2007 NOTICE OF PROPOSED AMENDMENTS

for the

MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES

MUTCD TEXT

(with revisions shown)

DECEMBER 2007

2007 NOTICE OF PROPOSED AMENDMENTS
MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES
LIST OF PARTS, CHAPTERS, AND SECTIONS

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APPENDIX A1. CONGRESSIONAL LEGISLATION

All of the text-related items on the "list of known errors" in the 2003 edition were incorporated. They are considered editorial unless otherwise noted.

Cross references to Chapters, Sections, Figures, and Tables have been updated as necessary to maintain accuracy.

The number or letter designations for items in listings within paragraphs have been updated as necessary to maintain an accurate sequence.

The word "centerline" was replaced by the phrase "center line" in 56 places in the 2003 MUTCD text in order to be consistent with "edge line."

The title of the "Standard Highway Signs and Markings" book was revised in 34 places in the 2003 MUTCD text to reflect the updated name of the book.

The Manual on Uniform Traffic Control Devices (MUTCD) is approved by the Federal Highway Administrator as the National Standard in accordance with Title 23 U.S. Code, Sections 109(d), 114(a), 217, 315, and 402(a), 23 CFR 655, and 49 CFR 1.48(b)(8), 1.48(b)(33), and 1.48(c)(2).

Addresses for Publications Referenced in the MUTCD

AAA
1000 AAA Drive
Heathrow, FL 32746
www.aaa.biz added to provide a complete list of addresses associated with the documents listed in Section 1A.11

American Association of State Highway and Transportation Officials (AASHTO)
444 North Capitol Street, NW, Suite 249
Washington, DC 20001
www.transportation.org

American National Standards Institute (ANSI)
1819 L Street, NW, 6th Floor
Washington, DC 20036
www.ansi.org added to provide a complete list of addresses associated with the documents listed in Section 1A.11

American Railway Engineering and Maintenance-of-Way Association (AREMA)
8201 Corporate Drive, Suite 1125
Landover, MD 20785-2230
www.arema.org

Federal Highway Administration Report Center
Facsimile number: 301.577.1421
report.center@fhwa.dot.gov

Illuminating Engineering Society (IES)
120 Wall Street, Floor 17
New York, NY 10005
www.iesna.org

Institute of Makers of Explosives
1120 19th Street, NW, Suite 310
Washington, DC 20036-3605

www.ime.org

Institute of Transportation Engineers (ITE)
1099 14th Street, NW, Suite 300 West
Washington, DC 20005-3438
www.ite.org

International Organization for Standards
c/o Mr. Gerard Kuso
Austrian Standards Institute
Heinestrabe 38
Postfach 130
A-1021
Wien, Austria
www.iso.ch

~~ISEA - The~~ International Safety Equipment Association (ISEA) edited to increase accuracy
1901 North Moore Street, Suite 808
Arlington, VA 22209
www.safetyequipment.org

National Committee on Uniform Traffic Laws and Ordinances (NCUTLO)
107 South West Street, Suite 110
Alexandria, VA 22314
www.ncutlo.org

Occupational Safety and Health Administration (OSHA)
U.S. Department of Labor
200 Constitution Avenue, NW
Washington, DC 20210
www.osha.gov

Transportation Research Board (TRB)
The National Academies
2101 Constitution Avenue, NW
Washington, DC 20418
www.nas.edu/trb

U.S. Architectural and Transportation Barriers Compliance Board (The U.S. Access Board)
1331 F Street, NW, Suite 1000
Washington, DC 20004-1111
www.access-board.gov

Acknowledgments

The Federal Highway Administration gratefully acknowledges the valuable assistance that it received from the National Committee on Uniform Traffic Control Devices and its over ~~200~~ 250 voluntary members in the development of this Manual.

MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES

INTRODUCTION

Standard:

Traffic control devices shall be defined as all signs, signals, markings, and other devices used to regulate, warn, or guide traffic, placed on, over, or adjacent to a street, highway, pedestrian facility, ~~or~~ bikeway, public facility, or private property open to public travel by authority of a public agency or official having jurisdiction.

The Manual on Uniform Traffic Control Devices (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, ~~or bicycle trail~~ bikeway, public facility, or private property open to public travel in accordance with 23 U.S.C. 109(d) and 402(a). The policies and procedures of the Federal Highway Administration (FHWA) to obtain basic uniformity of traffic control devices shall be as described in 23 CFR 655, Subpart F.

In accordance with 23 CFR 655.603(a), for the purposes of applicability of the MUTCD, private property open to public travel shall include toll roads and roads within shopping centers, parking lot areas, airports, sports arenas, and other similar business and/or recreation facilities that are privately owned, but where the public is allowed to travel without access restrictions. Private gated properties where public access is restricted and private highway-rail grade crossings shall not be considered to be private property open to public travel.

Any traffic control device design or application provision contained in this Manual shall be considered to 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 and any ~~other~~ items owned by FHWA.

Support:

The need for uniform standards was recognized long ago. The American Association of State Highway Officials (AASHO), now known as the American Association of State Highway and Transportation Officials (AASHTO), published a manual for rural highways in 1927, and the National Conference on Street and Highway Safety (NCSHS) published a manual for urban streets in 1930. In the early years, the necessity for unification of the standards applicable to the different classes of road and street systems was obvious. To meet this need, a joint committee of AASHO and NCSHS developed and published the original edition of this Manual on Uniform Traffic Control Devices (MUTCD) in 1935. That committee, now called the National Committee on Uniform Traffic Control Devices (NCUTCD), though changed from time to time in name, organization, and personnel, has been in continuous existence and has contributed to periodic revisions of this Manual. The FHWA has administered the MUTCD since the 1971 edition. The FHWA and its predecessor organizations have participated in the development and publishing of the previous editions. There were ~~eight~~ nine edited to increase accuracy previous editions of the MUTCD, and several of those editions were revised one or more times. Table I-1 traces the evolution of the MUTCD, including the two manuals developed by AASHO and NCSHS.

Standard:

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:

~~23 CFR 655.603 adopts the MUTCD as the national standard for any street, highway, or bicycle trail open to public travel in accordance with 23 U.S.C. 109(d) and 402(a).~~ 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.

Guidance:

The States ~~are encouraged to~~ should adopt Section 15-116 of the UVC, which states that, "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."

Support:

The Standard, Guidance, Option, and Support material described in this edition of the MUTCD provide the transportation professional with the information needed to make appropriate decisions regarding the use of traffic control devices on streets and highways. ~~The material in this edition is organized to better differentiate between Standards that must be satisfied for the particular circumstances of a situation, Guidances that should be followed for the particular circumstances of a situation, and Options that may be applicable for the particular circumstances of a situation.~~

Throughout this Manual the headings Standard, Guidance, Option, and Support are used to classify the nature of the text that follows. Figures, tables, and illustrations, or certain items 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~~ illustration, or certain item contained therein.

Standard:

When used in this Manual, the text headings shall be defined as follows:

1. **Standard—a statement of required, mandatory, or specifically prohibitive practice regarding a traffic control device. All Standard statements are labeled, and the text appears in bold type. The verb "shall" is typically used. The verb "should" is not used in Standard statements. Standard statements are sometimes modified by Options.**
2. **Guidance—a statement of recommended, but not mandatory, practice in typical situations, with deviations allowed if engineering judgment or engineering study indicates the deviation to be appropriate. All Guidance statements are labeled, and the text appears in unbold type. The verb "should" is typically used. The verb "shall" is not used in Guidance statements. Guidance statements are sometimes modified by Options.**
3. **Option—a statement of practice that is a permissive condition and carries no requirement or recommendation. Option statements ~~may~~ sometime contain allowable modifications to a Standard or Guidance statement. All Option statements are labeled, and the text appears in unbold type. The verb "may" is typically used. The verbs "shall" and "should" are not used in Option statements.**
4. **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. these four items were edited to increase consistency**

Support:

Throughout this Manual all dimensions and distances are provided in the International System of Units, a modernized version of the Metric system, and their English equivalent units are shown in parentheses.

Guidance:

Before laying out distances or determining ~~sign~~ sizes of devices, the public agency should decide whether to use the International System of Units (Metric) or the English equivalent units. The chosen units should be specified on plan drawings. The chosen unit of measurement should be made known to those responsible for designing, installing, or maintaining traffic control devices.

Signs with Metric legends are shown in the figures that illustrate sign images only if the design of the sign with Metric units differs from the design of the sign with English equivalent units in a manner that is in addition to just the legend itself. If the only design difference between the Metric sign and the English sign is the legend, only the English sign is illustrated.

Except when a specific numeral is required or recommended added to increase accuracy by the text of a Section of this Manual, numerals ~~shown~~ displayed edited to increase consistency on the ~~sign~~ 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 ~~signs~~ devices, the numerals should be appropriately altered to fit the specific ~~signing~~ situation.

Support:

The following information will be useful when reference is being made to a specific portion of text in this Manual.

There are ten Parts in this Manual and each Part is comprised of one or more Chapters. Each Chapter is comprised of one or more Sections. Parts are given a 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 number, such as Section 2B.03 – Size of Regulatory Signs.

Each Section is comprised of one or more paragraphs. The paragraphs are indented ~~but~~ and are ~~not~~ identified by a number ~~or letter~~. Paragraphs are counted from the beginning of each Section without regard to the intervening text headings (Standard, Guidance, Option, or Support). Some paragraphs have lettered or numbered items. As an example of how to cite this Manual, the phrase "Not less than 12 m (40 ft) beyond the stop line" that appears in Section 4D.14 of this Manual would be referenced in writing as "Section 4D.14, P1, A.1," and would be verbally referenced as "Item A.1 of Paragraph 1 of Section 4D.14." last sentence was updated to maintain accuracy

Standard:

In accordance with 23 CFR 655.603(b)~~(1)~~(3), States or other Federal agencies that have their own MUTCDs or Supplements to the National MUTCD shall revise these MUTCDs or Supplements to be in substantial conformance with changes to the National MUTCD within 2 years of ~~issuance of~~ the effective date of the Final Rule for the changes. Substantial conformance of such State or other Federal agency MUTCDs or Supplements shall be as defined in 23 CFR 655.603(b)(1). Unless a particular device is no longer serviceable, 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). In cases involving Federal-aid projects for new highway or bikeway construction or reconstruction, the traffic control devices installed (temporary or permanent) shall be in conformance 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 23 CFR 655.603(d)(3)]. The FHWA has the authority to establish other target compliance dates for implementation of particular changes to the MUTCD [23 CFR 655.603(d)~~(4)~~(1)]. These target compliance dates established by the FHWA shall be as follows:

Section 2A.06 Design of Signs—e-mail addresses prohibited on signs—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2A.12 Symbols—use of symbols from one type of sign on a different type of sign—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2A.13 Word Messages—ratio of letter height to legibility distance for sign letter sizes should be based on 1:30 ratio—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2A.19 Lateral Offset—crashworthiness of sign supports—January 17, 2013 for roads with posted speed limit of 80 km/h (50 mph) or higher.

Section 2B.03 Size of Regulatory Signs—increased sign sizes and other changes to Table 2B-1 in 2003 MUTCD—~~10 years from the effective date of the Final Rule for the 2003 MUTCD~~ December 22, 2013. edited to increase clarity now that the effective date is known

Section 2B.03 Size of Regulatory Signs—increased sign sizes and other changes to Table 2B-1 in 2009 MUTCD—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2B.03 Size of Regulatory Signs—required sign sizes for multi-lane roadways in new Table 2B-2 in 2009 MUTCD—10 years from the effective date of the Final Rule for the 2009 MUTCD.

~~Section 2B.04 STOP Sign (R1-1)—4-WAY plaque requirement—January 17, 2004.~~ no longer relevant

~~Section 2B.06 STOP Sign Placement—signs mounted on back of STOP sign—10 years from the effective date of the Final Rule for the 2003 MUTCD.~~ deleted because it is now incorporated into the Section 2B.10 compliance date

Section 2B.09 YIELD Sign Applications—changes in YIELD sign application criteria from the 1988 MUTCD—January 17, 2011.

Section 2B.10 STOP sign or YIELD Sign Placement—~~signs mounted~~ prohibition of items on back of STOP or YIELD signs and Guidance on other signs back-to-back with STOP or YIELD signs not obscuring shape and deletion of exception for DO NOT ENTER signs—10 years from the effective date of the Final Rule for the ~~2003~~ 2009 MUTCD. former item superseded by new item

Section 2B.11 Yield Here To Pedestrians Signs and Stop Here For Pedestrians Signs (R1-5~~, R1-5a~~ Series)—new Section in 2003 MUTCD added to increase accuracy —~~10 years from the effective date of the Final Rule for the 2003 MUTCD~~ December 22, 2013. edited to increase clarity now that the effective date is known

Section 2B.12 In-Street and Overhead Pedestrian Crossing Signs (R1-6, R1-6a, R1-9, and R1-9a)—new Overhead Pedestrian Crossing (R1-9 or R1-9a) signs—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2B.12 In-Street and Overhead Pedestrian Crossing Signs (R1-6, R1-6a, R1-9, and R1-9a)—special support requirements for in-street signs—5 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2B.13 Speed Limit Sign (R2-1)—color of changeable message legend of YOUR SPEED legend—~~10 years from the effective date of the Final Rule for the 2003 MUTCD~~ December 22, 2013. edited to increase clarity now that the effective date is known

Section 2B.19 Intersection Lane Control Signs (R3-5 through R3-8)—overhead lane-use signs should be provided for lane drops and shared through/turn lanes at signalized locations—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2B.25 Reversible Lane Control Signs (R3-9d, R3-9f through R3-9i)—removal of R3-9c and R3-9e signs—~~10 years from the effective date of the Final Rule for the 2003 MUTCD~~ December 22, 2013. edited to increase clarity now that the effective date is known

Sections 2B.26 through 2B.30 Regulatory Signs for Preferential ~~Only~~ Lanes ~~Signs (R3-10 through R3-15)—10 years from the effective date of the Final Rule for the 2003 MUTCD~~ December 22, 2013. edited to increase clarity now that the effective date is known

~~Section 2B.27 Preferential Only Lanes for High-Occupancy Vehicles (HOVs)—new section in Millennium Edition—January 17, 2007.~~ **no longer relevant**

~~Section 2B.28 Preferential Only Lane Sign Applications and Placement—10 years from the effective date of the Final Rule for the 2003 MUTCD.~~ **deleted because it is now incorporated into the Sections 2B.26 through 2B.30 compliance date**

Section 2B.31 Regulatory Signs for Toll Plazas—regulatory signs for toll plazas—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2B.32 Regulatory Signs for Managed Lanes and ETC Only Lanes—regulatory signs for managed lanes and ETC only lanes—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2B.33 Jughandle Signs (R3-23, R3-24, R3-25, and R3-26 Series)—regulatory signs for jughandles—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2B.35 DO NOT PASS WHEN SOLID LINE IS ON YOUR SIDE Sign (R4-15)—new R4-15 sign—10 years from the effective date of the Final Rule for the 2009 MUTCD.

~~Section 2B.37 ONE WAY Signs (R6-1, R6-2)—placement requirement at intersecting alleys—January 17, 2008.~~ **no longer relevant**

Section 2B.43 Slow Vehicle Turn-Out Signs (R4-12, R4-13, and R4-14)—new slow vehicle turn-out signs—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2B.46 Selective Exclusion Signs—new legends for various selective exclusion signs—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2B.47 ONE WAY Signs (R6-1, R6-2)—new requirement for ONE WAY signs—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2B.49 Divided Highway Crossing Signs (R6-3, R6-3a)—required use of Divided Highway Crossing signs—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Sections 2B.50 and 2B.51 Roundabout Signs—new regulatory signs for roundabouts—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2B.54 Design of Parking, Standing, and Stopping Signs—new signs for fee parking—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2B.59 Traffic Signal Signs (R10-1 through R10-32P)—changes to R10-1 through R10-4 series of pedestrian signs, and new signs and new designs for various traffic signal signs in Figure 2B-30—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2B.60 Photo Enforced Signs and Plaques (R10-18, R10-19P, R10-19aP)—new Section in 2003 MUTCD added to increase accuracy —~~10 years from the effective date of the Final Rule for the 2003 MUTCD~~ December 22, 2013. edited to increase clarity now that the effective date is known

Section 2B.61 Ramp Metering Signs (R10-28 and R10-29)—new ramp metering signs—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2B.65 Weigh Station Signs (R13 Series)—new design and legend for R13-1 sign—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2B.67 Hazardous Material Signs (R14-2, R14-3)—change in sign legend—~~10 years from the effective date of the Final Rule for the 2003 MUTCD~~ December 22, 2013. edited to increase clarity now that the effective date is known

Section 2B.69 Headlight Use Signs (R16-5 through R16-12)—new headlight use signs—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2B.70 Miscellaneous Regulatory Signs—new R16-4 sign—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2C.03 Design of Warning Signs—use of fluorescent yellow-green background color for pedestrian, bicycle, school, and playground signs and their related supplemental plaques—10 years from the effective date of the Final Rule for the 2009 MUTCD.

~~Section 2C.04 Size of Warning Signs—increased sizes of W4-1, W5-2, W6-3, and W12-1 signs—January 17, 2008.~~ **no longer relevant**

Section 2C.04 Size of Warning Signs—sizes of W1 Series Arrows signs, ~~W7 Series runaway truck signs,~~ superseded by new Section 2F.12 ~~W12-2p~~ W12-2a edited to increase accuracy low clearance signs, and W10-1 advance grade crossing sign—~~10 years from the effective date of the Final Rule for the 2003 MUTCD~~ December 22, 2013. edited to increase clarity now that the effective date is known

Section 2C.04 Size of Warning Signs—size of warning signs on multi-lane roads and changes in sizes in Table 2C-2—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2C.05 Placement of Warning Signs—revisions in Table 2C-4—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Sections 2C.06 through 2C.14 Horizontal Alignment Warning Signs—revised requirements regarding various horizontal alignment signs—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2C.13 Truck Rollover Warning Sign~~s~~ (W1-13~~, W1-13a~~)—new Section in 2003 MUTCD added to increase accuracy —~~10 years from the effective date of the Final Rule for the 2003 MUTCD~~ December 22, 2013. edited to increase clarity now that the effective date is known

Section 2C.14 Advisory Exit and Ramp Speed Signs (W13-2 and W13-3)—elimination of Curve Speed (W13-5) warning sign—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2C.19 NARROW BRIDGE Sign (W5-2)—elimination of symbol sign—~~10 years from the effective date of the Final Rule for the 2003 MUTCD~~ December 22, 2013. edited to increase clarity now that the effective date is known

Section 2C.21 Divided Highway Sign (W6-1)—removal of W6-1a and W6-1b word message signs—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2C.22 Divided Highway Ends Sign (W6-2)—removal of W6-2a and W6-2b word message signs—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2C.23 Freeway or Expressway Ends Signs (W19 Series)—new W19 series signs—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2C.29 PAVEMENT ENDS Sign (W8-3)—removal of symbol sign—January 17, 2011.

Section 2C.30 Shoulder and Uneven Lanes Signs (W8-4, W8-9, ~~and W8-9a~~ W8-17, and W8-23)—~~removal of~~ new symbol design for W8-17 sign~~s~~—~~January 17, 2011~~ 10 years from the effective date of the Final Rule for the 2009 MUTCD. new item supersedes previous item

Section 2C.31 Surface Condition Signs (W8-5, W8-7, W8-8, W8-13, and W8-14)—new W8-14 symbol sign—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2C.32 Warning Signs and Plaques for Motorcyclists (W8-15, W8-15P, and W8-16)—new W8-15 and W8-16 signs and new W8-15P plaque—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2C.34 Weather Condition Signs (W8-18, W8-19, W8-21, and W8-22)—new signs for weather conditions—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2C.35 Advance Traffic Control Signs (W3-1, W3-2, W3-3, W3-4)—removal of W3-1a, W3-2a, W3-3a word message signs—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2C.36 Advance Ramp Control Signal Signs (W3-7 and W3-8)—new signs for ramp metering—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2C.37 Reduced Speed ~~Reduction~~ Limit Ahead edited to increase consistency Signs (W3-5, W3-5a)—removal of R2-5 Series Reduced Speed Ahead signs and use of W3-5 or W3-5a warning signs instead—~~15 years from the effective date of the Final Rule for the 2003 MUTCD~~ December 22, 2018. edited to increase clarity now that the effective date is known

Section 2C.39 Merge Signs (W4-1, W4-5)—Entering Roadway Merge sign (~~W4-1a~~ W4-5 edited to increase accuracy)—~~10 years from the effective date of the Final Rule for the 2003 MUTCD~~ December 22, 2013. edited to increase clarity now that the effective date is known

Section 2C.40 Added Lane Signs (W4-3, W4-6)—Entering Roadway Added Lane sign (~~W4-3a~~ W4-6 edited to increase accuracy)—~~10 years from the effective date of the Final Rule for the 2003 MUTCD~~ December 22, 2013. edited to increase clarity now that the effective date is known

Section 2C.41 Lane Ends Signs (W4-2, W4-7, W9-1, W9-2)—new design of W4-2 sign—~~10 years from the effective date of the Final Rule for the 2003 MUTCD~~ December 22, 2013. edited to increase clarity now that the effective date is known

Section 2C.42 RIGHT (LEFT) LANE EXIT ONLY AHEAD Sign (W9-7)—new W9-7 sign—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Sections 2C.43 and 2C.44 Toll Facility Signs—new signs for toll facilities—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2C.45 Two-Way Traffic Sign (W6-3)—transition from one-way street—~~5 years from the effective date of the Final Rule for the 2003 MUTCD~~ December 22, 2008. edited to increase clarity now that the effective date is known

Section 2C.48 Intersection Warning Signs (W2-1 through W2-8)—new design of Circular Intersection (W2-6) sign—~~10 years from the effective date of the Final Rule for the 2003 MUTCD~~ December 22, 2013. edited to increase clarity now that the effective date is known

Section 2C.51 Vehicular Traffic Signs (W8-6, W11-1, W11-5, W11-5a, W11-8, W11-10, W11-11, W11-12P, W11-14, and W11-15)—new symbol signs W11-1, W11-5, W11-5a, W11-6, W11-11, and W11-14—~~10 years from the effective date of the Final Rule for the 2003 MUTCD~~ December 22, 2013. edited to increase clarity now that the effective date is known

Section 2C.51 Vehicular Traffic Signs (W8-6, W11-1, W11-5, W11-5a, W11-8, W11-10, W11-11, W11-12P, W11-14, and W11-15)—new W11-15 symbol sign—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2C.52 Nonvehicular Signs (W11-2, W11-3, W11-4, W11-6, W11-7, W11-9, and W11-16 through W11-22)—elimination of crosswalk lines from crossing signs and use of diagonal downward pointing arrow (W16-7P) supplemental plaque if at the crossing—January 17, 2011.

Section 2C.52 Nonvehicular Signs (W11-2, W11-3, W11-4, W11-6, W11-7, W11-9, and W11-16 through W11-22)—required use of fluorescent yellow-green background color for school signs and their related supplemental plaques—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2C.52 Nonvehicular Signs (W11-2, W11-3, W11-4, W11-6, W11-7, W11-9, and W11-16 through W11-22)—recommended use of fluorescent yellow-green background color for pedestrian, bicycle, and playground signs and their related supplemental plaques—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2C.52 Nonvehicular Signs (W11-2, W11-3, W11-4, W11-6, W11-7, W11-9, and W11-16 through W11-22)—new W11-16 through W11-22 symbol signs for various large animals—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2C.54 NEW TRAFFIC PATTERN AHEAD Sign (W23-2)—new W23-2 sign—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2C.61 Advance Street Name Plaque (W16-8P, W16-8aP)—requirement to use a combination of lower-case letters with initial upper-case letters—15 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2C.65 PHOTO ENFORCED Plaque (W16-10P)—new Section in 2003 MUTCD added to increase accuracy ~~—10 years from the effective date of the Final Rule for the 2003 MUTCD~~ December 22, 2013. edited to increase clarity now that the effective date is known

Section 2C.67 NEW Plaque (W16-15P)—new W16-15P plaque—2 years from the effective date of the Final Rule for the 2009 MUTCD.

Sections 2C.68 and 2C.69 Toll Facility Plaques—new plaques for toll facilities—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2D.05 Lettering Style—elimination of the practice for names of places, streets, and highways on conventional road guide signs of using all upper-case letters—15 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2D.08 Arrows—requirements for design and positioning of down arrows on overhead guide signs—15 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2D.25 TOLL Auxiliary Sign (M4-15)—requirement for use of TOLL auxiliary sign—5 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2D.26 Electronic Toll Collection (ETC) Only Auxiliary Signs (M4-16 and M4-20)—requirement for use of ETC Only auxiliary sign—5 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2D.35 Combination Lane Use/Destination Overhead Guide Sign (D15-1)—design of combined lane-use/destination overhead guide signs—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2D.45 Street Name Signs (D3-1 or D3-1a)—~~symbol sizes,~~ 150 mm (6 in) letter ~~sizes~~ height for lettering on ~~ground-~~ post-mounted edited to increase consistency Street Name signs (except on ~~roads that are not~~ multi-lane streets with speed limits greater than 60 km/h (40 mph)~~, other new provisions of Millennium Edition~~—January 9, 2012.

Section 2D.45 Street Name Signs (D3-1 or D3-1a)—200 mm (8 in) letter ~~sizes~~ height on ~~ground-~~ post-mounted edited to increase consistency signs on multi-lane streets with speed limits greater than 60 km/h (40 mph) and 300 mm (12 in) letter ~~sizes~~ height on overhead ~~mounted~~ edited to increase consistency signs—~~15 years from the effective date of the Final Rule for the 2003 MUTCD~~ December 22, 2018. edited to increase clarity now that the effective date is known

Section 2D.45 Street Name Signs (D3-1 or D3-1a)—pictograph on street name sign should be to right of street name—15 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2D.45 Street Name Signs (D3-1 or D3-1a)—limitations on alternative colors for street name signs—15 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2D.46 Advance Street Name Signs (D3-2)—new Section in 2000 MUTCD and revisions in 2003 MUTCD—~~15 years from the effective date of the Final Rule for the 2003 MUTCD~~ December 22, 2018. edited to increase clarity now that the effective date is known

~~Section 2D.45 General Service Signs (D9 Series)—Traveler Info Call 511 (D12-5) sign, Channel 9 Monitored (D12-3) sign—10 years from the effective date of the Final Rule for the 2003 MUTCD.~~ **this item is now shown as compliance dates for Sections 2F.07 and 2F.08**

Section 2D.47 Signing on Conventional Roads on Approaches to Interchanges—requirement for multi-lane approaches to interchanges to have guide signs to identify which direction of turn is to be made for access to each direction of the freeway or expressway—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2D.52 Community Wayfinding Signs—community wayfinding signs—15 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2D.53 Truck, Passing, or Climbing Lane Signs (D17-1 and D17-2)—new designs for truck lane signs—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2D.54 Slow Vehicle Turn-Out Sign (D17-7)—new D17-7 sign—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2E.19 Arrows for Interchange Guide Signs—requirements for design and positioning of down arrows on overhead guide signs—15 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2E.20 Diagrammatic Signs—new design and placement requirements for diagrammatic signs—15 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2E.21 Signing for Interchange Lane Drops—new requirements for use of EXIT ONLY and down arrows for lane drops—15 years from the effective date of the Final Rule for the 2009 MUTCD.

~~Section 2E.28 Interchange Exit Numbering—size of exit number plaque—January 17, 2008.~~ no longer relevant

Section 2E.27 Interchange Exit Numbering—LEFT on exit number plaques for left-hand exits—~~5 years from the effective date of the Final Rule for the 2003 MUTCD~~ December 22, 2018. change from 5 to 15 years is from errata list for 2003 MUTCD – edited to increase clarity now that the effective date is known

Sections 2E.27 Interchange Exit Numbering—required use of the reference location exit numbering system—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Sections 2E.29, 2E.32, and 2E.36 Freeway and Expressway Guide Signing—black-on-yellow LEFT sign panel requirements—10 years from the effective date of the Final Rule for the 2009 MUTCD.

~~Section 2E.30 Advance Guide Signs—advance placement distance—January 17, 2008.~~ no longer relevant

Sections 2E.51 ~~to~~ through 2E.54 Preferential ~~Only~~ Lane Guide Signs—new Section (2E.59) in the 2003 ~~Edition~~ MUTCD—~~10 years from the effective date of the Final Rule for the 2003 MUTCD~~ December 22, 2013. edited to increase clarity now that the effective date is known

Sections 2E.51 through 2E.54 Preferential Lane Guide Signs—new provisions in the 2009 MUTCD for preferential lane guide signing—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Sections 2E.55 through 2E.60 Toll Facility and Toll Plaza Signs—new provisions regarding toll facility and toll plaza signing—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2E.61 Guide Signs for Managed Lanes—new provisions for guide signs for managed lanes—5 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2F.02 General Service Signs for Conventional Roads—new designs for the D9-10 and D9-16 signs—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2F.04 Interstate Oasis Signing—Interstate Oasis signing—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2F.05 Rest Area and Other Roadside Area Signs—new D9-21 and D9-22 signs—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2F.07 Radio Information Signing —Channel 9 Monitored (D12-3) sign—December 22, 2013. this item was previously shown as a compliance date for Section 2D.45

Section 2F.08 TRAVEL INFO CALL 511 Sign (D12-5)—December 22, 2013. this item was previously shown as a compliance date for Section 2D.45

Section 2F.10 Brake Check Area Signs (D5-13 and D5-14)—new signs—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2F.11 Chain Up Area Signs (D5-15 and D5-16)—new signs—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2F.12 Truck Escape Ramp Signs (D17-3, D17-4, and D17-5)—new sign designs (colors)—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2G.03 Logos and Logo Sign Panels—design and location of RV Access message on logo sign panels—5 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2G.03 Logos and Logo Sign Panels—new provisions in this Section other than the design and location of RV Access message on logo sign panels—15 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2G.05 Size of Lettering—minimum height of letters and numerals on specific service signs—January 17, 2011.

Section 2G.05 Size of Lettering—letter sizes for word legend only logo sign panels—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2I.01 Reference Location Signs (D10-1 through D10-3) and Intermediate Reference Location Signs (D10-1a through D10-3a)—location and spacing of Reference Location signs and design of Intermediate Reference Location signs—~~10 years from the effective date of the Final Rule for the 2003 MUTCD~~ December 22, 2013. edited to increase clarity now that the effective date is known

Section 2I.03 ~~Reference Location Signs and~~ Enhanced Reference Location Signs (D10-4, D10-5)—design of Enhanced Reference Location signs and Intermediate Enhanced Reference Location signs—~~10 years from the effective date of the Final Rule for the 2003 MUTCD~~ December 22, 2013. edited to increase clarity now that the effective date is known

Section 2I.09 Acknowledgement Signs—new provisions for acknowledgement signs—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2J.04 General Design Requirements for Recreational and Cultural Interest Area Symbol Guide Signs—new designs for various recreational and cultural interest area signs—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 2K.03 Evacuation Route Signs (EM-1 and EM-1a)—new design and size of EM-1 sign—~~15 years from the effective date of the Final Rule for the 2003 MUTCD~~ December 22, 2018. edited to increase clarity now that the effective date is known

Section ~~3C.01~~ 2L.01 Object Marker Design and Placement Height—width of stripes on Type 3 striped marker—~~10 years from the effective date of the Final Rule for the 2003 MUTCD~~ December 22, 2013. edited to increase clarity now that the effective date is known

Chapter 2M Changeable Message Signs—new provisions for changeable message signs—10 years from the effective date of the Final Rule for the 2009 MUTCD.

~~Section 3B.01 Yellow Centerline Pavement Markings and Warrants—new section in Millennium Edition—January 3, 2003.~~ **no longer relevant**

Section 3B.03 Other Yellow Longitudinal Pavement Markings—spacing requirements for pavement marking arrows in two-way left-turn lanes—~~5 years from the effective date of the Final Rule for the 2003 MUTCD~~ December 22, 2008. edited to increase clarity now that the effective date is known

Sections 3B.04 and 3B.05 White Longitudinal Pavement Markings—dotted lines required for acceleration, deceleration, and auxiliary lanes—5 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 3B.05 Other White Longitudinal Pavement Markings—required locations for channelizing lines at exit and entrance ramp gores—5 years from the effective date of the Final Rule for the 2009 MUTCD.

~~Section 3B.07 Warrants for Use of Edge Lines—new section in Millennium Edition—January 3, 2003.~~ **no longer relevant**

Section 3B.09 Lane Reduction Transition Markings—use of dotted lines for lane reductions—5 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 3B.16 Stop and Yield Lines—stop lines shall not be used for yield conditions—5 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 3B.17 Do Not Block Intersection Markings—new Section—5 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 3B.18 Crosswalk Markings—gap between transverse lines of a crosswalk—~~10 years from the effective date of the Final Rule for the 2003 MUTCD~~ December 22, 2013. edited to increase clarity now that the effective date is known

Section 3B.20 Pavement Word, ~~and~~ Symbol, and Arrow Markings—~~typical~~ spacing of lane-use arrows in two-way left-turn lanes shown in Figure 3B-7—~~5 years from the effective date of the Final Rule for the 2003 MUTCD~~ December 22, 2008. edited to increase clarity now that the effective date is known

Section 3B.20 Pavement Word, Symbol, and Arrow Markings—lane-use arrows should be used for certain conditions and should be located in certain positions—5 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 3B.20 Pavement Word, Symbol, and Arrow Markings—ONLY marking should be used with turn arrows in dropped lanes—5 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 3B.20 Pavement Word, Symbol, and Arrow Markings—lane reduction arrow should be used where speed is 70 km/h (45 mph) or above—5 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 3B.22 Speed Reduction Markings—new Section—5 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 3B.24 Preferential Lane Word and Symbol Markings—preferential lane markings for ETC only lanes—5 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 3B.25 Preferential Lane Longitudinal Markings for Motor Vehicles—markings for buffer-separated and counter-flow preferential lanes—5 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 3B.26 Chevron and Diagonal Crosshatching Markings—requirement to use chevron markings in gores rather than optional diagonal markings—5 years from the effective date of the Final Rule for the 2009 MUTCD.

Sections 3B.27 and 3B.28 Speed Hump Markings and Advance Speed Hump Markings—if used, shall be as depicted—5 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 3B.29 Markings for Toll Plazas—recommended use of solid lane lines and required design of optional purple markings—5 years from the effective date of the Final Rule for the 2009 MUTCD.

Chapter 3C Roundabout Markings—changes from existing requirements and recommendations—5 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 3D.03 Delineator Application—delineators should be used with guardrail or longitudinal barriers—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 4C.04 Warrant 3, Peak Hour—signal should be actuated if this is only warrant met—15 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 4C.05 Warrant 4, Pedestrian Volume—signal should also control side street or driveway if installed at such location based on this warrant only—15 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 4C.06 Warrant 5, School Crossing—signal should also control side street or driveway if installed at such location based on this warrant only—15 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 4D.01 General—location of signalized midblock crosswalks—~~10 years from the effective date of the Final Rule for the 2003 MUTCD~~ December 22, 2013. edited to increase clarity now that the effective date is known

Section 4D.04 Signal Indications – Design, Illumination, Color, and Shape—strobes shall not be used—5 years from the effective date of the Final Rule for the 2009 MUTCD.

Section ~~4D.05~~ 4D.10 Application of Steady Signal Indications—Item B.4 in the third paragraph of the Standard edited to increase consistency —~~5 years from the effective date of the Final Rule for the 2003 MUTCD~~ December 22, 2008. edited to increase clarity now that the effective date is known

Section 4D.11 Number of Signal Faces on an Approach—various recommendations for signal displays for approaches with speeds of more than 60 km/h or more than 40 mph—15 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 4D.12 Visibility, Aiming, and Shielding of Signal Faces—backplates should be used for approaches with speeds of more than 60 km/h or more than 40 mph—15 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 4D.13 Lateral Positioning of Signal Faces—overhead-mounted separate flashing yellow arrow and flashing red arrow turn signal faces shall be over the turn lane—15 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 4D.17 Signal Indications for Left-Turn Movements – General—a protected only mode left-turn movement that does not begin and terminate at the same time as the adjacent through movement shall not be provided on an approach unless an exclusive left-turn lane exists—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 4D.19 Signal Indications for Protected Only Mode Left-Turn Movements—elimination of the use of a circular red signal indication in a protected only left-turn signal face for an approach where the CIRCULAR GREEN and left-turn GREEN ARROW signal indications do not begin and terminate together—15 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 4D.21 Signal Indications for Right-Turn Movements – General—a protected only mode right-turn movement that does not begin and terminate at the same time as the adjacent through movement shall not be provided on an approach unless an exclusive right-turn lane exists—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 4D.25 Signal Indications for Approaches With Shared Left-Turn/Right-Turn Lanes and No Through Movement—required signal displays for approaches with a shared left-turn/right-turn lane and no through movement—15 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 4D.26 Yellow Change and Red Clearance Intervals—red clearance interval should be provided when indicated by engineering practices, and durations of yellow change and red clearance intervals shall be determined using engineering practices—5 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 4D.27 Preemption and Priority Control of Traffic Control Signals—signals with railroad preemption should have backup power—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section ~~4D.12~~ 4D.31 Flashing Operation ~~of Traffic Control Signals~~ – Transition Out of Flashing Mode—duration of steady red clearance interval in change from red-red flashing mode to steady (stop-and-go) mode—~~10 years from the effective date of the Final Rule for the 2003 MUTCD~~ December 22, 2013. edited to increase clarity now that the effective date is known

Section 4D.34 Use of Signs at Signalized Locations—overhead lane-use signs should be provided for lane drops and shared through/turn lanes at signalized locations—10 years from the effective date of the Final Rule for the 2009 MUTCD.

~~Section 4E.06 Accessible Pedestrian Signals—new section in Millennium Edition—January 17, 2005.~~ no longer relevant

Section 4E.06 Accessible Pedestrian Signals—accessible pedestrian signals shall have both audible and vibrotactile features—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 4E.06 Accessible Pedestrian Signals—speech walk messages shall only be used where it is infeasible to install two pushbuttons more than 3 m (10 ft) apart on same corner—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 4E.07 Countdown Pedestrian Signals—new Section in 2003 MUTCD added to increase accuracy —~~10 years from the effective date of the Final Rule for the 2003 MUTCD~~ December 22, 2013 edited to increase clarity now that the effective date is known for countdown pedestrian signal hardware~~; 3 years from the effective date of the Final Rule for the 2003 MUTCD for operational requirements of countdown pedestrian signals~~. second portion is no longer relevant

Section 4E.07 Countdown Pedestrian Signals—addition of pedestrian change interval countdown displays to existing pedestrian signal heads—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 4E.08 Pedestrian Detectors—required positioning of pedestrian pushbuttons—15 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 4E.08 Pedestrian Detectors—new requirements in this Section except positioning of pedestrian pushbuttons—10 years from the effective date of the Final Rule for the 2009 MUTCD.

~~Section 4E.09 Accessible Pedestrian Signal Detectors—new section in Millennium Edition—January 17, 2005.~~ no longer relevant

Section 4E.09 Accessible Pedestrian Signal Detectors—locator tone shall be provided with accessible pedestrian signal pushbutton and other new requirements for accessible pedestrian signal pushbuttons—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 4E.10 Pedestrian Intervals and Signal Phases—pedestrian clearance time sufficient to travel to far side of the traveled way—~~5 years from the effective date of the Final Rule for the 2003 MUTCD~~ December 22, 2008. edited to increase clarity now that the effective date is known

Section 4E.10 Pedestrian Intervals and Signal Phases—pedestrian change interval shall not extend into yellow change and red clearance intervals—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 4E.10 Pedestrian Intervals and Signal Phases—slower recommended walking speed for calculating pedestrian clearance time—5 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 4E.10 Pedestrian Intervals and Signal Phases—if pedestrian clearance time only enough to get to median, additional pedestrian signal faces, pushbuttons, and signs shall be provided in median—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Chapter 4F Pedestrian Hybrid Signals—new Chapter—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 4G.04 Emergency-Vehicle Hybrid Signals—new Section—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 4I.02 Design of Freeway Entrance Ramp Control Signals—two signal faces for each lane with staggered release ramp metering signals—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 4J.02 Design and Location of Movable Bridge Signals and Gates—use of vertical stripes on gates—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Chapter 4K Toll Plaza Traffic Signals—new Chapter—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 4L.03 Warning Beacon—beacons with toll plaza canopy signs should be distinctly separate from lane-use signals—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 4M.01 Application of Lane-Use Control Signals—requirement to use lane-use control signals over the centers of controlled lanes at toll plazas—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 4N.02 In-Roadway Warning Lights at Crosswalks—requirement for sign with each pushbutton and requirement for additional pedestrian detector in median if period of operation is only enough to get to median—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 5C.05 NARROW BRIDGE Sign (W5-2)—elimination of symbol sign—~~10 years from the effective date of the Final Rule for the 2003 MUTCD~~ December 22, 2013. edited to increase clarity now that the effective date is known

Section 6D.01 Pedestrian Considerations—all new provisions for pedestrian accessibility—~~5 years from the effective date of the Final Rule for the 2003 MUTCD~~ December 22, 2008. edited to increase clarity now that the effective date is known

Section 6D.02 Accessibility Considerations—new Section in 2003 MUTCD— added to improve clarity ~~5 years from the effective date of the Final Rule for the MUTCD~~ December 22, 2008. edited to increase clarity now that the effective date is known

Section 6D.03 Worker Safety Considerations—all workers within the right-of-way shall wear high-visibility apparel ~~requirements—3~~ 2 years from the effective date of the Final Rule for the ~~2003~~ 2009 MUTCD.

