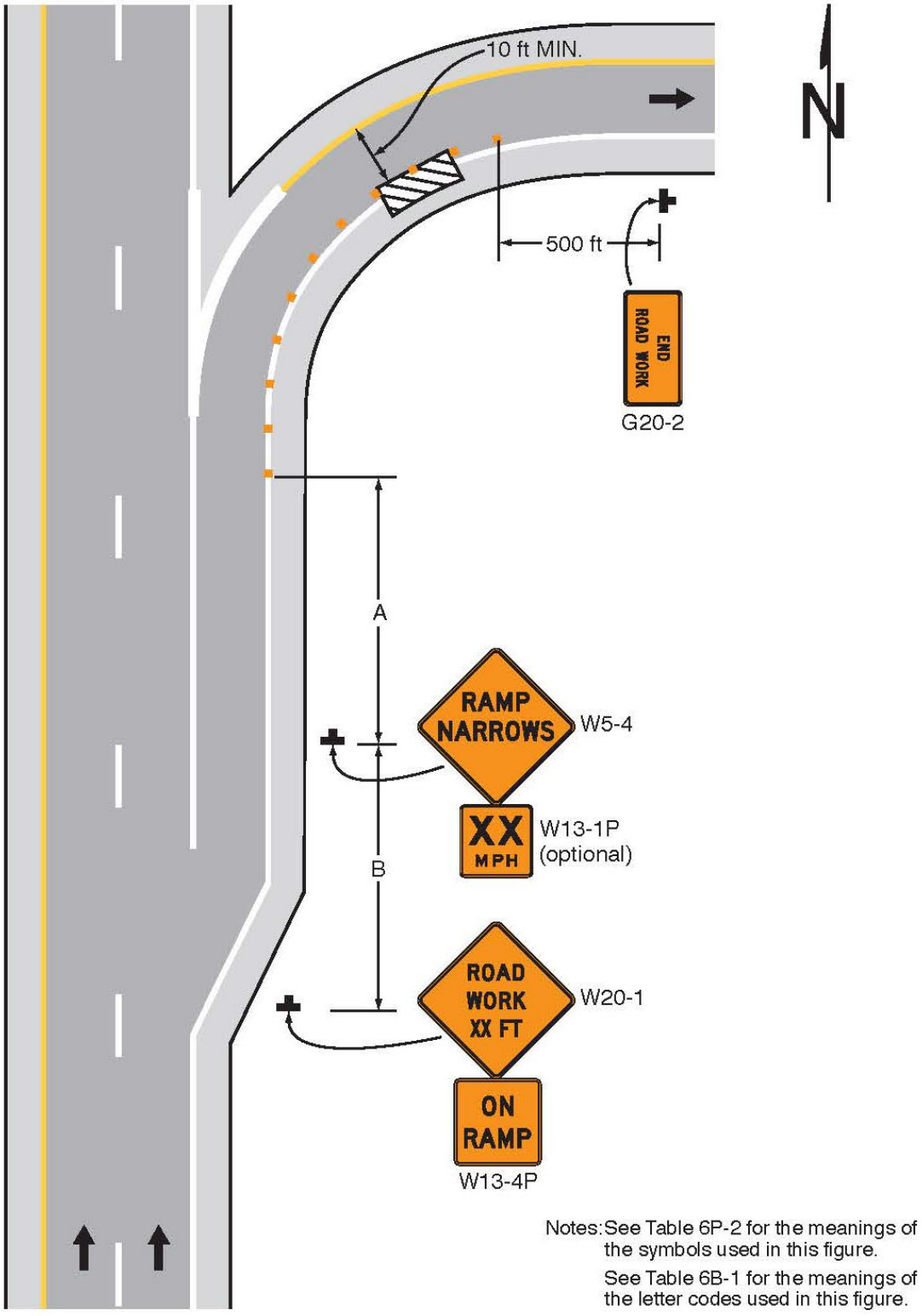
2. Positive protection devices may be used per Section 6M.02.

As an alternative to the ROAD WORK XX FT sign with supplementary ON RAMP plaque, a RAMP WORK XX FT sign may be used.

Support:

Wisconsin State Statute 340.01(22e) requires END ROAD WORK signs to be used to mark the end of all stationary highway maintenance or construction areas.

Figure 6P-43. Partial Exit Ramp Closure (TA-43)



Notes: See Table 6P-2 for the meanings of the symbols used in this figure.

See Table 6B-1 for the meanings of the letter codes used in this figure.

Typical Application 43

Notes for Figure 6P-44 —Typical Application 44

Work in the Vicinity of an Entrance Ramp

Guidance:

1. *An acceleration lane of sufficient length should be provided whenever possible as shown on the diagram on the left.*

Standard:

2. **For the information shown on the diagram on the right-hand side of the typical application, where inadequate acceleration distance exists for the temporary entrance, the YIELD sign shall be replaced with STOP signs (one on each side of the approach).**

Guidance:

3. *When used, the YIELD or STOP sign should be located so that ramp vehicular traffic has adequate sight distance of oncoming mainline vehicular traffic to select an acceptable gap in the mainline vehicular traffic flow, but should not be located so far forward that motorists will be encouraged to stop in the path of the mainline traffic. Also, a longer acceleration lane should be provided beyond the sign to reduce the gap size needed. If sufficient gaps are not available, consideration should be given to closing the ramp.*
4. *Where a STOP sign is used, a temporary stop line should be placed across the ramp at the desired stop location.*
5. *The mainline merging taper with the arrow board at its starting point should be located sufficiently in advance so that the arrow board is not confusing to drivers on the entrance ramp, and so that the mainline merging vehicular traffic from the lane closure has the opportunity to stabilize before encountering the vehicular traffic merging from the ramp.*
6. *If the ramp curves sharply to the right, warning signs with advisory speeds located in advance of the entrance terminal should be placed in pairs (one on each side of the ramp).*

Option:

7. Positive protection devices may be used per Section 6M.02.
8. A Stop Beacon (see Section 4S.05) or a Type B high-intensity warning flasher with a red lens may be placed above the STOP sign.
9. Where the acceleration distance is significantly reduced, a supplemental plaque may be placed below the Yield Ahead sign reading NO MERGE AREA.

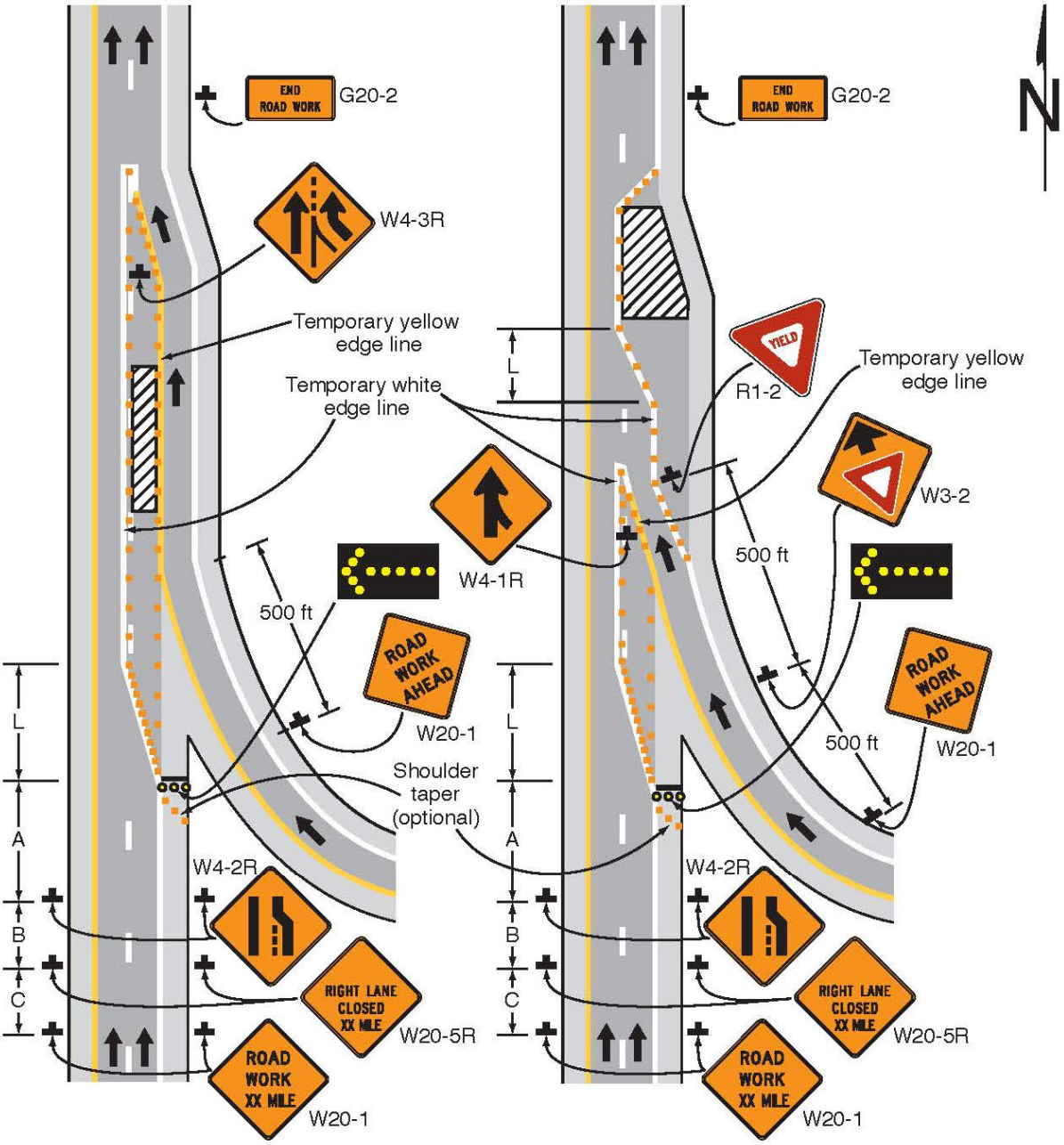
Standard:

10. **An arrow board shall be used when a freeway lane is closed. When more than one freeway lane is closed, a separate arrow board shall be used for each closed lane.**

Support:

Wisconsin State Statute 340.01(22e) requires END ROAD WORK signs to be used to mark the end of all stationary highway maintenance or construction areas.

Figure 6P-44. Work in the Vicinity of an Entrance Ramp (TA-44)



A – Added lane

B – Merge required

Notes: See Table 6P-2 for the meanings of the symbols used in this figure.

See Table 6B-1 for the meanings of the letter codes used in this figure.

See Table 6B-4 for formulas for calculating taper length (L).

Typical Application 44

Notes for Figure 6P-45 —Typical Application 45

Temporary Reversible Lane Using Movable Barriers

Support:

1. This application addresses one of several uses for movable barriers (see Section 6M.02) in highway TTC zones. In this example, one side of a 6-lane divided highway is closed to perform the work operation, and vehicular traffic is carried in both directions on the remaining 3-lane roadway by means of a median crossover.

   To accommodate unbalanced peak-period vehicular traffic volumes, the direction of travel in the center lane is switched to the direction having the greater volume, with the transfer typically being made twice daily. Thus, there are four vehicular traffic phases described as follows:

   a. Phase A—two travel lanes northbound and one lane southbound;
   b. Transition A to B—one travel lane in each direction;
   c. Phase B—one travel lane northbound and two lanes southbound; and
   d. Transition B to A—one travel lane in each direction.

   The typical application on the left illustrates the placement of devices during Phase A. The typical application on the right shows conditions during the transition (Transition A to B) from Phase A to Phase B.

Guidance:

2. *For the reversible lane situation depicted, the ends of the movable barrier should terminate in a protected area or a crash cushion should be provided. During Phase A, the transfer vehicle should be parked behind the downstream end of the movable barrier for southbound traffic as shown in the typical application on the left. During Phase B, the transfer vehicle should be parked between the downstream ends of the movable barriers at the north end of the TTC zone as shown in the typical application on the right.*

   The transition shift from Phase A to B should be as follows:

   a. Change the signs in the northbound advance warning area and transition area from a LEFT LANE CLOSED AHEAD to a 2 LEFT LANES CLOSED AHEAD. Change the mode of the second northbound arrow board from Caution to Right Arrow.
   b. Place channelizing devices to close the northbound center lane.
   c. Move the transfer vehicle from south to north to shift the movable barrier from the west side to the east side of the reversible lane.
   d. Remove the channelizing devices closing the southbound center lane.
   e. Change the signs in the southbound transition area and advance warning area from a 2 LEFT LANES CLOSED AHEAD to a LEFT LANE CLOSED AHEAD. Change the mode of the second southbound arrow board from Right Arrow to Caution.

3. *Where the lane to be opened and closed is an exterior lane (adjacent to the edge of the traveled way or the work space), the lane closure should begin by closing the lane with channelizing devices placed along a merging taper using the same information employed for a stationary lane closure. The lane closure should then be extended with the movable-barrier transfer vehicle moving with vehicular traffic. When opening the lane, the transfer vehicle should travel against vehicular traffic. The merging taper should be removed in a method similar to a stationary lane closure.*

Option:

4. The procedure may be used during a peak period of vehicular traffic and then changed to provide two lanes in the other direction for the other peak.
5. A longitudinal buffer space may be used in the activity area to separate opposing vehicular traffic.
6. A work vehicle or a shadow vehicle may be equipped with a truck-mounted attenuator.

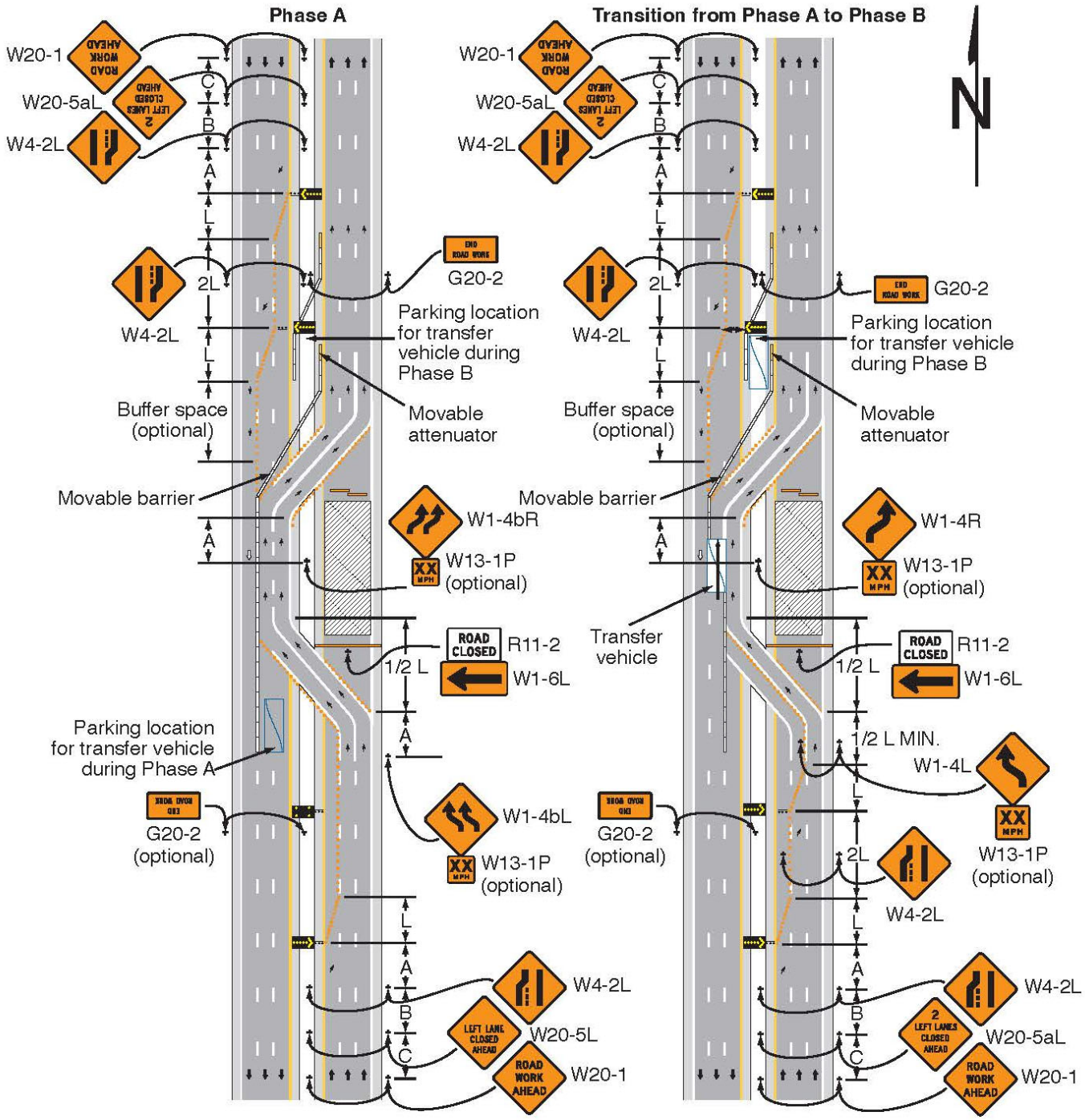
Standard:

6. An arrow board shall be used when a freeway lane is closed. When more than one freeway lane is closed, a separate arrow board shall be used for each closed lane.