Section 6E.02 High-Visibility Safety Apparel—all flaggers within the right-of-way shall wear high-visibility apparel ~~requirements for flaggers—3~~ 2 years from the effective date of the Final Rule for the ~~2003~~ 2009 MUTCD.

Sections 6E.04 through 6E.06 Automated Flagger Assistance Devices—new Sections—5 years from the effective date of the Final Rule for the 2009 MUTCD.

~~**Section 6F.03 Sign Placement—crashworthiness of sign supports—January 17, 2005.**~~ **no longer relevant**

Section 6F.30 NEW TRAFFIC PATTERN AHEAD Sign (W23-2)—new W23-2 sign—5 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 6F.57 Portable Changeable Message Signs—new requirements—5 years from the effective date of the Final Rule for the 2009 MUTCD.

~~Section 6F.58 Channelizing Devices—crashworthiness—January 17, 2005.~~ no longer relevant

Section 6F.61 Cones—width of retroreflective stripes—~~5 years from the effective date of the Final Rule for the 2003 MUTCD~~ December 22, 2008. edited to increase clarity now that the effective date is known

~~Section 6F.63 Type I, II, or III Barricades—crashworthiness—January 17, 2005.~~ no longer relevant

~~Section 6F.66 Longitudinal Channelizing Barricades—crashworthiness—January 17, 2005.~~ no longer relevant

Section 6F.70 Temporary Lane Separators—new Section—5 years from the effective date of the Final Rule for the 2009 MUTCD.

~~Section 6F.82 Crash Cushions—crashworthiness—January 17, 2005.~~ no longer relevant

Typical Applications 37, 38, 39, 42, and 44—arrow board required for each lane closed—2 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 7B.07 Sign Color for School Warning Signs—required use of fluorescent yellow-green background color for school signs and their related supplemental plaques—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 7B.10 School Advance ~~Warning~~ Crossing Assembly ~~(S1-1 with Supplemental Plaque)~~—use of AHEAD (W16-9P) plaque or distance plaque (W16-2P or W16-2aP)—January 17, 2011.

Section 7B.11 School ~~Crosswalk Warning~~ Crossing Assembly ~~(S1-1 with Diagonal Downward Pointing Arrow)~~—elimination of crosswalk lines from crossing signs and use of diagonal downward pointing arrow (W16-7P) supplemental plaque—January 17, 2011.

Section 7B.12 School Bus Stop Ahead Sign (S3-1)—new S3-1 sign—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 7B.13 SCHOOL BUS TURN AHEAD Sign (S3-2)—new S3-2 sign—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 7B.15 Reduced ~~Speed~~ School ~~Zone~~ Speed Limit edited to increase consistency Ahead Sign (S4-5, S4-5a)—removal of REDUCED SPEED AHEAD (R2-5a) signs and use of S4-5 or S4-5a warning signs instead— added to improve clarity ~~15 years from the effective date of the Final Rule for the 2003 MUTCD~~ December 22, 2018. edited to increase clarity now that the effective date is known

Section 7B.16 END SCHOOL ZONE Sign (S5-2)—required use of S5-2 sign—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 7D.04 Uniform of Adult Crossing Guards ~~and Student Patrols~~—new requirements for high-visibility apparel for adult crossing guards—~~5~~ 2 years from the effective date of the Final Rule for the ~~2003~~ 2009 MUTCD.

Section 8B.03 Highway-Rail Grade Crossing (Crossbuck) Sign (R15-1) and Number of Tracks ~~Sign~~ Plaque (R15-2P)—retroreflective strip on crossbuck support—January 17, 2011.

Sections 8B.04 and 8B.05 STOP or YIELD Signs at Grade Crossings—required use of STOP or YIELD signs with Crossbuck signs at passive grade crossings—5 years from the effective date of the Final Rule for the 2009 MUTCD.

~~Section 8B.04 Highway-Rail Grade Crossing Advance Warning Signs (W10 Series)—removal of existing W10-6 series signs—January 17, 2006.~~ no longer relevant

Section 8B.06 Highway-Rail Grade Crossing Advance Warning Signs (W10 Series)—required use of No Signal or SIGNAL AHEAD plaques with W10-1 through W10-4 signs—5 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 8B.13 Emergency Notification Sign (I-13)—new design—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 8C.04 Automatic Gates—use of vertical stripes—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 8C.06 Wayside Horn Systems—new Section—5 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 8C.08 Traffic Control Signals at or Near Highway-Rail Grade Crossings—pre-signals—~~10 years from the effective date of the Final Rule for the 2003 MUTCD~~ December 22, 2013. edited to increase clarity now that the effective date is known

Section 8C.08 Traffic Control Signals at or Near Highway-Rail Grade Crossings—signals with railroad preemption should have backup power—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 8C.09 Highway-Rail Grade Crossing(s) Within or In Close Proximity to Roundabouts, Traffic Circles, or Circular Intersections—requirements for grade crossings near roundabouts—5 years from the effective date of the Final Rule for the 2009 MUTCD.

Chapter 8E Pathway-Rail Grade Crossings—new Chapter—5 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 9B.01 Application and Placement of Signs—minimum 2.4 m (8 ft) vertical clearance of overhead traffic control devices over shared-use paths—10 years from the effective date of the Final Rule for the 2009 MUTCD.

~~Section 9B.04 Bicycle Lane Signs (R3-17, R3-17a, R3-17b)—deletion of preferential lane symbol (diamond) for bicycle lane signs—January 17, 2006.~~ **no longer relevant**

Section 9B.06 Bicycles May Use Full Lane Sign (R4-11)—new R4-11 sign—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 9B.09 Selective Exclusion Signs—new signs—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 9B.18 Bicycle Warning and Combined Bicycle/Pedestrian Signs (W11-1 and W11-15)—elimination of crosswalk lines from crossing signs and use of diagonal downward pointing arrow (W16-7P) supplemental plaque if at the crossing—January 17, 2011.

Section 9B.18 Bicycle Warning and Combined Bicycle/Pedestrian Signs (W11-1 and W11-15)—new W11-15 sign—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 9B.19 Other Bicycle Warning Signs—BIKEWAY NARROWS replaced by PATH NARROWS—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 9B.20 Bicycle Guide Signs (D1-1b, D1-1c, D1-2b, D1-2c, D1-3b, D1-3c, D11-1, D11-1c)—new designs for guide and destination signs—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 9B.21 Bicycle Route Signs (M1-8, M1-8a, M1-9)—new designs for bike route number signs—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 9B.24 Reference Location Signs (D10-1 through D10-3) and Intermediate Reference Location Signs (D10-1a through D10-3a)—new Section—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 9B.25 Mode-Specific Guide Signs for Shared-Use Paths (D11-1a, D11-1b, D11-2, D11-3, D11-4)—new Section—10 years from the effective date of the Final Rule for the 2009 MUTCD.

~~Chapter 9C Markings—deletion of preferential lane symbol (diamond) for bicycle pavement markings—January 17, 2007.~~ **no longer relevant**

Section 9C.07 Shared Lane Marking—new Section—5 years from the effective date of the Final Rule for the 2009 MUTCD.

Part 10 Traffic Controls for Highway-Light Rail Transit Grade Crossings—automatic gates, flashing-light signals, and blank-out signs—January 17, 2011.

Section 10C.02 Highway-Rail Grade Crossing Advance Warning Signs (W10 Series)—required use of No Signal or SIGNAL AHEAD plaques with W10-1 through W10-4 signs—5 years from the effective date of the Final Rule for the 2009 MUTCD.

~~Section 10C.15 Highway-Rail Grade Crossing Advance Warning Signs (W10 Series)—removal of existing W10-6 series signs—January 17, 2006.~~ **no longer relevant**

Section 10C.15 Highway-Rail Grade Crossing Advance Warning Signs (W10 Series)—required use of No Signal or SIGNAL AHEAD plaques with W10-1 through W10-4 signs—5 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 10C.21 Emergency Notification Sign (I-13)—new design—10 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 10D.01 Introduction—audible device requirement—5 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 10D.05 Wayside Horn Systems—new Section—5 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 10D.08 Use of Traffic Control Signals for Control of Light Rail Transit Vehicles at Grade Crossings —recommended design of light rail transit signal indications—15 years from the effective date of the Final Rule for the 2009 MUTCD.

Section 10D.10 Highway-Light Rail Transit Grade Crossing(s) Within or In Close Proximity to Roundabouts, Traffic Circles, or Circular Intersections—requirements for grade crossings near roundabouts—5 years from the effective date of the Final Rule for the 2009 MUTCD.

Chapter 10F Pathway-Light Rail Transit Grade Crossings—new Chapter—5 years from the effective date of the Final Rule for the 2009 MUTCD.

Option:

In order for maintenance personnel to understand what to do when replacing a damaged non-compliant traffic control device, agencies may establish a policy regarding whether to replace the device in kind or to replace it with a compliant device.

Support:

Often it is desirable to upgrade to a compliant device at the time of this maintenance of a damaged device. However, it might be appropriate to replace the damaged non-compliant device in kind at the time of this maintenance activity if engineering judgment indicates that:

A. One compliant device in the midst of a series of adjacent non-compliant devices could potentially be confusing to road users; and/or
B. The anticipated schedule for replacement of the whole series of non-compliant devices will result in achieving timely compliance with the MUTCD.

MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES
TABLE OF CONTENTS updated to maintain accuracy

CHAPTER 1A. GENERAL

Section 1A.01 Purpose of Traffic Control Devices

Support:

The purpose of traffic control devices, as well as the principles for their use, is to promote highway safety and efficiency by providing for the orderly movement of all road users on streets, ~~and~~ highways, bikeways, public facilities, and private property open to public travel throughout the Nation.

Traffic control devices notify road users of regulations and provide warning and guidance needed for the ~~reasonably safe,~~ uniform~~,~~ and efficient operation of all elements of the traffic stream in a manner intended to minimize the occurrences of crashes.

Standard:

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

Support:

Tourist-oriented directional signs and Specific Service signs are not considered advertising; rather, they are classified as motorist service signs.

Section 1A.02 Principles of Traffic Control Devices

Support:

This Manual contains the basic principles that govern the design and use of traffic control devices for all streets, ~~and~~ highways, bikeways, public facilities, and private property open to public travel regardless of type or class or the public agency or official having jurisdiction. This Manual's text 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:

To be effective, a traffic control device should meet five basic requirements:

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.

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 meet the five requirements listed in the previous paragraph. Vehicle speed should be carefully considered as an element that governs the design, operation, placement, and location of various traffic control devices.

Support:

The definition of the word "speed" varies depending on its use. The definitions of specific speed terms are contained in Section 1A.13.

Guidance:

The actions required of road users to obey regulatory devices should be specified by State statute, or in cases not covered by State statute, by local ordinance or resolution. Such statutes, ordinances, and resolutions should be edited to increase clarity consistent with the "Uniform Vehicle Code" (see Section 1A.11).

The proper use of traffic control devices should provide the reasonable and prudent road user with the information necessary to ~~reasonably safely~~ efficiently and lawfully use the streets, highways, pedestrian facilities, and bikeways in a manner intended to minimize the occurrences of crashes.

Support:

Uniformity of the meaning of traffic control devices is vital to their effectiveness. The meanings ascribed to devices in this Manual are in general accord with the publications mentioned in Section 1A.11.

Section 1A.03 Design of Traffic Control Devices

Guidance:

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; that size, shape, color, and

simplicity of message combine to produce a clear meaning; that legibility and size combine with placement to permit adequate time for response; and that uniformity, size, legibility, and reasonableness of the message combine to command respect.

~~**Standard:**~~

~~**All symbols shall be unmistakably similar to or mirror images of the adopted symbol signs, all of which are shown in the "Standard Highway Signs and Markings" book (see Section 1A.11). Symbols and colors shall not be modified unless otherwise stated herein. All symbols and colors for signs not shown in the "Standard Highway Signs and Markings" book shall follow the procedures for experimentation and change described in Section 1A.10.**~~ **this paragraph was relocated to Section 2A.06**

~~Guidance:~~

Aspects of a device's standard design should be modified only if there is a demonstrated need.

Support:

An example of modifying a device's design would be to modify the ~~Side Road (W2-2)~~ Combination Horizontal Alignment/Intersection (W1-10) sign to show ~~a second offset~~ intersecting side roads on both sides rather than on just one side of the major road within the curve.

Option:

~~Highway agencies may develop word message signs to notify road users of special regulations or to warn road users of a situation that might not be readily apparent. Unlike symbol signs and colors, new word message signs may be used without the need for experimentation.~~ this text was relocated to Section 2A.06

With the exception of symbols and colors, minor modifications in the specific design elements of a device may be made provided the essential appearance characteristics are preserved. ~~Although the standard design of symbol signs cannot be modified, it may be appropriate to change the orientation of the symbol to better reflect the direction of travel.~~ this text was relocated to Section 2A.06

Section 1A.04 Placement and Operation of Traffic Control Devices

Guidance:

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.

Traffic control devices should be placed and operated in a uniform and consistent manner.

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.

Section 1A.05 Maintenance of Traffic Control Devices

Guidance:

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

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:

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

Section 1A.06 Uniformity of Traffic Control Devices

Support:

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. Uniformity means treating similar situations in a similar way. The use of uniform traffic control devices does not, in itself, constitute uniformity. A standard device used where it is not appropriate is as objectionable as a nonstandard device; in fact, this might be worse, because such misuse might result in disrespect at those locations where the device is needed and appropriate.

Section 1A.07 Responsibility for Traffic Control Devices

Standard:

The responsibility for the design, placement, operation, maintenance, and uniformity of traffic control devices shall rest with the public agency or the official having jurisdiction. 23 CFR 655.603 adopts the Manual on Uniform Traffic Control Devices as the national standard for all traffic control devices installed on any street, highway, or ~~bicycle trail~~ bikeway, public facility, or private property open to public travel. When a State or other Federal agency manual or supplement is required, that manual or supplement shall be in substantial conformance with the ~~a~~National ~~Manual on Uniform Traffic Control Devices~~ MUTCD. edited to increase consistency

23 CFR 655.603 also states that traffic control devices on all streets, ~~and~~ highways, public facilities, and private property open to public travel in each State shall be in substantial conformance with standards issued or endorsed by the Federal Highway Administrator.

Support:

The Introduction of this Manual contains information regarding the meaning of substantial conformance and the applicability of the MUTCD to private property open to public travel.

The "Uniform Vehicle Code" (see Section 1A.11) has the following provision in Section 15-104 for the adoption of a uniform ~~M~~manual: edited to increase accuracy

> "(a) The [State Highway Agency] shall adopt a manual and specification for a uniform system of traffic control devices consistent with the provisions of this code for use upon highways within this State. Such uniform system shall correlate with and so far as possible conform to the system set forth in the most recent edition of the Manual on Uniform Traffic Control Devices for Streets and Highways, and other standards issued or endorsed by the Federal Highway Administrator."
>
> "(b) The Manual adopted pursuant to subsection (a) shall have the force and effect of law."

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.

Guidance:

Additionally, States ~~are encouraged to~~ should adopt Section 15-116 of the "Uniform Vehicle Code," which states that, "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."

Section 1A.08 Authority for Placement of Traffic Control Devices

Standard:

Traffic control devices, advertisements, announcements, 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, for the purpose of regulating, warning, or guiding traffic.

When the public agency or the official having jurisdiction over a street or highway has granted proper authority, others such as contractors and public utility companies shall be permitted to install temporary traffic control devices in temporary traffic control zones. Such traffic control devices shall conform with the Standards of this Manual.

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

Support:

Provisions of this Manual are based upon the concept that effective traffic control depends upon both appropriate application of the devices and reasonable enforcement of the regulations.

Although some highway design features, such as curbs, median barriers, guardrails, impact attenuators (crash cushions), speed humps or tables, and textured pavement, have a significant impact on traffic operations and safety, they are not considered to be traffic control devices and provisions regarding their design and use are generally not included in this Manual.

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. Most of these signs and other devices are not intended for use by road users in general, and their message is only important to individuals who have been instructed in their

meanings. 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. Examples include 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. Examples include markers that identify fire hydrant locations, signs that identify fire or water district boundaries, speed measurement pavement markings, and small indicator lights to assist in enforcement of red light violations.
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.
E. Signs giving civic organization meeting information.

Guidance:

Signs and other devices that do not have any traffic control purpose that are 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 should be located where they will not interfere with, or detract from, traffic control devices.

Any unauthorized traffic control device or other sign or message placed on the highway right-of-way by a private organization or individual constitutes a public nuisance and should be removed. All unofficial or nonessential traffic control devices, signs, or messages should be removed.

Section 1A.09 Engineering Study and Engineering Judgment

Standard:

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

Guidance:

The decision to use a particular device at a particular location should be made consistent with the principles of this Manual and, if required by this Manual, on the basis of either an engineering study or the application of engineering judgment. 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 the roads and streets that the devices complement. Jurisdictions with responsibility for traffic control that do not have engineers on their staffs who are trained and/or experienced in traffic control devices added to increase accuracy should seek engineering assistance from others, such as the State transportation agency, their county, a nearby large city, or a traffic engineering consultant.

Section 1A.10 Interpretations, Experimentations, Changes, and Interim Approvals

Standard:

Design, application, and placement of traffic control devices other than those adopted in this Manual shall be prohibited unless the provisions of this Section are followed.

Support:

Continuing advances in technology 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. In addition, unique situations often arise for device applications that might require interpretation or clarification of this Manual. It is important to have a procedure for recognizing these developments and for introducing new ideas and modifications into the system.

Standard:

Except as noted in the Option below, requests for any interpretation, permission to experiment, interim approval, or change shall be ~~sent~~ submitted electronically to the Federal Highway Administration (FHWA), Office of Transportation Operations, ~~400 Seventh Street, SW, HOTO, Washington, DC 20590~~ MUTCD team, at the following e-mail address: MUTCDofficialrequest@dot.gov.

Option:

Although electronic submittal is strongly preferred by the FHWA, requests for interpretations, permission to experiment, interim approvals, or changes may instead be mailed to the Office of Transportation Operations, HOTO-1, Federal Highway Administration, 1200 New Jersey Avenue, SE, Washington, DC 20590 if electronic submittal is not possible.

Support:

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 team member. Their e-mail addresses are available through the links contained on the "Who's Who" page on the MUTCD website at http://mutcd.fhwa.dot.gov/team.htm.

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

Guidance:

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:

Requests to experiment 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.

A request for permission to experiment will be considered only when submitted by the public agency or private toll facility responsible for the operation of the road or street on which the experiment is to take place.

A diagram indicating the process for experimenting with traffic control devices is shown in Figure 1A-1.

Guidance:

The request for permission to experiment should contain the following:

A. A statement indicating the nature of the problem.
B. A description of the proposed change to the traffic control device or application of the traffic control device, how it was developed, the manner in which it deviates from the standard, and how it is expected to be an improvement over existing standards.
C. Any illustration that would be helpful to understand the traffic control device or use of the traffic control device.
D. Any supporting data explaining how the traffic control device was developed, if it has been tried, in what ways it was found to be adequate or inadequate, and how this choice of device or application was derived.
E. A legally binding statement certifying that the concept of the traffic control device is not protected by a patent or copyright. (An example of a traffic control device concept would be countdown pedestrian signals in general. Ordinarily an entire general concept would not be patented or copyrighted, but if it were it would not be acceptable for experimentation unless the patent or copyright owner signs a waiver of rights acceptable to the FHWA. An example of a patented or copyrighted specific device within the general concept of countdown pedestrian signals would be a manufacturer's design for its specific brand of countdown signal, including the design details of the housing or electronics that are unique to that manufacturer's product. As long as the general concept is not patented or copyrighted, it is acceptable for experimentation to incorporate the use of one or more patented devices of one or several manufacturers.)
F. The time period and location(s) of the experiment.
G. A detailed research or evaluation plan that must provide for close monitoring of the experimentation, especially in the early stages of its field implementation. The evaluation plan should include before and after studies as well as quantitative data describing the performance of the experimental device.
H. 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 must also provide that the agency sponsoring the experimentation will terminate the experimentation at any time that it determines significant safety concerns are directly or indirectly attributable to the experimentation. The FHWA's Office of Transportation Operations has the right to terminate approval of the experimentation at any time if there is an indication of safety concerns. 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 device or application will be permitted to remain in place until an official rulemaking action has occurred.

I. An agreement to provide semiannual progress reports for the duration of the experimentation, and an agreement to provide a copy of the final results of the experimentation to the FHWA's Office of Transportation Operations within 3 months following completion of the experimentation. The FHWA's Office of Transportation Operations has the right to terminate approval of the experimentation if reports are not provided in accordance with this schedule.

Support:

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:

Requests for a change to this Manual 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: revisions to the interim approval process were to improve clarity

~~Requests for~~ Interim approval ~~include consideration of allowing~~ allows interim 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. The FHWA issues an Interim Approval by official memorandum signed by the Associate Administrator for Operations and posts this memorandum on the MUTCD website. ~~If granted,~~ The issuance by FHWA of an interim approval will typically result in the traffic control device or application being placed into the next scheduled rulemaking process for revisions to this Manual. ~~The device or application will be permitted to remain in place, under any conditions established in the interim approval, until an official rulemaking action has occurred.~~

Interim approval is considered based on the results of successful experimentation, results of analytical or laboratory studies, and/or review of non-U.S. experience with a traffic control device or application. Interim approval considerations include an assessment of relative risks, benefits, ~~and~~ costs, impacts, and other factors.

Interim approval allows for optional use of a traffic control device or application and does not create a new mandate or recommendation for use. Interim approval includes conditions that jurisdictions agree to comply with in order to use the traffic control device or application until an official rulemaking action has occurred.

Standard:

A jurisdiction desiring to use a traffic control device for which FHWA has issued an interim approval shall request permission from FHWA.

Guidance:

The request for permission to place a traffic control device under an interim approval should contain the following:

~~A. A statement indicating the nature of the problem.~~

~~B. A description of the proposed change to the traffic control device or application of the traffic control device, how it was developed, the manner in which it deviates from the standard, and how it is expected to be an improvement over existing standards.~~

A. ~~The location(s)~~ A description of where ~~it~~ the device will be used, ~~and any illustration that would be helpful to understand the traffic control device or use of the traffic control device.~~ such as a list of specific locations or highway segments or types of situations, or a statement of the intent to use the device jurisdiction-wide;

~~D. A legally-binding statement certifying that the concept of the traffic control device is not protected by a patent or copyright. (An example of a traffic control device concept would be countdown pedestrian signals in general. Ordinarily an entire general concept would not be patented or copyrighted, but if it were it would not be acceptable for interim approval unless the patent or copyright owner signs a waiver of rights acceptable to the FHWA. An example of a patented or copyrighted specific device within the general concept of countdown pedestrian signals would be a manufacturer's design for its specific brand of countdown signal, including the design details of the housing or electronics that are~~

~~unique to that manufacturer's product. Interim approval of a specific patented or copyrighted product is not acceptable.)~~

~~E. A detailed completed research or evaluation on this traffic control device.~~

B. An agreement to abide by the specific conditions for use of the device as contained in the FHWA's interim approval document;

C. An agreement to maintain and continually update a list of locations where the device 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; and
2. ~~This agreement must also provide that the agency sponsoring the interim approval will~~ Terminate use of the device or application installed under the interim approval at any time that it determines significant safety concerns are directly or indirectly attributable to the device or application. The FHWA's Office of Transportation Operations has the right to terminate the interim approval at any time if there is an indication of safety concerns.

Option:

A State may submit a request for the use of a device under interim approval for all jurisdictions in that State, as long as the request contains the information listed in the Guidance above.

~~Standard~~ Guidance:

~~Once an interim approval is granted to any jurisdiction for a particular traffic control device or application, subsequent jurisdictions shall be granted interim approval for that device or application by submitting a letter to the FHWA's Office of Transportation Operations indicating they will abide by Item F above and the specific conditions contained in the original interim approval.~~

A local jurisdiction using a traffic control device or application under an interim approval that was granted by FHWA either directly to that jurisdiction or on a statewide basis based on the State's request ~~shall~~ should inform the State of the locations of such use.

Option:

A device or application installed by a jurisdiction under an interim approval may remain in place, under any conditions established in the interim approval, until an official rulemaking action has occurred.

Support:

A diagram indicating the process for incorporating new traffic control devices into this Manual is shown in Figure 1A-2.

~~Procedures for revising this Manual are set out in the Federal Register of June 30, 1983 (48 FR 30145).~~ deleted because these procedures are no longer used

For additional information concerning interpretations, experimentation, changes, or interim approvals, ~~write to the FHWA, 400 Seventh Street, SW, HOTO, Washington, DC 20590, or~~ visit the MUTCD website at http://mutcd.fhwa.dot.gov.

Section 1A.11 Relation to Other Publications

Standard:

To the extent that they are incorporated by specific reference, the latest editions of the following publications, or those editions specifically noted, shall be a part of this Manual: "Standard Highway Signs and Markings" book (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:

The "Standard Highway Signs and Markings" book includes standard alphabets and symbols for ~~highway~~ deleted to increase consistency signs and pavement markings.

For information about the above publications, visit the Federal Highway Administration's MUTCD website at http://mutcd.fhwa.dot.gov, or write to the FHWA, ~~400 Seventh Street, SW,~~ 1200 New Jersey Avenue, SE, HOTO, Washington, DC 20590.

The 2000 FHWA publication entitled "Roundabouts-An Informational Guide" (FHWA-RD-00-067) is available at http://www.tfhrc.gov/safety/00068.htm, or write to the FHWA, 1200 New Jersey Avenue, SE, HSA-1, Washington, DC 20590.

The 2001 FHWA publication entitled "Federal-Aid Highway Program Guidance on High Occupancy Vehicle (HOV) Lanes" is available at http://www.fhwa.dot.gov/operations/hovguide01.htm, or write to the FHWA, ~~400 Seventh Street, SW,~~ 1200 New Jersey Avenue, SE, HOTM, Washington, DC 20590.

The 2001 FHWA publication entitled "Designing Sidewalks and Trails for Access—Part 2—Best Practices Design Guide" (FHWA-EP-01-027) is available by writing to the FHWA, 1200 New Jersey Avenue, SE, HEP, Washington, DC 20590.

The 2003 FHWA publication entitled "Travel Better, Travel Longer: A Pocket Guide to Improving Traffic Control and Mobility for Our Older Population" (FHWA-OP-03-098) is available at http://mutcd.fhwa.dot.gov/pdfs/PocketGuide0404.pdf, or write to the FHWA, 1200 New Jersey Avenue, SE, HOTO, Washington, DC 20590.

The January 2006 FHWA publication entitled "Ramp Management and Control Handbook" (FHWA-HOP-06-001) is available at http://ops.fhwa.dot.gov/publications/ramp_mgmt_handbook/manual/manual/default.htm, or write to the FHWA, 1200 New Jersey Avenue, SE, HOTM, Washington, DC 20590.

Other publications that are useful sources of information with respect to the use of this Manual are listed below. See Page i of this Manual for ordering information for the following publications (later editions might also be available as useful sources of information):

1. "AAA School Safety Patrol Operations Manual," 2006 Edition (AAA)
2. "A Policy on Geometric Design of Highways and Streets," ~~2001~~ 2004 edited to reference current edition Edition (American Association of State Highway and Transportation Officials—AASHTO)
3. "Guide for the Development of Bicycle Facilities," 1999 Edition (AASHTO)
4. "Guide to Metric Conversion," 1993 Edition (AASHTO)
5. "Guidelines for the Selection of Supplemental Guide Signs for Traffic Generators Adjacent to Freeways," 2001 Edition (AASHTO)
6. "Guidelines for the Selection of Supplemental Guide Signs for Traffic Generators Adjacent to Freeways, 4th Edition / Guide Signs, Part II: Guidelines for Airport Guide Signing / Guide Signs, Part III: List of Control Cities for Use in Guide Signs on Interstate Highways," Item Code: GSGLC-4, 2001 Edition (AASHTO) added to increase accuracy and to assist reader in finding this document on AASHTO's website
7. "Roadside Design Guide," 2001 Edition (AASHTO)
8. "Standard Specifications for Movable Highway Bridges," 1988 Edition (AASHTO)
9. "Traffic Engineering Metric Conversion Folders—Addendum to the Guide to Metric Conversion," 1993 Edition (AASHTO)
10. "2000 AREMA Communications & Signals Manual," American Railway Engineering & Maintenance-of-Way Association (AREMA)

~~11. "Designing Sidewalks and Trails for Access—Part 2—Best Practices Design Guide," 2001 Edition (FHWA) [Publication No. FHWA-EP-01-027]~~

11. "Practice for Roadway Lighting," RP-8, 2001, Illuminating Engineering Society (IES)
12. "Safety Guide for the Prevention of Radio Frequency Radiation Hazards in the Use of Commercial Electric Detonators (Blasting Caps)," Safety Library Publication No. 20, July 2001 Edition, Institute of Makers of Explosives
13. "American National Standard for High-Visibility Public Safety Vests," (ANSI/ISEA 207-2006), 2006 Edition (International Safety Equipment Association—ISEA)
14. "American National Standard for High-Visibility Safety Apparel and Headwear," added to improve accuracy (ANSI/ISEA ~~107-1999~~ 107-2004), ~~1999~~ 2004 Edition~~,~~ (ISEA) ~~- The Safety Equipment Association~~ edited to increase consistency
15. "Manual of Traffic Signal Design," 1998 Edition (Institute of Transportation Engineers—ITE)
16. "Manual of Transportation Engineering Studies," 1994 Edition (ITE)
17. "Pedestrian Traffic Control Signal Indications," Part 1—1985 Edition; Part 2 (LED Pedestrian Traffic Signal Modules)—2004 Edition (ITE)
18. "Preemption of Traffic Signals ~~at or~~ Near Railroad ~~Grade~~ Crossings ~~with Active Warning Devices~~," 2006 Edition (ITE)
19. "Purchase Specification for Flashing and Steady Burn Warning Lights," 1981 Edition (ITE)

~~19. "School Trip Safety Program Guidelines," 1984 Edition (ITE)~~

20. "Traffic Detector Handbook," 1991 Edition (ITE)
21. "Traffic Engineering Handbook," 1999 Edition (ITE)

22. "Traffic Signal Lamps," 1980 Edition (ITE)
23. "Traffic Control Devices Handbook," 2001 Edition (ITE)
24. "Vehicle Traffic Control Signal Heads," Part 1—1985 Edition; Part 2 (LED Circular Signal Supplement)—~~1998~~ 2005 Edition; Part 3 (LED Vehicular Arrow Traffic Signal Supplement)—2004 Edition (ITE)
25. "Uniform Vehicle Code (UVC) and Model Traffic Ordinance," 2000 Edition (National Committee on Uniform Traffic Laws and Ordinances)
26. "Occupational Safety and Health Administration Regulations (Standards - 29 CFR), General Safety and Health Provisions - 1926.20," amended June 30, 1993, Occupational Safety and Health Administration (OSHA)
27. "Highway Capacity Manual," 2000 Edition (Transportation Research Board—TRB)
28. "Recommended Procedures for the Safety Performance Evaluation of Highway Features," (NCHRP Report 350), 1993 Edition (~~Transportation Research Board~~ TRB) edited to increase consistency
29. "Accessible Pedestrian Signals," A-37, 1998 Edition, U.S. Architectural and Transportation Barriers Compliance Board (The U.S. Access Board)
30. "Building a True Community—Final Report—Public Rights-of-Way Access Advisory Committee (PRWAAC)," 2001 Edition (The U.S. Access Board)
31. "The Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG)," July 1998 Edition (The U.S. Access Board)
~~32. "Highway-Rail Intersection Architecture," U.S. Department of Transportation, Federal Railroad Administration (USDOT/FRA)~~

Section 1A.12 Color Code

Support:

The following color code establishes general meanings for ~~10~~ 11 colors of a total of 13 colors that have been identified as being appropriate for use in conveying traffic control information. ~~Central values and~~ edited to increase accuracy, as there are no central values specified for the various colors Tolerance limits for each color are contained in 23 CFR Part 655, Appendix to Subpart F and are available ~~from~~ at the Federal Highway Administration's ~~400 Seventh Street, SW, HOTO, Washington, DC 20590, and at FHWA's~~ MUTCD website at http://mutcd.fhwa.dot.gov or by writing to the FHWA, Office of Safety Research and Development (HRD-T-301), 6300 Georgetown Pike, McLean, VA 22101.

The ~~three~~ two colors for which general meanings have not yet been assigned are being reserved for future applications that will be determined only by 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.

Standard:

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—unassigned**
- **E. Fluorescent Pink—incident management**
- **F. Fluorescent Yellow-Green—pedestrian warning, bicycle warning, playground warning, school bus and school warning**
- **G. Green—indicated movements permitted, direction guidance**
- **H. Light Blue—unassigned**
- **I. Orange—temporary traffic control**
- **J. Purple—~~unassigned~~ electronic toll collection (ETC)**
- **K. Red—stop or prohibition**
- **L. White—regulation**
- **M. Yellow—warning**

Section 1A.13 Definitions of Words and Phrases in This Manual

Standard:

Unless otherwise defined ~~herein~~ in this Section, or in ~~the~~ other Parts of this Manual, ~~definitions contained~~ words or phrases shall have the meaning(s) as defined in the most recent editions of the

"Uniform Vehicle Code," "AASHTO Transportation Glossary (Highway Definitions)," and other publications ~~specified~~ listed in Section 1A.11 ~~are also incorporated and adopted by reference~~.

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

1. Active Grade Crossing Warning System—the flashing-light signals, with or without warning gates, together with the necessary control equipment used to inform road users of the approach or presence of trains at highway-rail or highway-light rail transit grade crossings.
2. 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.
3. Approach—all lanes of traffic moving towards an intersection or a midblock location from one direction, including any adjacent parking lane(s).
4. 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.
5. Average Annual 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 average annual daily traffic.
6. Average Day—a day representing traffic volumes normally and repeatedly found at a location. Where volumes are primarily influenced by employment, the average day is typically a weekday. When volumes are primarily influenced by entertainment or recreation, the average day is typically a weekend day.
7. 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.
8. Beacon—a highway traffic signal with one or more signal sections that operates in a flashing mode.
9. Bicycle—a pedal-powered vehicle upon which the human operator sits.
10. Bicycle Lane—a portion of a roadway that has been designated for preferential or exclusive use by bicyclists by ~~signs and~~ pavement markings and, if used, signs ~~for preferential or exclusive use by bicyclists~~.
11. 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. **repeated from Section 9A.03 since "bikeway" is now used in the Introduction**
12. 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 channelizing devices such as tubular markers or traversable curbs, but does not include a physical barrier.
13. ~~Centerline~~ 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.
14. 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. These signs are referred to as Dynamic Message Signs in the National Intelligent Transportation Systems (ITS) Architecture.
15. Channelizing Line Markings—a wide or double solid white line used to form islands where traffic in the same direction of travel is permitted on both sides of the island.
16. 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.
17. 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.
18. 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 nonrecoverable, traversable slope with a clear run-out area at its toe.
19. 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.

20. Concurrent Flow ~~HOV~~ Preferential Lane—~~an HOV~~ a preferential lane that is operated in the same direction as the adjacent mixed flow lanes, separated from the adjacent general purpose freeway lanes by a standard lane stripe, painted buffer, or barrier.
21. Contiguous Lane—a lane, preferential or otherwise, that is separated from the adjacent lane(s) only by a normal or wide lane line marking.
22. Conventional Road—a street or highway other than a low-volume road (as defined in Section 5A.01), expressway, or freeway.
23. ~~Contraflow~~ 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. ~~Contraflow~~ Counter-flow lanes are usually separated from the off-peak direction lanes by ~~plastic pylons~~ tubular markers or other flexible channelizing devices, or by moveable or permanent barrier. edited to increase consistency
24. Crashworthy—a characteristic of a roadside appurtenance that has been successfully crash tested in accordance with a national standard such as the National Cooperative Highway Research Program Report 350, "Recommended Procedures for the Safety Performance Evaluation of Highway Features."
25. 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 centerline; (b) any portion of a roadway at an intersection or elsewhere distinctly indicated as a pedestrian crossing by pavement marking added to increase clarity lines on the surface, which ~~may~~ might be supplemented by contrasting pavement texture, style, or color.
26. Crosswalk Lines—white pavement marking lines that identify a crosswalk.
27. Delineator—a retroreflective device mounted on the roadway surface or at the side of the roadway in a series to indicate the alignment of the roadway, especially at night or in adverse weather.
28. Detectable—having a continuous edge within 150 mm (6 in) of the surface so that pedestrians who have visual disabilities can sense its presence and receive usable guidance information.
29. Dynamic Envelope—the clearance required for the train and its cargo overhang due to any combination of loading, lateral motion, or suspension failure.
30. Edge Line Markings—white or yellow pavement marking lines that delineate the right or left edge(s) of a traveled way.
31. Electronic Toll Collection (ETC)—a system for collection of toll fees via equipment that communicates wirelessly with transponders mounted in vehicles (moving or stopped) to automatically deduct the toll fee from a pre-paid toll account.
32. End-of-Roadway Marker—a device used to warn and alert road users of the end of a roadway in other than temporary traffic control zones.
33. Engineering Judgment—the evaluation of available pertinent information, and the application of appropriate principles, Standards, Guidance, and practices as contained in this Manual and other sources, for the purpose of deciding upon the applicability, design, operation, or installation of a traffic control device. Engineering judgment shall be exercised by an engineer, or by an individual working under the supervision of an engineer, through the application of procedures and criteria established by the engineer. Documentation of engineering judgment is not required.
34. Engineering Study—the comprehensive analysis and evaluation of available pertinent information, and the application of appropriate principles, Standards, Guidance, and practices as contained in this Manual and other sources, for the purpose of deciding upon the applicability, design, operation, or installation of a traffic control device. An engineering study shall be performed by an engineer, or by an individual working under the supervision of an engineer, through the application of procedures and criteria established by the engineer. An engineering study shall be documented.
35. Expressway—a divided highway with partial control of access.

36. 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).

37. Flashing—an operation in which a light source, such as a signal indication, is turned on and off repetitively. revised to account for other types of flashing lights such as TTC warning lights, RR flashing lights, gate lights, and lights on STOP/SLOW paddles

38. Freeway—a divided highway with full control of access.

39. Gate—an automatically-operated or manually-operated traffic control device that is used to physically obstruct road users such that they cannot proceed past a particular point on a roadway or pathway, or such that they cannot enter a particular ramp, lane, roadway, or facility.

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

41. High-Occupancy Vehicle (HOV)—a motor vehicle carrying at least two or more persons, including carpools, vanpools, and buses.

42. Highway—a general term for denoting a public way for purposes of travel by vehicular travel, including the entire area within the right-of-way.

43. Highway-Light Rail Transit Grade Crossing—the general area where a highway and a light rail transit's right-of-way cross at the same level, within which are included the light rail transit tracks, highway, and traffic control devices for traffic traversing that area.

44. Highway-Rail Grade Crossing—the general area where a highway and a railroad's right-of-way cross at the same level, within which are included the railroad tracks, highway, and traffic control devices for highway traffic traversing that area.

45. 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 ~~signals at toll plazas,~~ power-operated signs, steadily-illuminated pavement markers, warning lights (see Section 6F.79), or steady burning electric lamps.

46. 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.

47. Hybrid Signal—a special type of highway traffic signal 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.

48. 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.

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

50. Intermediate Interchange—an interchange with an urban or rural route that is not a major or minor interchange as defined herein.

51. 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 or driveway with a roadway or highway shall not constitute an intersection.

(c) If a highway includes two roadways that are 9 m (30 ft) or more apart, then every crossing of each roadway of such divided highway by an intersecting highway shall be a separate intersection; in the event such intersecting highway also includes two roadways that are 9 m (30 ft) or more apart, then every crossing of two roadways of such highways shall be a separate intersection (see definition of Median). However, regardless of the distance between the separate intersections as defined herein, where a stopping point 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 deemed to be one intersection.

(d) Where a stopping point is designated on a roadway approaching an intersection as defined in Items (a) and (c) above, a vehicle of which any part is legally beyond said designated stopping point shall be deemed to be legally in the intersection.

(e) A vehicle, which is deemed to have or which has legally entered the intersection as defined in Items (a) and (c) above, upon departing said intersection shall be deemed to still be legally in the intersection until:

(1) The rear of the vehicle and any attached trailer(s) clears the intersection; or

(2) Where a marked or unmarked associated crosswalk is present, the rear of the vehicle and any attached trailer(s) clears said crosswalk.

52. **Island—a defined area between traffic lanes for control of vehicular movements or for pedestrian 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.**
53. **Lane Line Markings—white pavement marking lines that delineate the separation of traffic lanes that have the same direction of travel on a roadway.**
54. **Lane-Use Control Signal—a signal face displaying indications to permit or prohibit the use of specific lanes of a roadway or to indicate the impending prohibition of such use.**
55. **Legend—see Sign Legend.**
56. **Logo—a distinctive emblem~~, symbol,~~ or trademark that identifies a commercial business and/or the product or service offered by the business.**
57. **Longitudinal Markings—pavement markings that are generally placed parallel and adjacent to the flow of traffic such as lane lines, ~~centerlines~~ center lines, edge lines, channelizing lines, and others.**
58. **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.**
59. **Major Street—the street normally carrying the higher volume of vehicular traffic.**
60. 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.
61. **Median—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.**
62. **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.**
63. **Minor Street—the street normally carrying the lower volume of vehicular traffic.**
64. 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 towards the intersection, including turning lanes. **added to improve clarity**
65. **Object Marker—a device used to mark obstructions within or adjacent to the roadway.**
66. **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 number of persons in a vehicle.**
67. **Occupant—a person driving or riding in a car, truck, bus, or other vehicle.**
68. Open Road Electronic Toll Collection—a system designed to allow electronic toll collection (ETC) from vehicles traveling at normal highway speeds.
69. Opposing traffic—vehicles that are traveling in the opposite direction. At an intersection, vehicles that are entering an intersection from an approach that is approximately straight ahead would be considered to be opposing traffic, but vehicles that are entering an intersection from the left or the right from an approach that is approximately perpendicular would not be considered to be opposing traffic.
70. 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 are exclusive of sidewalks.

71. **Paved—a bituminous surface treatment, mixed bituminous concrete, or Portland cement concrete roadway surface that has both a structural (weight bearing) and a sealing purpose for the roadway.**
72. **Pedestrian—a person ~~afoot~~ on foot, in a wheelchair, on skates, or on a skateboard.**
73. **Pedestrian Facilities—a general term denoting improvements and provisions made to accommodate or encourage walking.**
74. **Pictograph—a pictorial representation used to identify a governmental jurisdiction, an area of jurisdiction, a governmental agency, a military base or branch of service, a governmental-approved university or college, or a government-approved institution.**
75. **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.**
76. **Preferential Lane—a highway lane reserved for the exclusive use of one or more specific types of vehicles or road user groups.**
77. **Principal Legend—place names, street names, and route numbers placed on guide signs.**
78. **Private Property Open to Public Travel—toll roads and roads within shopping centers, parking lot areas, airports, sports arenas, and other similar business and/or recreation facilities that are privately owned but where the public is allowed to travel without access restrictions. Private gated properties where access is restricted and private highway-rail grade crossings shall not be included in this definition.**
79. **Public Facility – any parking lot, parking garage, or accessway to or within such facilities, under the jurisdiction of and maintained by a public agency and where the public is invited to travel without access restrictions.**
80. **Public Road—any road, ~~or~~ street, or public facility under the jurisdiction of and maintained by a public agency and open to public travel.**
81. **Raised Pavement Marker—a device ~~with a height of at least 10 mm (0.4 in)~~ mounted on or in a road surface that has a height generally not exceeding approximately 25 mm (1 in) above the road surface and that is intended to be used as a positioning guide or to supplement or substitute for pavement markings ~~or to mark the position of a fire hydrant~~.**
82. **Regulatory Sign—a sign that gives notice to road users of traffic laws or regulations.**
83. **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.**
84. **Right-of-Way [Assignment]—the permitting of vehicles and/or pedestrians to proceed in a lawful manner in preference to other vehicles or pedestrians by the display of sign or signal indications.**
85. **Road—see Roadway.**
86. **Road User—a vehicle operator, bicyclist, or pedestrian, including persons with disabilities, within the highway, on a public facility, or on private property open to public travel ~~including persons with disabilities~~.**
87. **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 herein shall refer to any such roadway separately, but not to all such roadways collectively.**
88. **Roadway Network—a geographical arrangement of intersecting roadways.**
89. **Roundabout ~~Intersection~~—a circular intersection with yield control ~~of all entering traffic, channelized approaches, and appropriate geometric curvature, such that travel speeds on the circulatory roadway are typically less than 50 km/h (30 mph)~~ 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.**
90. **Rumble Strip—a series of intermittent, narrow, transverse areas of rough-textured, slightly raised, or depressed road surface that ~~is installed~~ extend across the travel lane to alert road users to unusual traffic conditions or are located along the shoulder or within islands formed by pavement markings to alert road users that they are leaving the travel lanes. edited to be consistent with the various uses of this phrase in Parts 3 and 6**
91. **Rural Highway—a type of roadway normally characterized by lower volumes, higher speeds, fewer turning conflicts, and less conflict with pedestrians.**

92. Safe-Positioned—the positioning of emergency vehicles at an incident in a manner that attempts to protect both the responders performing their duties and road users traveling through the incident scene.
93. 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.
94. School Zone—a designated roadway segment approaching, adjacent to, and beyond school buildings or grounds, or along which school related activity occurs, where special traffic law enforcement activity or increased fines for traffic violations are authorized.
95. 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.
96. 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.
97. 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.
98. Sign—any traffic control device that is intended to communicate specific information to road users through a word or symbol legend. Signs do not include highway traffic ~~control~~ edited to increase accuracy signals, pavement markings, delineators, or channelization devices.
99. Sign Assembly—a group of signs, located on the same support(s), that supplement one another in conveying information to road users.
100. 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.
101. Sign Legend—all word messages, logos, and symbol 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. added to increase clarity
102. Sign Panel—a separate panel or piece of material containing a word or symbol legend that is affixed to the face of a sign.
103. 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. added because we use the word "signing," which is not found in a standard dictionary, instead of "signage," which is defined in a standard dictionary
104. Speed—speed is defined based on the following classifications:
    (a) Advisory Speed—a recommended speed for all vehicles operating on a section of highway and based on the highway design, operating characteristics, and conditions.
    (b) Average Speed—the summation of the instantaneous or spot-measured speeds at a specific location of vehicles divided by the number of vehicles observed.
    (c) Design Speed—a selected speed used to determine the various geometric design features of a roadway.
    (d) 85th-Percentile Speed—the speed at or below which 85 percent of the motor vehicles travel.
    (e) 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.
    (f) Pace ~~Speed~~—the ~~highest speed within a specific range of speeds that represents more vehicles than in any other like range of speed. The range of speeds typically used is~~ 10 km/h or 10 mph speed range representing the speeds of the largest percentage of vehicles in the traffic stream.
    (g) Posted Speed—the speed limit determined by law or regulation added to increase accuracy and ~~shown~~ displayed edited to increase consistency on Speed Limit signs.
    (h) Statutory Speed—a speed limit established by legislative action that typically is applicable for highways with specified design, functional, jurisdictional and/or location characteristic and is not necessarily ~~shown~~ displayed edited to increase consistency on Speed Limit signs.
105. Speed Limit—the maximum (or minimum) speed applicable to a section of highway as established by law or regulation. added to increase accuracy

106. **Speed Measurement Markings—a white transverse pavement marking placed on the roadway to assist the enforcement of speed regulations.**
107. **Speed Zone—a section of highway with a speed limit that is established by law or regulation, added to increase accuracy but which might be different from a legislatively specified statutory speed limit.**
108. **Splitter Island—a median island used to separate opposing directions of traffic entering and exiting a roundabout.**
109. **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.**
110. **Street—see Highway.**
111. **Symbol—the approved design of a pictorial representation of a specific traffic control message for signs, pavement markings, traffic control signals, or other traffic control devices, as shown in the MUTCD.**
112. **Temporary Traffic Control Zone—an area of a highway 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.**
113. **Traffic—pedestrians, bicyclists, ridden or herded animals, vehicles, streetcars, and other conveyances either singularly or together while using for purposes of travel any highway, public facility, or private property open to public travel ~~for purposes of travel~~.**
114. **Traffic Control Device—a sign, signal, marking, or other device used to regulate, warn, or guide traffic, placed on, over, or adjacent to a street, highway, public facility, private property open to public travel, pedestrian facility, or shared-use path by authority of a public agency or official having jurisdiction.**
115. **Traffic Control Signal (Traffic Signal)—any highway traffic signal by which traffic is alternately directed to stop and permitted to proceed.**
116. **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.**
117. **Transverse Markings—pavement markings that are generally placed perpendicular and across the flow of traffic such as shoulder markings, word and symbol markings, stop lines, crosswalk lines, speed measurement markings, parking space markings, and others.**
118. **Traveled Way—the portion of the roadway for the movement of vehicles, exclusive of the shoulders, berms, sidewalks, and parking lanes.**
119. **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 drop lane rather than a turn bay.**
120. **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.**
121. **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 semiexclusive 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.**
122. **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. added to assist the reader**
123. **Warning Sign—a sign that gives notice to road users of a situation that might not be readily apparent.**
124. **Warrant—a warrant describes threshold conditions to the engineer in evaluating the potential safety and operational benefits of traffic control devices and is based upon average or normal conditions. 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.**
125. **Worker—a person on foot whose duties place him or her within the right-of-way of a street or highway, such as street or highway construction and maintenance forces, survey crews, utility crews, responders to incidents within the street or highway 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 of a street or highway.**

126. **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.**

127. **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 1A.14 Meanings of Acronyms and Abbreviations in This Manual **this section added to assist readers**

Standard:

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. **ADT—average daily traffic**
4. **AFAD—Automated Flagger Assistance Device**
5. **ANSI—American National Standards Institute**
6. **CFR—Code of Federal Regulations**
7. **CMS—changeable message sign**
8. **dBA—A-weighted decibels**
9. **EPA—Environmental Protection Agency**
10. **ETC—electronic toll collection**
11. **EV—electric vehicle**
12. **FHWA—Federal Highway Administration**
13. **FRA—Federal Railroad Administration**
14. **FTA—Federal Transit Administration**
15. **HOT—high occupancy tolls**
16. **HOTM—Highways-Office of Travel Management**
17. **HOTO—Highways-Office of Transportation Operations**
18. **HOV—high-occupancy vehicle**
19. **ILEV—inherently low emission vehicle**
20. **ISEA—International Safety Equipment Association**
21. **ITE—Institute of Transportation Engineers**
22. **ITS—intelligent transportation systems**
23. **km/h—kilometers per hour**
24. **LED—light emitting diode**
25. **LP—liquid petroleum**
26. **MPH or mph—miles per hour**
27. **MUTCD—Manual on Uniform Traffic Control Devices**
28. **NCHRP—National Cooperative Highway Research Program**
29. **PRT—perception-response time**
30. **RV—recreational vehicle**
31. **TDD—telecommunication devices for the deaf**
32. **TRB—Transportation Research Board**
33. **TTC—temporary traffic control**
34. **U.S.—United States**
35. **U.S.C.—United States Code**
36. **USDOT—United States Department of Transportation**
37. **UVC—Uniform Vehicle Code**
38. **VPH or vph—vehicles per hour**

Section ~~1A.14~~ 1A.15 Abbreviations Used on Traffic Control Devices

Standard:

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

The abbreviations shown in Table 1A-2 shall be used only on Portable Changeable Message signs. When the word messages shown in Table 1A-2 need to be abbreviated on a Portable Changeable Message sign, the abbreviations shown in Table 1A-2 shall be used.

Guidance:

The abbreviations for the words listed in Table 1A-2 that also show a prompt word should not be used ~~in connection with~~ on ~~traffic control devices~~ a Portable Changeable Message sign unless the prompt word shown in Table 1A-2 either precedes or follows the abbreviation.

Standard:

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

Guidance:

~~Where~~ If multiple abbreviations are permitted in Table~~s~~ 1A-1 or 1A-2, the same abbreviation should be used throughout a single jurisdiction.

Except as otherwise provided in Table 1A-1 or 1A-2 or unless absolutely 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.

CHAPTER 2A. GENERAL

Section 2A.01 Function and Purpose of Signs

Support:

This Manual contains Standards, Guidance, and Options for the signing ~~within the right-of-way~~ of all types of highways, public facilities, and private property open to public travel. The functions of signs are to provide regulations, warnings, and guidance information for road users. Both words and symbols are used to convey the messages. Signs are not typically used to confirm rules of the road.

Detailed sign requirements are located in the following Chapters of Part 2:

Chapter 2B—Regulatory Signs
Chapter 2C—Warning Signs
Chapter 2D—Guide Signs (Conventional Roads)
Chapter 2E—Guide Signs (Freeways and Expressways)
Chapter 2F—General Service Signs
Chapter ~~2F~~ 2G—Specific Service (Logo) Signs
Chapter ~~2G~~ 2H—Tourist-Oriented Directional Signs
Chapter 2I—General Information Signs
Chapter ~~2H~~ 2J—Recreational and Cultural Interest Area Signs
Chapter ~~2I~~ 2K—Emergency Management Signs
Chapter 2L—Object Markers and Barricades
Chapter 2M—Changeable Message Signs

Standard:

Because the requirements and standards for signs depend on the particular type of highway upon which they are to be used, the following definitions shall apply:

A. Freeway—a divided highway with full control of access;
B. Expressway—a divided highway with partial control of access;
C. Conventional Road—a street or highway other than a low-volume road (as defined in Section 5A.01), a freeway, or an expressway; and
D. Special Purpose Road—a low-volume, low-speed road that serves recreational areas or resource development activities~~, or that provides local access~~.

Section 2A.02 Definitions

Support:

Definitions that are applicable to signs are given in Sections 1A.13 and 2A.01.

Section 2A.03 Standardization of Application

Support:

It is recognized that urban traffic conditions differ from those in rural environments, and in many instances signs are applied and located differently. Where pertinent and practical, this Manual sets forth separate recommendations for urban and rural conditions.

Guidance:

~~Signs should be used only where justified by engineering judgment or studies, as noted in Section 1A.09.~~

Results from traffic engineering studies of physical and traffic factors should indicate the locations where signs are deemed necessary or desirable.

Roadway geometric design and sign application should be coordinated so that signing can be effectively placed to give the road user any necessary regulatory, warning, guidance, and other information.

Standard:

Each standard sign shall be displayed only for the specific purpose as prescribed in this Manual. Determination of the particular signs to be applied to a specific condition shall be made in accordance with the ~~criteria~~ provisions edited to increase consistency set forth in Part 2. Before any new highway, public facility, private property open to public travel, detour, or temporary route is opened to ~~traffic~~ public travel, all necessary signs shall be in place. Signs required by road conditions or restrictions shall be removed when those conditions cease to exist or the restrictions are withdrawn.

Section 2A.04 Excessive Use of Signs

Guidance:

Regulatory and warning signs should be used conservatively because these signs, if used to excess, tend to lose their effectiveness. If used, route signs and directional signs should be used frequently because ~~they~~ their use promotes ~~reasonably safe and~~ efficient operations and can result in lower crash rates by keeping road users informed of their location.

Section 2A.05 Classification of Signs

Standard:

Signs shall be defined by their function as follows:

A. Regulatory signs give notice of traffic laws or regulations.
B. Warning signs give notice of a situation that might not be readily apparent.
C. Guide signs show route designations, destinations, directions, distances, services, points of interest, and other geographical, recreational, or cultural information.

Support:

Object markers are defined in Chapter 2L.

Section 2A.06 Design of Signs

Support:

This Manual shows many typical standard signs and object markers approved for use on streets, highways, bikeways, and pedestrian crossings.

In the specifications for individual signs and object markers, the general appearance of the legend, color, and size are shown in the accompanying tables and illustrations, and are not always detailed in the text.

Detailed drawings of standard signs, object markers, ~~and~~ alphabets, and arrows (see Figure 2D-2) are shown in the "Standard Highway Signs and Markings" book. Section 1A.11 contains information regarding how to obtain this publication.

The basic requirements of a ~~highway~~ deleted to increase consistency sign are that it be legible to those for whom it is intended and that it be understandable in time to permit a proper response. Desirable attributes include:

A. High visibility by day and night; and
B. High legibility (adequately sized letters or symbols, and a short legend for quick comprehension by a road user approaching a sign).

Standardized colors and shapes are specified so that the several classes of traffic signs can be promptly recognized. Simplicity and uniformity in design, position, and application are important.

Standard:

The term legend shall include all word messages and symbol designs that are intended to convey specific meanings.

Uniformity in design shall include shape, color, dimensions, legends, borders, and illumination or retroreflectivity.

Standardization of these designs does not preclude further improvement by minor changes in the proportion or orientation of symbols, width of borders, or layout of word messages, but all shapes and colors shall be as indicated. this text was relocated from below

All symbols shall be unmistakably similar to or mirror images of the adopted symbol signs, all of which are shown in the "Standard Highway Signs and Markings" book (see Section 1A.11). Symbols and colors shall not be modified unless otherwise stated herein. All symbols and colors for signs not shown in the "Standard Highway Signs and Markings" book shall follow the procedures for experimentation and change described in Section 1A.10. this paragraph was relocated from Section 1A.03

Option:

Although the standard design of symbol signs cannot be modified, the orientation of the symbol may be changed to better reflect the direction of travel, if appropriate. this paragraph was relocated from Section 1A.03

Standard:

Where a standard word message is applicable, the wording shall be as herein provided.
~~Standardization of these designs does not preclude further improvement by minor changes in the proportion or orientation of symbols, width of borders, or layout of word messages, but all shapes and colors shall be as indicated.~~ this text was relocated to above

In situations where word messages are required other than those herein provided, the signs shall be of the same shape and color as standard signs of the same functional type.

Option:

State and local highway agencies may develop special word message signs in situations where roadway conditions make it necessary to provide road users with additional regulatory, warning, or guidance information, such as when road users need to be notified of special regulations or warned about a situation that might not be readily apparent. Unlike symbol signs and colors, new word message signs may be used without the need for experimentation. this paragraph was relocated within this Section for better continuity – the added text was relocated from Section 1A.03

Standard:

Except as ~~stated~~ noted edited to increase consistency in the Option below, Internet addresses and e-mail addresses shall not be ~~shown~~ displayed edited to increase consistency on any sign, supplemental plaque, sign panel (including logo sign added to increase consistency panels on Specific Service signs), or changeable message sign.

Guidance:

Unless otherwise stated in this Manual for a specific sign, and except as ~~stated~~ noted edited to increase consistency in the Option below, phone numbers of more than four characters should not be ~~shown~~ displayed edited to increase consistency on any sign, supplemental plaque, sign panel (including logo sign added to increase consistency panels on Specific Service signs), or changeable message sign.

Option:

Internet addresses, e-mail addresses, or phone numbers with more than four characters may be ~~shown~~ displayed edited to increase consistency on signs, supplemental plaques, sign panels, and changeable message signs that are intended for viewing only by pedestrians, bicyclists, occupants of parked vehicles, or drivers of vehicles on low-speed roadways where engineering judgment indicates that an area is available for drivers ~~can reasonably safely~~ to stop out of the traffic flow to read the message.

~~**Section 2A.07 Changeable Message Signs**~~ **the text from this Section has been relocated to new Chapter 2M**

Section ~~2A.08~~ 2A.07 Retroreflectivity and Illumination

Support:

There are many materials currently available for retroreflection and various methods currently available for the illumination of signs and object markers. New materials and methods continue to emerge. New materials and methods can be used as long as the signs and object markers meet the standard requirements for color, both by day and by night.

Standard:

Regulatory, warning, and guide signs and object markers shall be retroreflective or illuminated to show the same shape and similar color by both day and night, unless specifically stated otherwise in the text discussion in this Manual of a particular sign or group of signs.

The requirements for sign illumination shall not be considered to be satisfied by street or highway lighting.

Guidance:

All overhead sign installations on freeways and expressways should be illuminated unless an engineering study shows that retroreflection will perform effectively without illumination.

All overhead sign installations on conventional roads or special purpose roads should be illuminated unless engineering judgment indicates that retroreflection will perform effectively without illumination.

Option:

Sign elements may be illuminated by the means shown in Table 2A-1.

Retroreflection of sign elements may be accomplished by the means shown in Table 2A-2.

Light Emitting Diode (LED) units may be used individually within the face of a sign and in the border of a sign, except for Changeable Message Signs, to improve the conspicuity, increase the legibility of sign legends and borders, or provide a changeable message. ~~Individual LED pixels may be used in the border of a sign.~~

Standard:

If used, the LEDs shall be the same color as the sign legend, border, or background. If flashed, all LED units shall flash simultaneously at a rate of more than 50 and less than 60 times per minute. The uniformity of the sign design shall be maintained without any decrease in visibility, legibility, or driver comprehension during either daytime or nighttime conditions.

A module of multiple LED units used as a closely-spaced, single light source shall only be used within the sign face ~~for~~ if contained within the legend~~s~~ or within the symbol~~s~~.

Except for the STOP/SLOW paddles (see Section 6E.03) used by flaggers and the STOP paddles (see Section 7D.05) used by adult crossing guards, neither individual LED pixels nor groups of LEDs shall be used within the background area of a sign.

Support:

Other methods of enhancing the conspicuity of standard signs are described in Section 2A.15.

Information regarding the use of retroreflective material on the sign support is contained in Section 2A.21.

Section ~~2A.09~~ 2A.08 Minimum Retroreflectivity Levels

Support:

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

Section ~~2A.10~~ 2A.09 Shapes

Standard:

Particular shapes, as shown in Table 2A-3, shall be used exclusively for specific signs or series of signs, unless specifically stated otherwise in the text discussion in this Manual for a particular sign or class of signs.

Section ~~2A.11~~ 2A.10 Sign Colors

Standard:

The colors to be used on standard signs and their specific use on these signs shall be as indicated in the applicable Sections of this Manual. The color coordinates and values shall be as described in 23 CFR, Part 655, Subpart F, Appendix.

Support:

As a quick reference, common uses of sign colors are shown in Table 2A-4. Color schemes on specific signs are shown in the illustrations located in each appropriate Section.

Whenever white is specified herein as a color, it is understood to include silver-colored retroreflective coatings or elements that reflect white light.

The colors coral~~, purple,~~ and light blue are being reserved for uses that will be determined in the future by the Federal Highway Administration.

Information regarding color coding of destinations on guide signs, including community wayfinding signs, is contained in ~~Section 2D.03~~ Chapter 2D.

Option:

Where the color yellow is required, the fluorescent yellow color may also be used. Where the color orange is required, the fluorescent orange color may also be used. Where the color red is required, the fluorescent red color may also be used.

Section ~~2A.12~~ 2A.11 Dimensions

Support:

Sign and object marker sizes for use on the different classes of highways are shown in Sections 2B.03, 2C.04, 2D.04, 2E.14, 2F.01, 2I.01, 2K.01, 2L.01, 5A.03, 6F.02, 7B.01, 8B.02, and 9B.02, and in the "Standard Highway Signs and Markings" book (see Section 1A.11).

The "Standard Highway Signs and Markings" book (see Section 1A.11) prescribes design details for up to five different sizes depending on the type of traffic facility, including bikeways. Smaller sizes are designed to be used on bikeways and some other off-road applications. Larger sizes are designed for use on freeways and expressways, and can also be used to enhance road user safety and convenience on other facilities, especially on multi-lane divided highways and on undivided highways having five or more lanes of traffic and/or high speeds. The intermediate sizes are designed to be used on other highway types.

Standard:

The sign dimensions prescribed in this Manual and in the "Standard Highway Signs and Markings" book (see Section 1A.11) shall be used unless engineering judgment determines that other sizes are appropriate. Except as noted in the Option below, where engineering judgment determines that sizes smaller than the prescribed dimensions are appropriate for use, the sign dimensions shall not be less than the minimum dimensions specified in this Manual. The sizes shown in the Minimum columns that are smaller than the sizes shown in the Conventional Road columns in the various sign size tables in this Manual shall only be used on low-speed roadways, alleys, public facilities, and private property open to public travel where the reduced legend size would be adequate for the regulation or warning or where physical conditions preclude the use of larger sizes.

Option:

For alleys with restrictive physical conditions and vehicle usage that limits installation of the Minimum size sign (or the Conventional Road size sign if no Minimum size is shown), both the sign height and the sign width may be decreased by up to 150 mm (6 in).

Guidance:

The sizes shown in the Freeway and Expressway columns in the various sign size tables in this Manual should be used on freeways and expressways and for other higher-speed applications to provide larger signs for increased visibility and recognition.

The sizes shown in the Oversized columns in the various sign size tables in this Manual size should be used for those special applications where speed, volume, or other factors result in conditions where increased emphasis, improved recognition, or increased legibility is needed, as determined by engineering judgment or study.

Increases above the prescribed sizes should be used where greater legibility or emphasis is needed. ~~Wherever practical~~ If signs larger than the prescribed sizes are used, the overall sign dimensions should be increased in 150 mm (6 in) increments.

Standard:

Where engineering judgment determines that sizes ~~larger~~ that are different than the prescribed dimensions are appropriate for use, standard shapes and colors shall be used and standard proportions shall be retained as much as practical.

Guidance:

When supplemental plaques are installed with larger sized signs, a corresponding increase in the size of the plaque and its legend should also be made. The resulting plaque size should be approximately in the same relative proportion to the larger sized sign as the conventional sized plaque is to the conventional sized sign.

Section ~~2A.13~~ 2A.12 Symbols

Support:

Sometimes a change from word messages to symbols requires significant time for public education and transition. Therefore, this Manual includes the practice of using educational plaques to accompany some new symbol signs.

Standard:

Symbol designs shall in all cases be unmistakably similar to those shown in this Manual and in the "Standard Highway Signs and Markings" book (see Section 1A.11). New symbol designs shall be adopted by the Federal Highway Administration based on research evaluations to determine road user comprehension, sign conspicuity, and sign legibility.

Guidance:

New warning or regulatory symbol signs not readily recognizable by the public should be accompanied by an educational plaque.

Option:

State and/or local highway agencies may conduct research studies to determine road user comprehension, sign conspicuity, and sign legibility.

Educational plaques may be left in place as long as they are in serviceable condition.

Although most standard symbols are oriented facing left, mirror images of these symbols may be used where the reverse orientation might better convey to road users a direction of movement.

Standard:

A symbol used for a given category of signs (regulatory, warning, or guide) shall not be used for a different category of signs, except as specifically authorized in this Manual.

A recreational and cultural interest area prohibitory sign symbol (see Chapter 2J) shall not be used on streets or highways outside of recreational and cultural interest areas.

Except as otherwise noted in the Option below, a recreational and cultural interest area guide sign symbol (see Chapter 2J) shall not be used on any regulatory or warning sign.

Option:

A recreational and cultural interest area guide sign symbol may be used on a highway sign outside of a recreational and cultural interest area to supplement a comparable word message only if there is no approved symbol for that message in Chapters 2B through 2F or 2I.

Section ~~2A.14~~ 2A.13 Word Messages

Standard:

Except as noted in Section 2A.06, all word messages shall use standard wording and letters as shown in this Manual and in the "Standard Highway Signs and Markings" book (see Section 1A.11).

Guidance:

Word messages should be as brief as possible and the lettering should be large enough to provide the necessary legibility distance. A minimum specific ratio~~, such as~~ of 25 mm (1 in) of letter height per ~~12~~ 9 m (~~40~~ 30 ft) of legibility distance~~,~~ should be used.

~~Support:~~

~~Some research indicates that a ratio of 25 mm (1 in) of letter height per 10 m (33 ft) of legibility distance could be beneficial.~~

~~Guidance:~~

Abbreviations (see Section 1A.15) should be kept to a minimum, and should include only those that are commonly recognized and understood, such as AVE (for Avenue), BLVD (for Boulevard), N (for North), or JCT (for Junction).

Except as otherwise provided in Table 1A-1, word messages should not contain punctuation, apostrophes, question marks, ampersands, or other characters that are not letters or numerals unless absolutely necessary to avoid confusion.

Standard:

All sign lettering shall be in ~~capital~~ upper-case letters as provided in the "Standard Highway Signs and Markings" book (see Section 1A.11), ~~except as indicated in the Option below~~ unless specifically stated otherwise for a particular sign or type of message.

~~Option:~~

~~Word messages on street name signs and destinations~~ The lettering for names of places, streets, and highways on guide signs ~~may~~ shall be composed of a combination of lower-case letters with initial upper-case letters. The initial upper-case letters shall be approximately 1.33 times the "loop" height of the lower-case letters.

Section ~~2A.15~~ 2A.14 Sign Borders

Standard:

Unless specifically stated otherwise, each sign illustrated herein shall have a border of the same color as the legend, at or just inside the edge.

The corners of all sign borders shall be rounded, except for STOP signs.

Guidance:

A dark border on a light background should be set in from the edge, while a light border on a dark background should extend to the edge of the ~~panel~~ sign. edited to increase accuracy A border for 750 mm (30 in) signs with a light background should be from 13 to 19 mm (0.5 to 0.75 in) in width, 13 mm (0.5 in) from the edge. For similar signs with a light border, a width of 25 mm (1 in) should be used. For other sizes, the border width should be of similar proportions, but should not exceed the stroke-width of the major lettering of the sign. On signs exceeding 1800 x 3000 mm (72 x 120 in) in size, the border should be 50 mm (2 in) wide, or on larger signs, 75 mm (3 in) wide. Except for STOP signs and as otherwise provided in Section 2E.16, the corners of the sign should be rounded to ~~fit~~ a radius that is concentric with that of the border.

Section 2A.15 Enhanced Conspicuity for Standard Signs

Option:

Based upon engineering judgment, where the improvement of the conspicuity of a standard regulatory, warning, or guide sign is desired, any of the following methods may be used, as appropriate, to enhance the sign's conspicuity (see Figure 2A-1):

A. Increasing the size of a standard regulatory, warning, or guide sign.
B. Doubling-up of a standard regulatory, warning, or guide sign by adding a second identical sign on the left-hand side of the roadway.
C. Adding a solid yellow or fluorescent yellow rectangular "header panel" above a standard regulatory sign, with the width of the panel corresponding to the width of the standard regulatory sign. A legend of "NOTICE," "STATE LAW," or other appropriate text may be added in black letters within the header panel.
D. Adding a NEW plaque (see Section 2C.67) above a new standard regulatory or warning sign, for a period of time determined by engineering judgment, to call attention to the new sign.
E. Adding one or more red flags (cloth or retroreflective sheeting) above a standard regulatory or warning sign, with the flags oriented so as to be at 45 degrees to the vertical.
F. Adding a solid red or fluorescent red strip of retroreflective sheeting at least 75 mm (3 in) wide around the perimeter of a standard regulatory sign. This may be accomplished by affixing the standard regulatory sign on a red retroreflective background panel having a width and height that is 150 mm (6 in) larger than the size of the standard regulatory sign.
G. Adding a solid yellow, a solid fluorescent yellow, or a diagonally striped black and yellow (or black and fluorescent yellow) strip of retroreflective sheeting at least 75 mm (3 in) wide around the perimeter of a standard warning sign. This may be accomplished by affixing the standard warning sign on a background panel that is 150 mm (6 in) larger than the size of the standard warning sign.
H. Adding a warning beacon (see Section 4L.03) to a standard regulatory (other than a STOP or a Speed Limit sign), warning, or guide sign.
I. Adding a speed limit sign beacon (see Section 4L.04) to a standard Speed Limit sign.
J. Adding a stop beacon (see Section 4L.05) to a STOP sign.
K. Adding light emitting diode (LED) units within the symbol or legend of a sign or border of a standard regulatory, warning, or guide sign, as described in Section 2A.07.
L. Using other methods that are specifically allowed for certain signs as described elsewhere in this Manual.

Standard:

Strobe lights shall not be used to enhance the conspicuity of highway signs.

Section 2A.16 Standardization of Location

Support:

Standardization of position cannot always be attained in practice. Examples of heights and lateral locations of signs for typical installations are illustrated in Figure 2A-2, and examples of locations for some typical signs at intersections are illustrated in Figure 2A-3.

Standard:

Signs requiring ~~different~~ separate decisions by the road user shall be spaced sufficiently far apart for the ~~required~~ appropriate decisions to be made ~~reasonably safely~~. One of the factors considered when determining the appropriate spacing shall be the posted or 85th-percentile speed.

Guidance:

Signs should be located on the right-hand edited to increase clarity side of the roadway where they are easily recognized and understood by road users. Signs in other locations should be considered only as supplementary to signs in the normal locations, except as otherwise indicated.

Signs should be individually installed on separate posts or mountings except where:

A. One sign supplements another;
B. Route or directional signs are grouped to clarify information to motorists;
C. Regulatory signs that do not conflict with each other are grouped, such as Turn Prohibition signs posted with ONE WAY signs~~, street name signs posted with a stop or yield sign,~~ or a parking regulation sign posted with a Speed Limit sign; or
D. Street Name signs are posted with a STOP or YIELD sign. edited to increase accuracy

Signs should be located so that they:

A. Are outside the clear zone unless placed on a breakaway or yielding support (see Section 2A.19),
B. Optimize nighttime visibility,
C. Minimize the effects of mud splatter and debris,
D. Do not obscure each other,
E. Do not obscure the sight distance to approaching vehicles on the major street for drivers who are stopped on minor-street approaches, and
F. Are not hidden from view.

Support:

The clear zone is the total roadside border area, starting at the edge of the traveled way, available for use by errant vehicles. The width of the clear zone is dependent upon traffic volumes, speeds, and roadside geometry. Additional information can be found in AASHTO's "Roadside Design Guide" (see Section 1A.11).

Guidance:

With the increase in traffic volumes and the desire to provide road users regulatory, warning, and guidance information, an order of priority for sign installation should be established.

Support:

An order of priority is especially critical where space is limited for sign installation and there is a demand for several different types of signs. Overloading road users with too much information is not desirable.

Guidance:

Because regulatory and warning information is more critical to the road user than guidance information, regulatory and warning signing whose location is critical should be displayed rather than guide signing in cases where conflicts occur. Community wayfinding and acknowledgement guide signs should have a lower priority as to placement than other guide signs. Information of a less critical nature should be moved to less critical locations or omitted.

Option:

Under some circumstances, such as on curves to the right, signs may be placed on median islands or on the left-hand edited to increase clarity side of the road. A supplementary sign located on the left-hand side edited to increase clarity of the roadway may be used on a multi-lane road where traffic in a lane to the right ~~lane~~ edited to increase clarity might obstruct the view to the right.

Guidance:

In urban areas where crosswalks exist, signs should not be placed within 1.2 m (4 ft) in advance of the crosswalk (see Figure 2A-3). added to assist the reader

STOP or YIELD signs should not be placed farther than 15 m (50 ft) from the edge of the pavement of the intersected roadway (see Figure 2A-3). added to provide the classification of the information shown in the figure

Section 2A.17 Overhead Sign Installations

Guidance:

Overhead signs should be used on freeways and expressways, at locations where some degree of lane-use control is desirable, and at locations where space is not available at the roadside.

Support:

The operational requirements of the present highway system are such that overhead signs have value at many locations. The factors to be considered for the installation of overhead sign displays are not definable in specific numerical terms.

Option:

The following conditions (not in priority order) may be considered in an engineering study to determine if overhead signs would be beneficial:

A. Traffic volume at or near capacity,
B. Complex interchange design,
C. Three or more lanes in each direction,
D. Restricted sight distance,
E. Closely spaced interchanges,
F. Multi-lane exits,
G. Large percentage of trucks,
H. Street lighting background,
I. High-speed traffic,
J. Consistency of sign message location through a series of interchanges,
K. Insufficient space for ~~ground-~~ post-mounted edited to increase consistency signs,
L. Junction of two freeways, and
M. Left exit ramps.

Over-crossing structures may ~~serve for the~~ be used to support ~~of~~ overhead signs.

Support:

~~and~~ Under some circumstances, the use of over-crossing structures as sign supports ~~may~~ might be the only practical solution that will provide adequate viewing distance. The use of such structures as sign supports ~~may~~ might eliminate the need for the foundations and sign supports along the roadside.

Section 2A.18 Mounting Height paragraphs have been rearranged within this Section to improve clarity

~~Support~~ **Standard:**

The provisions of this Section shall apply unless specifically stated otherwise for a particular sign or object marker elsewhere in this Manual.

Support:

The mounting height requirements for object markers are provided in Chapter 2L.

In addition to the provisions of this Section, information affecting the minimum mounting height of signs as a function of crash performance can be found in AASHTO's "Roadside Design Guide" (see Section 1A.11).

Standard:

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 ~~districts~~ areas shall be ~~at least~~ 1.5 m (5 ft)~~, measured from the bottom of the sign to the near edge of the pavement~~ (see Figure 2A-2).

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, ~~the clearance to the bottom of the sign~~ shall be ~~at least~~ 2.1 m (7 ft) (see Figure 2A-2).

The minimum height, measured vertically from the bottom of the sign to the sidewalk, of signs installed above sidewalks shall be 2.1 m (7 ft).

Option:

The height to the bottom of a secondary sign mounted below another sign may be 0.3 m (1 ft) less than the height specified above.

Guidance:

If the bottom of a secondary sign that is mounted below another sign is mounted lower than 2.1 m (7 ft) above a pedestrian sidewalk or pathway (see Section 6D.02), the secondary sign should not project more than 100 mm (4 in) into the pedestrian facility.

Option:

~~Where~~ Signs that are placed 9 m (30 ft) or more from the edge of the traveled way~~, the~~ may be installed with a minimum height ~~to the bottom of such signs may be~~ of 1.5 m (5 ft), ~~above the level~~ measured vertically from the bottom of the sign to the elevation of the near edge of the pavement ~~edge~~.

Standard:

Directional signs on freeways and expressways shall be installed with a minimum height of 2.1 m (7 ft), measured vertically from the bottom of the sign to the elevation of the near edge of the pavement. All route signs, warning signs, and regulatory signs on freeways and expressways shall be ~~at least~~ installed with a minimum height of 2.1 m (7 ft), measured vertically from the bottom of the sign to ~~above~~ the ~~level~~ elevation of the near edge of the pavement ~~edge~~. If a secondary sign is mounted below another sign on a freeway or expressway, the major sign shall be installed ~~at least~~ with a minimum height of 2.4 m (8 ft) and the secondary sign ~~at least~~ shall be installed with a minimum height of 1.5 m (5 ft), measured vertically from the bottom of the sign to ~~above~~ the ~~level~~ elevation of the near edge of the pavement ~~edge~~. sentences were rearranged

Where large signs having an area exceeding 5 square meters (50 square feet) are installed on multiple breakaway posts, the clearance from the ground to the bottom of the sign shall be at least 2.1 m (7 ft). repeated from Section 6F.03

Option:

A route sign assembly consisting of a route sign and auxiliary signs (see Section 2D.30) may be treated as a single sign for the purposes of this Section.

The mounting height may be adjusted when supports are located near the edge of the right-of-way on a steep backslope.

Support:

Without this flexibility regarding steep backslopes, some agencies might decide to relocate the sign closer to the road, which might be less desirable.

Standard:

Overhead ~~mounted~~ edited to increase consistency signs shall provide a vertical clearance of not less than 5.2 m (17 ft) to the sign, light fixture, or sign bridge~~,~~ over the entire width of the pavement and shoulders except where the structure on which the overhead signs are to be mounted or other structures along the roadway near the sign structure have a lesser vertical clearance ~~is used for the design of other structures~~.

Option:

If the vertical clearance of other structures along the roadway near the sign structure is less than 4.9 m (16 ft), the vertical clearance to an overhead sign structure~~s~~ or support~~s~~ may be as low as 0.3 m (1 ft) higher than the vertical clearance of the other structures in order to improve the visibility of the overhead signs.

In special cases it may be necessary to reduce the clearance to overhead signs because of substandard dimensions in tunnels and other major structures such as double-deck bridges.

Support:

Figure 2A-2 illustrates some examples of the mounting height requirements contained in this Section.

Section 2A.19 Lateral Offset

Standard:

For overhead sign supports, the minimum lateral offset from the edge of the shoulder (or if no shoulder exists, from the edge of the pavement) to the near edge of overhead sign supports (cantilever or sign bridges) shall be 1.8 m (6 ft). Overhead sign supports shall have a barrier or crash cushion to shield them if they are within the clear zone.