Support:

Wisconsin State Statute 340.01(22e) requires END ROAD WORK signs to be used to mark the end of all stationary highway maintenance or construction areas.

Figure 6P-45. Temporary Reversible Lane Using Movable Barriers (TA-45)



Typical Application 45

Notes: See Table 6P-2 for the meanings of the symbols used in this figure.
See Table 6B-1 for the meanings of the letter codes used in this figure.
See Table 6B-4 for formulas for calculating taper length (L).

Notes for Figure 6P-46 —Typical Application 46

Work in the Vicinity of a Grade Crossing

Guidance:

1. *When grade crossings exist either within or in the vicinity of roadway work activities, extra care should be taken to minimize the probability of conditions being created, by lane restrictions, flagging, or other operations, where vehicles might be stopped within the grade crossing, considered as being 15 feet on either side of the closest and farthest rail.*

Standard:

2. **If the queuing of vehicles across active rail tracks cannot be avoided, a uniformed law enforcement officer or flagger shall be provided at the grade crossing to prevent vehicles from stopping within the grade crossing (as described in Note 1 above), even if automatic warning devices are in place.**

Guidance:

3. *Early coordination with the railroad company or transit agency should occur before work starts.*
4. *In the example depicted, the buffer space of the activity area should be extended upstream of the grade crossing (as shown) so that a queue created by the flagging operation will not extend across the grade crossing.*
5. *The DO NOT STOP ON TRACKS sign should be used on all approaches to a grade crossing within the limits of a TTC zone.*

Option:

6. Positive protection devices may be used per Section 6M.02.
7. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
8. A BE PREPARED TO STOP sign may be added to the sign series.
9. Automated Flagger Assistance Devices (see Section 6L.02) may be used in situations where there is only one lane of approaching traffic in the direction to be controlled.

Guidance:

10. *When used, the BE PREPARED TO STOP sign should be located before the Flagger symbol sign.*

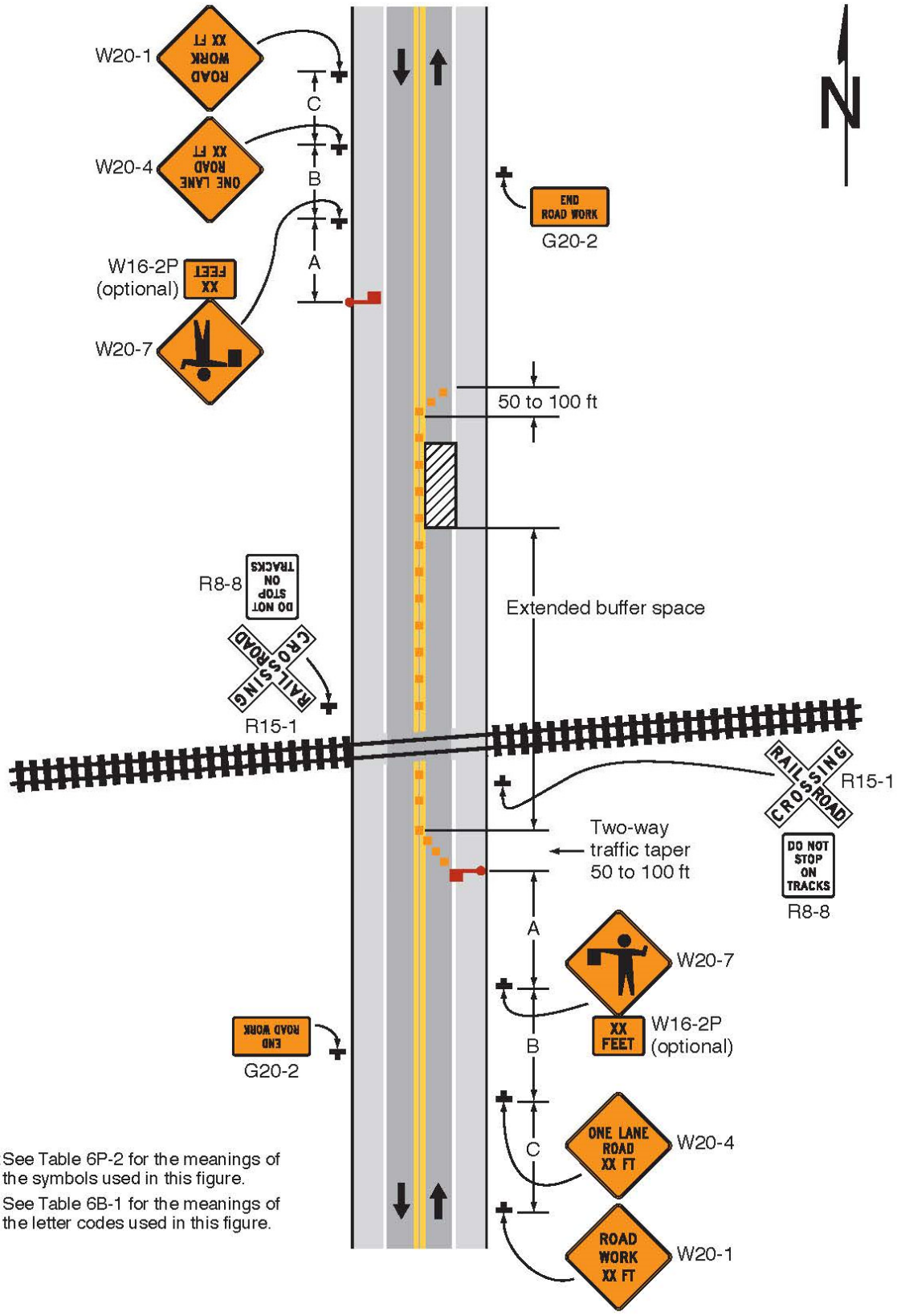
Standard:

11. **At night, flagger stations shall be illuminated, except in emergencies.**

Support:

Wisconsin State Statute 340.01(22e) requires END ROAD WORK signs to be used to mark the end of all stationary highway maintenance or construction areas.

Figure 6P-46. Work in the Vicinity of a Grade Crossing (TA-46)



Notes: See Table 6P-2 for the meanings of the symbols used in this figure.

See Table 6B-1 for the meanings of the letter codes used in this figure.