~~Ground~~ Post-mounted edited to increase consistency sign and object marker supports shall be crashworthy (breakaway, yielding, or shielded with a longitudinal barrier or crash cushion) if within the clear zone.

Guidance:

For ~~ground~~ post-mounted edited to increase consistency signs, the minimum lateral offset should be 3.7 m (12 ft) from the edge of the traveled way. If a shoulder wider than 1.8 m (6 ft) exists, the minimum lateral

offset for ~~ground-~~ post-mounted edited to increase consistency signs should be 1.8 m (6 ft) from the edge of the shoulder.

Support:

The minimum lateral offset requirements for object markers are provided in Chapter 2L.

The minimum lateral offset is intended to keep trucks and cars that use the shoulders from striking the signs or supports.

Guidance:

All supports should be located as far as practical from the edge of the shoulder. Advantage should be taken to place signs behind existing roadside barriers, on over-crossing structures, or other locations that minimize the exposure of the traffic to sign supports.

Option:

Where permitted, signs may be placed on existing supports used for other purposes, such as highway traffic signal supports, highway lighting supports, and utility poles.

Standard:

If signs are placed on existing supports, they shall meet other placement criteria contained in this Manual.

Option:

Lesser lateral offsets may be used on connecting roadways or ramps at interchanges, but not less than 1.8 m (6 ft) from the edge of the traveled way.

On conventional roads in areas where ~~lateral offsets are limited~~ it is impractical to locate a sign with the lateral offset prescribed by this Section, a ~~minimum~~ lateral offset of no less than 0.6 m (2 ft) may be used. edited to increase clarity

A minimum offset of 0.3 m (1 ft) from the face of the curb may be used in urban areas where sidewalk width is limited or where existing poles are close to the curb.

Guidance:

Overhead sign supports and post-mounted sign and object marker supports should not intrude into the usable width of a sidewalk or other pedestrian facility.

Support:

Figures 2A-2 and 2A-3 illustrate some examples of the lateral offset requirements contained in this Section.

Section 2A.20 Orientation

Guidance:

Unless otherwise stated in this Manual, signs should be vertically mounted at right angles to the direction of, and facing, the traffic that they are intended to serve.

Where mirror reflection from the sign face is encountered to such a degree as to reduce legibility, the sign should be turned slightly away from the road. Signs that are placed 9 m (30 ft) or more from the pavement edge should be turned toward the road. On curved alignments, the angle of placement should be determined by the direction of approaching traffic rather than by the roadway edge at the point where the sign is located.

Option:

On grades, sign faces may be tilted forward or back from the vertical position to improve the viewing angle.

Section 2A.21 Posts and Mountings

Standard:

Sign posts, foundations, and mountings shall be so constructed as to hold signs in a proper and permanent position, and to resist swaying in the wind or displacement by vandalism.

Support:

The latest edition of AASHTO's "Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals" contains additional information regarding posts and mounting (see Page i for AASHTO's address).

Option:

Where engineering judgment indicates a need to draw attention to the sign during nighttime conditions, a strip of retroreflective material may be used on regulatory and warning sign supports.

Standard:

If a strip of retroreflective material is used on the sign support, it shall be at least 50 mm (2 in) in width, it shall be placed for the full length of the support from the sign to within 0.6 m (2 ft) above the edge of the roadway, and its color shall match the background color of the sign, except that the color of the strip for the YIELD and DO NOT ENTER signs shall be red.

Section 2A.22 Maintenance

Guidance:

All traffic signs and object markers should be kept properly positioned, clean, and legible, and should have adequate retroreflectivity. Damaged or deteriorated signs should be replaced.

To assure adequate maintenance, a schedule for inspecting (both day and night), cleaning, and replacing signs and object markers should be established. Employees of highway, law enforcement, and other public agencies whose duties require that they travel on the roadways should be encouraged to report any damaged, deteriorated, or obscured signs or object markers at the first opportunity.

Steps should be taken to see that weeds, trees, shrubbery, and construction, maintenance, and utility materials and equipment do not obscure the face of any sign or object marker.

A regular schedule of replacement of lighting elements for illuminated signs should be maintained.

Section 2A.23 Median Opening Treatments for Divided Highways with Wide Medians

Guidance:

Where divided highways are separated by median widths at the median opening itself of 9 m (30 ft) or more, median openings should be signed as two separate intersections.

CHAPTER 2B. REGULATORY SIGNS

Section 2B.01 Application of Regulatory Signs

Standard:

Regulatory signs shall be used to inform road users of selected traffic laws or regulations and indicate the applicability of the legal requirements.

Regulatory signs shall be installed at or near where the regulations apply. The signs shall clearly indicate the requirements imposed by the regulations and shall be designed and installed to provide adequate visibility and legibility in order to obtain compliance.

Regulatory signs shall be retroreflective or illuminated (see Section 2A.07) to show the same shape and similar color by both day and night, unless specifically stated otherwise in the text discussion of a particular sign or group of signs ~~(see Section 2A.07)~~.

The requirements for sign illumination shall not be considered to be satisfied by street~~,~~ or highway~~, or strobe~~ lighting.

Section 2B.02 Design of Regulatory Signs

~~Support~~ Standard:

~~Most~~ **Regulatory signs ~~are~~ shall be rectangular~~, with the longer dimension vertical~~ unless specifically designated otherwise. ~~The shapes and colors of regulatory signs are listed in Tables 2A-3 and 2A-4, respectively. Exceptions are specifically noted in the following Sections.~~ Regulatory signs shall be designed in accordance with the sizes, shapes, colors, and legends contained in the "Standard Highway Signs and Markings" book (see Section 1A.11).**

Option: these two paragraphs were relocated from Section 2B.54

Regulatory word message signs other than those classified and specified in this Manual and the "Standard Highways Signs and Markings" book (see Section 1A.11) may be developed to aid the enforcement of other laws or regulations.

Except for symbols on regulatory signs, minor modifications may be made to the design provided that the essential appearance characteristics are met.

Support:

The use of educational plaques to supplement symbol signs is described in Section 2A.12.

Guidance:

Changeable message signs displaying a regulatory message incorporating a prohibitory message that includes a red circle and slash on a static sign should display a red symbol that approximates the same red circle and slash as closely as possible.

Section 2B.03 Size of Regulatory Signs

Standard:

Except as noted in Section 2A.11, the sizes for regulatory signs shall be as shown in Table 2B-1.

~~Guidance:~~

~~The Freeway and Expressway sizes should be used for higher-speed applications to provide larger signs for increased visibility and recognition.~~

~~Option:~~

~~The Minimum size may be used on low-speed roadways where the reduced legend size would be adequate for the regulation or where physical conditions preclude the use of the other sizes.~~

~~The Oversized size may be used for those special applications where speed, volume, or other factors result in conditions where increased emphasis, improved recognition, or increased legibility would be desirable.~~

~~Signs larger than those shown in Table 2B-1 may be used (see Section 2A.11).~~

Support:

Section 2A.11 contains information regarding the applicability of the various columns in Table 2B-1.

Standard:

The minimum sizes for certain regulatory signs facing traffic on multi-lane conventional roads shall be as shown in Table 2B-2.

A minimum size of 900 x 900 mm (36 x 36 in) shall be used for STOP signs that face multi-lane approaches.

Section 2B.04 Right-of-Way at Intersections

Support:

The "Uniform Vehicle Code" (see Section 1A.11) establishes the right-of-way rule at intersections having no regulatory traffic control signs such that the driver of a vehicle approaching an intersection must yield the right-of-way to any vehicle or pedestrian already in the intersection. When two vehicles approach an intersection from different streets or highways at approximately the same time, the right-of-way rule requires the driver of the vehicle on the left to yield the right-of-way to the vehicle on the right. The right-of-way can be modified at through streets or highways by placing STOP (R1-1) signs (see Sections 2B.05 through 2B.07) or YIELD (R1-2) signs (see Sections 2B.08 and 2B.09) on one or more approaches.

Guidance:

Engineering judgment should be used to establish intersection control. The following factors should be considered:

A. Vehicular, bicycle, and pedestrian traffic volumes on all approaches;
B. Number and angle of approaches;
C. Approach speeds;
D. Sight distance available on each approach; and
E. Reported crash experience.

STOP or YIELD signs should be used at an intersection if ~~engineering judgment indicates that~~ one or more of the following conditions exist: relocated from Section 2B.05

A. An intersection of a less important road with a main road where application of the normal right-of-way rule would not be expected to provide reasonable compliance with the law;
B. A street entering a designated through highway or street; and/or
C. An unsignalized intersection in a signalized area. ~~and/or~~
~~D. High speeds, restricted view, or crash records indicate a need for control by the STOP sign.~~

In addition, the use of STOP or YIELD signs should be considered at the intersection of two minor streets or local roads where the intersection has more than three approaches and where one or more of the following conditions exist:

A. Approach speeds are above 30 mph on any approach;
B. The combined vehicular, bicycle, and pedestrian volume entering the intersection from all approaches averages more than 2,000 units per day;
C. The ability to see conflicting traffic on an approach is not sufficient to allow a road user to stop or yield in compliance with the normal right-of-way rule if such stopping or yielding is necessary; and/or
D. Crash records indicate that 5 or more crashes that involve the failure to yield the right-of-way at the intersection under the normal right-of-way rule have been reported within a 3-year period, or that 3 or more such crashes have been reported within a 2-year period.

STOP or YIELD signs should not be used for speed control. relocated from Section 2B.05

Once the decision has been made to ~~install two-way stop~~ control an intersection, the decision regarding the appropriate ~~street to stop~~ roadway to control should be based on engineering judgment. In most cases, the ~~street~~ roadway carrying the lowest volume of traffic should be ~~stopped~~ controlled. relocated from Section 2B.05

A STOP or YIELD sign should not be installed on the ~~major street~~ higher volume roadway unless justified by an ~~traffic~~ engineering study. relocated from Section 2B.05

Support:

The following are considerations that might influence the decision regarding the appropriate ~~street~~ roadway upon which to install a STOP or YIELD sign where two ~~streets~~ roadways with relatively equal volumes and/or characteristics intersect: relocated from Section 2B.05

A. ~~Stopping~~ Controlling the direction that conflicts the most with established pedestrian crossing activity or school walking routes;
B. ~~Stopping~~ Controlling the direction that has obscured vision, dips, or bumps that already require drivers to use lower operating speeds; and
~~C. Stopping the direction that has the longest distance of uninterrupted flow approaching the intersection; and~~

C. ~~Stopping~~ Controlling the direction that has the best sight distance from a controlled position to observe conflicting traffic.

Standard:

Because the potential for conflicting commands could create driver confusion, STOP or YIELD signs shall not be ~~installed at intersections where~~ used in conjunction with any traffic control signal~~s are installed and operating~~ operation, except ~~as noted in Section 4D.01.~~ in the following cases: relocated from Section 2B.05

A. If the signal indication for an approach is a flashing red at all times;

B. If a minor street or driveway is located within or adjacent to the area controlled by the traffic control signal, but does not require separate traffic signal control because an extremely low potential for conflict exists; or

C. If a channelized turn lane is separated from the adjacent travel lanes by an island and the channelized turn lane is not controlled by a traffic control signal.

Except as noted in Section 2B.09, STOP signs and YIELD signs shall not be installed on different approaches to the same unsignalized intersection if those approaches conflict with or oppose each other.

Portable or part-time STOP or YIELD signs shall not be used except for emergency and temporary traffic control zone purposes. relocated from Section 2B.05

A portable or part-time (folding) STOP sign that is manually installed and manually retrieved shall not be used during a power outage to control a signalized approach unless the maintaining agency can ensure that the signal indication that will first be displayed upon restoration of power is a flashing red signal indication and that the portable STOP sign will be manually retrieved prior to stop-and-go operation of the traffic control signal.

Option:

A portable or part-time (folding) STOP sign that is operated automatically such that it only displays the STOP message during a power outage and automatically ceases to display the STOP message upon restoration of power may be used during a power outage to control a signalized approach.

Section ~~2B.04~~ 2B.05 STOP Sign (R1-1) and ALL WAY Plaque (R1-3P)

Standard:

When ~~a sign is used to indicate that traffic is~~ it is determined that a full stop is always required ~~to stop~~ on an approach to an intersection, a STOP (R1-1) sign (see Figure 2B-1) shall be used.

The STOP sign shall be an octagon with a white legend and border on a red background.

Secondary legends shall not be used on STOP sign faces. ~~If appropriate, a supplemental plaque (R1-3 or R1-4) shall be used to display a secondary legend. If the number of approach legs controlled by STOP signs at an intersection is three or more, the numeral on the supplemental plaque, if used, shall correspond to the actual number of legs controlled by STOP signs.~~

At intersections where all approaches are controlled by STOP signs (see Section 2B.07), an ALL WAY supplemental plaque (R1-3P ~~or R1-4~~) shall be mounted below each STOP sign. ~~Such~~ The ALL WAY plaque~~s~~ (see Figure 2B-1) shall have a white legend and border on a red background. the 2nd sentence was relocated from the previous paragraph

The ALL WAY plaque shall only be used if all intersection approaches are controlled by STOP signs.

Supplemental plaques with legends such as 2-WAY, 3-WAY, 4-WAY, or other numbers of ways shall not be used with STOP signs.

~~Option:~~

~~The ALL-WAY (R1-4) supplemental plaque may be used instead of the 4-WAY (R1-3) supplemental plaque.~~

Support:

The use of the CROSS TRAFFIC DOES NOT STOP (W4-4P) plaque (and other plaques with variations of this word message) is described in Section 2C.62.

Guidance:

Plaques with the appropriate alternative messages of TRAFFIC FROM LEFT (RIGHT) DOES NOT STOP (W4-4aP) or ONCOMING TRAFFIC DOES NOT STOP (W4-4bP) 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.

Option:

An EXCEPT RIGHT TURN (R1-10P) plaque (see Figure 2B-1) may be mounted below the STOP sign if an engineering study determines that a special combination of geometry and traffic volumes is present that makes it possible for right-turning traffic on the approach to be permitted to enter the intersection without stopping.

The design and application of Stop Beacons are described in Section 4L.05.

Section ~~2B.05~~ 2B.06 STOP Sign Applications many paragraphs have been relocated to the new Section 2B.04

Guidance:

~~STOP signs should be installed in a manner that minimizes the numbers of vehicles having to stop.~~ At intersections where a full stop is not necessary at all times, consideration should first be given to using less restrictive measures such as YIELD signs (see Sections 2B.08 and 2B.09).

The use of STOP signs on the minor-street approaches should be considered if engineering judgment indicates that a stop is always required because of one or more of the following conditions:

A. The vehicular traffic volumes on the through street or highway exceed 6,000 vehicles per day;
B. A restricted view exists that requires road users on the minor-street approach to stop in order to adequately observe conflicting traffic on the through street or highway; and/or
C. Crash records indicate that 3 or more crashes that are susceptible to correction by the installation of a STOP sign have been reported within a 12-month period, or that 5 or more such crashes have been reported within a 2-year period. Such crashes include right-angle collisions involving road users on the minor-street approach failing to yield the right-of-way to traffic on the through street or highway.

Support:

The use of the STOP sign at highway-rail~~road~~ grade crossings is described in Sections 8B.04 and 8B.05. The use of the STOP sign at highway-light rail transit grade crossings is described in Section 10C.04.

~~**Section 2B.06 STOP Sign Placement**~~ **most of the text from this Section has been incorporated into Section 2B.10**

~~**Standard:**~~

~~**The STOP sign shall be installed on the right side of the approach to which it applies. When the STOP sign is installed at this required location and the sign visibility is restricted, a Stop Ahead sign (see Section 2C.29) shall be installed in advance of the STOP sign.**~~

~~**The STOP sign shall be located as close as practical to the intersection it regulates, while optimizing its visibility to the road user it is intended to regulate.**~~

~~**STOP signs and YIELD signs shall not be mounted on the same post.**~~

~~Guidance:~~

~~Other than a DO NOT ENTER sign, no sign should be mounted back-to-back with a STOP sign in a manner that obscures the shape of the STOP sign.~~

~~Support:~~

~~Section 2A.16 contains additional information about separate and combined mounting of other signs with STOP signs.~~

~~Guidance:~~

~~Stop lines, when used to supplement a STOP sign, should be located at the point where the road user should stop (see Section 3B.16).~~

~~If only one STOP sign is installed on an approach, the STOP sign should not be placed on the far side of the intersection.~~

~~Where two roads intersect at an acute angle, the STOP sign should be positioned at an angle, or shielded, so that the legend is out of view of traffic to which it does not apply.~~

~~Where there is a marked crosswalk at the intersection, the STOP sign should be installed in advance of the crosswalk line nearest to the approaching traffic.~~

~~Option:~~

~~At wide-throat intersections or where two or more approach lanes of traffic exist on the signed approach, observance of the stop control may be improved by the installation of an additional STOP sign on the left side of the road and/or the use of a stop line. At channelized intersections, the additional STOP sign may be effectively placed on a channelizing island.~~

~~Support:~~

~~Figure 2A-2 shows examples of some typical placements of STOP signs.~~

Section 2B.07 Multiway Stop Applications

Support:

Multiway stop control can be useful as a safety measure at intersections if certain traffic conditions exist. Safety concerns associated with multiway stops include pedestrians, bicyclists, and all road users expecting other road users to stop. Multiway stop control is used where the volume of traffic on the intersecting roads is approximately equal.

The restrictions on the use of STOP signs described in Section 2B.04 also apply to multiway stop applications.

Guidance:

The decision to install multiway stop control should be based on an engineering study.

The following criteria should be considered in the engineering study for a multiway STOP sign installation:

A. Where traffic control signals are justified, the multiway stop is an interim measure that can be installed quickly to control traffic while arrangements are being made for the installation of the traffic control signal.
B. ~~A crash problem, as indicated by 5~~ Five or more reported crashes in a 12-month period that are susceptible to correction by a multiway stop installation. Such crashes include right-turn edited to increase clarity and left-turn collisions as well as right-angle collisions.
C. Minimum volumes:
    1. The vehicular volume entering the intersection from the major street approaches (total of both approaches) averages at least 300 vehicles per hour for any 8 hours of an average day; and
    2. The combined vehicular, pedestrian, and bicycle volume entering the intersection from the minor street approaches (total of both approaches) averages at least 200 units per hour for the same 8 hours, with an average delay to minor-street vehicular traffic of at least 30 seconds per vehicle during the highest hour; but
    3. If the 85th-percentile approach speed of the major-street traffic exceeds 65 km/h or exceeds 40 mph, the minimum vehicular volume warrants are 70 percent of the above values.
D. Where no single criterion is satisfied, but where Criteria B, C.1, and C.2 are all satisfied to 80 percent of the minimum values. Criterion C.3 is excluded from this condition.

Option:

Other criteria that may be considered in an engineering study include:

A. The need to control left-turn conflicts;
B. The need to control vehicle/pedestrian conflicts near locations that generate high pedestrian volumes;
C. Locations where a road user, after stopping, cannot see conflicting traffic and is not able to ~~reasonably safely~~ negotiate the intersection unless conflicting cross traffic is also required to stop; and
D. An intersection of two residential neighborhood collector (through) streets of similar design and operating characteristics where multiway stop control would improve traffic operational characteristics of the intersection.

Section 2B.08 YIELD Sign (R1-2)

Standard:

The YIELD (R1-2) sign (see Figure 2B-1) shall be a downward-pointing equilateral triangle with a wide red border and the legend YIELD in red on a white background.

Support:

The YIELD sign assigns right-of-way to traffic on certain approaches to an intersection. Vehicles controlled by a YIELD sign need to slow down to a speed that is reasonable for the existing conditions or stop when necessary to avoid interfering with conflicting traffic.

Section 2B.09 YIELD Sign Applications

Option:

YIELD signs may be ~~used instead of STOP signs if engineering judgment indicates that one or more of the following conditions exist~~ installed:

A. ~~When the ability to see all potentially conflicting traffic is sufficient to allow a road user traveling at the posted speed, the 85th percentile speed, or the statutory speed to pass through the intersection or to stop in a reasonably safe manner~~ On the approaches to a through street or highway where conditions are such that a stop is not always required.

~~B. If controlling a merge-type movement on the entering roadway where acceleration geometry and/or sight distance is not adequate for merging traffic operation.~~

B. At the second crossroad of a divided highway, where the median width at the intersection is 9 m (30 ft) or greater. In this case, a STOP or YIELD sign may be installed at the entrance to the first roadway of a divided highway, and a YIELD sign may be installed at the entrance to the second roadway.

C. On a channelized turn lane that is separated from the adjacent travel lanes by an island, even if the adjacent lanes at the intersection are controlled by a highway traffic control signal or by a STOP sign.

D. At an intersection where a special problem exists and where engineering judgment indicates the problem to be susceptible to correction by the use of the YIELD sign.

E. Facing the entering roadway for a merge-type movement if engineering judgment indicates that control is needed because acceleration geometry and/or sight distance is not adequate for merging traffic operation.

Standard:

A YIELD (R1-2) sign shall be used to assign right-of-way at the entrance to a roundabout ~~intersection~~. YIELD signs at roundabouts shall be used to control the approach roadways and shall not be used to control the circulatory roadway.

Section 2B.10 STOP Sign or YIELD Sign Placement this Section was edited to include the STOP sign provisions from Section 2B.06

Standard:

The STOP or YIELD sign shall be installed on the near side of the intersection on the right-hand edited to increase clarity side of the approach to which it applies. ~~YIELD signs shall be placed on both the left and right sides of approaches to roundabout intersections with more than one lane on the signed approach where raised splitter islands are available on the left side of the approach.~~ When the STOP or YIELD sign is installed at this required location and the sign visibility is restricted, a Stop Ahead sign shall be installed in advance of the STOP sign or a Yield Ahead sign (see Section 2C.35) shall be installed in advance of the YIELD sign ~~(see Section 2C.35)~~.

The STOP or YIELD sign shall be located as close as practical to the intersection it regulates, while optimizing its visibility to the road user it is intended to regulate.

STOP signs and YIELD signs shall not be mounted on the same post.

No items other than retroreflective strips on the supports (see Section 2A.21), official traffic control signs, sign installation dates, inventory stickers, anti-vandalism stickers, and bar codes shall be mounted on the fronts or backs of STOP or YIELD signs or on their supports.

Guidance:

~~Other than a DO NOT ENTER sign, no sign should be~~ A sign that is mounted back-to-back with a STOP or YIELD sign ~~in a manner that obscures the shape~~ should stay within the edges of the STOP or YIELD sign. If necessary, the size of the STOP or YIELD sign should be increased so that any other sign installed back-to-back with a STOP or YIELD sign remains within the edges of the STOP or YIELD sign.

Option:

Where drivers proceeding straight ahead must yield to traffic approaching from the opposite direction, such as at a one-lane bridge, a TO ONCOMING TRAFFIC (R1-2aP) plaque may be mounted below the YIELD sign.

Support:

Figure 2A-3 shows examples of some typical placements of STOP signs and YIELD signs.

Section 2A.16 contains additional information about separate and combined mounting of other signs with STOP or YIELD signs.

Guidance:

Stop lines (see Section 3B.16), when used to supplement a STOP sign, should be located at a point where the road user should stop. Yield lines (see Section 3B.16), when used to supplement a YIELD sign, should be located at a point where the road user should yield ~~(see Section 3B.16)~~.

Where there is a marked crosswalk at the intersection, the STOP sign should be installed in advance of the crosswalk line nearest to the approaching traffic.

Except at roundabouts ~~intersections~~, deleted to increase consistency where there is a marked crosswalk at the intersection, the YIELD sign should be installed in advance of the crosswalk line nearest to the approaching traffic. this paragraph and the next paragraph were switched to provide better continuity

Where two roads intersect at an acute angle, the STOP or YIELD sign should be positioned at an angle, or shielded, so that the legend is out of view of traffic to which it does not apply.

~~At a roundabout intersection, to prevent circulating vehicles from yielding unnecessarily, the face of the YIELD sign should not be visible from the circulatory roadway.~~ deleted because it is covered by the previous paragraph

If a raised splitter island is available on the left-hand side of a multi-lane roundabout approach, an additional YIELD sign should be placed on the left-hand side of the approach.

Option:

If a raised splitter island is available on the left-hand side of a single lane roundabout approach, an additional YIELD sign may be placed on the left-hand side of the approach.

At wide-throat intersections or where two or more approach lanes of traffic exist on the signed approach, observance of the ~~yield~~ right-of-way control may be improved by the installation of an additional STOP or YIELD sign on the left-hand edited to increase clarity side of the road and/or the use of a stop or yield line. At channelized intersections or at divided roadways separated by a median, the additional STOP or YIELD sign may be ~~effectively~~ placed on a channelizing island or in the median. An additional STOP or YIELD sign may also be placed overhead facing the approach at the intersection to improve observance of the right-of-way control.

Standard:

Two STOP signs or two YIELD signs shall not be placed on the same support facing in the same direction to provide extra emphasis.

Support:

Section 2C.39 contains information regarding the use of a NO MERGE AREA (W4-5P) supplemental plaque in conjunction with a YIELD sign.

Section 2B.11 Yield Here To Pedestrians Signs and Stop Here For Pedestrians Signs (R1-5~~, R1-5a~~ Series)

Standard:

Yield Here To (Stop Here For) Pedestrians (R1-5, R1-5a, R1-5b, or R1-5c) signs (see Figure 2B-2) shall be used if yield (stop) lines are used in advance of ~~an unsignalized marked midblock~~ a crosswalk that crosses an uncontrolled multi-lane approach~~, Yield Here To Pedestrians (R1-5 or R1-5a) signs (see Figure 2B-2) shall be~~.

Guidance:

If yield (stop) lines and Yield Here To (Stop Here For) Pedestrians signs are used in advance of a crosswalk that crosses an uncontrolled multi-lane approach, they should be placed 6.1 to 15 m (20 to 50 ft) in advance of the nearest crosswalk line (see Section 3B.16 and Figure 3B-16), and parking should be prohibited in the area between the yield (stop) line and the crosswalk.

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

Option:

Yield Here To (Stop Here For) Pedestrians signs may be used in advance of a crosswalk that crosses an uncontrolled multi-lane approach to indicate to road users where to yield (stop) even if yield (stop) lines are not used.

Standard:

A Pedestrian Crossing (W11-2) warning sign shall not be post-mounted at a crosswalk location where Yield Here To (Stop Here For) Pedestrians signs have been installed in advance of the crosswalk.

Option:

A Pedestrian Crossing (W11-2) warning sign may be mounted overhead at the crosswalk location where Yield Here To (Stop Here For) Pedestrians signs have been installed in advance of the crosswalk.

An advance Pedestrian Crossing (W11-2) warning 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.

In-Street Pedestrian Crossing signs and Yield Here To (Stop Here For) Pedestrians signs may be used together at the same crosswalk.

Section 2B.12 In-Street and Overhead Pedestrian Crossing Signs (R1-6, R1-6a, R1-9, and R1-9a)

Option:

The In-Street Pedestrian Crossing (R1-6 or R1-6a) sign or the Overhead Pedestrian Crossing (R1-9 or R1-9a) sign (see Figure 2B-2) may be used to remind road users of laws regarding right-of-way at an unsignalized pedestrian ~~crossing~~ crosswalk. The legend STATE LAW may be ~~shown~~ displayed edited to increase consistency at the top of the R1-6 and R1-6a signs, if applicable. On the R1-6 and R1-6a signs, the legends STOP ~~FOR~~ or YIELD ~~TO~~ may be used ~~in conjunction with~~ instead of edited to increase clarity the appropriate STOP sign or YIELD sign symbol.

Guidance:

In-Street Pedestrian Crossing signs should be used if engineering judgment or an engineering study indicates that one or more of the following conditions exists at an unsignalized location:

A. There is a need to remind drivers of the normal right-of-way rule that requires them to stop for or yield to pedestrians within the crosswalk;
B. The application of other measures has not achieved reasonable compliance with the law on the part of drivers; or
C. The pedestrian volume crossing the roadway at an intersection or midblock location during an average day is 25 or more during any 1 hour.

Option:

In addition to the conditions listed in the previous paragraph, other criteria may be developed and applied by highway agencies in determining the applicability of In-Street Pedestrian Crossing signs.

Standard:

If used, the In-Street Pedestrian Crossing sign shall be placed in the roadway at the crosswalk location on the center line, on a lane line, or on a median island. The In-Street Pedestrian Crossing sign shall not be post-mounted on the left-hand or right-hand side of the roadway.

If used, the Overhead Pedestrian Crossing sign shall be placed over the roadway at the crosswalk location.

An In-Street or Overhead Pedestrian Crossing sign shall be not be placed in advance of the crosswalk to educate road users about the State law prior to reaching the crosswalk, nor shall it be installed as an educational display that is not near any crosswalk.

Guidance:

If an island (see Chapter 3G) is available, the In-Street Pedestrian Crossing sign, if used, should be placed on the island.

Option:

If a Pedestrian Crossing (W11-2) warning sign is used in combination with an In-Street or an Overhead Pedestrian Crossing sign, the W11-2 sign with a Downward Diagonal Arrow (W16-7P) plaque may be post-mounted on the right-hand side of the roadway at the crosswalk location.

Standard:

The In-Street Pedestrian Crossing sign and the Overhead Pedestrian Crossing sign shall not be used at signalized locations.

The STOP FOR legend shall only be used in States where the State law specifically requires that a driver must stop for a pedestrian in a crosswalk.

~~If used,~~ The In-Street Pedestrian Crossing sign shall have a black legend (except for the red STOP or YIELD sign symbols) and border on ~~either~~ a white ~~and/or fluorescent yellow-green~~ background, surrounded by an outer fluorescent yellow-green background area, as illustrated in Figure 2B-2, or by an outer fluorescent yellow background area. edited to increase clarity The Overhead Pedestrian Crossing sign shall have a black legend and border on a fluorescent yellow or fluorescent yellow-green background at the top of the sign and a black legend and border on a white background at the bottom of the sign, as illustrated in Figure 2B-2.

~~If~~ Unless the In-Street Pedestrian Crossing sign is placed ~~in the roadway~~ on a physical island, the sign support shall ~~comply with the breakaway requirements of the latest edition of AASHTO's "Specification for Structural Supports for Highway Signs, Luminaires, and Traffic Signals" (see Page i)~~ be designed to bend over and then bounce back to its normal vertical position when struck by a vehicle.

Support:

The Provisions of Section 2A.18 concerning mounting height are not applicable for the In-Street Pedestrian Crossing sign.

Standard:

The top of an In-Street Pedestrian Crossing sign shall be no more than 1.2 m (4 ft) above the pavement surface. The top of an In-Street Pedestrian Crossing sign placed in an island shall be no more than 1.2 m (4 ft) above the island surface.

Option:

The In-Street Pedestrian Crossing sign may be used seasonably to prevent damage in winter because of plowing operations, and may be removed at night if the pedestrian activity at night is minimal.

In-Street or Overhead Pedestrian Crossing signs and Yield Here To (Stop Here For) Pedestrians signs may be used together at the same crosswalk.

In-Street and Overhead Pedestrian Crossing signs may be used together at the same crosswalk.

Section 2B.13 Speed Limit Sign (R2-1)

Standard:

~~After~~ Speed zones (other than statutory speed limits) shall only be established on the basis of an engineering study that has been ~~made~~ performed in accordance with ~~established~~ traffic engineering practices. The engineering study shall include an analysis of the current speed distribution of free-flowing vehicles.

The Speed Limit (R2-1) sign (see Figure 2B-1) shall display the limit established by law, ordinance, regulation, or as adopted by the authorized agency based on the engineering study. The speed limits ~~shown~~ displayed edited to increase consistency shall be in multiples of 10 km/h or 5 mph.

Speed Limit (R2-1) signs, indicating speed limits for which posting is required by law, shall be located at the points of change from one speed limit to another. relocated from Section 2B.18

At the downstream end of the section to which a speed limit applies, a Speed Limit sign showing the next speed limit shall be installed. Additional Speed Limit signs shall be installed beyond major intersections and at other locations where it is necessary to remind road users of the speed limit that is applicable. relocated from Section 2B.18

Speed Limit signs indicating the statutory speed limits shall be installed at entrances to the State and, where appropriate, at jurisdictional boundaries ~~of metropolitan~~ in urban areas. relocated from Section 2B.18

Support:

In general, the maximum speed limits applicable to rural and urban roads are established:

A. Statutorily – a maximum speed limit applicable to a particular class of road, such as freeways or city streets, that is established by State law; or
B. As altered speed zones – based on engineering speed studies.

State statutory limits might restrict the maximum speed limit that can be established on a particular road, notwithstanding what an engineering study might indicate.

Option:

If a jurisdiction has a policy of installing Speed Limit signs only on the streets that enter a city, neighborhood, or residential area to indicate the speed limit that is applicable to the entire city, neighborhood, or residential area unless otherwise posted, a CITYWIDE (R2-5aP), NEIGHBORHOOD (R2-5bP), or RESIDENTIAL (R2-5cP) plaque may be mounted above the Speed Limit sign and an UNLESS OTHERWISE POSTED (R2-5P) plaque may be mounted below the Speed Limit sign (see Figure 2B-1).

Guidance:

A Reduced Speed Limit Ahead (W3-5 or W3-5a) sign (see Section 2C.37) should be used to inform road users of a reduced speed zone where the speed limit is being reduced by more than 20 km/h or by more than 10 mph, or where engineering judgment indicates the need for advance notice to comply with the posted speed limit ahead.

At least once every 5 years, States and local agencies should reevaluate non-statutory speed limits on segments of their roadways that have undergone a significant change in roadway characteristics or surrounding land use since the last review.

No more than three speed limits should be displayed on any one Speed Limit sign or assembly.

When a speed limit is to be posted, it should be within 10 km/h or 5 mph of the 85th-percentile speed of free-flowing traffic.

Option:

Other factors that may be considered when establishing speed limits are the following:

A. Road characteristics, shoulder condition, grade, alignment, and sight distance;
B. The pace ~~speed~~;
C. Roadside development and environment;
D. Parking practices and pedestrian activity; and
E. Reported crash experience for at least a 12-month period.

Two types of Speed Limit signs may be used: one to designate passenger car speeds, including any nighttime information or minimum speed limit that might apply; and the other to show any special speed limits for trucks and other vehicles.

A changeable message sign that changes the speed limit for traffic and ambient conditions may be installed provided that the appropriate speed limit is ~~shown~~ displayed edited to increase consistency at the proper times.

A changeable message sign that displays to approaching drivers the speed at which they are traveling may be installed in conjunction with a Speed Limit sign.

Guidance:

If a changeable message sign displaying approach speeds is installed, the legend YOUR SPEED XX km/h (MPH) or such similar legend should be ~~shown~~ displayed. edited to increase consistency The color of the changeable message legend should be a yellow legend on a black background or the reverse of these colors.

Support:

Advisory Speed signs are discussed in Sections 2C.08 and 2C.14 and Temporary Traffic Control Zone Speed signs are discussed in Part 6.

Section 2B.14 Truck Speed Limit ~~Sign~~ Plaque (R2-2P)

Standard:

Where a special speed limit applies to trucks or other vehicles, the legend TRUCKS XX or such similar legend shall be ~~shown~~ displayed edited to increase consistency ~~on the same panel as~~ below the legend SPEED LIMIT XX on the same sign or on a separate R2-2P ~~sign~~ plaque (see Figure 2B-1) below the standard legend. edited to increase clarity

Section 2B.15 Night Speed Limit ~~Sign~~ Plaque (R2-3P)

Standard:

Where different speed limits are prescribed for day and night, both limits shall be posted.

Guidance:

A Night Speed Limit (R2-3P) ~~sign~~ plaque (see Figure 2B-1) should be reversed using a white retroreflectorized legend and border on a black background.

Option:

A Night Speed Limit ~~sign~~ plaque may be combined with or installed below the standard Speed Limit (R2-1) sign.

Section 2B.16 Minimum Speed Limit ~~Sign~~ Plaque (R2-4P)

Standard:

A Minimum Speed Limit (R2-4P) ~~sign~~ plaque (see Figure 2B-3) shall be displayed only in combination with a Speed Limit sign.

Option:

Where engineering judgment determines that slow speeds on a highway might impede the normal and reasonable movement of traffic, the Minimum Speed Limit ~~sign~~ plaque may be installed below a Speed Limit (R2-1) sign to indicate the minimum legal speed. If desired, ~~these two signs~~ the Speed Limit sign and the Minimum Speed Limit plaque may be combined on the R2-4a sign (see Figure 2B-3).

Section 2B.17 FINES HIGHER Plaque (R2-6P)

Option:

The FINES HIGHER (R2-6P) plaque (see Figure 2B-1) may be used to advise road users when increased fines are imposed for traffic violations within designated roadway segments.

The FINES HIGHER plaque may be mounted below an applicable regulatory or warning sign in a temporary traffic control zone, a school zone, or other applicable designated zones.

The following may be mounted below the FINES HIGHER plaque:

A. A supplemental plaque specifying the times that the higher fines are in effect (similar to the S4-1P plaque shown in Figure 7B-1), or
B. A supplemental plaque WHEN CHILDREN (WORKERS) ARE PRESENT, or
C. A supplemental plaque WHEN FLASHING (similar to the S4-4P plaque shown in Figure 7B-1) if used in conjunction with a yellow flashing beacon.

The legend FINES HIGHER may be replaced by ~~multiple values such as~~ FINES DOUBLE (R2-6aP) ~~or FINES TRIPLE~~, ~~or by a specific value such as $150~~ $XX FINE (R2-6bP), or another legend appropriate to the specific regulation (see Figure 2B-1).

Standard:

The FINES HIGHER plaque shall be a rectangle with a black legend and border on a white background.

All supplemental plaques mounted below the FINES HIGHER plaque shall be rectangles with black legends and borders on white backgrounds.

The FINES HIGHER plaque shall include a SCHOOL, WORK ZONE, or other applicable designated zone plaque mounted above the applicable regulatory or warning sign. The SCHOOL supplemental plaque shall be rectangular in shape with a black legend and border on a ~~yellow or~~ fluorescent yellow-green background (same as the S4-3P plaque described in Section 7B.14). The WORK ZONE supplemental plaque (see Section 6F.12) shall be rectangular in shape with a black legend and border on an orange background.

Guidance:

If used, the FINES HIGHER plaque should be located at the beginning of the temporary traffic control zone, school zone, or other applicable designated zone and just beyond any interchanges, major intersections, or other major traffic generators.

Agencies should limit the use of the FINES HIGHER plaque to locations where work is actually underway, or to locations where the roadway, shoulder, or other conditions, including the presence of a school, require a speed reduction or extra caution on the part of the road user.

Support:

Section 6F.12 contains information regarding other signs associated with increased fines for traffic violations in temporary traffic control zones.

~~**Section 2B.18 Location of Speed Limit Signs**~~ **these three paragraphs were incorporated into Section 2B.13**

~~**Standard:**~~

~~**Speed Limit (R2-1) signs, indicating speed limits for which posting is required by law, shall be located at the points of change from one speed limit to another.**~~

~~**At the end of the section to which a speed limit applies, a Speed Limit sign showing the next speed limit shall be installed. Additional Speed Limit signs shall be installed beyond major intersections and at other locations where it is necessary to remind road users of the speed limit that is applicable.**~~

~~**Speed Limit signs indicating the statutory speed limits shall be installed at entrances to the State and at jurisdictional boundaries of metropolitan areas.**~~

Section ~~2B.19~~ 2B.18 ~~Turn~~ Movement Prohibition Signs (R3-1 through R3-4, ~~and~~ R3-18, and R3-27)

Standard:

Except as noted in the Option, where ~~turns~~ specific movements are prohibited, ~~Turn~~ Movement Prohibition signs shall be installed.

Guidance:

~~Turn~~ Movement Prohibition signs should be placed where they will be most easily seen by road users who might be intending to ~~turn~~ make the movement.

If No Right Turn (R3-1) signs (see Figure 2B-3) are used, at least one should be placed either over the roadway or at a right-hand edited to increase clarity corner of the intersection.

If No Left Turn (R3-2) signs (see Figure 2B-3) are used, at least one should be placed ~~either~~ grammar – more than two choices over the roadway, at the far left-hand corner of the intersection, on a median, or in conjunction with the STOP sign or YIELD sign located on the near right-hand corner.

Except as noted in the ~~Option~~ Guidance below for signalized locations, edited to maintain accuracy if NO TURNS (R3-3) signs (see Figure 2B-3) are used, two signs should be used, one at a location specified for a No Right Turn sign and one at a location specified for a No Left Turn sign.

If No U-Turn (R3-4) signs (see Figure 2B-3) or combination No U-Turn/No Left Turn (R3-18) signs (see Figure 2B-3) are used, at least one should be used at a location specified for No Left Turn signs. this paragraph and the next paragraph were combined

~~If combination No U-Turn/No Left Turn (R3-18) signs (see Figure 2B-3) are used, at least one should be used at a location specified for No Left Turn signs.~~

Option:

If both left turns and U-turns are prohibited, the R3-18 sign may be used instead of separate R3-2 and R3-4 signs. this paragraph was relocated to increase continuity

Guidance:

If No Straight Through (R3-27) signs (see Figure 2B-3) are used, at least one should be placed either over the roadway or at a location where it can be seen by road users who might be intending to travel straight through the intersection.

If signals are present:

A. The No Right Turn sign ~~may~~ should be installed adjacent to a signal face viewed by road users in the right-hand edited to increase clarity lane.
B. The No Left Turn (or No U-Turn or combination No U-Turn/No Left Turn) sign ~~may~~ should be installed adjacent to a signal face viewed by road users in the left-hand edited to increase clarity lane.
C. A NO TURNS sign ~~may~~ should be placed adjacent to a signal face viewed by all road users on that approach, or two signs ~~may~~ should be used.

Option:

If signals are present, an additional ~~Turn~~ Movement Prohibition sign may be ~~ground~~ post-mounted edited to increase consistency to supplement the sign mounted overhead.

Where ONE WAY signs are used (see Section 2B.47), ~~Turn Prohibition~~ No Left Turn and No Right Turn signs may be omitted.

When the movement restriction applies during certain time periods only, the following ~~Turn~~ Movement Prohibition signing alternatives may be used and are listed in order of preference:

A. Changeable message signs, especially at signalized intersections.
B. Permanently mounted signs incorporating a supplementary legend showing the hours and days during which the prohibition is applicable.
C. Portable signs, installed by proper authority, located off the roadway at each corner of the intersection. The portable signs are only to be used during the time that the ~~turn~~ movement prohibition is applicable.

~~Turn~~ Movement Prohibition signs may be omitted at a ramp entrance to an expressway or a channelized intersection where the design is such as to indicate clearly the one-way traffic movement on the ramp or turning lane.

Standard:

The No Left Turn (R3-2) sign, the No U-Turn (R3-4) sign, and the combination No U-Turn/No Left Turn (R3-18) sign shall not be used at approaches to roundabouts to prohibit drivers from turning left onto the circulatory roadway of a roundabout.

Support:

At roundabouts, the use of R3-2, R3-4, or R3-18 signs to prohibit left turns onto the circulatory roadway might confuse drivers about the possible legal turning movements around the roundabout. ONE WAY (R6-1 or R6-2) signs and/or Roundabout Directional Arrow (R6-4 series) signs (see Section 2B.50) are the appropriate signs to indicate the travel direction within a roundabout.

Section ~~2B.20~~ 2B.19 Intersection Lane Control Signs (R3-5 through R3-8)

Standard:

Intersection Lane Control signs, if used, shall require road users in certain lanes to turn, shall permit turns from a lane where such turns would otherwise not be permitted, shall require a road user to stay in the same lane and proceed straight through an intersection, or shall indicate permitted movements from a lane.

Intersection Lane Control signs (see Figure 2B-4) shall have three applications:

A. Mandatory Movement Lane Control (R3-5, R3-5a, and R3-7) signs,
B. Optional Movement Lane Control (R3-6) sign, and
C. Advance Intersection Lane Control (R3-8 series) signs.

Guidance:

When Intersection Lane Control signs are mounted overhead, each sign should be placed over the lane or a projection of the lane to which it applies.

On signalized approaches where lane drops, multiple-lane turns involving shared through-and-turn lanes, or other lane-use regulations that would be unexpected by unfamiliar road users are present, overhead lane control signs should be installed at the signalized location over the appropriate lanes or projections thereof and in advance of the intersection over the appropriate lanes. Where overhead mounting on the approach is impractical for the advance and/or intersection lane-use signs, post-mounted R3-8 series signs should be installed in prominent locations in advance of the intersection and oversized versions should be considered.

Standard:

Use of an overhead sign for one approach lane shall not require installation of overhead signs for the other lanes of that approach.

Option:

Where the number of through lanes on an approach is two or less, the Intersection Lane Control signs (R3-5, R3-6, or R3-8) may be overhead or ~~ground~~ post-mounted. edited to increase consistency

Intersection Lane Control signs may be omitted where:

A. ~~Turning bays have~~ A turn bay has been provided by physical construction or pavement markings, and
B. Only the road users using such turn~~ing~~ bays are permitted to make a ~~similar~~ turn in that direction.

At roundabouts, Intersection Lane Control (R3-5, R3-6, and R3-8 series) signs may display any of the arrow symbol options shown in Figure 2B-5.

Section ~~2B.21~~ 2B.20 Mandatory Movement Lane Control Signs (R3-5, R3-5a, ~~and~~ R3-7, and R3-20)

Standard:

If used, the Mandatory Movement Lane Control (R3-5, R3-5a, and R3-7) sign~~s~~ (see Figure 2B-4) shall indicate only ~~those~~ the single vehicle movement~~s~~ that ~~are~~ is required from ~~each~~ the lane. If used, the Mandatory Movement Lane Control sign ~~and~~ shall be located in advance of the intersection, such as near the upstream end of the mandatory movement lane, and/or at the intersection where the regulation applies. When the mandatory movement applies to lanes exclusively designated for HOV traffic, the R3-5cP supplemental plaque shall be used. When the mandatory movement applies to lanes that are not HOV facilities, but are lanes exclusively designated for buses and/or taxis, the word message R3-5dP and/or R3-5gP supplemental plaques shall be used.

Where the number of lanes available to through traffic on an approach is three or more, Mandatory Movement Lane Control (R3-5 and R3-5a) symbol signs, if used, shall be mounted overhead (see Section 2B.19). The R3-7 word message sign shall be for ~~ground~~ post-mounting edited to increase consistency only.

If the R3-5 or R3-5a edited to increase consistency sign is ~~ground~~ post-mounted edited to increase consistency on a ~~multi-lane~~ two-lane edited to increase consistency approach, a supplemental plaque (see Figure 2B-4), such as LEFT LANE (R3-5bP), HOV 2+ (R3-5cP), TAXI LANE (R3-5dP), CENTER LANE (R3-5eP), RIGHT LANE (R3-5fP), BUS LANE (R3-5gP), or ~~LEFT 2~~ BOTH edited to increase consistency LANES, indicating the lane with the appropriate movement shall be added below.

The Mandatory Movement Lane Control (R3-7) sign shall include the legend RIGHT (LEFT) LANE MUST TURN RIGHT (LEFT). The Mandatory Movement Lane Control ~~symbol signs~~ (R3-5 and R3-5a) symbol signs edited to increase consistency shall include the legend ONLY.

Guidance:

Mandatory Movement Lane Control signs should be accompanied by lane-use arrow markings, especially where traffic volumes are high, where there is a high percentage of commercial vehicles, or where other distractions exist.

Option:

The Straight Through Only (R3-5a) sign may be used to require a road user in a particular lane to proceed straight through an intersection.

When the Mandatory Movement Lane Control sign for a left-turn lane is installed back-to-back with a Keep Right (R4-7) sign, the dimensions of the Mandatory Movement Lane Control (R3-5) sign may be the same as the Keep Right sign.

~~Except for the R3-7 sign, Mandatory Movement Lane Control signs may be overhead or ground mounted.~~ replaced by new 2nd paragraph of Standard above

The diamond symbol may be used instead of the word message HOV on the R3-5cP supplemental plaque.

The BEGIN RIGHT TURN LANE (R3-20R) sign (see Figure 2B-4) may be post-mounted on the right-hand side of the roadway at the upstream end of a mandatory right-turn lane for enforcement purposes. The BEGIN LEFT TURN LANE (R3-20L) sign (see Figure 2B-4) may be post-mounted on a median (or on the left-hand side of the roadway for a one-way street) at the upstream end of a mandatory left-turn lane for enforcement purposes.

Section ~~2B.22~~ 2B.21 Optional Movement Lane Control Sign (R3-6)

Standard:

If used, the Optional Movement Lane Control (R3-6) sign (see Figure 2B-4) shall be used for two or more movements from a specific lane or to emphasize permitted movements. If used, the Optional Movement Lane Control sign shall be located in advance of the intersection, such as near the upstream end of an adjacent mandatory movement lane, and/or added to increase clarity at the intersection where the regulation applies.

If used, the Optional Movement Lane Control sign shall indicate all permissible movements from specific lanes.

Optional Movement Lane Control signs shall be used for two or more movements from a specific lane where a movement, not normally allowed, is permitted.

The Optional Movement Lane Control sign shall not be used alone to effect a turn prohibition.

Where the number of lanes available to through traffic on an approach is three or more, Optional Movement Lane Control (R3-6) signs, if used, shall be mounted overhead (see Section 2B.19).

If the Optional Movement Lane Control sign is post-mounted on a two-lane approach, a supplemental plaque (see Figure 2B-4), such as LEFT LANE (R3-5bP), HOV 2+ (R3-5cP), TAXI LANE (R3-5dP), CENTER LANE (R3-5eP), RIGHT LANE (R3-5fP), or BUS LANE (R3-5gP), indicating the lane with the appropriate movements shall be added below.

Option:

The word message OK may be used within the border in combination with the arrow symbols of the R3-6 sign.

Standard:

Because more than one movement is permitted from the lane, the word message ONLY shall not be used on an Optional Movement Lane Control sign.

Section ~~2B.23~~ 2B.22 Advance Intersection Lane Control Signs (R3-8 Series)

Option:

Advance Intersection Lane Control (R3-8, R3-8a, and R3-8b) signs (see Figure 2B-4) may be used to indicate the configuration of all lanes ahead.

The word messages ONLY, OK, THRU, ALL, or HOV 2+ may be used within the border in combination with the arrow symbols of the R3-8 sign series. The HOV 2+ (R3-5cP) supplemental plaque may be installed at the top outside border of the R3-8 sign over the applicable lane. The diamond symbol may be used instead of the word message HOV. The minimum allowable vehicle occupancy requirement may vary based on the level established for a particular facility.

Guidance:

If used, an Advance Intersection Lane Control sign should be placed at an adequate distance in advance of the intersection so that road users can select the appropriate lane. If used, the Advance Intersection Lane Control sign should be installed either in advance of the tapers or at the beginning of the turn lane.

Option:

An Advance Intersection Lane Control sign may be repeated closer to the intersection for additional emphasis.

Standard:

Where the number of lanes available to through traffic on an approach is three or more, Advance Intersection Lane Control signs, if used, shall not be mounted overhead (see Section 2B.19).

Section 2B.23 RIGHT (LEFT) LANE MUST EXIT Sign (R3-33)

Option:

A RIGHT (LEFT) LANE MUST EXIT (R3-33) sign (see Figure 2B-4) may be used to inform road users that traffic in the right-hand (left-hand) lane of a roadway that is approaching a grade-separated interchange is required to depart the roadway on the exit ramp at the next interchange.

Support:

Section 2C.42 contains information regarding a warning sign that can be used in advance of lane drops at grade-separated interchanges.

Section 2B.24 Two-Way Left Turn Only Signs (R3-9a, R3-9b)

Guidance:

Two-Way Left Turn Only (R3-9a or R3-9b) signs (see Figure 2B-6) should be used in conjunction with the required pavement markings where a nonreversible lane is reserved for the exclusive use of left-turning vehicles in either direction and is not used for passing, overtaking, or through travel.

Option:

The ~~ground-~~ post-mounted edited to increase consistency R3-9b sign may be used as an alternate to or a supplement to the overhead ~~-mounted~~ edited to increase consistency R3-9a sign. The legend BEGIN or END may be used within the border of the main sign itself, or on ~~a plaque~~ an M4-6 or M4-14 auxiliary sign (see Sections 2D.22 and 2D.23) mounted immediately above it.

Support:

Signing is especially helpful to drivers in areas where the two-way left turn only maneuver is new, in areas subject to environmental conditions that frequently obscure the pavement markings, and on peripheral streets with two-way left turn only lanes leading to an extensive system of routes with two-way left turn only lanes.

Section 2B.25 Reversible Lane Control Signs (R3-9d, R3-9f through R3-9i)

Option:

A reversible lane may be used for through traffic (with left turns either permitted or prohibited) in alternating directions during different periods of the day, and the lane may be used for exclusive left turns in one or both directions during other periods of the day as well. Reversible Lane Control (R3-9d, R3-9f through R3-9i) signs (see Figure 2B-6) may either be static type or changeable message type. These signs may be either ~~ground~~ post-mounted or overhead ~~mounted~~. edited to increase consistency

Standard:

~~Ground-~~ Post-mounted edited to increase consistency Reversible Lane Control signs shall be used only as a supplement to overhead signs or signals. ~~Ground-~~ Post-mounted edited to increase consistency signs shall be identical in design to the overhead signs and an additional legend such as CENTER LANE shall be added to the sign (R3-9f) to indicate which lane is controlled. For both word messages and symbols, this legend shall be at the top of the sign.

Where it is determined by an engineering study that lane-use control signals or physical barriers are not necessary, the lane shall be controlled by overhead Reversible Lane Control signs (see Figure 2B-7).

Option:

Reversing traffic flow may be controlled with pavement markings and Reversible Lane Control signs (without the use of lane control signals), when all of the following conditions are met:

A. Only one lane is being reversed,
B. An engineering study indicates that the use of Reversible Lane Control signs alone would result in an acceptable level of safety and efficiency, and
C. There are no unusual or complex operations in the reversible lane pattern.

Standard:

Reversible Lane Control signs shall contain the legend or symbols designating the allowable uses of the lane and the time periods such uses are allowed. Where symbols and legend are used, their meanings shall be as shown in Table 2B-3.

Reversible Lane Control signs shall consist of a white background with a black legend and border, except for the R3-9d sign, where the color red is used.

Symbol signs, such as the R3-9d sign, shall consist of the appropriate symbol in the upper portion of the sign with the appropriate times of the day and days of the week below it. All times of the day and days of the week shall be accounted for on the sign to eliminate confusion to the road user.

In situations where more than one message is conveyed to the road user, such as on the R3-9d sign, the sign legend shall be arranged as follows:

A. The prohibition or restriction message is the primary legend and shall be on the top for word message signs and to the far left for symbol signs,
B. The permissive use message shall be ~~shown~~ displayed edited to increase consistency as the second legend, and
C. The OTHER TIMES message shall be ~~shown~~ displayed edited to increase consistency at the bottom for word message signs and to the far right for symbol signs.

Option:

The symbol signs may also include a downward pointing arrow with the legend THIS LANE. The term OTHER TIMES may be used for either the symbol or word message sign.

Standard:

A Reversible Lane Control sign shall be mounted over the center of the lane that is being reversed and shall be perpendicular to the roadway alignment.

If the vertical or horizontal alignment is curved to the degree that a driver would be unable to see at least one sign, and preferably two signs, then additional overhead signs shall be installed. The placement of the signs shall be such that the driver will have a definite indication of the lanes specifically reserved for use at any given time. Special consideration shall be given to major generators introducing traffic between the normal sign placement.

Transitions at the entry to and exit from a section of roadway with reversible lanes shall be carefully reviewed, and advance signs shall be installed to notify or warn drivers of the boundaries of the reversible lane controls. The R3-9g or R3-9h signs shall be used for this purpose.

Option:

More than one sign may be used at the termination of the reversible lane to emphasize the importance of the message (R3-9i).

Standard:

Flashing beacons, if used to accentuate the overhead Reversible Lane Control signs, shall comply with the applicable requirements for flashing beacons in Chapter 4L.

When used in conjunction with Reversible Lane Control signs, the Turn Prohibition signs (R3-1 to R3-4, R3-18) shall be mounted overhead and separate from the Reversible Lane Control signs. The Turn Prohibition signs shall be designed and installed in accordance with Section 2B.18.

Guidance:

For additional emphasis, a supplemental plaque stating the distance of the prohibition, such as NEXT 1.6 km (NEXT 1 MILE), should be added to the Turn Prohibition signs that are used in conjunction with Reversible Lane Control signs.

If used, overhead signs should be located at intervals not greater than 400 m (0.25 mi). The bottom of the overhead Reversible Lane Control signs should not be more than 5.8 m (19 ft) above the pavement grade.

Where more than one sign is used at the termination of a reversible lane, they should be at least 75 m (250 ft) apart. Longer distances between signs are appropriate for streets with speeds over 60 km/h (35 mph), but the separation should not exceed 300 m (1,000 ft).

Because editorial revision to increase consistency left-turning vehicles have a significant impact on the safety and efficiency of a reversible lane operation, if an exclusive left-turn lane or two-way left-turn lane cannot be incorporated into the lane-use pattern for a particular peak or off-peak period, consideration should be given to prohibiting left turns and U-turns during that time period.

Section 2B.26 Regulatory Signs for Preferential ~~Only~~ Lanes – General ~~Signs (R3-10 through R3-15)~~ existing Sections 2B.26 through 2B.28 have been edited; paragraphs have been relocated within and between these Sections and the text has been reorganized into five Sections

Support:

Preferential ~~only~~ lanes are lanes designated exclusively for special traffic uses such as high-occupancy vehicles (HOVs), vehicles equipped with electronic toll collection (ETC) transponders, light rail, buses, taxis, or bicycles. Preferential ~~only~~ lane treatments might be as simple as restricting a turning lane to a certain class of vehicles during peak periods, or as sophisticated as providing a separate roadway system within a highway corridor for certain vehicles.

~~HOV~~ Preferential lanes ~~may take many forms depending on the level of usage and the design of the facility. They may~~ might be barrier-separated (on a separate alignment or physically separated from the other travel lanes by a barrier or median), ~~or they may be concurrent with other travel lanes and be~~ buffer-separated (separated from the adjacent general purpose lanes only by a narrow buffer area created with longitudinal pavement markings), or contiguous (separated from the adjacent general purpose lanes only by a lane line). ~~Physically separated HOV~~ Preferential lanes ~~may~~ might be operated in a constant direction or ~~may 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. this paragraph was relocated from Section 2B.27

~~HOV~~ Preferential lanes ~~may~~ might be operated on a 24-hour basis, for extended periods of the day, during peak travel periods only, during special events, or during other activities. this paragraph was relocated from Section 2B.27

A managed lane operated on a real-time basis in response to changing conditions might be operated as an HOV lane, with or without other requirements such as tolling or vehicle type, for a period of time as needed. Additional information regarding signs for managed lanes is contained in Sections 2B.32 and 2E.61.

Information regarding Preferential ~~Only~~ Lane signs for bicycle lanes is contained in Section 9B.04.

Section~~s~~ 2E.51 through 2E.54 contain~~s~~ additional provisions regarding ~~signing~~ signs for preferential ~~only~~ lanes on freeway and expressway facilities. Figures 2E-35 through 2E-43 show application and placement examples for Preferential ~~Only~~ Lane signs for a variety of preferential ~~only~~ lane situations. this paragraph was relocated from Section 2B.28

~~Option:~~

~~Preferential only lane assignments may be made on a full-time or part-time basis.~~

Standard:

When a preferential ~~only~~ lane is established, the Preferential ~~Only~~ Lane regulatory signs (see Figure 2B-8) and pavement markings (see Sections 3B.24 and 3B.25) for these lanes shall be used to advise road users.

Support:

Preferential Lane (R3-10 series through R3-15 series) regulatory signs consist of several different general types of regulatory signs as follows (see Figure 2B-8):

A. Vehicle Occupancy Definition signs define the vehicle occupancy requirements applicable to an HOV lane (such as "2 OR MORE PERSONS PER VEHICLE") or types of single-occupant vehicles (such as motorcycles or ILEVs) that are allowed to use an HOV lane (see Section 2B.27).
B. Periods of Operation signs notify road users of the days and hours during which the preferential restrictions are in effect (see Section 2B.28).
C. Preferential Lane Advance signs notify road users that a preferential lane restriction begins ahead (see Section 2B.29).
D. Preferential Lane Ends signs notify users of the termination point of the preferential lane restrictions (see Section 2B.30).

Standard:

Regulatory signs applicable only to a preferential lane shall be distinguished from regulatory signs applicable to general purpose lanes by the inclusion of the applicable symbol(s) and/or word(s) (see Figure 2B-8).

Support:

The symbol and word message that appears on a particular Preferential ~~Only~~ Lane regulatory sign will vary based on the specific type of allowed traffic and on other related operational constraints that have been established for a particular lane, such as an HOV lane, a bus lane, ~~or~~ a taxi lane, or an ETC only lane. ~~Section 2B.27 contains information regarding the restriction of the use of the diamond symbol to HOV lanes only. The requirements for guide and regulatory signs in advance of all preferential only lanes on freeways are provided in Section 2E.59.~~ Sections 2B.32, 2D.26, and 2E.51 through 2E.61 contain additional provisions regarding signs and pictographs used with ETC only lanes.

~~**Standard:**~~

~~**At the end of a preferential only lane, a Lane Ends (R3-12a or R3-15a) sign shall be used.**~~

Option:

Changeable message signs may ~~be used to~~ supplement, substitute for, or be used in combination with static Preferential Lane regulatory signs where travel conditions change or where multiple types of operational strategies (such as variable occupancy requirements, vehicle types, or pricing policies) are used and varied throughout the day or week, or on a real-time basis, to manage the use of, control of, or access to preferential ~~only~~ lanes.

Support:

Figure 2B-8 illustrates examples of changeable messages in combination with static Preferential Lane regulatory signs.

Standard:

When changeable message signs (see ~~Section 2A.07~~ Chapter 2M) are used as regulatory signs for preferential ~~only~~ lanes, they shall be the required sign size and shall display the required letter height and legend format that corresponds to the type of roadway facility and design speed.

Guidance:

When Preferential ~~Only~~ Lane regulatory signs are used on conventional roads, the decision regarding whether to use a ~~specific ground-~~ post-mounted edited to increase consistency or overhead version of a particular type of sign should be based on an engineering study that considers the available space, the existing signs for the ~~adjoining~~ adjacent general purpose traffic lanes, roadway and traffic characteristics, the proximity to existing overhead ~~signing~~ signs, the ability to install overhead signs, and any other unique local factors. this paragraph was relocated from Section 2B.28

~~The decision to use a specific ground-mounted or overhead sign for a preferential only lane should be based on an engineering study that considers the available space, the existing signs for adjoining general purpose lanes, roadway and traffic characteristics, the proximity of other overhead signing, the ability to install overhead signs, and any other unique local factors.~~

~~Ground-mounted Preferential Only Lane (R3-10, R3-11, and R3-12 series) signs should be installed where preferential only lanes are implemented on freeways, expressways, and conventional roads.~~

If overhead regulatory signs applicable only to a preferential lane are located in approximately the same longitudinal position along the highway as overhead signs applicable only to the general purpose lanes, the signs for the preferential lane should be separated laterally from the signs for the general purpose lanes to the maximum extent practical to minimize conflicting information.

Standard:

If used, overhead Preferential ~~Only~~ Lane (R3-13 series, R3-14 series, and R3-15 series) regulatory signs shall ~~only be installed along preferential only lanes on freeways and expressways. These overhead signs shall~~ be installed on the side of the roadway where the entrance to the preferential ~~only~~ lane is located and any appropriate adjustments shall be made to the sign message. ~~The sign sizes shall differ between freeways and expressways as provided in Table 2B-1 to reflect the different design speeds for each type of roadway.~~ this paragraph was relocated from Section 2B.28

Option:

Where a median of sufficient width is available, the R3-13 series and R3-15 series signs may be post-mounted.

Support:

The sizes for Preferential ~~Only~~ Lane regulatory signs will differ to reflect the design speeds for each type of roadway facility. Table 2B-1 provides sizes for each type of roadway facility.

Guidance:

The edges of Preferential Lane regulatory signs that are post-mounted on a median barrier should not project beyond the outer edges of the barrier, including in areas where lateral clearance is limited.

Option:

Where lateral clearance is limited, Preferential Lane regulatory signs that are post-mounted on a median barrier and that are 1800 mm (72 in) or less in width may be skewed up to 45 degrees in order to fit within the barrier width or may be mounted with a vertical clearance of not less than 4.3 m (14 ft) to the sign over the entire width of the pavement and shoulders.

Guidance:

Where lateral clearance is limited, Preferential Lane regulatory signs that are post-mounted on a median barrier and that are wider than 1800 mm (72 in) should be mounted with a vertical clearance of not less than 4.3 m (14 ft) to the sign over the entire width of the pavement and shoulders.

On conventional roadways, Preferential ~~Only~~ Lane regulatory sign spacing should be determined by engineering judgment based on prevailing speed, block length, distances from adjacent intersections, and other site-specific considerations.

Support:

Sections 2B.27 and 2B.28 contain provisions regarding the placement of Preferential Lane regulatory signs on freeways and expressways.

Standard:

The ~~R3-10, R3-11, R3-11a, R3-11c, R3-13, R3-13a, R3-14, and R3-14a~~ signs illustrated in Figure 2B-8 that incorporate the diamond symbol shall be used exclusively with preferential ~~only~~ lanes for high-occupancy vehicles to indicate the particular occupancy requirement and time restrictions applying to that lane. The ~~R3-10a, R3-11b, and R3-14b~~ signs illustrated in Figure 2B-8 that do not have a diamond

symbol shall be used ~~in situations where a~~ with preferential ~~only~~ lanes ~~is~~ that are not ~~an~~ HOV lanes, but ~~is~~ are designated for use by other types of vehicles (such as bus and/or taxi use).

Option:

Agencies may select from either the HOV abbreviation or the diamond symbol, or use both, to reference the HOV lane designation. this paragraph was relocated from Section 2B.27

~~The diamond symbol may be used instead of the word message HOV.~~

Standard:

When the diamond symbol (or HOV abbreviation) is used without text on the ~~ground-~~ post-mounted edited to increase consistency Preferential ~~Only~~ Lane (R3-10 series, R3-11 series, and R3-12 series) regulatory signs, it shall be centered on the top line of the sign. When the diamond symbol (or HOV abbreviation) is used with associated text on the ~~ground-~~ post-mounted edited to increase consistency Preferential ~~Only~~ Lane (R3-10 series, R3-11 series, and R3-12 series) regulatory signs, it shall appear to the left of the associated text. When the diamond symbol is used on the overhead Preferential ~~Only~~ Lane (R3-13, R3-13a, R3-14, and R3-14a) regulatory signs, it shall appear in the top left quadrant. The diamond symbol for the R3-15, ~~and~~ R3-15a, R3-15b, and R3-15c signs shall appear on the left side of the sign. The diamond symbol shall not be used on the bus, taxi, or bicycle Preferential ~~Only~~ Lane signs. the sequence of the last two sentences was reversed

~~The~~ Vehicle Occupancy Definition, Periods of Operation, and Preferential Lane Advance regulatory signs for HOV ~~signs (see Section 2B.26)~~ lanes shall display the minimum allowable vehicle occupancy requirement established for each HOV lane, ~~The vehicle occupancy requirement established for an HOV lane shall be referenced~~ displayed immediately after the word message HOV or the diamond symbol. ~~The diamond symbol shall be restricted for use with HOV lanes only.~~ this paragraph is a combination of two paragraphs that were relocated from Section 2B.27

Support:

The agencies that own and operate ~~preferential only~~ HOV lanes ~~for high-occupancy vehicles (HOV lanes) shall~~ have the authority and responsibility to determine how they are operated and the occupancy requirements ~~for vehicles operating in HOV lanes~~. ~~The minimum occupancy requirement shall be two occupants per vehicle.~~ Information about federal requirements for certain types of single-occupant vehicles to be eligible to use HOV lanes that receive Federal-aid program funding and about requirements associated with proposed significant changes to the operation of an existing HOV lane and certain vehicles are contained in the "Federal-Aid Highway Program Guidance on High Occupancy Vehicle (HOV) Lanes" (see Section 1A.11). **this paragraph was relocated from Section 2B.27**

~~Option:~~

~~The ground-mounted Preferential Only Lane Operational (R3-11 series) signs and the overhead Preferential Only Lane Operational (R3-14 series) signs may be used to supplement changeable message signs that are used to convey preferential only lane restrictions.~~

~~Support:~~

~~Figures 2E-46 through 2E-52 show example signing layouts using the R3-10 through R3-15 series signs for various preferential only lane applications.~~

Section 2B.27 Preferential ~~Only~~ Lanes ~~for High-Occupancy Vehicles (HOVs)~~ Vehicle Occupancy Definition Signs (R3-10 Series and R3-13 Series)

Standard:

The R3-10, ~~R3-10b,~~ R3-13, and R3-13a Vehicle Occupancy Definition signs shall be used ~~in situations~~ where agencies determine that it is appropriate to provide a sign that defines the ~~operational strategy (such as~~ minimum occupancy ~~or types~~ of vehicles~~) that is being used to manage or regulate the vehicles~~ that are ~~permitted~~ allowed to use ~~a preferential only~~ an HOV or managed lane. this paragraph was relocated from Section 2B.26

Guidance:

The Inherently Low Emission Vehicle (ILEV) (~~R3-10b~~ R3-10a) sign should be used ~~to indicate that~~ when it is permissible for a properly labeled and certified ILEV, regardless of the number of occupants, to use an HOV lane. When used, the ILEV signs should be ~~ground-~~ post-mounted edited to increase consistency in advance of and at intervals along the HOV lane based upon engineering judgment and the placement of other

Preferential Lane regulatory signs. The ~~R3-10b~~ R3-10a sign is only applicable to HOV lanes and should not to be used with other preferential ~~only~~ lane applications. this paragraph was relocated from Section 2B.26

Support:

~~Inherently low-emission vehicles~~ ILEVs are defined by the Environmental Protection Agency (EPA) as vehicles having no fuel vapor (hydrocarbon) emissions~~. These vehicles must~~ and are certified by the EPA as meeting the emissions standards and requirements specified in 40 CFR 88-311-93 and 40 CFR 88.312-93(c). this paragraph was relocated from Section 2B.26

Guidance:

The legend format of the R3-10 and R3-13 signs should have ~~this~~ the following sequence: this paragraph was relocated from Section 2B.26

A. Top Line: "HOV 2+ ONLY" (or 3+ or 4+ if appropriate)
B. Bottom Lines: "2 OR MORE PERSONS PER VEHICLE" (or 3 or 4 if appropriate)

The legend format of the R3-13a sign should have the following sequence:

A. Top Line: "HOV 2+ ONLY" (or 3+ or 4+ if appropriate)
B. Middle Lines: "2 OR MORE PERSONS PER VEHICLE" (or 3 or 4 if appropriate)
C. Bottom Lines: Times and days the occupancy restriction is in effect

Support:

Section 2B.32 contains information regarding modifications of the legends of Vehicle Occupancy Definition signs when single-occupant ETC-equipped vehicles are allowed to use an HOV lane by paying a toll fee.

Standard:

For barrier- or buffer-separated preferential lanes, an overhead Vehicle Occupancy Definition (R3-13 or R3-13a) sign~~, which defines the occupancy requirement,~~ shall be installed at least 800 m (0.5 mi) in advance of the beginning of or initial entry point to an HOV lane. These signs shall only be displayed in advance of the beginning of or initial entry point to HOV lanes. this paragraph was relocated from Section 2B.28

Option:

For barrier-separated ~~preferential only~~ HOV lanes, the sequence of a post-mounted Periods of Operation (R3-11a) sign followed by a ~~ground-~~ post-mounted edited to increase consistency Vehicle Occupancy Definition (R3-10) sign~~s defining the occupancy requirement may be alternated in series with Preferential Only Lane Operational (R3-11, R3-11a, R3-11b, or R3-11c) signs. These signs~~ may be located at intervals of approximately ~~1 km~~ 800 m (~~0.6~~ 0.5 mi) along the length of the ~~preferential only~~ HOV lane, at intermediate entry points, and at designated enforcement areas as defined by the operating agency. this paragraph was relocated from Section 2B.28

Standard:

For buffer-separated HOV lanes, the sequence of a post-mounted Periods of Operation (R3-11a) sign followed by a ~~Ground-~~ post-mounted edited to increase consistency Vehicle Occupancy Definition (R3-10) sign~~s defining the occupancy requirement~~ shall be located ~~and alternated with Preferential Only Lane Operational (R3-11 series) signs in series~~ at intervals not greater than ~~1 km~~ 800 m (~~0.6~~ 0.5 mi) along the length of the ~~preferential only~~ buffer-separated HOV lane, at designated gaps in the buffer where vehicles are allowed to legally access the ~~preferential only~~ HOV lane, and within designated enforcement areas as defined by the operating agency. this sentence came from a paragraph in Section 2B.28

For ~~concurrent-flow preferential only~~ contiguous HOV lanes, the sequence of a post-mounted Periods of Operation (R3-11a) sign followed by a ~~ground-~~ post-mounted edited to increase consistency Vehicle Occupancy Definition (R3-10) sign~~s defining the occupancy requirement~~, and ILEV (R3-10a) signs if appropriate, shall be located ~~and alternated with Preferential Only Lane Operational (R3-11 series) signs in series~~ at intervals not greater than ~~1 km~~ 800 m (~~0.6~~ 0.5 mi) along the length of the ~~preferential only~~ HOV lane. this paragraph was relocated from Section 2B.28

Guidance:

The signs within each Preferential Lane regulatory sign sequence should be separated by a distance of not less than 245 m (800 ft) and not more than 300 m (1,000 ft).

Standard:

For all types of direct access ramps that provide access to or lead to ~~preferential only~~ HOV lanes, a ~~ground-~~ post-mounted edited to increase consistency Vehicle Occupancy Definition (R3-10) sign ~~defining the occupancy requirement~~, and an ILEV (R3-10a) sign if appropriate, ~~and a Preferential Only Lane Operational (R3-11 series) sign~~ shall be used at the beginning or initial entry point for ~~all types of~~ the direct access ramp~~s that provide access or lead to preferential only lanes~~. this paragraph was relocated from Section 2B.28

~~Standard:~~

~~The requirements for a minimum number of occupants in a vehicle to use an HOV lane shall be in effect for most, or all, of at least one of the usual times of the day when the demand to travel is greatest (such as morning or afternoon peak travel periods) and the traffic congestion problems on the roadway and adjoining transportation corridor are at their worst.~~

~~The Federal Highway Administration (FHWA) shall be consulted if a significant operational change is proposed that could reasonably be expected to affect a specific HOV lane or portions of the HOV system that were funded or approved by FHWA. This shall include portions of the local, regional, or Federal-aid highway system, where operational changes might significantly impact the operation of one HOV lane or portions of the regional HOV system. To assure consistency with the provisions of Titles 23 and 49 of the United States Code (U.S.C), the important issues and possible impacts of any significant operational changes shall be reviewed to determine if any Federal approval is required.~~

~~In accordance with the "Federal-Aid Highway Program Guidance on High Occupancy Vehicle (HOV) Lanes" (see Section 1A.11), a proposed test or demonstration project that seeks to significantly change the operation of the HOV lanes for any length of time shall require a Federal review as outlined in Section 2 of the "Federal-Aid Highway Program Guidance on High Occupancy Vehicle (HOV) Lanes" prior to initiating such a test or demonstration project. Also in accordance with the Federal-Aid Highway Program Guidance on HOV lanes, any proposal to significantly change the operation of an HOV lane shall require some form of Federal review, which might require potential action.~~

~~Support:~~

~~FHWA Division Offices, with involvement from the Federal Transit Administration (FTA), are responsible for reviewing proposals to significantly change the operation of HOV lanes. Federal interests in this review include commitments made during the National Environmental Policy Act process as described in Title 23 CFR, Part 771, in project agreements, transportation planning requirements, and transportation conformity requirements under the Clean Air Act (40 CFR, Part 51).~~

~~Proposals to adjust only the HOV lane hours of operation during the day (for example, minor changes in hours during peak travel periods) or the occupancy requirements (for example, HOV 3+ to HOV 2+) are not typically considered significant operational changes and might not require an explicit Federal review or approval.~~

~~Any action that has the potential to adversely affect the area's flow of traffic, roadway and traveler safety, or the environment might be considered to be a significant operational change. Any proposal to significantly adjust the hours of operation, or to convert an HOV lane to a general purpose travel lane, would be considered a significant operational change to the original project design concept or scope. Examples of significant operational changes could include:~~

~~A. Switching from 24-hour HOV lane operations to only a portion of the day or week;~~
~~B. Implementing a pricing option to an existing HOV lane (such as HOT lane or toll lane);~~
~~C. Significantly reducing the hours of operation of an HOV lane that is operational during only one peak travel period; or~~
~~D. Managing or operating the HOV lane in a manner that renders it functionally inoperable or obsolete (such as not providing enforcement of the occupancy requirement).~~

~~Guidance:~~

~~An engineering study based on the current and estimated future travel demand for a corridor and facility should be the basis for determining when, during a typical day, there should be a minimum occupancy requirement for a vehicle to use an HOV lane.~~

~~Support:~~

~~Inherently low emission vehicle (ILEV) eligibility, testing and certification requirements, labeling, and other regulatory provisions are developed and administered through the Environmental Protection Agency (EPA). EPA is the only entity with the authority to certify ILEVs. Vehicle manufacturers must request the~~

~~EPA to grant an ILEV certification for any vehicle to be considered and labeled as meeting those standards. According to the EPA, 1996 was the first year that they certified any ILEVs. EPA regulations specify that ILEVs must meet the emission standards specified in 40 CFR 88.311-93 and their labeling must be in accordance with 40 CFR 88.312-93(e). EPA established the ILEV concept to recognize vehicles with no fuel vapor (hydrocarbons) emissions. Zero emission vehicles (electric powered vehicles) that have no emissions are the only other type of clean fuel vehicles that are allowed to use HOV lanes.~~

~~**Standard:**~~

~~**Agencies shall permit a vehicle with less than the required number of occupants to operate on HOV lanes if:**~~

~~**A. The vehicle is properly labeled and certified as an ILEV and the lane is not a bus only HOV lane, or**~~

~~**B. The HOV lanes are part of a project that is participating in the FHWA Value Pricing Pilot Program (see Section 2 of the "Federal-Aid Highway Program Guidance on High Occupancy Vehicle (HOV) Lanes").**~~

~~**Motorcycles shall be permitted to use HOV lanes that receive Federal-aid program funding.**~~

Section 2B.28 Preferential ~~Only~~ Lane Periods of Operation Signs ~~Applications and Placement~~ (R3-11 Series and R3-14 Series)

Guidance:

The sizes of ~~the ground-~~ post-mounted edited to increase consistency ~~Preferential Only Lane Operational~~ Periods of Operation (R3-11 series) signs should remain consistent to accommodate any manual addition or ~~subtraction~~ removal of a single line of text for each sign. this paragraph was relocated from Section 2B.26

Support:

Consistent sign sizes are beneficial for agencies when ordering sign materials, as well as when making text changes to existing signs if changes occur to operating times or occupancy restrictions in the future. For example, the R3-11c sign has space for one line located below "24 HOURS" if an agency desires to add additional information (such as "MON – FRI"), yet the R3-11c sign has the same dimensions as the other R3-11 series signs. this paragraph was relocated from Section 2B.26

Standard:

When used, the ~~ground-~~ post-mounted edited to increase consistency ~~Preferential Only Lane Operational~~ Periods of Operation (R3-11 series) signs shall be located adjacent to the preferential ~~only~~ lane, and the overhead ~~Preferential Only Lane Operational~~ Periods of Operation (R3-14 series) signs shall be mounted directly over the lane. this paragraph was relocated from Section 2B.26

The legend format of the ~~ground-~~ post-mounted edited to increase consistency ~~Preferential Only Lane Operational~~ Periods of Operation (R3-11 series) signs shall have the following sequence: this paragraph was relocated from Section 2B.26

A. Top Lines: Lanes applicable, such as "RIGHT LANE" or "2 RIGHT ~~2~~ LANES" or "THIS LANE"

B. Middle Lines: Eligible uses, such as "HOV 2+ ONLY" (or 3+ or 4+ if appropriate) or "BUSES ONLY" or other applicable uses or eligible turning movements

C. Bottom Lines: Applicable times and days, such as "7 AM – 9 AM" or "6:30 AM – 9:30 AM, MON-FRI"

The legend format of the overhead ~~Preferential Only Lane Operational~~ Periods of Operation (R3-14 series) signs shall have the following sequence: this paragraph was relocated from Section 2B.26

A. Top Line: Eligible uses, such as "HOV 2+ ONLY" (or 3+ or 4+ if appropriate) or "BUSES ONLY" or other ~~types of vehicles~~ applicable uses or eligible turning movements

B. Bottom Lines: Applicable times and days, with the time and day placed above the down arrow, such as "7 AM – 9 AM" or "6:30 AM – 9:30 AM, MON-FRI" (When the operating periods exceed the available line width, the hours and days of the week shall be stacked as shown for the R3-14a sign in Figure 2B-8.)