Typical Application 46

Notes for Figure 6P-47 – Typical Application 47

Bicycle Lane Closure without a Detour

Guidance:

1. *If a bicycle lane on a roadway having a speed limit of 35 mph or higher is closed and conditions are not appropriate to direct bicyclists into a shared lane, a separate bicycle facility or detour route should be considered (see Figures 6P-48 and 6P-51).*

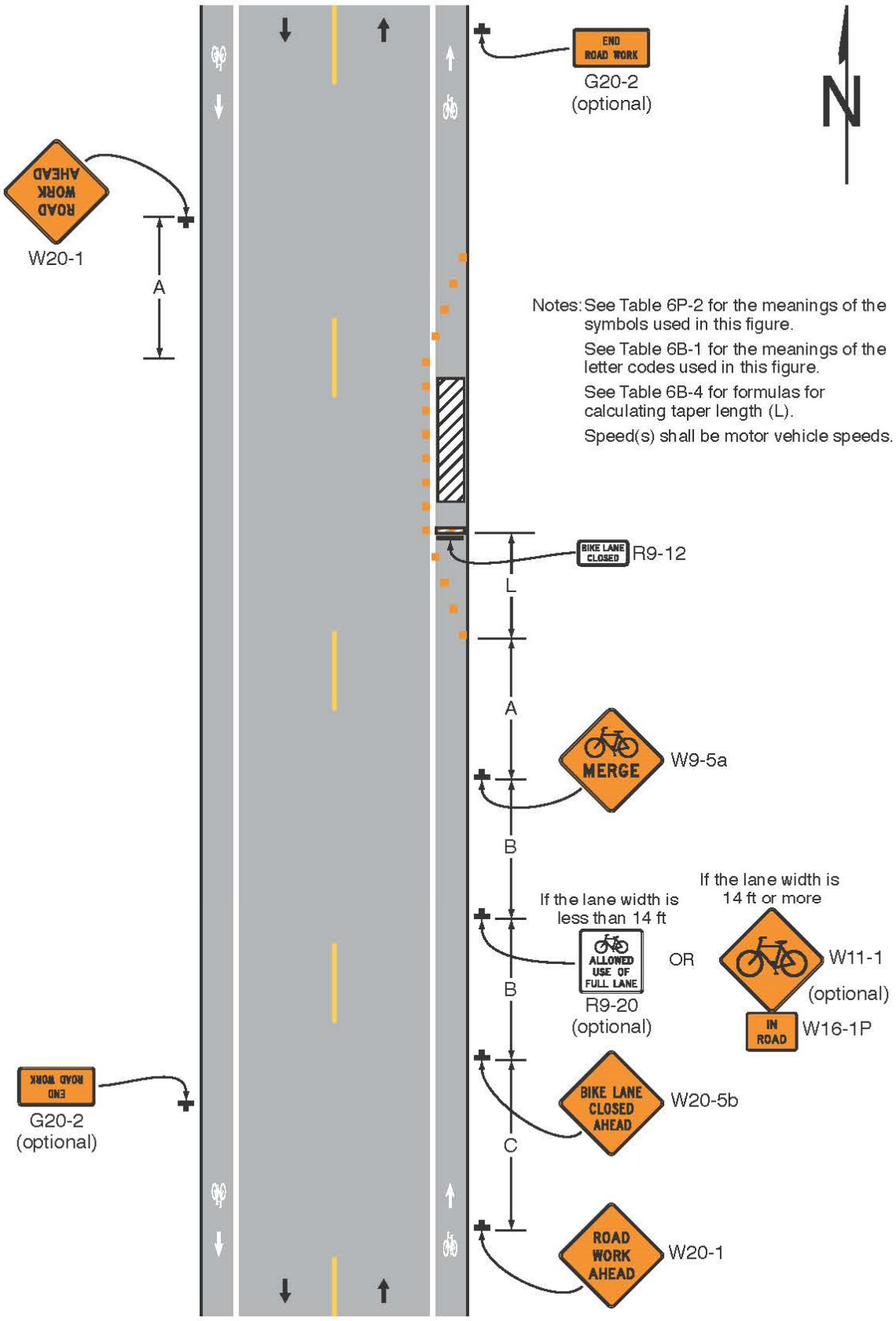
Option:

2. If a bicycle lane on a roadway having a speed limit of 30 mph or less is closed, and the adjacent travel lane is less than 14 feet wide, then BICYCLES ALLOWED USE OF FULL LANE signs may be used.
3. If a bicycle lane on a roadway having a speed limit of 30 mph or less is closed, and the adjacent travel lane is at least 14 feet wide throughout the TTC zone, then Bicycle Warning signs in association with IN STREET or IN ROAD plaques may be used.

Support:

Wisconsin State Statute 340.01(22e) requires END ROAD WORK signs to be used to mark the end of all stationary highway maintenance or construction areas.

Figure 6P-47. Bicycle Lane Closure without a Detour (TA-47)



Typical Application 47

Notes for Figure 6P-48 – Typical Application 48

Bicycle Lane Closure with an On-Road Detour

Guidance:

1. *A detour route for bicyclists where a section of bicycle lane is closed should use the most direct route practical on roadways or shoulders where conditions are appropriate for bicycling.*
2. *Bicycle related regulatory and/or warning signs should be considered along the bicycle detour based on engineering judgment and traffic conditions.*
3. *A Street Name sign or Bike Route Name sign should be mounted with the Bike Detour sign.*

Option:

4. The Street Name sign or Bike Route Name sign may be either white on green or black on orange.

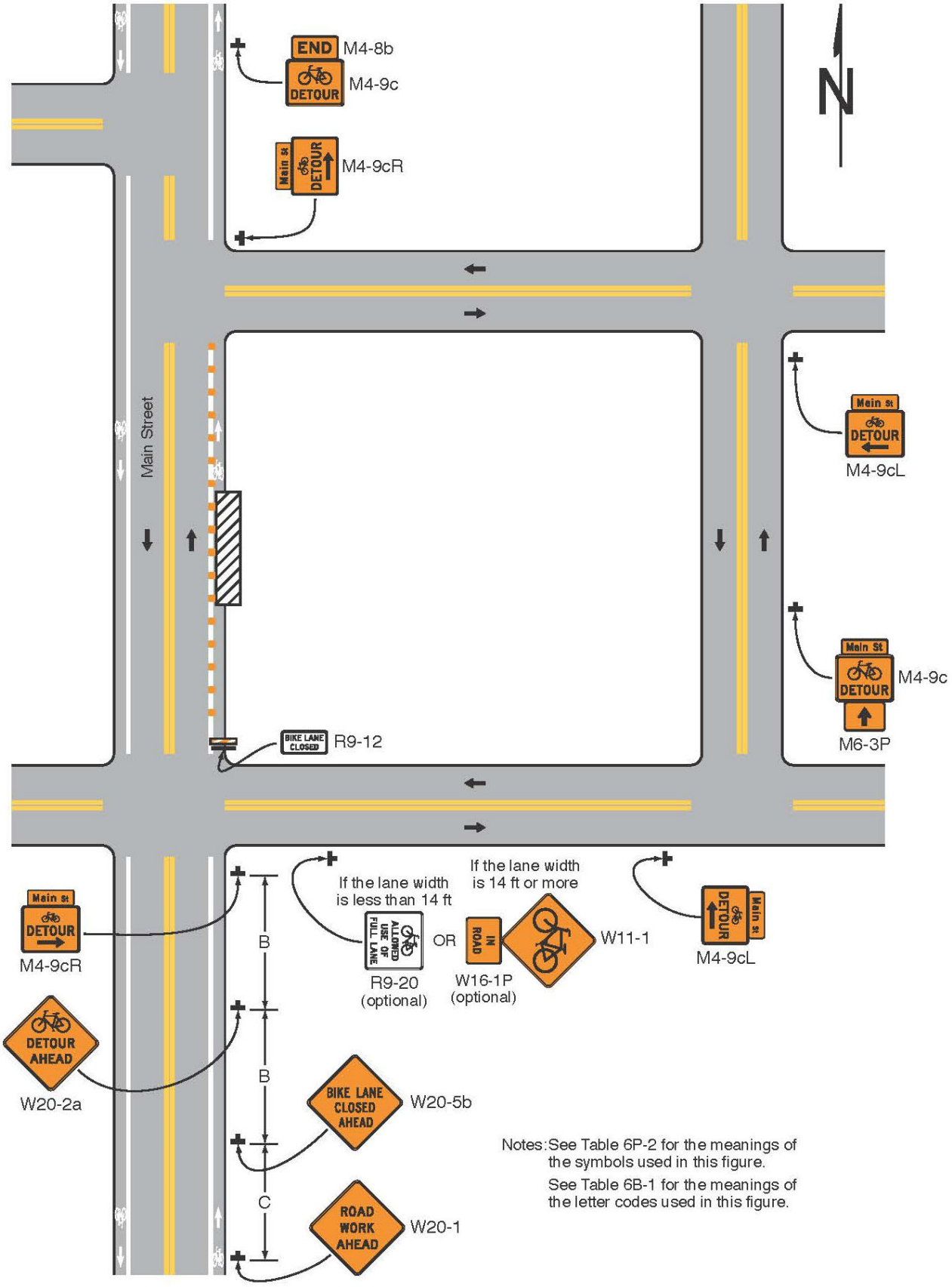
Standard:

5. **Where used, the Street Name sign or Bike Route Name sign shall be placed above the Bike Detour sign.**

Option:

6. If a bicycle lane on a roadway having a speed limit of 30 mph or less is closed, and the adjacent travel lane is less than 14 feet wide, then BICYCLES ALLOWED USE OF FULL LANE signs may be used.
7. If a bicycle lane on a roadway having a speed limit of 30 mph or less is closed, and the adjacent travel lane is at least 14 feet wide throughout the TTC zone, then Bicycle Warning signs in association with IN STREET or IN ROAD plaques may be used.