Option:

Where additional movements are permitted from a preferential ~~only~~ lane on an approach to an intersection, the format and words used in the legend in the middle lines on the ~~ground-~~ post-mounted edited to increase consistency ~~Preferential Only Lane Operational~~ Periods of Operation (R3-11 series) signs and on

the top line of the overhead ~~Preferential Only Lane Operational~~ Periods of Operation (R3-14 series) signs may be modified to accommodate the permitted movements (such as "HOV 2+ AND RIGHT TURNS ONLY").

this paragraph was relocated from Section 2B.26

A MOTORCYCLES ALLOWED (R3-11P) plaque may be used where motorcycles, regardless of the number of occupants, are allowed to use an HOV lane.

Standard:

If used, the MOTORCYCLES ALLOWED plaque shall be mounted below a post-mounted Preferential Lane Periods of Operation (R3-11, R3-11a, or R3-11c) sign.

For all barrier-separated and buffer-separated preferential ~~only~~ lanes, an overhead ~~Preferential Only Lane Operational~~ Periods of Operation (R3-14 series) sign shall be used at the beginning or initial entry point, and at any intermediate ~~access~~ entry points or gaps in the barrier where vehicles are allowed to legally access the barrier-separated or buffer-separated preferential ~~only~~ lanes. For all barrier-separated and buffer-separated preferential lanes, ~~Ground-~~ post-mounted edited to increase consistency ~~Preferential Only Lane Operational~~ Periods of Operation (R3-11 series) signs shall be used only as a supplement to the overhead signs at the beginning or initial entry point, or at any intermediate ~~access~~ entry points or gaps in the barrier or buffer.

~~**For buffer-separated preferential only lanes (painted buffer of 0.6 m (2 ft) or more), an overhead Preferential Only Lane Operational (R3-14 series) sign shall be used at the beginning or initial entry point, and at intermediate access points or gaps where vehicles are allowed to legally access the buffer-separated preferential only lane.~~** **this paragraph was incorporated into the previous paragraph**

For contiguous preferential lanes, including those where a preferential lane is added to the roadway (see Figure 2E-39 for HOV lanes) and those where a general purpose lane transitions into a preferential lane (see Figure 2E-40 for HOV lanes), an overhead Periods of Operation (R3-14 Series) sign shall be used at the beginning or initial entry point of the preferential lane.

Guidance:

Overhead (R3-14 series) or post-mounted (R3-11 series) Periods of Operation signs should be installed at periodic intervals along the length of a contiguous preferential lane.

Option:

Additional overhead (R3-14 series) or post-mounted (R3-11 series) Periods of Operation signs may be provided along the length of any type of preferential lane.

On conventional roads, the overhead Periods of Operation (R3-14 series) signs may be installed at the beginning or entry points and/or at intermediate points along preferential lanes in any geometric configuration.

Standard:

For all types of direct access ramps that provide access to or lead to preferential lanes, a post-mounted Periods of Operation (R3-11 series) sign shall be used at the beginning or initial entry point of the direct access ramp.

Option:

For direct access ramps to preferential ~~only~~ lanes, an overhead ~~Preferential Only Lane Operational~~ Periods of Operation (R3-14 series) sign may be used at the beginning or initial entry point to supplement the required ~~ground-~~ post-mounted edited to increase consistency signs.

Lane-use control signals (see Chapter 4M) may be used at access points to preferential lanes to indicate that a ramp or access roadway leading to the preferential lane or facility, or one or more specific lanes of the facility, are open or closed.

~~**Standard:**~~

~~**A ground-mounted Preferential Only Lane Operational (R3-11, R3-11a, R3-11b, or R3-11d) sign shall be installed at the beginning, initial entry point, intermediate access points, and direct access ramps to all types of preferential only lanes. The overhead Preferential Only Lane Operational (R3-14 series) signs shall be installed only at the beginning or initial entry point to all types of preferential only lanes.**~~

~~Option:~~

~~Additional ground-mounted Preferential Only Lane (R3-10, R3-11, R3-11a, R3-11b, or R3-11e) signs may be provided along the length of a preferential only lane.~~

~~For barrier-separated reversible-flow preferential only lanes, Preferential Only Lane signs may be either static or changeable message type.~~

~~For buffer-separated preferential only lanes, overhead Preferential Only Lane Operational (R3-14 series) signs may be used at specific locations and intervals along the length of the preferential only lane to supplement the ground-mounted R3-10 signs defining the occupancy requirement and the Preferential Only Lane Operational (R3-11 series) signs based on an engineering study.~~

~~For concurrent-flow preferential only lanes, overhead Preferential Only Lane Operational (R3-14 series) signs may be used at specific locations and intervals along the length of the preferential only lane to supplement the ground-mounted R3-10 signs defining the occupancy requirement and the Preferential Only Lane Operational (R3-11 series) signs based on an engineering study.~~

~~Support:~~

~~Section 2B.26 contains provisions regarding the use of changeable message signs for preferential only lanes.~~

Section 2B.29 Preferential Lane Advance Signs (R3-12, R3-12e, R3-12f, R3-15 R3-15a, and R3-15d)

Guidance:

The Preferential ~~Only~~ Lane ~~Ahead~~ Advance (~~R3-10a,~~ R3-12, R3-12e, R3-12f, ~~and~~ R3-15, R3-15a, and R3-15d) signs should be used for advance notification of a general purpose lane that becomes a preferential ~~only~~ lane~~s~~ (see Figure 2E-40). this paragraph was relocated from Section 2B.26

The Preferential Lane Advance (R3-12, R3-12f, R3-15, and R3-15d) signs should be used for advance notification of a barrier-separated, buffer-separated, or contiguous preferential lane that is added to the general purpose lanes.

Option:

The legends on the R3-12f and R3-15d signs may be modified to suit the type of preferential lane.

~~Overhead Preferential Only Lane Ahead (R3-15) signs may be placed approximately 1.6 km (1 mi) and 3.2 km (2 mi) in advance of the beginning or initial entry points to any type of preferential only lane.~~ this paragraph was relocated from Section 2B.28

~~The ground-mounted Preferential Only Lane Ahead (R3-12) sign may be installed at a minimum of 1.6 km (1 mi) in advance of the beginning or initial entry point to any type of preferential only lane.~~ this paragraph was relocated from Section 2B.28

Guidance:

~~For all barrier-separated preferential only lanes, an overhead Preferential Only Lane Ahead (R3-15) sign should be installed and located at least 1.6 km (1 mi) in advance of the beginning or initial entry point.~~ this paragraph was relocated from Section 2B.28

On conventional roads, for general purpose lanes that become preferential lanes, a post-mounted (R3-12e) or overhead (R3-15a) Preferential Lane Advance sign should be installed in advance of the beginning of or initial entry point to the preferential lane at a distance determined by engineering judgment based on prevailing speed, traffic characteristics, and other site-specific considerations. The distance selected should provide adequate opportunity for ineligible vehicles to vacate the lane prior to the beginning of the restriction.

On freeways and expressways, for general purpose lanes that become preferential lanes, an overhead Preferential Lane Advance (R3-15a) sign should be installed at least 1.6 km (1 mi) in advance of the beginning of the preferential lane restriction.

Option:

Additional post-mounted or overhead Preferential Lane Advance signs may be placed farther in advance of or closer to the beginning or initial entry points to a preferential lane.

Section 2B.30 Preferential Lane Ends Signs (R3-12a, R3-12b, R3-12c, R3-12d, R3-12g, R3-12h, R3-15b, R3-15c, and R3-15e)

Standard:

~~The~~ A ~~ground-~~ post-mounted edited to increase consistency Preferential ~~Only~~ Lane Ends ~~800 m (1/2 Mile)~~ (R3-12b or R3-12h) sign shall be installed at least 800 m (0.5 mi) in advance of the termination of ~~an HOV~~ a preferential lane. this paragraph was relocated from Section 2B.28

Except as noted in the Option below, ~~The~~ a ~~ground-~~ post-mounted edited to increase consistency Preferential ~~Only~~ Lane Ends (R3-12a or R3-12g) sign shall be installed at the point where ~~the~~ a preferential ~~only~~ lane and restriction end~~s~~ and traffic must merge into the general purpose lanes.

~~All longitudinal pavement markings, as well as word and symbol pavement markings, associated with the preferential only lane shall end where the R3-12a sign designating the end of the preferential only lane restriction is installed.~~ this deleted sentence is now covered in Chapter 3B

A post-mounted Preferential Lane Ends (R3-12d) sign shall be installed at least 800 m (0.5 mi) in advance of the point where a preferential lane restriction ends and the lane becomes a general purpose lane.

Except as noted in the Option below, a post-mounted Preferential Lane Ends (R3-12c) sign shall be installed at the point where a preferential lane restriction ends and the lane becomes a general purpose lane.

Option:

An overhead Preferential Lane Ends (R3-15b or R3-15e) sign may be installed instead of or in addition to a post-mounted R3-12a or R3-12g sign at the point where a preferential lane and restriction ends and traffic must merge into the general purpose lanes.

An overhead Preferential Lane Ends (R3-15c) sign may be installed instead of or in addition to a post-mounted R3-12c sign at the point where the preferential lane restriction ends and the lane becomes a general purpose lane.

Section 2B.31 Regulatory Signs for Toll Plazas

Support:

Toll plaza operations often include lane-specific restrictions on vehicle type, forms of payment accepted, and speed limits or required stops. Vehicles are typically required to come to a stop to pay the toll in the cash payment and exact change lanes. Electronic toll collection (ETC) lanes with favorable geometrics typically allow vehicles to move through the toll plaza without stopping, but usually within a set regulatory speed limit or advisory speed. In some ETC lanes, vehicles might be required to stop while their ETC payment is processed due to geometric or other conditions.

Guidance:

Regulatory signs applicable only to a particular lane or lanes should be located in a position that makes their applicability clear to road users approaching the toll plaza.

Regulatory signs, or regulatory panels within guide signs, indicating any restrictions on vehicle type and forms of toll payment accepted at a specific toll plaza lane should be installed over the applicable lane either on the toll plaza canopy or on a separate structure immediately in advance of the canopy.

Support:

Section 2E.55 contains information regarding the incorporation of regulatory messages into guide signs for toll plazas.

Standard:

For lanes approaching, within, or adjacent to a toll plaza that are reserved exclusively for vehicles equipped with electronic toll collection (ETC) transponders, the ETC (pictograph) ONLY – NO CASH (R3-16) regulatory lane-use sign (see Figure 2B-9) shall be installed over the approach lane(s) with a down arrow located directly over the approximate center of each such lane. This sign shall also be installed over the Open Road ETC Only lanes on an approach to a divergence for a separate alignment on which a toll plaza for cash toll payments is located (see Section 2E.57 and Figure 2E-52).

The ETC (pictograph) ONLY – NO CASH (R3-16) sign shall incorporate a top header panel with a purple background and white border. Within the header panel, the pictograph adopted by the toll facility's ETC payment system (such as E-Z Pass or SunPass) shall be on a white rectangular or square underlay panel and the black legend ONLY shall be on a separate rectangular white panel. The bottom portion of the sign shall have a white background and black border with the black legend NO CASH and one black down arrow for each applicable lane.

The ETC (pictograph) ONLY – NO CASH (R3-16) sign for an ETC only facility that accepts nationally interoperable transponders shall also incorporate the nationally interoperable ETC symbol (M8-3) shown in Figure 2E-50. The M8-3 symbol shall only be used on signs for ETC facilities that accept electronic payment from any toll operator's ETC transponder.

Guidance:

One or more Speed Limit (R2-1) signs (see Section 2B.13) should be installed in appropriate locations for an ETC Only lane at a toll plaza in which an enforceable regulatory speed limit is established for a lane in which it is intended that vehicles move through the toll plaza without stopping while toll fee payment processing occurs in other lanes at the toll plaza. The speed limit displayed on the signs should be based on an engineering study taking into account the geometry of the plaza and the lanes and other appropriate safety and operational factors.

A Speed Limit (R2-1) sign should not be installed for a toll plaza lane for which a STOP (R1-1) sign is used or for which a stop is required.

Option:

Speed limit signs may be installed over the applicable lane on the toll plaza canopy, on the approach end of the toll booth island, on the toll booth itself, or on a vertical element of the canopy structure. Downward or diagonally downward pointing arrows may be used to supplement the speed limit signs if an engineering study or engineering judgment indicates that the arrow is needed to clarify the applicability of the signs or to improve compliance.

Standard:

A STOP (R1-1) sign shall not be installed for a toll plaza lane that is operated as an ETC Only lane and that is designed for tolls to be collected while vehicles continue moving.

Option:

A STOP (R1-1) sign may be installed to require vehicles to come to a complete stop to pay a toll in an attended or exact change lane, even if that lane is also available for optional use by vehicles with an ETC transponder. A PAY TOLL (R3-29P) or TAKE TICKET (R3-30P) plaque (see Figure 2B-9), as appropriate to the operation, may be installed directly under the STOP (R1-1) sign for a toll plaza cash lane, if needed.

The mounting height of the STOP sign and any supplemental plaque may be less than the normal mounting height requirements if constrained by the physical features of the toll island or toll plaza.

The lateral offset of a STOP or other regulatory sign located within a toll plaza island may be reduced to a minimum of 0.3 m (1 ft) from the face of the toll island or raised barrier to the nearest edge of the sign.

Guidance:

If used, a STOP (R1-1) sign for a toll plaza cash payment lane should be located in a longitudinal position as near as practical to the point where a vehicle is expected to stop to pay the toll or take a ticket.

Option:

A Toll Rate Schedule (R3-28) sign (see Figure 2B-9) may be installed a short distance in advance of the toll plaza to indicate the toll fees applicable to the various vehicle types.

Guidance:

If used, the Toll Rate Schedule (R3-28) sign should be located approximately 30 to 60 m (100 to 200 ft) in advance of the toll plaza.

The R3-28 sign should not contain more than three lines of text.

Section 2B.32 Regulatory Signs for Managed Lanes and ETC Only Lanes

Support:

A managed lane is a highway lane (or set of lanes) or a highway facility for which one or more variable operational strategies, such as tolling, pricing, vehicle type and/or occupancy requirements, and direction of travel, are implemented and managed in real time in response to changing conditions.

A managed lane might be on a separate alignment, might be barrier-separated or buffer-separated from the general purpose lanes, or might be contiguous with the general purpose lanes.

Under certain operational strategies, a managed lane is a special type of Preferential lane (see Sections 2B.26 through 2B.30).

Standard:

The provisions of Sections 2B.26 through 2B.30 regarding regulatory signs for Preferential lanes shall apply to managed lanes operated at all times or at certain times with fixed or variable vehicle occupancy requirements (HOV), vehicle type restrictions, and/or a toll fee payment requirement to use

the lane(s). Such managed lanes shall use changeable message signs or changeable message elements within static signs to display the appropriate regulatory sign messages only when they are in effect.

When a single-occupant vehicle equipped with an ETC transponder is allowed to use an HOV lane by paying a toll fee, the Vehicle Occupancy Definition (R3-13 or R3-13a) signs (see Section 2B.27) shall be modified to include the pictograph adopted by the facility's ETC payment system (such as E-Z Pass or SunPass) to indicate the allowable use (see Figure 2B-10). Also in this case, regulatory signs shall be used to indicate the toll fee charged for such vehicles. If the toll fee varies, regulatory signs that include changeable message elements, such as the R3-31 and R3-32 signs that are illustrated in Figure 2B-10, shall be used to display the actual toll amount or rate in effect at any given time.

When only vehicles equipped with an ETC transponder are allowed to use a managed lane or any tolled facility, regulatory signs to indicate such a restriction shall be provided and shall incorporate the pictograph adopted by the toll facility's ETC payment system and the word ONLY. If incorporated within the white background of a regulatory sign or within the green background of a guide sign, the ETC pictograph shall be on a white rectangular or square panel set on a purple backplate with a white border as shown in Figures 2B-10 and 2E-54. If used on a header panel within a regulatory or guide sign, the ETC pictograph shall have a white border and the header panel shall have a purple background with a white border as shown on the R3-16 signs in Figure 2B-9.

When certain types of vehicles (such as trucks or motorcycles) are prohibited from using a managed lane or when a managed lane is restricted to use by only certain types of vehicles during certain operational strategies, regulatory signs or regulatory panels within the appropriate guide signs that include changeable message elements shall be used to display the open/closed status of the managed lane for such vehicle types.

When the vehicle occupancy required for use of an HOV lane is varied as a part of a managed lane operational strategy, regulatory signs that include changeable message elements shall be used to display the required vehicle occupancy in effect.

Section 2B.33 Jughandle Signs (R3-23, R3-24, R3-25, and R3-26 Series)

Support:

A jughandle turn is a left-turn or U-turn that because of special geometry is made by initially making a right turn. This type of turn can increase the operational efficiency of a roadway by eliminating the need for exclusive left-turn lanes and can increase the operational efficiency of a traffic control signal by eliminating the need for protected left-turn phases. A jughandle turn can also provide an opportunity for trucks and commercial vehicles to make a U-turn where the median and roadway are not of sufficient width to accommodate a traditional U-turn by these vehicles.

Figure 2B-12 shows examples of regulatory and destination guide signing for various types of jughandle turns.

Standard:

On multi-lane roadways, since road users generally anticipate that they need to be in the left-hand lane when approaching a location where they desire to turn left or make a U-turn, an ALL TURNS FROM RIGHT LANE (R3-23) or a U TURN FROM RIGHT LANE (R3-23a) sign (see Figure 2B-11) shall be installed in advance of the location to inform drivers that left turns and/or U-turns will be made from the right-hand lane.

Option:

Where a median of sufficient width is available, supplemental regulatory or guide signs may also be placed on the left-hand side of the roadway.

Standard:

An R3-24 series sign (see Figure 2B-11) with an upward diagonal arrow pointing to the right if the jughandle entrance is designed as an exit ramp or an R3-25 series sign (see Figure 2B-11) with a horizontal arrow pointing to the right if the jughandle entrance is designed as an intersection shall be installed on the right-hand side of the roadway at the entrance to the jughandle. The legend on the sign shall be ALL TURNS, U TURN, or U AND LEFT TURNS, as appropriate.

If the jughandle is designed such that the jughandle entrance is downstream of the location where the turn would normally have been made (see Drawing C of Figure 2B-11), an R3-26 series sign (see Figure 2B-11) with an arrow pointing straight upward shall be installed on the right-hand side of the

roadway at the intersection to inform road users that they need to proceed straight through the intersection in order to make a left turn or U-turn. The legend on the sign shall be U TURN or U AND LEFT TURNS, as appropriate.

Support:

The R3-24, R3-25, and R3-26 series of signs are designed to be mounted below conventional guide signs.

Section 2C.14 contains information regarding the use of advisory exit and ramp speed signs for exit ramps.

Section ~~2B.29~~ 2B.34 Do Not Pass Sign (R4-1)

Option:

The Do Not Pass (R4-1) sign (see Figure 2B-13) may be used in addition to pavement markings (see Section 3B.02) to emphasize the restriction on passing. The Do Not Pass sign may be used at the beginning of, and at intervals within, a zone through which sight distance is restricted or where other conditions make overtaking and passing inappropriate.

A DO NOT PASS (R4-1P) educational plaque (see Figure 2B-13) may be mounted below the R4-1 symbol sign.

A DO NOT PASS (R4-1a) word message sign (see Figure 2B-13) may be used instead of the symbol sign.

If signing is needed on the left-hand added for increased clarity side of the roadway for additional emphasis, NO PASSING ZONE (W14-3) signs may be used (see Section 2C.47).

Support:

Standards for determining the location and extent of no-passing zone pavement markings are set forth in Section 3B.02.

Section 2B.35 DO NOT PASS WHEN SOLID LINE IS ON YOUR SIDE Sign (R4-15)

Option:

The DO NOT PASS WHEN SOLID LINE IS ON YOUR SIDE (R4-15) sign (see Figure 2B-13) may be installed to remind road users of the meaning of the solid yellow center line for no-passing zones.

Section 2B.36 DO NOT DRIVE ON SHOULDER Sign (R4-17) and DO NOT PASS ON SHOULDER Sign (R4-18)

Option:

The DO NOT DRIVE ON SHOULDER (R4-17) sign (see Figure 2B-13) may be installed to inform road users that using the shoulder of a roadway as a travel lane is prohibited.

The DO NOT PASS ON SHOULDER (R4-18) sign (see Figure 2B-13) may be installed to inform road users that using the shoulder of a roadway to pass other vehicles is prohibited.

Section ~~2B.30~~ 2B.37 PASS WITH CARE Sign (R4-2)

Guidance:

The PASS WITH CARE (R4-2) sign (see Figure 2B-13) should be installed at the downstream end of a no-passing zone if a Do Not Pass sign has been installed at the ~~beginning~~ upstream end of the zone.

Section ~~2B.31~~ 2B.38 SLOWER TRAFFIC KEEP RIGHT Sign (R4-3) and KEEP RIGHT EXCEPT TO PASS Sign (R4-16)

Option:

The SLOWER TRAFFIC KEEP RIGHT (R4-3) sign (see Figure 2B-13) or the KEEP RIGHT EXCEPT TO PASS (R4-16) sign (see Figure 2B-13) may be used on multi-lane roadways to reduce unnecessary lane changing.

Guidance:

If used, the SLOWER TRAFFIC KEEP RIGHT or the KEEP RIGHT EXCEPT TO PASS sign should be installed just beyond the beginning of a multi-lane pavement, and at selected locations where there is a tendency on the part of some road users to drive in the left-hand added to increase clarity lane (or lanes) below the normal speed of traffic. This sign should not be used on the approach to an interchange or through an interchange area.

Section ~~2B.32~~ 2B.39 ~~Slow-Moving Traffic~~ TRUCKS USE RIGHT LANE Sign~~s~~ (R4-5~~, R4-6~~)

~~Support:~~

~~The Slow-Moving Traffic Lane signs (see Figure 2B-8) are used to direct vehicles into an extra lane that has been provided for slow-moving vehicles.~~

Guidance:

If an extra lane has been provided for trucks and other slow-moving traffic, a SLOWER TRAFFIC KEEP RIGHT (R4-3) sign (see Figure 2B-13), TRUCKS USE RIGHT LANE (R4-5) sign (see Figure 2B-13), or other appropriate sign should be installed at the beginning of the lane. ~~A TRUCK LANE (R4-6) sign, with the appropriate distance shown should be installed in advance of the lane.~~

Option:

The SLOWER TRAFFIC KEEP RIGHT sign may be used as a supplement or as an alternative to the TRUCKS USE RIGHT LANE sign. Both signs may be used on multi-lane roadways to improve capacity and reduce lane changing.

The TRUCKS USE RIGHT LANE (R4-5) sign may be used on multi-lane roadways to reduce unnecessary lane changing.

Guidance:

If an extra lane has been provided for trucks and other slow-moving traffic, a Lane Ends sign (see Section 2C.41) should be installed in advance of the point where the extra lane ends. Appropriate pavement markings should be installed at both the ~~beginning~~ upstream and ~~the~~ downstream ends of the extra lane (see Section 3B.09 and Figure 3B-13).

Support:

Section 2D.53 contains information regarding advance information signs for extra lanes that have been provided for trucks and other slow-moving traffic.

Section ~~2B.33~~ 2B.40 Keep Right and Keep Left Signs (R4-7, R4-8)

Option:

The Keep Right (R4-7) sign (see Figure 2B-13) may be used at locations where it is necessary for traffic to pass only to the right-hand side edited to increase clarity of a roadway feature or obstruction. The Keep Left (R4-8) sign (see Figure 2B-13) may be used at locations where it is necessary for traffic to pass only to the left-hand side edited to increase clarity of a roadway feature or obstruction.

Guidance:

At locations where it is not readily apparent that traffic is required to keep to the right, a Keep Right sign should be used.

If used, the Keep Right sign should be installed as close as practical to approach ends of raised medians, parkways, islands, and underpass piers~~, and at other locations where it is not readily apparent that traffic is required to keep to the right~~. The sign should be mounted on the face of or just in front of a pier or other obstruction separating opposite directions of traffic in the center of the highway such that traffic will have to pass to the right-hand side edited to increase clarity of the sign.

Standard:

The Keep Right sign shall not be installed on the right-hand edited to increase clarity side of the roadway in a position where traffic must pass to the left-hand side edited to increase clarity of the sign.

Option:

The Keep Right sign may be omitted at intermediate ends of divisional islands and medians.

Word message KEEP RIGHT (LEFT) with an arrow (R4-7a or R4-7b) signs (see Figure 2B-13) may be used instead of the R4-7 or R4-8 symbol signs.

Where the obstruction obscures the Keep Right sign, the minimum placement height may be increased for better sign visibility.

A narrow Keep Right (R4-7c) sign (see Figure 2B-13) may be installed on the nose of a median island where the median width is too narrow to accommodate an R4-7 sign that is 600 mm (24 in) wide.

Standard:

A narrow Keep Right (R4-7c) sign shall not be installed on a median island that has a width of 1.8 m (6 ft) or more at the point where the sign is to be located.

Section 2B.41 STAY IN LANE Sign (R4-9)

Option:

A STAY IN LANE (R4-9) sign (see Figure 2B-13) may be used on multi-lane highways to direct road users to stay in their lane until conditions permit shifting to another lane.

Guidance:

If a STAY IN LANE sign is used, it should be accompanied by a double solid white lane line(s) to prohibit lane changing or a single solid white lane line(s) to discourage lane changing in that section of roadway.

Section 2B.42 RUNAWAY VEHICLES ONLY Sign (R4-10)

Guidance:

A RUNAWAY VEHICLES ONLY (R4-10) sign (see Figure 2B-13) should be installed near a truck escape (or runaway truck) ramp entrance to discourage other road users from entering the ramp.

Section 2B.43 Slow Vehicle Turn-Out Signs (R4-12, R4-13, and R4-14)

Support:

On two-lane highways in areas where traffic volumes and/or vertical or horizontal curvature make passing difficult, turn-out areas are sometimes provided for the purpose of giving a group of faster vehicles an opportunity to pass a slow-moving vehicle.

Option:

A SLOW VEHICLES WITH XX OR MORE FOLLOWING VEHICLES MUST USE TURN-OUT (R4-12) sign (see Figure 2B-13) may be installed in advance of a turn-out area to inform drivers who are driving so slow that they have accumulated a specific number of vehicles behind them that they are required to use the turn-out to allow the vehicles following them to pass.

Support:

The specific number of vehicles displayed on the R4-12 sign provides law enforcement personnel with the information they need to enforce this regulation.

Option:

If an R4-12 sign has been installed in advance of a turn-out area, a SLOW VEHICLES MUST USE TURN-OUT AHEAD (R4-13) sign (see Figure 2B-13) may also be installed downstream from the R4-12 sign, but upstream from the turn-out area, to remind slow drivers that they are required to use a turn-out that is a short distance ahead.

Standard:

If an R4-12 sign has been installed in advance of a turn-out area, a SLOW VEHICLES MUST TURN OUT (with arrow) (R4-14) sign (see Figure 2B-13) shall be installed at the entry point of the turn-out area.

Support:

Section 2D.54 contains information regarding advance information signs for slow vehicle turn-out areas.

Section ~~2B.34~~ 2B.44 DO NOT ENTER Sign (R5-1)

Standard:

The DO NOT ENTER (R5-1) sign (see Figure 2B-14) shall be used where traffic is prohibited from entering a restricted roadway.

Guidance:

The DO NOT ENTER sign, if used, should be placed directly in view of a road user at the point where a road user could wrongly enter a divided highway, one-way roadway, or ramp (see Figure 2B-15). The sign should be mounted on the right-hand edited to increase clarity side of the roadway, facing traffic that might enter the roadway or ramp in the wrong direction.

If the DO NOT ENTER sign would be visible to traffic to which it does not apply, the sign should be turned away from, or shielded from, the view of that traffic.

Option:

The DO NOT ENTER sign may be installed where it is necessary to emphasize the one-way traffic movement on a ramp or turning lane.

A second DO NOT ENTER sign on the left side of the roadway may be used, particularly where traffic approaches from an intersecting roadway (see Figure 2B-15).

Support:

Section 2B.48 contains information regarding an optional lower mounting height for DO NOT ENTER signs that are located along the exit ramp facing a road user who is traveling in the wrong direction.

Section ~~2B.35~~ 2B.45 WRONG WAY Sign (R5-1a)

Option:

The WRONG WAY (R5-1a) sign (see Figure 2B-14) may be used as a supplement to the DO NOT ENTER sign where an exit ramp intersects a crossroad or a crossroad intersects a one-way roadway in a manner that does not physically discourage or prevent wrong-way entry (see Figure 2B-15).

Guidance:

If used, the WRONG WAY sign should be placed at a location along the exit ramp or the one-way roadway farther from the crossroad than the DO NOT ENTER sign (see Section 2E.49).

Support:

Section 2B.48 contains information regarding an optional lower mounting height for WRONG WAY signs that are located along the exit ramp facing a road user who is traveling in the wrong direction.

Section ~~2B.36~~ 2B.46 Selective Exclusion Signs

Support:

Selective Exclusion signs (see Figure 2B-14) give notice to road users that State or local statutes or ordinances exclude designated types of traffic from using particular roadways or facilities.

Standard:

If used, Selective Exclusion signs shall clearly indicate the type of traffic that is excluded.

Support:

Typical exclusion messages include:

A. No Trucks (R5-2),
B. NO MOTOR VEHICLES (R5-3),
C. NO COMMERCIAL VEHICLES ~~EXCLUDED~~ (R5-4),
D. NO TRUCKS (VEHICLES) WITH LUGS ~~PROHIBITED~~ (R5-5),
E. No Bicycles (R5-6),
F. NO NON-MOTORIZED TRAFFIC ~~PROHIBITED~~ (R5-7),
G. NO MOTOR-DRIVEN CYCLES ~~PROHIBITED~~ (R5-8), and
H. No Hazardous Material ~~Prohibited~~ (R14-3) (see Section 2B.67).

Option:

Appropriate combinations or groupings of these legends into a single sign, such as NO PEDESTRIANS BICYCLES MOTOR-DRIVEN CYCLES ~~PROHIBITED~~ (R5-10a), or NO PEDESTRIANS ~~AND~~ OR BICYCLES ~~PROHIBITED~~ (R5-10b) may be used.

Guidance:

If an exclusion is governed by vehicle weight, a Weight Limit sign (see Section 2B.64) should be used instead of a Selective Exclusion sign.

The Selective Exclusion sign should be placed on the right-hand edited to increase clarity side of the roadway at an appropriate distance from the intersection so as to be clearly visible to all road users turning into the roadway that has the exclusion. The NO PEDESTRIANS ~~PROHIBITED~~ (R5-10c) or No Pedestrian Crossing (R9-3~~a~~) sign (see Section 2B.58) added to assist the reader should be installed so as to be clearly visible to pedestrians at a location where an alternative route is available.

Option:

The NO TRUCKS (R5-2a) sign may be used as an alternate to the No Trucks (R5-2) symbol sign.

The NO PEDESTRIANS ~~PROHIBITED~~ (R5-10c) or No Pedestrian Crossing (R9-3~~a~~) sign may also be used at underpasses or elsewhere where pedestrian facilities are not provided.

The AUTHORIZED VEHICLES ONLY (R5-13) or the FOR OFFICIAL USE ONLY (R5-14) sign may be used at median openings and other locations to prohibit vehicles from using the median opening or facility unless they have special permission (such as law enforcement vehicles or emergency vehicles) or are performing official business (such as highway agency maintenance vehicles).

Section ~~2B.37~~ 2B.47 ONE WAY Signs (R6-1, R6-2)

Standard:

Except as noted in the Option, the ONE WAY (R6-1 or R6-2) sign (see Figure 2B-16) shall be used to indicate streets or roadways upon which vehicular traffic is allowed to travel in one direction only.

ONE WAY signs shall be placed parallel to the one-way street at all alleys and roadways that intersect one-way roadways as shown in Figures 2B-17 through 2B-20.

~~Guidance:~~

~~Where~~ At intersections with divided highways ~~are separated by median widths at the intersection itself of 9 m (30 ft) or more~~, ONE WAY signs ~~should~~ shall be placed, visible to each crossroad approach, on the near right, ~~and~~ far left, and far right corners of each intersection with the directional roadways as shown in Figures ~~2B-12 and~~ 2B-18 through 2B-20.

Option:

ONE WAY signs may be omitted on the one-way roadways of divided highways, where the design of interchanges indicates the direction of traffic on the separate roadways.

ONE WAY signs may be omitted on the medians (see Figures 2B-19 and 2B-20) at intersections with divided highways that have median widths at the intersection itself of less than 9 m (30 ft).

Standard:

At unsignalized intersections, ONE WAY signs shall be placed on the near right and the far left corners of the intersection facing traffic entering or crossing the one-way street (see Figure 2B-17, Sheet 1 of 2).

At signalized intersections, ONE WAY signs shall be placed ~~either~~ grammar – more than two choices near the appropriate signal faces, on the poles holding the traffic signals, on the mast arm or span wire holding the signals, or at the locations specified for unsignalized intersections.

At unsignalized T-intersections where the roadway at the top of the T-intersection is a one-way roadway, ONE WAY signs shall be placed on the near right and the far side of the intersection facing traffic on the stem approach (see Figure 2B-17, Sheet 2 of 2).

At signalized T-intersections where the roadway at the top of the T-intersection is a one-way roadway, ONE WAY signs shall be placed near the appropriate signal faces, on the poles holding the traffic signals, on the mast arm or span wire holding the signals, or at the locations specified for unsignalized intersections.

Option:

Where the central island of a roundabout allows for the installation of signs, ONE WAY signs may be used instead of or in addition to Roundabout Directional Arrow (R6-4 series) signs (see Section 2B.50) to direct traffic counter-clockwise around the central island.

Guidance:

Where used on the central island of a roundabout, the mounting height of a ONE WAY sign should be at least 1.2 m (4 ft), measured vertically from the bottom of the sign to the elevation of the near edge of the traveled way.

Support:

Using ONE WAY signs on the central island of a roundabout might result in some drivers incorrectly concluding that the cross street is a one-way street. Using Roundabout Directional Arrow signs might reduce this confusion. However, using ONE WAY signs might be necessary in States that have defined a roundabout as a series of T-intersections.

Section 2B.48 Wrong-Way Traffic Control at Interchange Ramps text was relocated from Section 2E.50 because it relates more to regulatory signs rather than guide signs

Standard:

At interchange exit ramp terminals where the ramp intersects a crossroad in such a manner that wrong-way entry could inadvertently be made, the following signs shall be used (see Figure 2B-21):

A. At least one ONE WAY sign for each direction of travel on the crossroad shall be placed where the exit ramp intersects the crossroad.

B. At least one DO NOT ENTER sign shall be conspicuously placed near the downstream end of the exit ramp in positions appropriate for full view of a road user starting to enter wrongly from the crossroad.

C. At least one WRONG WAY sign shall be placed on the exit ramp facing a road user traveling in the wrong direction.

Guidance:

In addition, the following pavement markings should be used (see Figure 2B-21):

A. On two-lane paved crossroads at interchanges, double solid yellow lines should be used as a ~~centerline~~ center line for an adequate distance on both sides approaching the ramp intersections.

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

Option:

The following traffic control devices may be used to supplement the above signs and pavement markings:

A. Additional ONE WAY signs may be placed, especially on two-lane rural crossroads, appropriately in advance of the ramp intersection to supplement the required ONE WAY sign(s).

B. Additional WRONG WAY signs may be used.

C. Slender, elongated wrong-way arrow pavement markings (see Figure 3B-24) intended primarily to warn wrong-way road users that they are traveling in the wrong direction may be placed upstream from the ramp terminus (see Figure 2B-21) to indicate the correct direction of traffic flow. Wrong-way arrow pavement markings may also be placed on the exit ramp at appropriate locations near the crossroad junction to indicate wrong-way movement. The wrong-way arrow markings may consist of pavement markings or bidirectional red-and-white raised pavement markers or other units that show red to wrong-way road users and white to other road users (see Figure 3B-24).

D. Lane-use arrow pavement markings may be placed on the exit ramp and crossroad near their intersection to indicate the permissive direction of flow.

~~E. Guide signs or may be used on entrance ramps near the crossroad to inform road users of the freeway or expressway entrance, as appropriate (see Figure 2E-37).~~ relocated to Section 2D.48

E. Freeway entrance signs (see Section 2D.48) may be used.

Guidance:

On interchange entrance ramps where the ramp merges with the through roadway and the design of the interchange does not clearly make evident the direction of traffic on the separate roadways or ramps, a ONE WAY sign visible to traffic on the entrance ramp and through roadway should be placed on each side of the through roadway near the entrance ramp merging point as illustrated in Figure 2B-22.

Option:

At locations where engineering judgment determines that a special need exists, other standard warning or prohibitive methods and devices may be used as a deterrent to the wrong-way movement.

Where there are no parked cars, pedestrian activity or other obstructions such as snow or vegetation, and if an engineering study indicates that a lower mounting height would address wrong-way movements on freeway or expressway exit ramps, a DO NOT ENTER sign(s) and/or a WRONG WAY sign(s) that is located along the exit ramp facing a road user who is traveling in the wrong direction may be installed at a minimum mounting height of 0.9 m (3 ft), measured vertically from the bottom of the sign to the elevation of the near edge of the pavement.

Support:

Section 2B.49 contains further information on signing to avoid wrong-way movements at at-grade intersections on expressways.

Section ~~2B.38~~ 2B.49 Divided Highway Crossing Signs (R6-3, R6-3a)

~~Option~~ Standard:

On unsignalized minor-street approaches from which both left turns and right turns are permitted onto a divided highway, except as noted in the Option below, a ~~The~~ Divided Highway Crossing (R6-3 or R6-3a) sign (see Figure 2B-16) ~~may~~ shall be used to advise road users that they are approaching an intersection with a divided highway.

Option:

If the divided highway has a traffic volume of less than 400 AADT and a speed limit of 40 km/h (25 mph) or less, the Divided Highway Crossing signs facing the minor-street approaches may be omitted.

A Divided Highway Crossing sign may be used on signalized minor-street approaches from which both left turns and right turns are permitted onto a divided highway to advise road users that they are approaching an intersection with a divided highway.

Standard:

~~When the~~ If a edited to increase accuracy Divided Highway Crossing sign is used at a four-legged intersection, the R6-3 sign shall be used. ~~When~~ If edited to increase accuracy used at a T-intersection, the R6-3a sign shall be used.

~~Option:~~

The Divided Highway Crossing sign ~~may~~ shall be located on the near right corner of the intersection, ~~and may be~~ mounted beneath a STOP or YIELD sign or on a separate support.

Option:

An additional Divided Highway Crossing sign may be installed on the left-hand side of the approach to supplement the Divided Highway Crossing sign on the near right corner of the intersection.

Section 2B.50 Roundabout Directional Arrow Signs (R6-4, R6-4a, and R6-4b)

Guidance:

Where the central island of a roundabout allows for the installation of signs, Roundabout Directional Arrow (R6-4 series) signs should be used in the central island to direct traffic counter-clockwise around the central island, except as noted in the Option in Section 2B.47 and as noted in the Option below.

Standard:

The R6-4 sign (see Figure 2B-23) shall be a horizontal rectangle with two black chevrons pointing to the right on a white background. The R6-4a sign (see Figure 2B-23) shall be a horizontal rectangle with three black chevrons pointing to the right on a white background. The R6-4b sign (see Figure 2B-23) shall be a horizontal rectangle with four black chevrons pointing to the right on a white background. No border shall be used on the Roundabout Directional Arrow signs.

Roundabout Directional Arrow signs shall be used only at roundabouts and other circular intersections.

Guidance:

When used on the central island of a roundabout, the mounting height of a Roundabout Directional Arrow sign should be at least 1.2 m (4 ft), measured vertically from the bottom of the sign to the elevation of the near edge of the traveled way.

Option:

Wider chevrons within the Roundabout Directional Arrow sign, more than one Roundabout Directional Arrow sign, and/or R6-4a or R6-4b signs may be used facing high-speed approaches, facing approaches with limited visibility, or in other circumstances as determined by engineering judgment where increased sign visibility would be appropriate.

Section 2B.51 Roundabout Circulation Plaque (R6-5P)

Guidance:

Where the central island of a roundabout does not provide a reasonable place to install a sign, Roundabout Circulation (R6-5P) plaques (see Figure 2B-23) should be placed below the YIELD signs on each approach.

Option:

At roundabouts where Roundabout Directional Arrow signs and/or ONE WAY signs have been installed in the central island, Roundabout Circulation plaques may be placed below the YIELD signs on approaches to roundabouts to supplement the central island signs.

The Roundabout Circulation plaque may be used at any type of circular intersection.

Section 2B.52 Examples of Roundabout Signing

Support:

Figures 2B-24 through 2B-26 illustrate examples of regulatory and warning signing for roundabouts of various configurations.