Figure 6P-48. Bicycle Lane Closure with an On-Road Detour (TA-48)



Typical Application 48

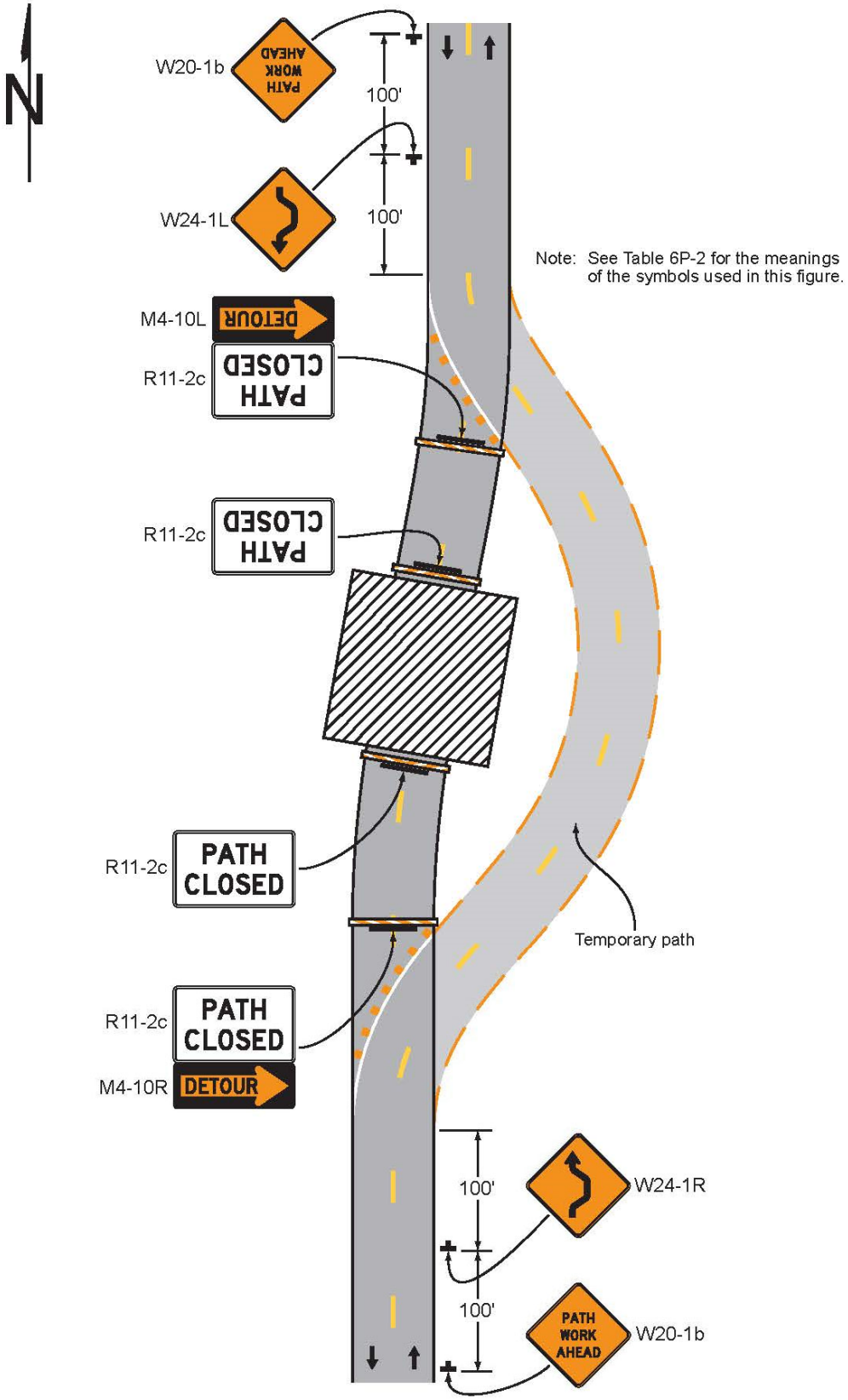
Notes for Figure 6P-49 – Typical Application 49

Shared-Use Path Closure with a Diversion

Guidance:

1. *The temporary paved shared-use path should be at least as wide as the shared-use path that was temporarily closed.*

Figure 6P-49. Shared-Use Path Closure with a Diversion (TA-49)



Typical Application 49

Notes for Figure 6P-50 – Typical Application 50

On-Road Detour for a Shared-Use Path

Guidance:

1. *The on-road detour route for bicyclists should use the most direct route practical on roadways or shoulders where conditions are appropriate for bicycling.*
2. *Bicycle related regulatory and/or warning signs should be considered along the bicycle detour based on engineering judgment and traffic conditions.*
3. *A Street Name sign or Bike Route Name sign should be mounted with the Bike Detour sign.*

Option:

4. The Street Name sign or Bike Route Name sign may be either white on green or black on orange.

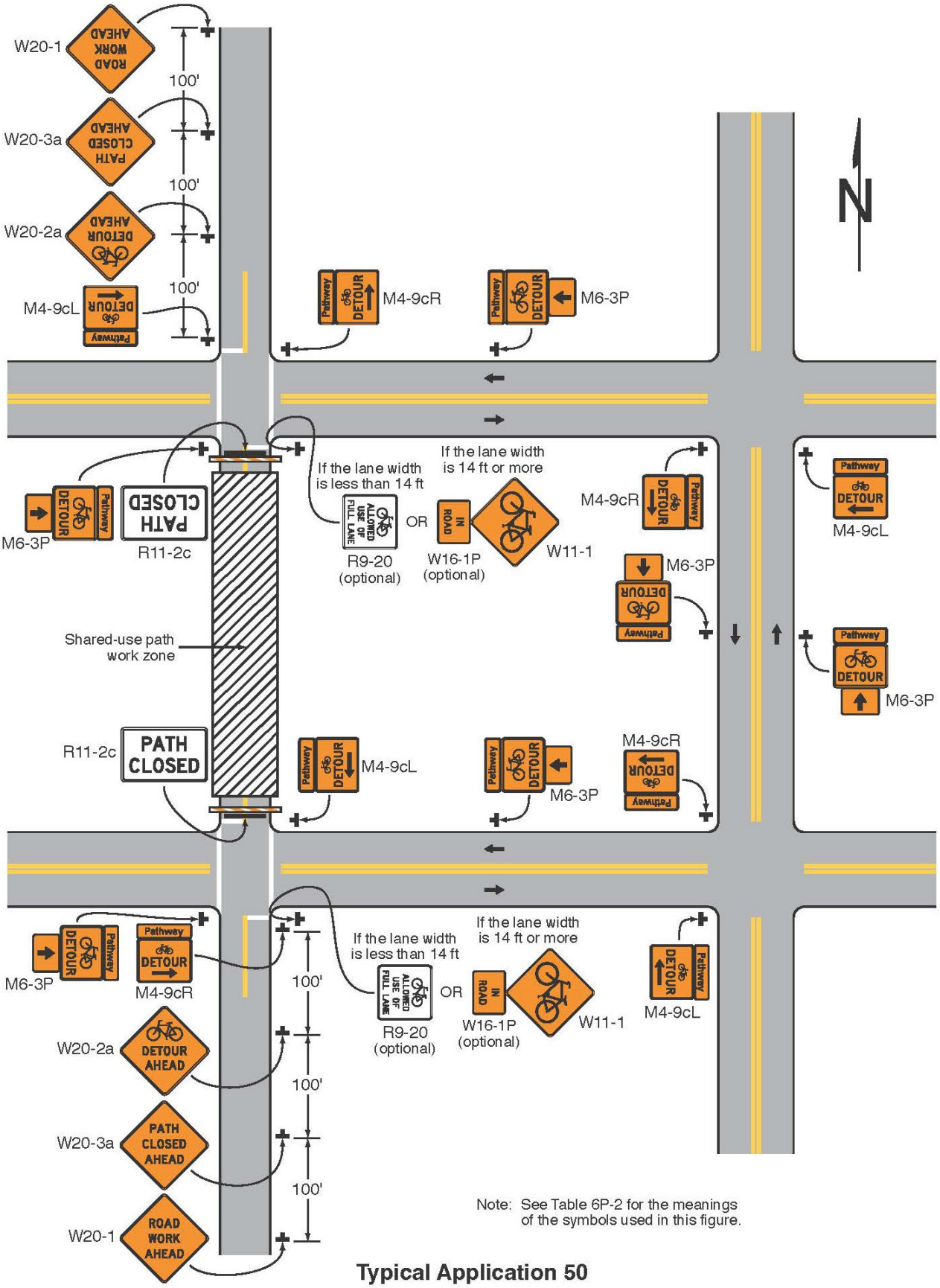
Standard:

5. **Where used the Street Name sign or Bike Route Name sign shall be placed above the Bike Detour sign.**

Option:

6. If a bicycle lane on a roadway having a speed limit of 30 mph or less is closed, and the adjacent travel lane is less than 14 feet wide, then BICYCLES ALLOWED USE OF FULL LANE signs may be used.
7. If a bicycle lane on a roadway having a speed limit of 30 mph or less is closed, and the adjacent travel lane is at least 14 feet wide throughout the TTC zone, then Bicycle Warning signs in association with IN STREET or IN ROAD plaques may be used.

Figure 6P-50. On-Road Detour for a Shared-Use Path (TA-50)



Note: See Table 6P-2 for the meanings of the symbols used in this figure.

Typical Application 50

Notes for Figure 6P-51 – Typical Application 51

Paved Shoulder Closure with a Bicycle Diversion onto a Temporary Path

Option:

1. This plan may be used where a paved shoulder is closed and a temporary paved path is provided for bicyclists.

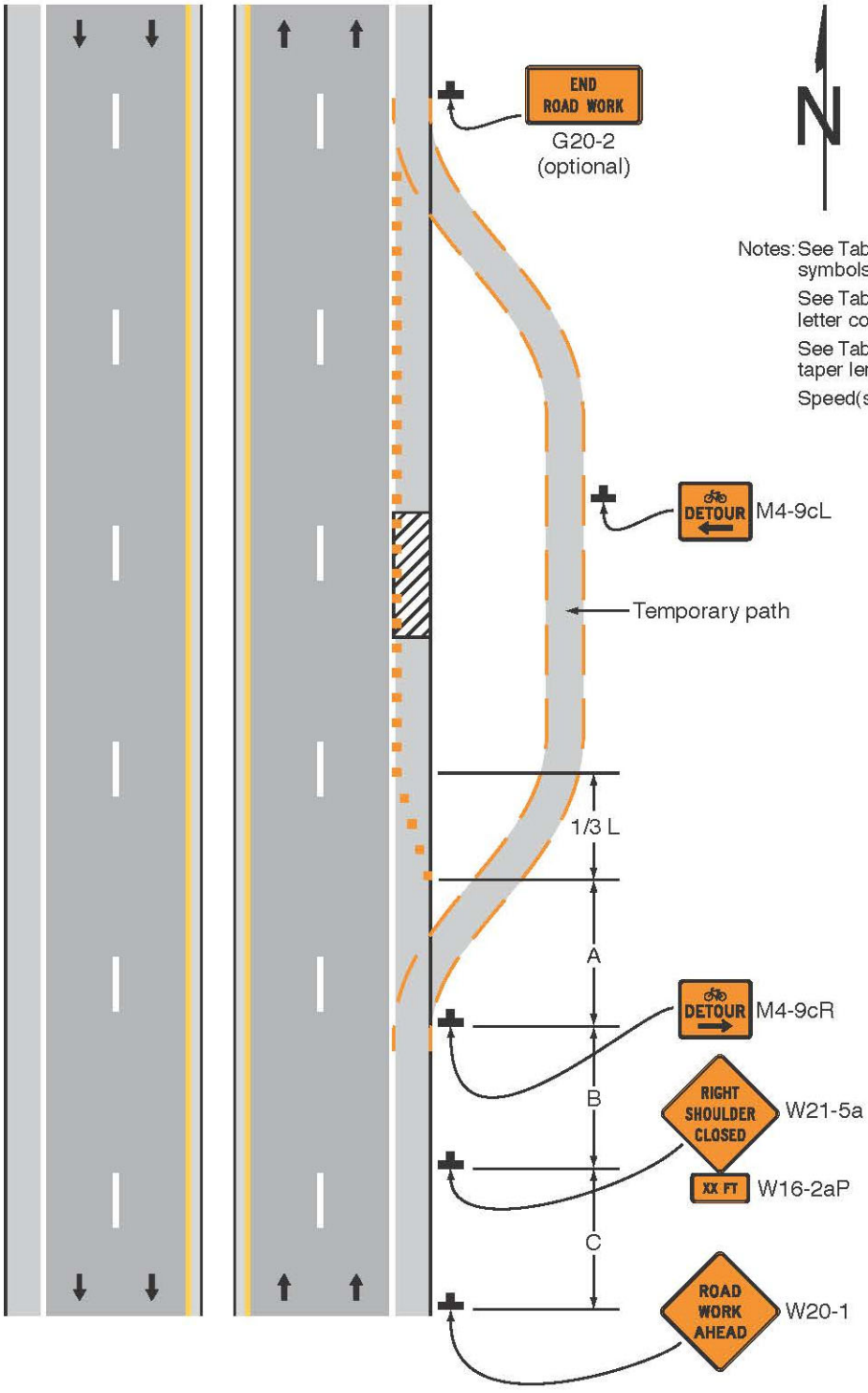
Guidance:

2. *This plan should be used where a paved shoulder is closed on a roadway having a speed limit greater than or equal to 45 mph that is part of a bikeway system (local, county or state) and a temporary paved path is provided for bicyclists.*

Support:

Wisconsin State Statute 340.01(22e) requires END ROAD WORK signs to be used to mark the end of all stationary highway maintenance or construction areas.

Figure 6P-51. Paved Shoulder Closure with a Bicycle Diversion onto a Temporary Path (TA-51)



Notes: See Table 6P-2 for the meanings of the symbols used in this figure.

See Table 6B-1 for the meanings of the letter codes used in this figure.

See Table 6B-4 for formulas for calculating taper length (L).

Speed(s) shall be motor vehicle speeds.

Based on specific site conditions and work durations, refer to Figure 6P-5 or 6P-34 for information regarding additional TTC devices and/or placement of barriers for motor vehicle traffic.

Typical Application 51

Notes for Figure 6P-52 – Typical Application 52

Short-Term or Short-Duration Work in a Circular Intersection

Option:

1. Flashing warning lights and/or flags may be used to call attention to the advance warning signs. A BE PREPARED TO STOP sign may be added to the sign series.
2. If closure continues overnight, warning lights may be used on the channelizing devices.

Standard:

3. **Where a quadrant of the circular intersection is closed, only one direction of approach traffic shall be released at a time.**
4. **At night, flagger stations shall be illuminated, except in emergencies.**
5. **WRONG WAY signs shall be covered.**

Guidance:

6. *When used, the BE PREPARED TO STOP sign should be located between the Flagger sign and the ONE LANE ROAD sign.*
7. *YIELD, ONE WAY, and Directional arrow signs should be covered or removed.*
8. *Confusing or misleading guide or lane-use control signs should be covered.*

Option:

9. Crosswalks may be closed.
10. As an alternative to closing crosswalks, warning signs may be added informing pedestrians that there is traffic coming from the left.