Chapter 2D contains information regarding guide signing at roundabouts and Chapter 3C contains information regarding pavement markings at roundabouts.

Section ~~2B.39~~ 2B.53 Parking, Standing, and Stopping Signs (R7 and R8 Series)

Support:

Signs governing the parking, stopping, and standing of vehicles cover a wide variety of regulations, and only general guidance can be provided here. The word "standing" when used on the R7 and R8 series of signs refers to the practice of a driver keeping the vehicle in a stationary position while continuing to occupy the vehicle. Typical examples of parking, stopping, and standing signs and plaques added to increase accuracy (see Figures 2B-27 and 2B-28) are as follows: signs and plaques added to list in order to provide a complete list of the signs and plaques shown in previous Figures 2B-16 and 2B-17

1. NO PARKING ANY TIME (R7-1);
2. NO PARKING ~~8:30~~ X:XX AM TO ~~5:30~~ X:XX PM (R7-2, R7-2a);
3. NO PARKING EXCEPT SUNDAYS AND HOLIDAYS (R7-3);
4. NO STANDING ANY TIME (R7-4);
5. ~~ONE~~ XX HOUR PARKING ~~9~~ X:XX AM-~~7~~ X:XX PM (R7-5);
6. NO PARKING LOADING ZONE (R7-6);
7. NO PARKING BUS STOP (R7-7, R7-107, R7-107a);
8. RESERVED PARKING for persons with disabilities (R7-8);
9. VAN ACCESSIBLE (R7-8aP, R7-8bP);
10. Pay Station (R7-20);
11. Pay Parking or Pay to Park (R7-21, R7-21a, R7-22, R7-22a);
12. Parking Permitted X:XX AM TO X:XX PM (R7-23);
13. Parking Permitted XX HOUR(S) XX AM – XX PM (R7-23a);
14. XX HR PARKING X:XX AM TO X:XX PM (R7-108);
15. NO PARKING ANYTIME /XX HOUR PARKING X:XX AM – X:XX PM (R7-200, R7-200a);
16. TOW-AWAY ZONE (R7-201P, R7-201aP);
17. THIS SIDE OF SIGN (R7-202P);
18. EMERGENCY SNOW ROUTE NO PARKING IF OVER XX mm (INCHES) (R7-203);
19. NO PARKING ON PAVEMENT (R8-1);
20. NO PARKING EXCEPT ON SHOULDER (R8-2);
21. NO PARKING (R8-3, R8-3a);

~~L. No Parking (R8-3a), and~~

22. EXCEPT SUNDAYS & HOLIDAYS (R8-3bP);
23. ON PAVEMENT (R8-3cP);
24. ON BRIDGE (R8-3dP);
25. ON TRACKS (R8-3eP);
26. EXCEPT ON SHOULDER (R8-3fP);
27. LOADING ZONE (R8-3gP);
28. X:XX AM TO X:XX PM (R8-3hP);
29. EMERGENCY PARKING ONLY (R8-4);
30. NO STOPPING ON PAVEMENT (R8-5);
31. NO STOPPING EXCEPT ON SHOULDER (R8-6); and
32. EMERGENCY STOPPING ONLY (R8-7).

Section ~~2B.40~~ 2B.54 Design of Parking, Standing, and Stopping Signs

Support:

Discussions of parking signs and parking regulations in this Section apply not only to parking, but also to standing and stopping.

Standard:

The legend on parking signs shall state applicable regulations. Parking signs (see Figures 2B-27 and 2B-28) shall ~~conform to~~ comply with the standards of shape, color, and location.

Where parking is prohibited at all times or at specific times, the basic design for parking signs shall have a red legend and border on a white background (Parking Prohibition signs), except that the R8-4 and R8-7 signs and the alternate design for the R7-201aP plaque shall have a black legend and border on a white background, and the R8-3a sign shall have a black legend and border and a red circle and slash on a white background.

Where only limited-time parking or parking in a particular manner are permitted, the signs shall have a green legend and border on a white background (Permissive Parking signs).

Guidance:

Parking signs should display the following information from top to bottom of the sign, in the order listed:

A. The restriction or prohibition;
B. The times of the day that it is applicable, if not at all hours; and
C. The days of the week that it is applicable, if not every day.

If the parking restriction applies to a limited area or zone, the limits of the restriction should be shown by arrows or supplemental plaques. If arrows are used and if the sign is at the end of a parking zone, there should be a single-headed arrow pointing in the direction that the regulation is in effect. If the sign is at an intermediate point in a zone, there should be a double-headed arrow pointing both ways. When a single sign is used at the transition point between two parking zones, it should display a right and left arrow pointing in the direction that the respective restrictions apply.

Where special parking restrictions are imposed during heavy snowfall, ~~Snow~~ Emergency Snow Route (R7-203) signs (see Figure 2B-27) should be installed. The legend will vary according to the regulations, but the signs should be vertical rectangles, having a white background with the upper part of the plate a red background.

Standard:

Where parking spaces that are reserved for persons with disabilities are designated to accommodate wheelchair vans, a VAN ACCESSIBLE (~~R7-8b~~ R7-8aP) from errata list for 2003 MUTCD plaque (see Figure 2B-27) ~~should~~ shall be mounted below the R7-8 sign. relocated and changed to Standard

Guidance:

When used to direct drivers to van-accessible parking facilities, a VAN ACCESSIBLE (~~R7-8a~~ R7-8bP) plaque (see Figure 2B-27) should be mounted below the ~~D4-1~~ D9-6 sign. from errata list for 2003 MUTCD

Standard:

The R7-8 sign (see Figure 2B-27) shall have a green legend and border and a white wheelchair symbol on a square blue panel, all on a white background. The R7-8aP plaque shall have a green legend and border on a white background. The R7-8bP plaque shall have a white legend and border on a blue background.

Option:

To minimize the number of parking signs, blanket regulations that apply to a given district may, if legal, be posted at district boundary lines.

As an alternate to the use of arrows to show designated restriction zones, word messages such as BEGIN, END, HERE TO CORNER, HERE TO ALLEY, THIS SIDE OF SIGN, or BETWEEN SIGNS may be used.

Where parking is prohibited during certain hours and time-limited parking or parking in a particular manner is permitted during certain other time periods, the red Parking Prohibition and green Permissive Parking signs may be designed as follows:

A. Two 300 x 450 mm (12 x 18 in) parking signs may be used with the red Parking Prohibition sign installed above or to the left of the green Permissive Parking sign; or
B. The red Parking Prohibition sign and the green Permissive Parking sign may be combined to form an R7-200 sign on a single 600 x 450 mm (24 x 18 in) sign, or an R7-200a sign on a single 300 x 750 mm (12 x 30 in) sign.

At the transition point between two parking zones, a single sign or two signs mounted side by side may be used.

The words NO PARKING may be used as an alternative to the No Parking symbol. The supplemental educational plaque, NO PARKING, with a red legend and border on a white background, may be used above signs incorporating the No Parking symbol.

Alternate designs for the R7-107 sign may be developed such as the R7-107a sign (see Figure 2B-27). Alternate designs may include, on a single ~~panel~~ sign, edited to increase accuracy a transit logo, an approved bus symbol, a parking prohibition, the words BUS STOP, and an arrow. The preferred bus symbol color is black, but other dark colors may be used. Additionally, the transit logo may be ~~shown~~ displayed edited to increase consistency on the bus face in the appropriate colors instead of placing the logo separately. The reverse side of the sign may contain bus routing information.

To make the parking regulations more effective and to improve public relations by giving a definite warning, a TOW-AWAY ZONE (R7-201P) ~~sign~~ plaque (see Figure 2B-27) ~~reading TOW-AWAY ZONE (R7-201)~~ may be appended to, or incorporated in, any parking prohibition sign. The Tow-Away Zone (R7-201aP) symbol ~~sign~~ plaque may be used instead of the R7-201P word message ~~sign~~ plaque. The R7-201aP ~~sign~~ plaque may have either a black or red legend and border on a white background.

Guidance:

If a fee is charged for parking and a midblock pay station is used instead of individual parking meters for each parking space, pay parking signs should be used. Pay Parking (R7-22 or R7-22a) signs (see Figure 2B-27) should be used to define the area where the pay station parking applies. Pay Station (R7-20) signs (see Figure 2B-27) should be used at the pay station or to direct road users to the pay station.

Standard:

If the pay parking is subject to a maximum time limit, the appropriate time limit (number of hours or minutes) shall be displayed on the Pay Parking (R7-21 or R7-21a) and Pay Station (R7-20) signs.

Option:

In rural areas, the legends NO PARKING ON PAVEMENT (R8-1) or NO STOPPING ON PAVEMENT (R8-5) ~~is~~ are generally suitable and may be used. If a roadway has paved shoulders, the NO PARKING EXCEPT ON SHOULDER sign (R8-2) or the NO STOPPING EXCEPT ON SHOULDER sign (R8-6) may be used as ~~it is~~ these signs would be less likely to cause confusion. The R8-3a symbol sign or the word message NO PARKING (R8-3) sign may be used to prohibit any parking along a given highway. Word message supplemental plaques (see Figure 2B-28)~~, such as ON PAVEMENT (R8-3c) or ON BRIDGE (R8-3d),~~ may be mounted below the R8-3 or R8-3a sign. These word message supplemental plaques may include legends such as EXCEPT SUNDAYS & HOLIDAYS (R8-3bP), ON PAVEMENT (R8-3cP), ON BRIDGE (R8-3dP), ON TRACKS (R8-3eP), EXCEPT ON SHOULDERS (R8-3fP), LOADING ZONE (with arrow) (R8-3gP), and X:XX AM TO X:XX PM (with arrow) (R8-3hP).

Section ~~2B.41~~ 2B.55 Placement of Parking, Stopping, and Standing Signs

Guidance:

When signs with arrows are used to indicate the extent of the restricted zones, the signs should be set at an angle of not less than 30 degrees or more than 45 degrees with the line of traffic flow in order to be visible to approaching traffic.

Spacing of signs should be based on legibility and sign orientation.

If the zone is unusually long, signs showing a double arrow should be used at intermediate points within the zone.

Standard:

If the signs are mounted at an angle of 90 degrees to the curb line, two signs shall be mounted back to back at the transition point between two parking zones, each with ~~the~~ an appended ~~message~~ THIS SIDE OF SIGN (R7-202P) supplemental plaque.

Guidance:

If the signs are mounted at an angle of 90 degrees to the curb line, ~~At intermediate points within a zone,~~ a single sign without any arrow or appended plaque should be used at intermediate points within a zone, facing in the direction of approaching traffic. Otherwise the standards of placement should be the same as for signs using directional arrows.

Section ~~2B.42~~ 2B.56 Emergency Restriction Signs (R8-4, R8-7, R8-8)

Option:

The EMERGENCY PARKING ONLY (R8-4) sign (see Figure 2B-28) or the EMERGENCY STOPPING ONLY (R8-7) sign (see Figure 2B-28) may be used to discourage or prohibit shoulder parking, particularly where scenic or other attractions create a tendency for road users to stop temporarily~~, even though~~ on the shoulder because a turnout or rest area~~s have~~ has not been provided.

The DO NOT STOP ON TRACKS (R8-8) sign (see Figure 8B-4) may be used to discourage or prohibit parking or stopping on railroad tracks (see Section 8B.09).

Standard:

Emergency Restriction signs shall be rectangular and shall have a red or black legend and border on a white background.

Section ~~2B.43~~ 2B.57 WALK ON LEFT FACING TRAFFIC and No Hitchhiking Signs (R9-1, R9-4, R9-4a)

Option:

The WALK ON LEFT FACING TRAFFIC (R9-1) sign (see Figure 2B-29) may be used on highways where no sidewalks are provided.

Standard:

If used, the WALK ON LEFT FACING TRAFFIC sign shall be installed on the right-hand edited to increase clarity side of the road where pedestrians walk on the pavement or shoulder in the absence of pedestrian pathways or sidewalks.

Option:

The No Hitchhiking (R9-4~~a~~) sign (see Figure 2B-29) may be used to prohibit standing in or adjacent to the roadway for the purpose of soliciting a ride. The R9-4a word message sign (see Figure 2B-29) may be used as an alternate to the R9-4~~a~~ symbol sign.

Section ~~2B.44~~ 2B.58 Pedestrian Crossing Signs (R9-2, R9-3)

Option:

Pedestrian Crossing signs (see Figure 2B-29) may be used to limit pedestrian crossing to specific locations.

Standard:

If used, Pedestrian Crossing signs shall be installed to face pedestrian approaches.

Option:

Where crosswalks are clearly defined, the CROSS ONLY AT CROSSWALKS (R9-2) sign may be used to discourage jaywalking or unauthorized crossing.

The No Pedestrian Crossing (R9-3~~a~~) sign may be used to prohibit pedestrians from crossing a roadway at an undesirable location or in front of a school or other public building where a crossing is not designated.

The NO PEDESTRIAN CROSSING (R9-3a) word message sign may be used as an alternate to the R9-3~~a~~ symbol sign. The USE CROSSWALK (R9-3bP) supplemental plaque, along with an arrow, may be installed below either sign to designate the direction of the crossing.

Support:

One of the most frequent uses of the Pedestrian Crossing signs is at signalized intersections that have three crossings that can be used and one leg that cannot be crossed.

Guidance:

The R9-3bP ~~sign~~ plaque should not be installed in combination with educational plaques.

Because pedestrians who have visual disabilities typically need additional guidance as to where not to cross, No Pedestrian Crossing (R9-3 and R9-3a) signs should be supplemented with detectable guidance, such as grass strips, landscaping, planters, fencing, rails, or barriers.

Section ~~2B.45~~ 2B.59 Traffic Signal Signs (R10-1 through ~~R10-21~~ R10-32P)

Option:

To supplement traffic signal control, Traffic Signal signs R10-1 through ~~R10-21~~ R10-32P may be used to regulate road users.

~~Guidance:~~

~~When used, Traffic Signal signs should be located adjacent to the signal face to which they apply.~~ deleted as locations near signal faces are now specifically specified where appropriate

Standard:

Traffic Signal signs applicable to pedestrian actuation (see Figure 2B-29) or bicyclist actuation (see Figure 9B-2) shall be mounted immediately above or incorporated into the ~~pedestrian~~ pushbutton detector units (see Section 4E.08).

Support:

Traffic Signal signs applicable to pedestrians include:

A. CROSS ONLY ON GREEN ~~LIGHT ONLY~~ (symbolic circular green) (R10-1);
B. CROSS ONLY ON ~~WALK~~ (symbolic walk indication) SIGNAL ~~ONLY~~ (R10-2);
C. Push Button for ~~GREEN LIGHT~~ Walk Signal (R10-3); and
D. Push Button for ~~WALK SIGNAL~~ Green Signal (R10-4).

Option:

The following signs may be used as an alternate for the R10-3 and R10-4 signs:

A. Push Button to Cross Street ~~(arrow), PUSH BUTTON~~ Wait for ~~GREEN LIGHT~~ Walk Signal (R10-3a); or
B. Push Button to Cross Street ~~(arrow), PUSH BUTTON~~ ~~WALK SIGNAL~~ Wait for Green Signal (R10-4a).

The name of the street to be crossed may be substituted for the word STREET in the legends on the R10-3a and R10-4a signs.

~~The symbol sign R10-2a may be used as an alternate to sign R10-2.~~ Where symbol-type pedestrian signal indications are used, an educational sign (R10-3b) may be used instead of the R10-3 sign to improve pedestrian understanding of pedestrian indications at signalized intersections. Where word-type pedestrian signal indications are being retained for the remainder of their useful service life, the legends WALK/DONT WALK may be substituted for the symbols on the educational sign R10-3b, thus creating educational sign R10-3c. The R10-3d educational sign may be used ~~if~~ to inform pedestrians that the pedestrian clearance time is sufficient only for the pedestrian to cross to the median at locations where pedestrians cross in two stages using a median refuge island. ~~The diagrammatic sign R10-4b may also be used as an alternate to sign R10-4. At intersections where pedestrians cross in two stages using a median refuge island, the word message "CROSS TO MEDIAN" may be placed on the near corner of the refuge island along with the educational plaque.~~ The R10-3e educational sign may be used where countdown pedestrian signals have been provided. In order to assist the pedestrian in understanding which pushbutton to push, the R10-3f to R10-3i educational signs that provide the name of the street to be crossed may be used instead of the R10-b to R10-3e educational signs.

The R10-24 or R10-26 sign (see Section 9B.11) may be used where a pushbutton detector has been installed exclusively for bicyclists to actuate a special bicycle phase or a concurrent vehicular green phase.

The R10-25 sign (see Figure 2B-29) may be used where a pushbutton detector has been installed for pedestrians to activate In-Roadway Warning Lights (see Chapter 4N) or flashing beacons that have been added to the pedestrian warning signs.

Traffic Signal signs (see Figure 2B-30) may be installed at certain locations to clarify signal control. Among the legends that may be used for this purpose are LEFT ON GREEN ARROW ONLY (R10-5) (see Section 4D.19), STOP HERE ON RED (R10-6 or R10-6a) for observance of stop lines, DO NOT BLOCK INTERSECTION (R10-7) for avoidance of traffic obstructions, USE LANE(S) WITH GREEN ARROW (R10-8) for obedience to ~~Lane Control~~ lane-use control edited for consistency signals (see Chapter 4M), added to assist reader LEFT TURN YIELD ON GREEN (symbolic circular green ~~ball~~) (R10-12), ~~and~~ LEFT TURN SIGNAL YIELD ON GREEN (symbolic circular green ~~ball~~) (R10-21) ~~(see Sections 4D.18 and 4D.20)~~, and LEFT TURN YIELD ON FLASHING RED ARROW AFTER STOP (R10-27).

Guidance:

If used, the LEFT ON GREEN ARROW ONLY (R10-5) sign, the LEFT TURN YIELD ON GREEN (symbolic circular green) (R10-12) sign, the LEFT TURN SIGNAL YIELD ON GREEN (symbolic circular green) (R10-21) sign, or the LEFT TURN YIELD ON FLASHING RED ARROW AFTER STOP (R10-27) sign should be located adjacent to the left-turn signal face.

Option:

If needed for additional emphasis, an additional LEFT TURN YIELD ON GREEN (symbolic circular green) (R10-12) sign with an AT SIGNAL (R10-31P) supplemental plaque (see Figure 2B-30) may be installed in advance of the intersection.

In situations where traffic control signals are coordinated for progressive timing, the Traffic Signal Speed (I1-1) sign may be used (see Section 2I.04).

Standard:

~~**The NO TURN ON RED (R10-11a, R10-11b) sign (see Figure 2B-19) shall be used to prohibit**~~ **Where a right turn on red (or a left turn on red from a one-way street to a one-way street) is to be prohibited, a symbolic NO TURN ON RED (symbolic circular red) (R10-11) sign (see Figure 2B-30) or a NO TURN ON RED (R10-11a, R10-11b) word message sign (see Figure 2B-30) shall be used.**

~~Option:~~

~~A symbolic NO TURN ON RED (R10-11) sign (see Figure 2B-19) may be used as an alternate to the R10-11a and R10-11b signs.~~ incorporated into previous paragraph

Guidance:

If used, the No Turn on Red sign should be installed near the appropriate signal head.

A No Turn on Red sign should be considered when an engineering study finds that one or more of the following conditions exists:

A. Inadequate sight distance to vehicles approaching from the left (or right, if applicable);
B. Geometrics or operational characteristics of the intersection that might result in unexpected conflicts;
C. An exclusive pedestrian phase;
D. An unacceptable number of pedestrian conflicts with right-turn-on-red maneuvers, especially involving children, older pedestrians, or persons with disabilities;
E. More than three right-turn-on-red accidents reported in a 12-month period for the particular approach; or
F. The skew angle of the intersecting roadways creates difficulty for older drivers to see traffic approaching from their left.

Where turns on red are permitted and the signal indication is a steady added to increase accuracy RED ARROW, the RIGHT (LEFT) ON RED ARROW AFTER STOP (R10-17a) sign (see Figure 2B-30) should be installed adjacent to the RED ARROW signal indication.

Option:

A supplemental R10-20a plaque (see Figure 2B-30) showing times of day (similar to the S4-1P plaque shown in Figure 7B-1) with a black legend and border on a white background may be mounted below a No Turn on Red sign to indicate that the restriction is in place only during certain times.

Alternatively, a blank-out sign may be used instead of a static NO TURN ON RED sign, to display either the NO TURN ON RED legend or the No Right Turn symbol or word message, as appropriate, only at certain times during the day or during one or more portion(s) of a particular cycle of the traffic signal.

On signalized approaches with more than one right-turn lane, a NO TURN ON RED EXCEPT FROM RIGHT LANE (R10-11c) sign (see Figure 2B-30) may be post-mounted at the intersection or a NO TURN ON RED FROM THIS LANE (with down arrow) (R10-11d) sign may be mounted directly over the center of the lane from which turns on red are prohibited.

Standard:

The CROSSWALK STOP ON RED (symbolic circular red) (R10-23) sign (see Figure 2B-30) shall be used in conjunction with pedestrian hybrid signals (see Section 4F.02).

The EMERGENCY SIGNAL (R10-13) sign (see Figure 2B-30) shall be used in conjunction with emergency-vehicle traffic control signals (see Section 4G.02).

The EMERGENCY SIGNAL—STOP WHEN FLASHING RED (R10-14 or R10-14a) sign (see Figure 2B-30) shall be used in conjunction with emergency-vehicle hybrid signals (see Section 4G.04).

Option:

In order to remind drivers who are making turns to yield to pedestrians, especially at intersections where right turn on red is permitted and pedestrian crosswalks are marked, a ~~TURNING TRAFFIC MUST YIELD TO PEDESTRIANS~~ Turning Vehicles Yield to Pedestrians (R10-15) sign (see Figure 2B-30) may be used. this paragraph was relocated within this section to improve continuity

A U-TURN YIELD TO RIGHT TURN (R10-16) sign (see Figure 2B-30) may be installed near the left-turn signal face if U-turns are allowed on a protected left-turn movement on an approach from which ~~drivers making a right turn from the conflicting approach to their left are~~ a right-turn GREEN ARROW signal indication is simultaneously being ~~shown~~ displayed ~~a right-turn GREEN ARROW signal indication~~ to drivers making a right turn from the conflicting approach to their left.

A RIGHT TURN ON RED MUST YIELD TO U-TURN (R10-30) sign (see Figure 2B-30) may be installed to remind road users that they must yield to conflicting U-turn traffic on the street or highway onto which they are turning right on a red signal after stopping.

Section ~~2B.46~~ 2B.60 Photo Enforced Signs and Plaques (R10-18, R10-19P, R10-19aP)

Option:

A TRAFFIC LAWS PHOTO ENFORCED (R10-18) sign (see Figure 2B-1) may be installed at a jurisdictional boundary to advise road users that some of the traffic regulations within that jurisdiction are being enforced by photographic equipment.

A Photo Enforced (R10-19P) plaque or a PHOTO ENFORCED (R10-19aP) word message ~~sign~~ plaque (see Figure 2B-1) may be mounted below a regulatory sign to advise road users that the regulation is being enforced by photographic equipment.

Standard:

If used below a regulatory sign, the Photo Enforced (R10-19P or R10-19aP) ~~sign~~ plaque shall be a rectangle with a black legend and border on a white background.

Section 2B.61 Ramp Metering Signs (R10-28 and R10-29)

Guidance:

When ramp control signals (see Chapter 4I) are used to meter traffic on a freeway or expressway entrance ramp, regulatory signs with legends appropriate to the control should be installed adjacent to the ramp control signal faces.

For entrance ramps with only one controlled lane, an XX VEHICLE(S) PER GREEN (R10-28) sign (see Figure 2B-31) should be used to inform road users of the number of vehicles that are permitted to proceed during each short display of the green signal indication. For entrance ramps with more than one controlled lane, an XX VEHICLE(S) PER GREEN EACH LANE (R10-29) (see Figure 2B-31) sign should be used to inform road users of the number of vehicles that are permitted to proceed from each lane during each short display of the green signal indication.

Section ~~2B.47~~ 2B.62 KEEP OFF MEDIAN Sign (R11-1)

Option:

The KEEP OFF MEDIAN (R11-1) sign (see Figure 2B-32) may be used to prohibit driving into or parking on the median.

Guidance:

The KEEP OFF MEDIAN sign should be installed on the left of the roadway within the median at random intervals as needed wherever there is a tendency for encroachment.

Section ~~2B.48~~ 2B.63 ROAD CLOSED Sign (R11-2) and LOCAL TRAFFIC ONLY Signs (R11-3 Series, R11-4)

Guidance:

The ROAD CLOSED (R11-2) sign should be installed where roads have been closed to all traffic (except authorized vehicles).

ROAD CLOSED—LOCAL TRAFFIC ONLY (R11-3) or ROAD CLOSED TO THRU TRAFFIC (R11-4) signs should be used where through traffic is not permitted, or for a closure some distance beyond the sign, but where the highway is open for local traffic up to the point of closure.

Standard:

The Road Closed (R11-2, R11-3 series, and R11-4) signs (see Figure 2B-32) shall be designed as horizontal rectangles. These signs shall be preceded by the applicable Advance Road Closed warning sign with the secondary legend AHEAD and, if applicable, an Advance Detour warning sign (see Section 6F.19).

Option:

The word message BRIDGE OUT may be substituted for the ROAD CLOSED message where applicable.

Section ~~2B.49~~ 2B.64 Weight Limit Signs (R12-1 through R12-5)

Option:

The Weight Limit (R12-1) sign carrying the legend WEIGHT LIMIT XX t (~~XX~~ TONS) may be used to indicate vehicle weight restrictions including load.

Where the restriction applies to axle weight rather than gross load, the legend may be AXLE WEIGHT LIMIT XX t (~~XX~~ TONS) or AXLE WEIGHT LIMIT ~~XX~~XX kg (~~XXXX~~ LBS) (R12-2).

To restrict trucks of certain sizes by reference to empty weight in residential ~~districts~~ areas, edited to increase consistency the legend may be NO TRUCKS OVER XX t (~~XX~~ TONS) EMPTY WT or NO TRUCKS OVER ~~XX~~XX kg (~~XXXX~~ LBS) EMPTY WT (R12-3).

In areas where multiple regulations of the type described above are applicable, a sign combining the necessary messages on a single ~~panel~~ sign edited to increase accuracy may be used, such as WEIGHT LIMIT XX t (~~XX~~ TONS) PER AXLE, XX t (~~XX~~ TONS) GROSS (R12-4).

Posting of specific load limits may be accomplished by use of the Weight Limit symbol sign (R12-5). A sign containing the legend WEIGHT LIMIT on the top two lines, and showing three different truck symbols and their respective weight limits for which restrictions apply may be used, with the weight limits ~~shown~~ displayed edited to increase consistency to the right of each symbol as XX t (~~XX~~ T). A bottom line of legend stating GROSS WT may be included if needed for enforcement purposes.

Standard:

If used, the Weight Limit sign (see Figure 2B-32) shall be located in advance of the applicable section of highway or structure.

Guidance:

If used, the Weight Limit sign with an advisory distance ahead legend should be placed at approach road intersections or other points where prohibited vehicles can detour or turn around.

A METRIC (W14-16P) plaque should be mounted above a Weight Limit sign that shows the load limits in metric units.

Section ~~2B.50~~ 2B.65 Weigh Station Signs (R13 Series)

Guidance:

~~An ALL TRUCKS/COMMERCIAL VEHICLES NEXT RIGHT~~ A TRUCKS OVER XX TONS MUST ENTER WEIGH STATION NEXT RIGHT (R13-1) sign (see Figure 2B-33) should be used to direct appropriate traffic into a weigh station.

The R13-1 sign should be supplemented by the D8 series of guide signs (see Section 2D.51).

Option:

The reverse color combination, a white legend and border on a black background, may be used for the R13-1 sign.

Section ~~2B.51~~ 2B.66 TRUCK ROUTE Sign (R14-1)

Guidance:

The TRUCK ROUTE (R14-1) sign (see Figure 2B-33) should be used to mark a route that has been designated to allow truck traffic.

Option:

On a numbered highway, the TRUCK (M4-4) auxiliary sign may be used (see Section 2D.20).

Section ~~2B.52~~ 2B.67 Hazardous Material Signs (R14-2, R14-3)

Option:

The Hazardous Material Route (R14-2) sign (see Figure 2B-33) may be used to identify routes that have been designated by proper authority for vehicles transporting hazardous material.

On routes where the transporting of hazardous material is prohibited, the Hazardous Material Prohibition (R14-3) sign (see Figure 2B-33) may be used.

Guidance:

If used, the Hazardous Material Prohibition sign should be installed on a street or roadway at a point where vehicles transporting hazardous material have the opportunity to take an alternate route.

Section ~~2B.53~~ 2B.68 National Network Signs (R14-4, R14-5)

Support:

The signing of the National Network routes for trucking is optional.

Standard:

When a National Network route is signed, the National Network (R14-4) sign (see Figure 2B-33) shall be used.

Option:

The National Network Prohibition (R14-5) sign (see Figure 2B-33) may be used to identify routes, portions of routes, and ramps where trucks are prohibited. The R14-5 sign may also be used to mark the ends of designated routes.

Section 2B.69 Headlight Use Signs (R16-5 through R16-12)

Support:

Some States require road users to turn on their vehicle headlights under certain weather conditions, as a safety improvement measure on roadways experiencing high crash rates, or in special situations such as when driving through a tunnel.

Option:

A LIGHTS ON WHEN USING WIPERS (R16-5) sign (see Figure 2B-34) or a LIGHTS ON WHEN RAINING (R16-6) sign (see Figure 2B-34) may be installed to inform road users of State laws regarding headlight use. Although these signs are typically installed facing traffic entering the State just inside the State border, they also may be installed at other locations within the State.

Guidance:

If a particular section of roadway has been designated as a safety improvement zone within which headlight use is required, a TURN ON HEADLIGHTS NEXT XX km (MILES) (R16-7) sign (see Figure 2B-34) or a BEGIN DAYTIME HEADLIGHT SECTION (R16-11) sign (see Figure 2B-34) should be installed at the upstream end of the section, and a END DAYTIME HEADLIGHT SECTION (R16-12) sign (see Figure 2B-34) should be installed at the downstream end of the section.

Option:

A TURN ON HEADLIGHTS (R16-8) sign (see Figure 2B-34) may be installed to require road users to turn on their headlights in special situations such as when driving through a tunnel. A TURN OFF HEADLIGHTS (R16-9) sign (see Figure 2B-34) or a CHECK HEADLIGHTS (R16-10) sign (see Figure 2B-34) may be installed downstream from the special situation to inform drivers that the using their headlights is no longer required.

Section ~~2B.54~~ 2B.70 ~~Other~~ Miscellaneous Regulatory Signs

~~Option:~~ these two paragraphs were relocated to Section 2B.02

~~Regulatory word message signs other than those classified and specified in this Manual and the "Standard Highways Sign" book (see Section 1A.11) may be developed to aid the enforcement of other laws or regulations.~~

~~Except for symbols on regulatory signs, minor modifications in the design may be permitted provided that the essential appearance characteristics are met.~~

Option:

A FENDER BENDER MOVE VEHICLES FROM TRAVEL LANES (R16-4) sign (see Figure 2B-35) may be installed to inform road users of State laws that require them to move their vehicles to the shoulder of the roadway to minimize the resulting effect on roadway congestion if they have been involved in a minor non-injury crash.

Standard:

When a seat belt symbol is used, the symbol shown in Figure 2B-35 shall be used.

Guidance:

The seat belt symbol should not be used alone ~~but in connection with mandatory seat belt regulatory messages~~. If used, the seat belt symbol should be incorporated into regulatory sign messages for mandatory seat belt use.

CHAPTER 2C. WARNING SIGNS

Section 2C.01 Function of Warning Signs

Support:

Warning signs call attention to unexpected conditions on or adjacent to a highway, ~~or~~ street, public facility, or private property open to public travel and to situations that might not be readily apparent to road users. Warning signs alert road users to conditions that might call for a reduction of speed or an action in the interest of safety and efficient traffic operations.

Section 2C.02 Application of Warning Signs

~~**Standard:**~~

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

Guidance:

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.

Support:

The categories of warning signs are shown in Table 2C-1.

Warning signs specified herein cover most of the conditions that are likely to be encountered. Additional warning signs for low-volume roads (as defined in Section 5A.01), temporary traffic control zones, school areas, highway-rail grade crossings, bicycle facilities, and highway-light rail transit grade crossings are discussed in Parts 5 through 10, respectively.

Option:

Word message warning signs other than those specified in this Manual may be developed and installed by State and local highway agencies.

Section 2C.03 Design of Warning Signs

Standard:

Except as noted in the Option below 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 ~~unless specifically designated otherwise~~. edited to increase clarity Warning signs shall be designed in accordance with the sizes, shapes, colors, and legends contained in the "Standard Highway Signs and Markings" book (see Section 1A.11).

Option:

Oversized versions of diamond shaped warning signs may be rectangular.

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.11) and intersection warning signs (see Section 2C.48) in order to approximate the geometric configuration of the intersecting roadway(s).

Guidance:

Warning signs regarding conditions associated with pedestrians, bicyclists, and playgrounds~~, school buses, and schools may~~ should have a black legend and border on a ~~yellow background or a black legend and border on a~~ fluorescent yellow-green background.

Standard:

Warning signs regarding conditions associated with school buses and schools shall have a black legend and border on a fluorescent yellow-green background (see Section 7B.07).

Section 2C.04 Size of Warning Signs

Standard:

Except as noted in Section 2A.11, the sizes for warning signs shall be as shown in Table 2C-2.

~~Guidance:~~

~~The Conventional Road size should be used on conventional roads.~~

~~The Freeway and Expressway sizes should be used for higher-speed applications to provide larger signs for increased visibility and recognition.~~

~~Option:~~

~~The Minimum size may be used on low-speed roadways where the reduced legend size would be adequate for the warning or where physical conditions preclude the use of the other sizes.~~

~~Guidance:~~

~~Oversized signs and larger sizes may be used for those special applications where speed, volume, or other factors result in conditions where increased emphasis, improved recognition, or increased legibility would be desirable.~~

Support:

Section 2A.11 contains information regarding the applicability of the various columns in Table 2C-2.

Standard:

The minimum size for all diamond-shaped warning signs facing traffic on multi-lane conventional roads shall be 900 x 900 mm (36 x 36 in).

The minimum size for supplemental warning plaques that are not included in Table 2C-2 shall be as shown in Table 2C-3.

Option:

Signs larger than those shown in Tables 2C-2 and 2C-3 may be used (see Section 2A.11).

Section 2C.05 Placement of Warning Signs

Support:

For information on placement of warning signs, see Sections 2A.16 to 2A.21.

~~The total time needed to perceive and complete a reaction to a sign is the sum of the times necessary for Perception, Identification (understanding), Emotion (decision making), and Volition (execution of decision), and is called the PIEV time. The PIEV time can vary from several seconds for general warning signs to 6 seconds or more for warning signs requiring high road user judgment.~~

The time needed for detection, recognition, decision, and reaction is called the Perception-Response Time (PRT). Table 2C-4 lists ~~suggested~~ recommended sign placement distances for two conditions. This table is provided as an aid for determining warning sign location. The distances shown in Table 2C-4 can be adjusted for roadway features, other signing, and to improve visibility.

Guidance:

Warning signs should be placed so that they provide an adequate ~~PIEV time~~ PRT. The distances contained in Table 2C-4 are for guidance purposes and should be applied with engineering judgment. Warning signs should not be placed too far in advance of the condition, such that drivers might tend to forget the warning because of other driving distractions, especially in urban areas.

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

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

Option:

Warning signs that advise road users about conditions that are not related to a specific location, such as Deer Crossing or SOFT SHOULDER, may be installed in an appropriate location, based on engineering judgment, since they are not covered in Table 2C-4.

Section 2C.06 Horizontal Alignment Warning Signs

Support:

A variety of horizontal alignment warning signs (see Figure 2C-1), pavement markings (see Chapter 3B), and delineation (see Chapter 3D) 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.06 through 2C.15.

Standard:

In advance of horizontal curves on freeways, on expressways, and on roadways with more than 1,000 AADT that are functionally classified as arterials or collectors, horizontal alignment warning signs shall be used in accordance with Table 2C-5 based on the speed differential between the roadway's posted or statutory speed limit and the horizontal curve's advisory speed.

Option:

Horizontal Alignment Warning signs may also be used on other roadways or on arterial and collector roadways with less than 1,000 AADT based on engineering judgment.

Section ~~2C.06~~ 2C.07 Horizontal Alignment Signs (W1-1 through W1-5, W1-11, W1-15)

Standard:

When ~~engineering judgment determines the need for~~ Table 2C-5 indicates that a horizontal alignment sign (see Figure 2C-1) is required or recommended, ~~one of the W1-1 through W1-5, W1-10, W1-11 or W1-15 signs~~ the sign installed in advance of the curve shall be ~~used~~ a Curve (W1-2) sign unless a different sign is recommended or allowed by the provisions of this Section.

Guidance:

A Turn (W1-1) sign should be used instead of a Curve sign in advance of curves that have advisory speeds of 50 km/h (30 mph) or less (see Figure 2C-2).

Where there are two changes in roadway alignment that are separated by a tangent distance of less than 180 m (600 ft), the Reverse Turn (W1-3) sign should be used instead of multiple Turn (W1-1) signs and the Reverse Curve (W1-4) sign should be used instead of multiple Curve (W1-2) signs.

A Winding Road (W1-5) sign should 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 180 m (600 ft).

Option:

~~The~~ A NEXT XX km (MILES) (W7-3a) supplemental distance plaque (see Section 2C.58) ~~NEXT XX km (NEXT XX MILES) (W7-3a)~~ may be installed below the Winding Road sign where continuous roadway curves exist for a specific distance ~~(see Section 2C.45)~~.

~~The horizontal alignment Turn (W1-1), Curve (W1-2), Reverse Turn (W1-3), Reverse Curve (W1-4), or Winding Road (W1-5) signs (see Figure 2C-1) may be used in advance of situations where the horizontal roadway alignment changes. A One-Direction Large Arrow (W1-6) sign (see Figure 2C-1 and Section 2C.09) may be used on the outside of the turn or curve.~~

If the curve has a change in horizontal alignment ~~is~~ of 135 degrees or more, the Hairpin Curve (W1-11) sign ~~(see Figure 2C-1)~~ may be used instead of a Curve sign.

If the curve has a change ~~in horizontal alignment is~~ of direction of approximately 270 degrees, such as on a cloverleaf interchange ramp, the 270-degree Loop (W1-15) sign ~~(see Figure 2C-1)~~ may be used instead of a Curve sign.

Guidance:

~~The application of these signs should conform to Table 2C-5.~~

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.

~~Option:~~

~~An Advisory Speed (W13-1) plaque (see Section 2C.46) may be used to indicate the speed for the change in horizontal alignment. The combination Horizontal Alignment/Advisory Speed sign (see Section 2C.07), combination Horizontal Alignment/Intersection sign (see Section 2C.08), or the Curve Speed sign (see Section 2C.36) may also be used.~~

~~If the reduction in speed is 20 km/h (15 mph) or greater, a supplemental combination Horizontal Alignment/Advisory Speed sign or Curve Speed (W13-5) sign may be installed as near as practical to the point of curvature. If the reduction in speed is 40 km/h (25 mph) or greater, one or more additional Curve Speed signs may be installed along the curve.~~

Section ~~2C.46~~ 2C.08 Advisory Speed Plaque (W13-1P)

Option:

The Advisory Speed (W13-1P) plaque (see Figure 2C-1) may be used to supplement any warning sign to indicate the advisory speed for a condition.

Standard:

The use of the Advisory Speed plaque for horizontal curves shall be in accordance with the information shown in Table 2C-5. The Advisory Speed plaque shall also be used where an engineering study indicates a need to advise road users of the advisory speed for ~~a~~ other roadway conditions.

If used, the Advisory Speed plaque shall carry the message XX km/h (~~XX~~ MPH). The speed ~~shown~~ displayed edited to increase consistency shall be a multiple of 10 km/h or 5 mph.

Except in emergencies or when the condition is temporary, an Advisory Speed plaque shall not be installed until the advisory speed has been determined by an engineering study.

The Advisory Speed plaque shall only be used to supplement a warning sign and shall not be installed as a separate sign installation.

The advisory speed shall be determined by an engineering study that follows established engineering practices.

Guidance:

The advisory speed should be determined based on free-flowing traffic conditions.

Because changes in conditions, such as roadway geometrics, surface characteristics, or sight distance, might affect the advisory speed, each location should be periodically evaluated ~~and the Advisory Speed plaque changed if necessary~~ when conditions change.