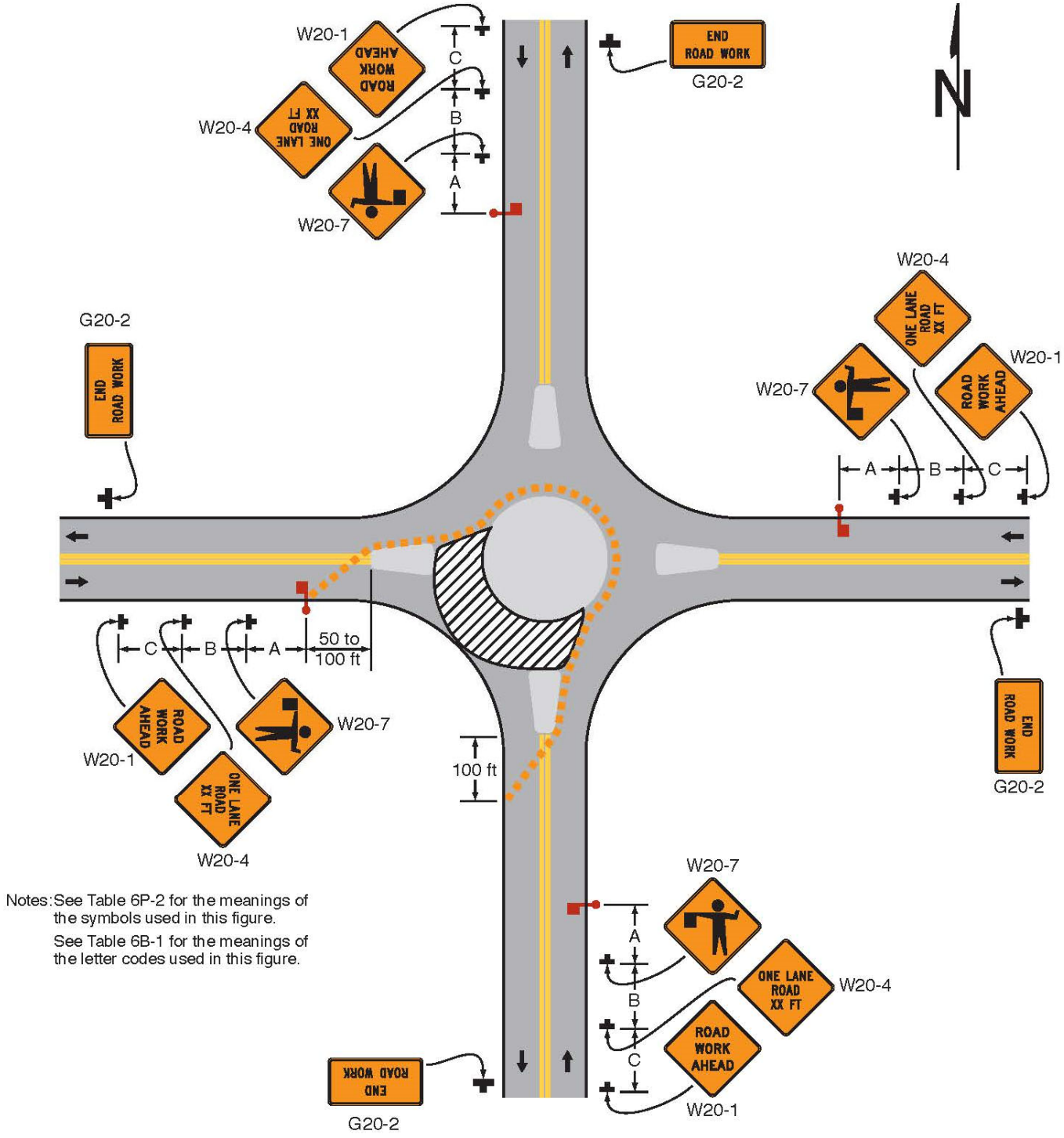
Guidance:

11. *Since the geometrics of the circular intersection will be temporarily altered, consideration should be given to establishing a truck detour for the duration of the project.*
12. *For intermediate or long-term work, the circular intersection should be closed and traffic detoured, with appropriate detour signing (see Figure 6P-8) provided.*

Support:

Wisconsin State Statute 340.01(22e) requires END ROAD WORK signs to be used to mark the end of all stationary highway maintenance or construction areas.

Figure 6P-52. Short-Term or Short-Duration Work in a Circular Intersection (TA-52)



Notes: See Table 6P-2 for the meanings of the symbols used in this figure.

See Table 6B-1 for the meanings of the letter codes used in this figure.

Typical Application 52

Notes for Figure 6P-53 – Typical Application 53
Flagging Operation on a Single-Lane Circular Intersection

Standard:

1. **Flaggers shall follow the procedures provided in Sections 6D.05 and 6D.06.**
2. **When crosswalks or other pedestrian facilities are closed or relocated, temporary facilities (see Figure 6P-29) shall be detectable and shall include accessibility features consistent with the features present in the existing pedestrian facility.**
3. **At night, flagger stations shall be illuminated, except in emergencies.**

Guidance:

4. *Flaggers on each approach to the intersection should coordinate with each other so that traffic proceeds through the circular intersection from only one entry point at any one time.*
5. *When designing the TTC and installing the channelizing devices for work activities at circular intersections, accommodations for the turning radius of wider heavy commercial vehicles should be considered.*
6. *Since the geometrics of the circular intersection will temporarily be altered, consideration should be given to establishing a truck detour for the duration of the project.*
7. *For intermediate or long-term work, the circular intersection should be closed if traffic cannot be accommodated, and traffic detoured with appropriate detour signing (see Figure 6P-8) provided.*
8. *Conflicting pavement markings should be removed for long-term projects. For short-term and intermediate-term projects where this is impracticable, the channelizing devices in the area where the pavement markings conflict should be placed at a maximum spacing of ½ S feet where S is the speed in mph. Temporary markings should be installed where needed.*
9. *When used, the BE PREPARED TO STOP sign should be located between the Flagger sign and the ONE LANE ROAD sign.*
10. *The buffer space should be extended so that the two-way traffic taper is placed before a horizontal (or crest vertical) curve to provide adequate sight distance for the flagger and a queue of stopped vehicles.*
11. *Care should be exercised when establishing the limits of the TTC zone to ensure adequate sight distance in advance of the transition.*

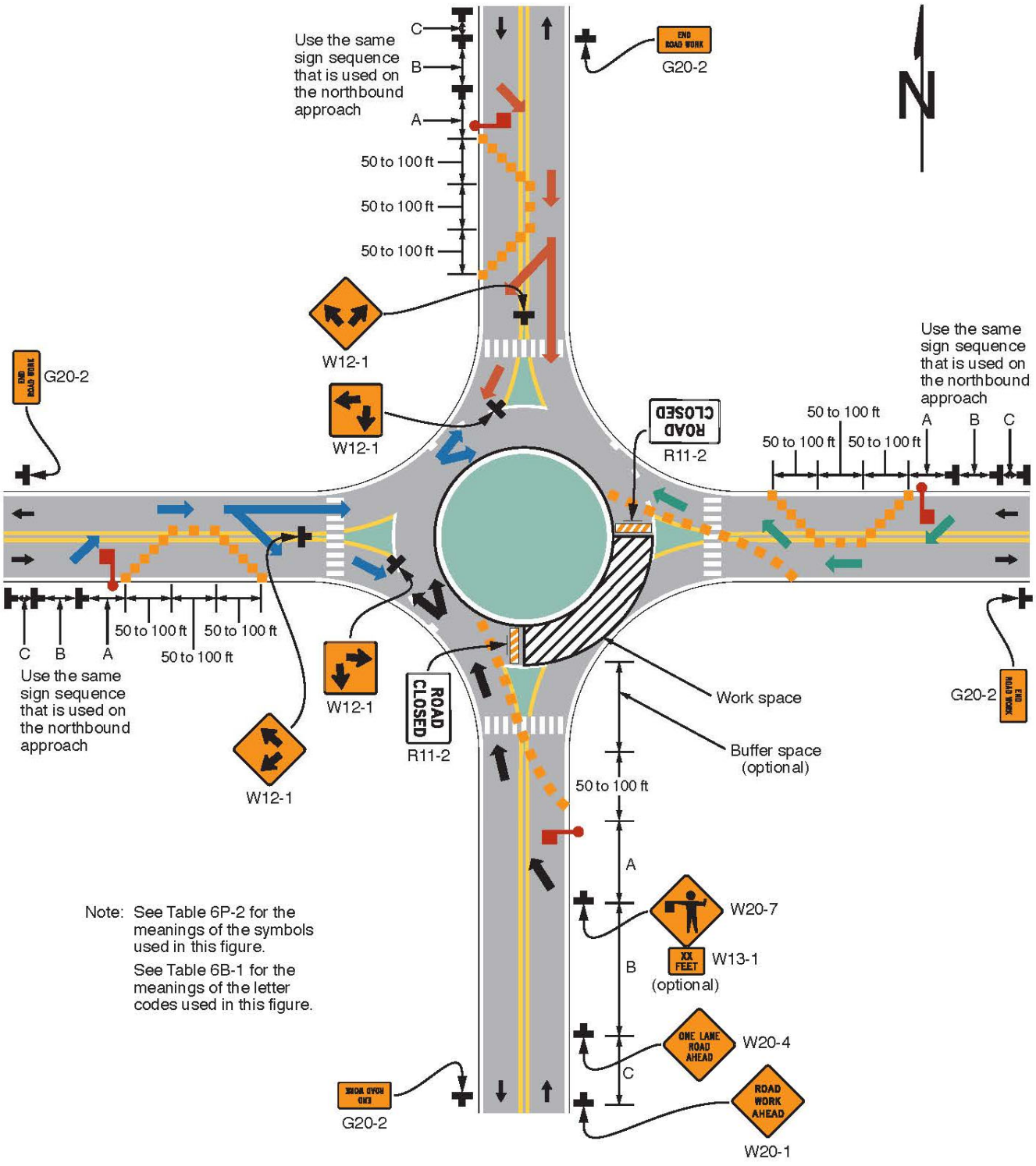
Option:

12. Periodic adjustments to the channelizing devices may be allowed in an active TTC zone to accommodate the turning movements of tractor trailer vehicles and other large vehicles.
13. On the approaches where traffic flow will be split, two pilot vehicles may be used to guide traffic through the circular intersection.

Support:

Wisconsin State Statute 340.01(22e) requires END ROAD WORK signs to be used to mark the end of all stationary highway maintenance or construction areas.

Figure 6P-53. Flagging Operation on a Single-Lane Circular Intersection (TA-53)



Note: See Table 6P-2 for the meanings of the symbols used in this figure.

See Table 6B-1 for the meanings of the letter codes used in this figure.

Typical Application 53

Notes for Figure 6P-54 – Typical Application 54

Inside Lane Closure on a Multi-Lane Circular Intersection

Standard:

1. **When crosswalks or other pedestrian facilities are closed or relocated, temporary facilities (see Figure 6P-29) shall be detectable and shall include accessibility features consistent with the features present in the existing pedestrian facility.**

Guidance:

2. *Care should be exercised when establishing the limits of the TTC zone to ensure adequate sight distance in advance of the transition.*
3. *When designing the TTC and installing the channelizing devices for work activities at circular intersections, accommodations for the turning radius of wider heavy commercial vehicles should be considered.*
4. *Since the geometrics of the circular intersection will temporarily be altered, consideration should be given to establishing a truck detour for the duration of the project.*
5. *For intermediate or long-term work, the circular intersection should be closed if traffic cannot be accommodated, and traffic detoured with appropriate detour signing provided (see Figure 6P-8).*
6. *Conflicting pavement markings should be removed for long-term projects. For short-term and intermediate-term projects where this is impracticable, the channelizing devices in the area where the pavement markings conflict should be placed at a maximum spacing of ½ S feet where S is the speed in mph. Temporary markings should be installed where needed.*

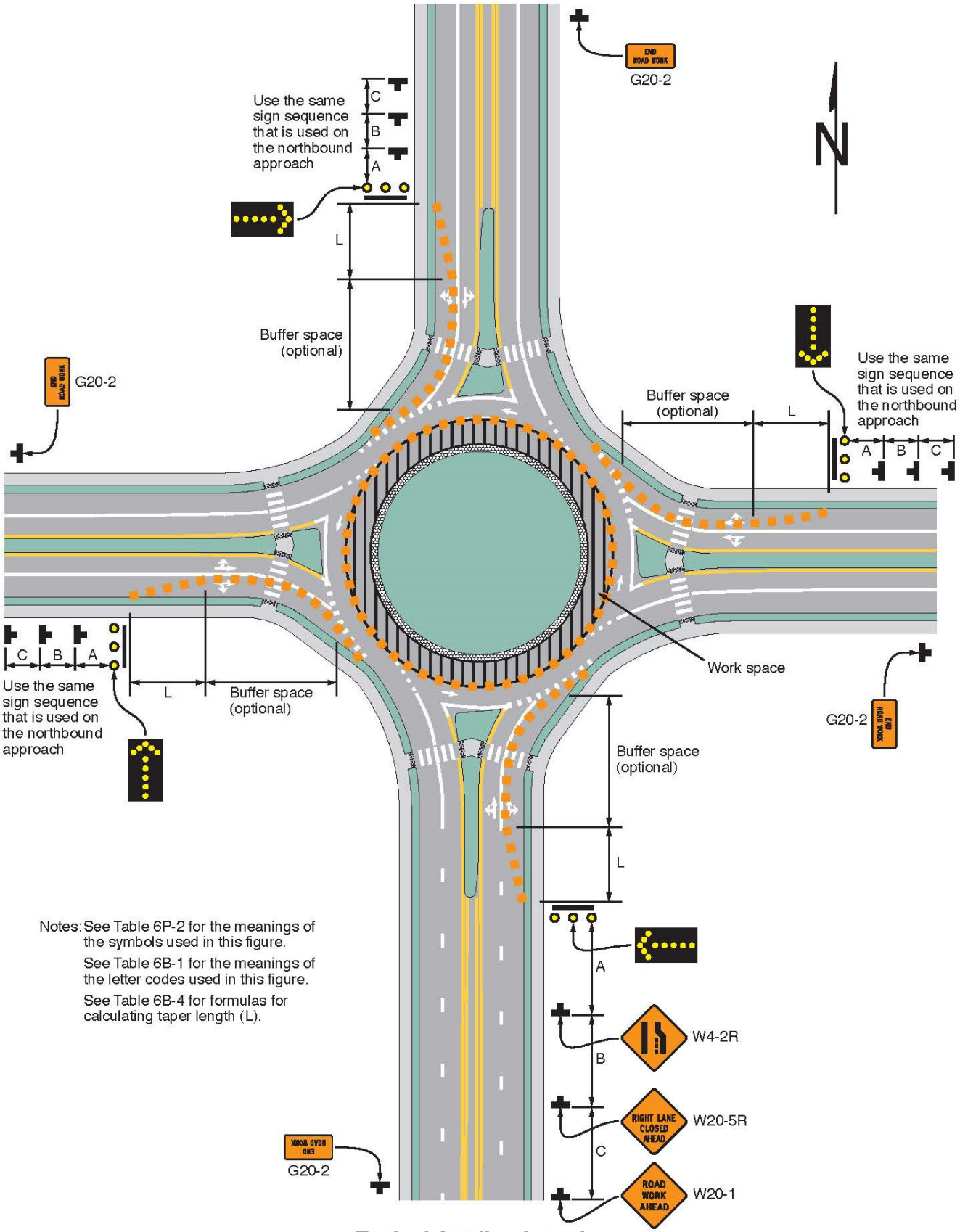
Option:

7. A portable changeable message sign may be used as part of the TTC plan to provide clear guidance to motorists on all approaches to the circular intersection.
8. On a multi-lane approach, a lane (or lanes) on either the left-hand side or the right-hand side may be closed.

Support:

Wisconsin State Statute 340.01(22e) requires END ROAD WORK signs to be used to mark the end of all stationary highway maintenance or construction areas.

Figure 6P-54. Inside Lane Closure on a Multi-Lane Circular Intersection (TA-54)



Notes: See Table 6P-2 for the meanings of the symbols used in this figure.
See Table 6B-1 for the meanings of the letter codes used in this figure.
See Table 6B-4 for formulas for calculating taper length (L).

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