~~Option:~~

~~The advisory speed may be the 85th percentile speed of free-flowing traffic, the speed corresponding to a 16-degree ball bank indicator reading, or the speed otherwise determined by an engineering study because of unusual circumstances.~~

~~Support:~~

~~A 10-degree ball-bank indicator reading, formerly used in determining advisory speeds, is based on research from the 1930s. In modern vehicles, the 85th percentile speed on curves approximates a 16-degree reading. This is the speed at which most drivers' judgment recognizes incipient instability along a ramp or curve.~~

Option:

At or near a toll plaza, an Advisory Speed plaque may be installed independently of other warning signs at an appropriate location to indicate the recommended (non-regulatory) maximum speed at which vehicles can move through the plaza without stopping in an ETC Only lane while toll fee payment processing occurs.

Guidance:

The advisory speed displayed on the plaque should be based on an engineering study taking into account the geometry of the plaza and the lane to which it applies and other appropriate safety and operational factors.

Option:

An Advisory Speed plaque for a toll plaza ETC Only lane may be installed independently over the applicable lane on the toll plaza canopy, on the approach end of the toll booth island, on the toll booth itself, or on a vertical element of the canopy structure. A downward or diagonally downward pointing arrow may be used to supplement the Advisory Speed plaque if an engineering study or engineering judgment indicates the arrow is needed to clarify the applicability of the plaque to a particular lane.

Guidance:

An Advisory Speed plaque should not be installed for a toll plaza lane at which a STOP (R1-1) sign is used.

Section ~~2C.10~~ 2C.09 Chevron Alignment Sign (W1-8)

~~Option~~ Standard:

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 ~~may~~ shall be ~~used to provide additional emphasis and guidance for a change in horizontal alignment~~ in accordance with the information shown in Table 2C-5.

Option:

A Chevron Alignment sign may be used as an alternate or supplement to standard delineators and edge lines as appropriate on curves ~~or to the One-Direction Large Arrow (W1-6) sign~~.

Standard:

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

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 1.2 m (4 ft), measured vertically from the bottom of the sign to the elevation of the near edge of the pavement.

~~Option:~~

~~A Chevron Alignment sign may be used on the far side of an intersection to inform drivers of a change of horizontal alignment for through traffic.~~

Guidance:

The approximate spacing of Chevron Alignment signs on the turn or curve measured from the point of curvature (PC) should be ~~such that the road user always has at least two in view, until the change in alignment eliminates the need for the signs~~ as shown in Table 2C-6.

If used, 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.

Standard:

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.

Chevron Alignment signs shall not be used to mark obstructions within or adjacent to the roadway, as this is the function of an object marker (see Chapter 2L) .

Section ~~2C.07~~ 2C.10 Combination Horizontal Alignment/Advisory Speed Signs (W1-1a, W1-2a)

Option:

The Turn (W1-1) sign or the Curve (W1-2) sign may be combined with the Advisory Speed (W13-1P) plaque (see Section 2C.08) to create a combination Turn/Advisory Speed (W1-1a) sign ~~(see Figure 2C-1),~~ or combination Curve/Advisory Speed (W1-2a) sign (see Figure 2C-1).

Standard:

~~When~~ If used, the combination Horizontal Alignment/Advisory Speed sign shall not be used alone and shall not be used as a substitute for a Horizontal Alignment sign and Advisory Speed plaque at the advance warning location. The combination Horizontal Alignment/Advisory Speed sign shall only be used as a supplement to other advance horizontal alignment warning signs in accordance with the information shown in Table 2C-5. ~~and~~ If used, the combination Horizontal Alignment/Advisory Speed sign shall be installed at the beginning of the turn or curve.

Section ~~2C.08~~ 2C.11 Combination Horizontal Alignment/Intersection Sign (W1-10 Series)

Option:

The Turn (W1-1) sign or the Curve (W1-2) 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.

Guidance:

Elements of the combination Horizontal Alignment/Intersection sign related to horizontal alignment should ~~conform to~~ comply with the provisions of Section 2C.07, and elements related to intersection configuration should ~~conform to~~ comply with the provisions of Section 2C.48. 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 ~~shown~~ displayed edited to increase consistency on any one combination Horizontal Alignment/Intersection sign.

Standard:

The use of the combination Horizontal Alignment/Intersection sign shall be in accordance with the information shown in Table 2C-5.

Section ~~2C.09~~ 2C.12 One-Direction Large Arrow Sign (W1-6)

Option:

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 in order to delineate a change in horizontal alignment (see Figure 2C-2).

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

Standard:

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

The use of the One-Direction Large Arrow sign shall be in accordance with the information shown in Table 2C-5.

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.

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.

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

Guidance:

If used, 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~~ 2C.13 Truck Rollover Warning Sign (W1-13)

Standard:

The use of the Truck Rollover Warning (W1-13) sign (see Figure 2C-1) on freeway and expressway ramps shall be in accordance with the information shown in Table 2C-5.

~~Option~~ Guidance:

A Truck Rollover Warning (W1-13) sign ~~(see Figure 2C-1) may~~ should be used to warn drivers of vehicles with a high center of gravity, such as trucks, tankers, and recreational vehicles, of a curve or turn ~~having~~ that has geometric conditions that ~~are prone to cause such vehicles to lose~~ might contribute to a loss of control and ~~overturn~~ a rollover.

Standard:

~~When the~~ If a Truck Rollover Warning (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:

The Truck Rollover Warning sign may be displayed ~~either~~ grammar – more than two choices as a static sign, as a static sign supplemented by a flashing warning beacon, or as a changeable message 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:

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

Section ~~2C.36~~ 2C.14 Advisory Exit~~,~~ and Ramp~~, and Curve~~ Speed Signs (W13-2~~,~~ and W13-3~~, W13-5~~)

Standard:

Advisory Exit~~,~~ Speed (W13-2) and Advisory Ramp~~, and Curve~~ Speed (W13-3) signs (see Figure 2C-1) shall be vertical rectangles. ~~The advisory Exit Speed (W13-2), Ramp Speed (W13-3), or Curve Speed (W13-5) signs (see Figure 2C-5) shall be used where engineering judgment indicates the need to advise road users of the recommended speed on an exit, a ramp, or a curve.~~ The use of Advisory Exit Speed and Advisory Ramp Speed signs on freeway and expressway ramps shall be in accordance with the information shown in Table 2C-5.

Guidance:

~~When~~ If used, the Advisory Exit Speed sign should be installed along the deceleration lane and the advisory speed displayed should be based on an engineering study. When a Truck Rollover (W1-13) sign (see Section 2C.13) is also installed for the ramp, the advisory exit speed should be based on the truck advisory speed for the horizontal alignment using recommended engineering practices.

If used, the Advisory Exit Speed sign should be visible in time for the road user to ~~make a reasonably safe slowing~~ decelerate and make an exiting maneuver.

Support:

Table 2C-4 lists recommended advance sign placement distances for deceleration to various advisory speeds.

Guidance:

If used, the Advisory Ramp Speed sign should be ~~visible in time for the road user to reduce to the recommended~~ installed on the ramp to confirm the ramp advisory speed.

If used, Chevron Alignment (W1-8) signs and/or One-Direction Large Arrow (W1-6) signs should be installed on the outside of the exit curve as described in Sections 2C.09 and 2C.12.

Option:

Where there is a need to remind road users of the recommended advisory speed, a horizontal alignment warning sign with an advisory speed plaque may be installed at or beyond the beginning of the exit curve or on the outside of the curve, provided that it is apparent that the sign applies only to exiting traffic. These signs may also be used at intermediate points along the ramp, especially if the ramp curvature changes and the subsequent curves on the ramp have a different advisory speed than the initial ramp curve.

Support:

Figure 2C-3 shows an example of advisory speed signing for an exit ramp.

~~Option:~~

~~One or more Ramp Speed signs may be used along the deceleration lane, beyond the gore, or along the ramp (see Figure 2C-7). Based on engineering judgment, the Ramp Speed sign may be installed on the inside or outside of the curve to enhance its visibility.~~

~~A Turn (W1-1) or Curve (W1-2) sign with an Advisory Speed (W13-1) plaque may be used in place of a Ramp Speed sign if it is located such that it clearly does not apply to drivers on the main roadway.~~

~~A Curve Speed sign may be used at and beyond the beginning of a curve following a Horizontal Alignment and Advisory Speed sign combination, or when there is a need to remind road users of the recommended speed, or where the recommended speed changes because of a change in curvature (see Section 2C.06). Based on engineering judgment, the Curve Speed sign may be installed on the inside or outside of the curve to enhance its visibility.~~

~~The advisory speed may be the 85th percentile speed of free-flowing traffic, the speed corresponding to a 16-degree ball bank indicator reading, or the speed otherwise determined by an engineering study because of unusual circumstances.~~

~~Support:~~

~~A 10-degree ball bank indicator reading, formerly used in determining advisory speeds, is based on research from the 1930s. In modern vehicles, the 85th percentile speed on curves approximates a 16-degree reading. This is the speed at which most drivers' judgment recognizes incipient instability along a ramp or curve.~~

Section 2C.15 Combination Horizontal Alignment/Advisory Exit and Ramp Speed Signs (W13-6 and W13-7)

Option:

A horizontal alignment sign (see Section 2C.07) may be combined with an Advisory Exit Speed or Advisory Ramp Speed sign to create a combination Horizontal Alignment/Advisory Exit Speed (W13-6) sign or a combination Horizontal Alignment/Advisory Ramp Speed (W13-7) sign (see Figure 2C-1). These combination signs may be used where the severity of the exit ramp curvature might not be apparent to road users in the deceleration lane or where the curvature needs to be specifically identified as being on the exit ramp rather than on the mainline.

Section ~~2C.12~~ 2C.16 Hill Signs (W7-1, W7-1a~~, W7-1b~~)

Guidance:

The Hill (W7-1) sign (see Figure 2C-4) 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.

The Hill sign and supplemental grade (W7-3) plaque (see Section 2C.60) used in combination, or the ~~W7-1b~~ W7-1a sign used alone, should be installed in advance of downgrades for the following conditions:

A. 5% grade that is more than 900 m (3,000 ft) in length,
B. 6% grade that is more than 600 m (2,000 ft) in length,
C. 7% grade that is more than 300 m (1,000 ft) in length,
D. 8% grade that is more than 230 m (750 ft) in length, or
E. 9% grade that is more than 150 m (500 ft) in length.

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

Supplemental plaques (see Section 2C.60) 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 (W7-3a) plaque or the combination distance/grade (W7-3b) plaque at periodic intervals of approximately 1.6 km (1 mi) spacing should be considered.

Standard:

~~When~~ If the percent grade is ~~shown~~ displayed edited to increase consistency on a supplemental plaque, the ~~message X%~~ plaque shall be placed below the ~~inclined ramp/truck symbol~~ Hill (W7-1) ~~or the word message HILL (W7-1a)~~ sign. edited to increase clarity

Option:

~~The word message HILL (W7-1a) sign may be used as an alternate to the symbol (W7-1) sign. The percent grade message may be included within these signs.~~

A USE LOW GEAR (W7-2P) or TRUCKS USE LOWER GEAR (W7-2bP) supplemental plaque (see Figure 2C-4) may be used to indicate a situation where downshifting as well as braking might be advisable.

~~Section 2C.13 Truck Escape Ramp Signs (W7-4 Series)~~ relocated to Section 2F.12

Section ~~2C.14~~ 2C.17 HILL BLOCKS VIEW Sign (W7-6)

Option:

A HILL BLOCKS VIEW (W7-6) sign (see Figure 2C-4) may be used in advance of a crest vertical curve to advise road users to reduce speed as they approach and traverse the hill as only limited stopping sight distance is available.

Guidance:

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

Section ~~2C.15~~ 2C.18 ROAD NARROWS Sign (W5-1)

Guidance:

A ROAD NARROWS (W5-1) sign (see Figure 2C-5) 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 ~~might not be able to pass~~ traveling in opposite directions cannot simultaneously travel through the narrow portion of the roadway without reducing speed.

Option:

Additional emphasis may be provided by the use of object markers and delineators (see Chapters 2L and 3D). The Advisory Speed (W13-1P) plaque (see Section 2C.08) may be used to indicate the recommended speed.

Section ~~2C.16~~ 2C.19 NARROW BRIDGE Sign (W5-2)

Guidance:

A NARROW BRIDGE (W5-2) sign (see Figure 2C-5) should be used in advance of any bridge or culvert having a two-way roadway clearance width of 4.9 to 5.5 m (16 to 18 ft), or any bridge or culvert having a roadway clearance less than the width of the approach travel lanes.

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

Option:

A NARROW BRIDGE sign may be used in advance of a bridge or culvert on which the approach shoulders are narrowed or eliminated.

Section ~~2C.17~~ 2C.20 ONE LANE BRIDGE Sign (W5-3)

Guidance:

A ONE LANE BRIDGE (W5-3) sign (see Figure 2C-5) should be used on two-way roadways in advance of any bridge or culvert:

A. Having a clear roadway width of less than 4.9 m (16 ft), or
B. Having a clear roadway width of less than 5.5 m (18 ft) when commercial vehicles constitute a high proportion of the traffic, or
C. Having a clear roadway width of 5.5 m (18 ft) or less where the sight distance is limited on the approach to the structure.

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

Section ~~2C.18~~ 2C.21 Divided Highway ~~(Road)~~ Sign (W6-1)

Guidance:

A Divided Highway (W6-1) ~~symbol~~ edited to increase consistency sign (see Figure 2C-5) 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.

~~Option:~~

~~The word message DIVIDED HIGHWAY (W6-1a) or DIVIDED ROAD (W6-1b) sign (see Figure 2C-3) may be used as an alternate to the symbol sign.~~

Standard:

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

Section ~~2C.19~~ 2C.22 Divided Highway ~~(Road)~~ Ends Sign (W6-2)

Guidance:

A Divided Highway Ends (W6-2) ~~symbol~~ edited to increase consistency sign (see Figure 2C-5) should be used in advance of the upstream end of a section of physically divided highway (not an intersection or junction) as a warning of two-way traffic ahead.

~~Option:~~

The Two-Way Traffic (W6-3) ~~symbol~~ edited to increase consistency sign (see Section 2C.45) ~~may~~ should be used to give warning and notice of the transition to a two-lane, two-way section.

~~The word message DIVIDED HIGHWAY ENDS (W6-2a) or DIVIDED ROAD ENDS (W6-2b) sign (see Figure 2C-3) may be used as an alternate to the symbol sign.~~

Section 2C.23 Freeway or Expressway Ends Signs (W19 Series)

Option:

A FREEWAY ENDS XX km (MILES) (W19-1) sign or a FREEWAY ENDS (W19-3) sign (see Figure 2C-5) may be used in advance of the downstream end of a freeway.

An EXPRESSWAY ENDS XX km (MILES) (W19-2) sign or an EXPRESSWAY ENDS (W19-4) sign (see Figure 2C-5) may be used in advance of the downstream end of an expressway.

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

Guidance:

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-5) should be used in addition to the Freeway Ends signs in advance of the downstream end of the freeway.

Section ~~2C.20~~ 2C.24 Double Arrow Sign (W12-1)

Option:

The Double Arrow (W12-1) sign (see Figure 2C-5) 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.

Guidance:

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

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 obstruction. Where stripe markings are used on the obstruction, they should be discontinued to leave a 75 mm (3 in) space around the outside of the sign.

Section ~~2C.21~~ 2C.25 DEAD END/NO OUTLET Signs (W14-1, W14-1a,W14-2, W14-2a)

Option:

The DEAD END (W14-1) sign (see Figure 2C-5) may be used at the entrance of a single road or street that terminates in a dead end or cul-de-sac. The NO OUTLET (W14-2) sign (see Figure 2C-5) may be used at the entrance to a road or road network from which there is no other exit.

DEAD END (W14-1a) or NO OUTLET (W14-2a) signs (see Figure 2C-5) 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.

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

Standard:

The DEAD END (W14-1a) and NO OUTLET (W14-2a) signs shall be horizontal rectangles with an arrow pointing to the left or right.

When the W14-1 or W14-2 sign is used, the sign shall be posted as near as practical 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 ~~off, if possible,~~ at the nearest intersecting street.

The DEAD END (W14-1a) or NO OUTLET (W14-2a) signs 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.

Section ~~2C.22~~ 2C.26 Low Clearance Signs (W12-2 and ~~W12-2p~~ W12-2a)

Standard:

The Low Clearance (W12-2) sign (see Figure 2C-5) shall be used to warn road users of clearances less than 300 mm (12 in) above the statutory maximum vehicle height.

Guidance:

The actual clearance should be ~~shown~~ displayed edited to increase consistency on the Low Clearance sign to the nearest 25 mm (1 in) not exceeding the actual clearance. However, in areas that experience changes in temperature causing frost action, a reduction, not exceeding 75 mm (3 in), should be used for this condition.

Where the clearance is less than the legal maximum vehicle height, the W12-2 sign with a supplemental distance plaque should be placed at the nearest intersecting road or wide point in the road at which a vehicle can detour or turn around.

In the case of an arch or other structure under which the clearance varies greatly, two or more signs should be used as necessary on the structure itself to give information as to the clearances over the entire roadway.

Clearances should be evaluated periodically, particularly when resurfacing operations have occurred.

Option:

The Low Clearance sign may be installed on or in advance of the structure. If a sign is placed on the structure, it may be a rectangular shape (~~W12-2p~~ W12-2a) with the appropriate legend (see Figure 2C-5).

Section ~~2C.23~~ 2C.27 BUMP and DIP Signs (W8-1, W8-2)

Guidance:

BUMP (W8-1) and DIP (W8-2) signs (see Figure 2C-6) should be used to give warning of a sharp rise or depression in the profile of the road.

Option:

These signs may be supplemented with an Advisory Speed plaque (see Section 2C.08).

Standard:

The DIP sign shall not be used at a short stretch of depressed alignment that might momentarily hide a vehicle.

Guidance:

A short stretch of depressed alignment that might momentarily hide a vehicle should be treated as a no-passing zone when ~~centerline~~ center line striping is provided on a two-lane or three-lane road (see Section 3B.02).

Section ~~2C.24~~ 2C.28 SPEED HUMP Sign (W17-1)

Guidance:

The SPEED HUMP (W17-1) sign (see Figure 2C-6) should be used to give warning of a vertical deflection in the roadway that is designed to limit the speed of traffic.

If used, the SPEED HUMP sign should be supplemented by an Advisory Speed plaque (see Section 2C.08).

Option:

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.

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

Support:

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 intersections. However, ~~this~~ these differences in engineering terminology ~~is~~ are not well known by the public, so for signing purposes ~~the~~ these terms are interchangeable.

Section ~~2C.25~~ 2C.29 PAVEMENT ENDS Sign (W8-3)

Guidance:

A PAVEMENT ENDS (W8-3) word message sign (see Figure 2C-6) should be used where a paved surface changes to either a gravel treated surface or an earth road surface.

Option:

An Advisory Speed plaque (see Section 2C.08) may be used when the change in roadway condition requires a reduced speed.

Section ~~2C.26~~ 2C.30 Shoulder and Uneven Lanes Signs (W8-4, W8-9, ~~and W8-9a~~ W8-17, and W8-23)

Option:

The NO SHOULDER (W8-23) sign (see Figure 2C-6) may be used to warn road users that a shoulder does not exist along a portion of the roadway.

The SOFT SHOULDER (W8-4) sign (see Figure 2C-6) may be used to warn of a soft shoulder condition.

The LOW SHOULDER (W8-9) sign (see Figure 2C-6) may be used to warn of a shoulder condition where there is an elevation difference of less than 75 mm (3 in) between the shoulder and the travel lane.

Guidance:

The Shoulder Drop Off (~~W8-9a~~ W8-17) sign (see Figure 2C-6) should be used when an unprotected shoulder drop-off, adjacent to the travel lane, exceeds 75 mm (3 in) in depth for a significant continuous length along the roadway, based on engineering judgment.

Option:

A SHOULDER DROP-OFF (W8-17P) supplemental plaque (see Figure 2C-6) may be mounted below the W8-17 sign.

The SHOULDER DROP OFF (W8-17a) word message sign (see Figure 2C-6) may be used instead of the W8-17 sign.

A Shoulder Drop Off (W8-17) sign with an UNEVEN LANES (W8-11P) supplemental plaque (see Figure 2C-6) may be used to warn of a difference in elevation between travel lanes.

Standard:

When used, shoulder and uneven lanes signs shall be placed in advance of the condition (see Table 2C-4).

Guidance:

Additional shoulder or uneven lanes signs should be placed at appropriate intervals along the road where the condition continually exists. relocated to end of Section

Section ~~2C.27~~ 2C.31 ~~Slippery When Wet Sign (W8-5)~~ Surface Condition Signs (W8-5, W8-7, W8-8, W8-13, and W8-14)

Option:

The Slippery When Wet (W8-5) sign (see Figure 2C-6) may be used to warn ~~that a~~ of unexpected slippery conditions ~~might exist~~. Supplemental plaques 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.

The LOOSE GRAVEL (W8-7) sign (see Figure 2C-6) may be used to warn of loose gravel on the roadway surface.

The ROUGH ROAD (W8-8) sign (see Figure 2C-6) may be used to warn of a rough roadway surface.

The BRIDGE ICES BEFORE ROAD (W8-13) sign (see Figure 2C-6) 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. this paragraph was relocated from Section 2C.28

The Falling Rocks (W8-14) sign (see Figure 2C-6) may be used in advance of an area that is adjacent to a hillside, mountain, or cliff where rocks frequently fall onto the roadway. A FALLING ROCKS (W8-14P) supplemental plaque (see Figure 2C-6) may be mounted below the W8-14 sign.

Guidance:

When used, ~~a Slippery When Wet~~ Surface Condition signs should be placed in advance of the beginning of the affected section (see Table 2C-4), and additional signs should be placed at appropriate intervals along the road where the condition exists.

Section 2C.32 Warning Signs and Plaques for Motorcyclists (W8-15, W8-15P, and W8-16)

Support:

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.31, such as Slippery When Wet, LOOSE GRAVEL, or ROUGH ROAD, can also be helpful to motorcyclists if those conditions exist.

Option:

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-6) 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.

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-6) may be used to provide advance warning of this condition to motorcyclists, bicyclists, and other road users.

A Motorcycle (W8-15P) plaque (see Figure 2C-6) may be mounted below a W8-15 or W8-16 sign if the warning is intended to be directed primarily to motorcyclists.

Section ~~2C.28~~ 2C.33 ~~BRIDGE ICES BEFORE ROAD Sign (W8-13)~~ NO CENTER STRIPE Sign (W8-12)

Option:

~~A BRIDGE ICES BEFORE ROAD (W8-13) sign (see Figure 2C-4) 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.~~ this paragraph and the previous paragraph were combined and relocated to Section 2C.31

The NO CENTER STRIPE (W8-12) sign (see Figure 2C-6) may be used to warn of a roadway without center line pavement markings.

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

Option:

The ROAD MAY FLOOD (W8-18) sign (see Figure 2C-6) 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-6) may also be installed within a roadway section that frequently floods.

Standard:

If used, the Depth Gauge sign shall be in addition to the ROAD MAY FLOOD sign, shall be placed at the location where the flood waters are expected to be the deepest, and shall be mounted at a height such that the bottom of the sign is at the approximate elevation of the roadway.

Option:

The GUSTY WINDS AREA (W8-21) sign (see Figure 2C-6) 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 km (MILES) (W7-3a) supplemental plaque may be mounted below the W8-21 sign to inform road users of the length of roadway that frequently experiences strong wind gusts.

The WATCH FOR FOG (W8-22) sign (see Figure 2C-6) may be used to warn road users that foggy conditions frequently reduce visibility along a section of highway. A NEXT XX km (MILES) (W7-3a) supplemental plaque may be mounted below the W8-22 sign to inform road users of the length of roadway that frequently experiences foggy conditions.

Section ~~2C.29~~ 2C.35 Advance Traffic Control Signs (W3-1, W3-2, W3-3, W3-4)

Standard:

The Advance Traffic Control symbol signs (see Figure 2C-6) include the Stop Ahead (W3-1), Yield Ahead (W3-2), and Signal Ahead (W3-3) signs. These signs 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-4). 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-1.

Support:

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

Guidance:

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

Option:

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.

~~Word messages (W3-1a, W3-2a, W3-3a) may be used as alternates to the Advance Traffic Control symbol signs.~~

A supplemental street name plaque (see Section 2C.61) may be installed above or below an Advance Traffic Control sign.

A warning beacon may be used with an Advance Traffic Control sign.

A BE PREPARED TO STOP (W3-4) sign (see Figure 2C-6) may be used to warn of stopped traffic caused by a traffic control signal or in advance of a section of roadway that regularly experiences traffic congestion.

Standard:

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.

Option:

The BE PREPARED TO STOP sign may be supplemented with a warning beacon (see Section 4L.03).

Guidance:

When the 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-14).

Support:

Section 2C.39 contains information regarding the use of a NO MERGE AREA (W4-5P) supplemental plaque in conjunction with a Yield Ahead sign.

Section 2C.36 Advance Ramp Control Signal Signs (W3-7 and W3-8)

Option:

A RAMP METER AHEAD (W3-7) sign (see Figure 2C-6) 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 4I).

Guidance:

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-6) should be installed in advance of the ramp entrance on the arterial, and on the ramp, to alert road users to the presence and operation of ramp meters.

Standard:

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

Section ~~2C.30~~ 2C.37 Reduced Speed ~~Reduction~~ Limit Ahead Signs (W3-5, W3-5a) the name of this sign was revised to be consistent with the Stop Ahead, Yield Ahead, and Signal Ahead names

Guidance:

A Reduced Speed ~~Reduction~~ Limit Ahead (W3-5 or W3-5a) sign (see Figure 2C-7) should be used to inform road users of a reduced speed zone ~~when~~ where the speed limit is being reduced by more than 20 km/h or by more than 10 mph, or where engineering judgment indicates the need for advance notice to comply with the posted speed limit ahead.

Standard:

If used, Reduced Speed ~~Reduction~~ Limit Ahead signs shall be followed by a Speed Limit (R2-1) sign installed at the beginning of the zone where the speed limit applies.

The speed limit displayed on the Reduced Speed ~~Reduction~~ Limit Ahead sign shall be identical to the speed limit displayed on the subsequent Speed Limit sign.

Section 2C.38 DRAWBRIDGE AHEAD Sign (W3-6)

Standard:

A DRAWBRIDGE AHEAD (W3-6) sign (see Figure 2C-6) shall be used in advance of movable bridge signals and gates (see Section 4J.02) to give warning to road users, except in urban conditions where such signing would not be practical.

Section ~~2C.31~~ 2C.39 Merge Signs (W4-1, W4-5)

Option:

A Merge (W4-1) sign (see Figure 2C-8) 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.

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:

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.

Where two roadways of approximately equal importance converge, a Merge sign should be placed on each roadway.

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-8) should be used to better portray the actual geometric conditions to road users on the entering roadway.

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

The Merge sign should not be used in place of a Lane Ends sign (see Section 2C.41) where lanes of traffic moving on a single roadway must merge because of a reduction in the actual or usable pavement width ~~(see Section 2C.41)~~.

Option:

An Entering Roadway Merge (W4-5) sign with a NO MERGE AREA (W4-5P) supplemental plaque (see Figure 2C-8) 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.

For a yield-controlled channelized right-turn movement onto a roadway without an acceleration lane, a NO MERGE AREA (W4-5P) 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.

Section ~~2C.32~~ 2C.40 Added Lane Signs (W4-3, W4-6)

Guidance:

The Added Lane (W4-3) sign (see Figure 2C-8) 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.

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-8) should be used to better portray the actual geometric conditions to road users on the curving roadway.

Section ~~2C.33~~ 2C.41 Lane Ends Signs (W4-2, W4-7, W9-1, W9-2)

Guidance:

The LANE ENDS MERGE LEFT (RIGHT) (W9-2) ~~word~~ sign~~,~~ or the Lane Ends (W4-2) ~~symbol~~ sign~~,~~ should be used to warn of the reduction in the number of traffic lanes in the direction of travel on a multi-lane highway (see Figure 2C-8).

Option:

The RIGHT (LEFT) LANE ENDS (W9-1) ~~word~~ sign (see Figure 2C-8) may be used in advance of the Lane Ends (W4-2) ~~symbol~~ sign or the LANE ENDS MERGE LEFT (RIGHT) (W9-2) ~~word~~ sign as additional warning or to emphasize that the traffic lane is ending and that a merging maneuver will be required.

The THRU TRAFFIC MERGE LEFT (RIGHT) (W4-7) sign (see Figure 2C-8) may be used as a supplement to other warning and/or regulatory signs to warn road users in the right-hand (left-hand) lane that their lane is about to become a mandatory turn or exit lane.

On one-way streets or on divided highways where the width of the median will permit, two Lane Ends signs may be placed facing approaching traffic, one on the right-hand edited to increase clarity side and the other on the left-hand edited to increase clarity side or median.

Support:

~~The reduction in the number of traffic lanes may also be delineated with roadway edge lines (see Section 3B.09) and/or roadway delineation (see Chapter 3D).~~ Section 3B.09 contains information regarding the use of pavement markings in conjunction with a lane reduction.

Guidance:

Where an extra lane has been provided for slower moving traffic (see Section 2B.39), a Lane Ends word sign or a Lane Ends (W4-2) symbol sign should be installed in advance of the downstream end of the extra lane.

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

Section 2C.42 RIGHT (LEFT) LANE EXIT ONLY AHEAD Sign (W9-7)

Option:

The RIGHT (LEFT) LANE EXIT ONLY AHEAD (W9-7) sign (see Figure 2C-8) may be used to provide advance warning to road users that traffic in the right-hand (left-hand) lane of a roadway that is approaching a grade-separated interchange will be required to depart the roadway on an exit ramp at the next interchange.

Standard:

The W9-7 sign shall be a horizontal rectangle with a black legend and border on a yellow background.

Guidance:

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, whichever is furthest upstream from the exit.

Support:

Section 2B.23 contains information regarding a regulatory sign that can also be used for lane drops at grade-separated interchanges.

Section 2C.43 Toll Road Begins Signs (W9-4 and W9-5)

Guidance:

The TOLL ROAD BEGINS XX km (MILE) (W9-4) warning sign (see Figure 2C-9) should be used on a non-tolled highway that transitions to become a tolled highway. This sign should be installed approximately 1.6 km (1 mi) in advance of the start of the tolled section of highway.

The LAST EXIT BEFORE TOLL (W16-16P) plaque (see Section 2C.68) should also be used on the appropriate guide signs for the last exit upstream from the point where the tolled highway section begins.

Option:

Additional W9-4 warning signs may be installed upstream from and downstream from the recommended sign at 1.6 km (1 mi), such as at 3.2 km (2 mi) and 800 m (0.5 mi) in advance of the start of the tolled section of highway.

The TOLL ROAD BEGINS (W9-5) warning sign (see Figure 2C-9) may be installed at or near the point where the tolled highway section begins.

Standard:

The W9-4 and W9-5 signs shall each be a horizontal rectangle with a black legend and border on a yellow background.

Section 2C.44 Stop Ahead Pay Toll Sign (W9-6)

Standard:

The Stop Ahead Pay Toll (W9-6) sign shall be a horizontal rectangle with a black legend and border on a yellow background. The legend shall include the distance to the toll plaza and, except for toll-ticket facilities, the toll fee for passenger or 2-axle vehicles (see Figure 2C-9). Where the toll fee for passenger or 2-axle vehicles is variable by time of day, a changeable message element shall be incorporated into the W9-6 sign to display the toll fee in effect.

Guidance:

The Stop Ahead Pay Toll (W9-6) sign should be installed overhead at approximately 1.6 km (1 mi) and 800 m (0.5 mi) in advance of mainline toll plazas at which some or all lanes are required to come to a stop to pay a toll fee (see Sections 2E.56 and 2E.57).

Option:

If there is insufficient space for the W9-6 sign at the 1.6 km (1 mi) or 800 m (0.5 mi) advance locations, the Stop Ahead Pay Toll (W9-6P) plaque (see Section 2C.69) may be installed at those advance locations above the appropriate guide sign(s) that relate to toll payment types.

An additional W9-6 sign may be installed approximately 3.2 km (2 mi) in advance of a mainline toll plaza. This sign may be either overhead or post-mounted.

If the visibility of a ramp toll plaza at which some or all lanes are required to come to a stop to pay a toll fee is limited, the W9-6 sign may also be installed in advance of the ramp toll plaza.

Section ~~2C.34~~ 2C.45 Two-Way Traffic Sign (W6-3)

Guidance:

A Two-Way Traffic (W6-3) sign (see Figure 2C-8) 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.

A Two-Way Traffic (W6-3) sign with an AHEAD (W16-9P) plaque (see Figure 2C-14) 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-17, Sheet 2 of 2).

Option:

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.22.

Section 2C.46 Two-Way Traffic on a Three-Lane Roadway Sign (W6-5 and W6-6)

Option:

A Two-Way Traffic on a Three-Lane Roadway (W6-5 or W6-6) sign (see Figure 2C-8) may be used at the beginning of and at intervals along a three-lane, two-way section of roadway that permanently has one lane of traffic in one direction and two lanes of traffic in the other direction.

A Two-Way Traffic on a Three-Lane Roadway sign with an AHEAD (W16-9P) plaque (see Figure 2C-14) may be used to warn road users of a transition from a one-way street to a three-lane, two-way section of roadway that permanently has one lane of traffic in one direction and two lanes of traffic in the other direction.

Standard:

If a Two-Way Traffic on a Three-Lane Roadway sign is used, the sign that is used in each direction shall be consistent with the pavement markings on the three-lane roadway.

The Two-Way Traffic on a Three-Lane Roadway sign shall not be used for three-lane roadways that have a reversible lane or a two-way left-turn lane for a center lane.

Section ~~2C.35~~ 2C.47 NO PASSING ZONE Sign (W14-3)

Standard:

The NO PASSING ZONE (W14-3) sign (see Figure 2C-8) 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 side of the roadway at the beginning of no-passing zones identified by ~~either~~ grammar – more than two choices pavement markings or Do Not Pass signs or both (see Sections 2B.34 and 3B.02).

~~Section 2C.36 Advisory Exit, Ramp, and Curve Speed Signs (W13-2, W13-3, W13-5)~~ relocated to Section 2C.14

Section ~~2C.37~~ 2C.48 Intersection Warning Signs (W2-1 through ~~W2-6~~ W2-8)

Option:

A Cross Road (W2-1) symbol, Side Road (W2-2 or W2-3) symbol, T-Symbol (W2-4), or Y-Symbol (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. The Circular Intersection (W2-6) symbol sign ~~accompanied by an educational TRAFFIC CIRCLE (W16-12p) plaque~~ (see Figure 2C-10) may be installed in advance of a circular intersection (see Figures 2B-24 through 2B-26).

An educational plaque (see Figure 2C-10) with a legend such as TRAFFIC CIRCLE (W16-12P) or ROUNDABOUT (W16-17P) may be mounted below a Circular Intersection symbol sign.

The relative importance of the intersecting roadways may be shown by different widths of lines in the symbol.

An advance street name plaque (see Section 2C.61) may be installed above or below an Intersection Warning sign.

Guidance:

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

Intersection Warning signs, other than the Circular Intersection (W2-6) symbol sign and the T-intersection (W2-4) symbol sign should not be used on approaches controlled by STOP signs, YIELD signs, or signals. ~~The Circular Intersection (W2-6) symbol sign should be installed on the approach to a YIELD sign controlled roundabout intersection.~~

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

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) symbol (see Figure 2C-10) should be used instead of the Side Road symbol.

Section ~~2C.38~~ 2C.49 Two-Direction Large Arrow Sign (W1-7)

Standard:

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

If used, it shall be installed on the far side of a T-intersection in line with, and at approximately a right angle to, traffic approaching ~~traffic~~ from the stem of the T-intersection.

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.

The Two-Direction Large Arrow sign directing traffic to the left and right shall not be used in the central island of a roundabout.

Guidance:

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.39~~ 2C.50 Traffic Signal Signs (W25-1, W25-2)

Standard:

Unless a separate left-turn signal face, a flashing yellow arrow signal face, or a flashing red arrow signal face added to increase consistency with Part 4 is provided and is operated as described in Sections 4D.18 through 4D.20, if the possibility exists that a steady added to increase accuracy CIRCULAR YELLOW signal indication could be displayed to an approach from which drivers are turning left permissively without the simultaneous display of a steady added to increase accuracy CIRCULAR YELLOW signal indication to the opposing approach (see Section 4D.10), either a W25-1 or a W25-2 sign (see Figure 2C-10) shall be installed near the left-most signal head. If the operation described in the previous sentence occurs on a cycle-by-cycle basis during all times that the traffic

control signal is operated in the stop-and-go mode, the ONCOMING TRAFFIC HAS EXTENDED GREEN (W25-1) sign shall be used; if the operation occurs only occasionally, the ONCOMING TRAFFIC MAY HAVE EXTENDED GREEN (W25-2) sign shall be used.

The W25-1 and W25-2 signs shall be vertical rectangles.

Section ~~2C.40~~ 2C.51 Vehicular Traffic Signs (W8-6, W11-1, W11-5, W11-5a, W11-8, W11-10, W11-11, W11-12P, W11-14, and W11-15)

Option:

Vehicular Traffic (W8-6, W11-1, W11-5, W11-5a, W11-8, W11-10, W11-11, W11-12P, W11-14, and W11-15) signs (see Figure 2C-11) may be used to alert road users to locations where unexpected entries into the roadway by trucks, bicyclists, 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 Crossing symbol (W11-10) sign. The combined Bicycle/Pedestrian (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 XING (W11-15P) supplemental plaque (see Figure 2C-11) may be mounted below the W11-15 sign.

Support:

These locations might be relatively confined or might occur randomly over a segment of roadway.

Guidance:

Vehicular Traffic 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.

If the condition or activity is seasonal or temporary, the Vehicular Traffic sign should be removed or covered when the condition or activity does not exist.

Option:

Supplemental plaques (see Section 2C.56) with legends such as AHEAD, XX METERS (~~XX~~ FEET), NEXT XX km (~~NEXT XX~~ MILES), or SHARE THE ROAD may be mounted below Vehicular Traffic signs to provide advance notice to road users of unexpected entries.

Standard:

The Emergency Vehicle (W11-8) sign with the EMERGENCY SIGNAL AHEAD (W11-12P) supplemental plaque (see Figure 2C-11) shall be placed in advance of all emergency-vehicle traffic control signals (see Chapter 4G).

Option:

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.

A Warning Beacon (see Section 4L.03) and a supplemental WHEN FLASHING (W16-13P) plaque (see Figure 2C-14) may be used with any Vehicular Traffic sign to indicate specific periods when the condition or activity is present or is likely to be present.

Support:

Section 2A.15 contains information regarding enhanced sign conspicuity.

Section ~~2C.41~~ 2C.52 Nonvehicular Signs (W11-2, W11-3, W11-4, W11-6, W11-7, W11-9, and W11-16 through W11-22)

Option:

Nonvehicular (W11-2, W11-3, W11-4, W11-6, W11-7, W11-9, and W11-16 through W11-22) signs (see Figure 2C-12) may be used to alert road users in advance of locations where unexpected entries into the roadway or shared use of the roadway by pedestrians, animals, and other crossing activities might occur.

Support:

These conflicts might be relatively confined, or might occur randomly over a segment of roadway.

Option:

When used in advance of a crossing, Nonvehicular warning signs may be supplemented with supplemental plaques (see Section 2C.56) with the legend AHEAD, XX METERS (~~XX~~ FEET), or NEXT XX km (~~NEXT XX~~ MILES) to provide advance notice to road users of crossing activity.

Standard:

When used at the crossing, Nonvehicular signs shall be supplemented with a diagonal downward pointing arrow (W16-7P) plaque (see Figure 2C-14) showing the location of the crossing.

Option:

The crossing location may be defined with crosswalk markings (see Section 3B.18).

Standard:

School signs and their related supplemental plaques shall have a fluorescent yellow-green background with a black legend and border (see Section 7B.07).

Guidance:

Pedestrian, Bicycle, and ~~School~~ Playground signs and their related supplemental plaques ~~may~~ should have a fluorescent yellow-green background with a black legend and border.

~~Guidance:~~

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.

Nonvehicular signs should be used only at locations where the crossing activity is unexpected or at locations not readily apparent.

Option:

A Warning Beacon (see Section 4L.03) and a supplemental WHEN FLASHING (W16-13P) plaque (see Figure 2C-14) may be used with any Nonvehicular sign to indicate specific periods when the condition or activity is likely to be present or is actually present.

Support:

Section 2A.15 contains information regarding enhanced sign conspicuity.

Section ~~2C.42~~ 2C.53 Playground Sign (W15-1)

Option:

The Playground (W15-1) sign (see Figure 2C-12) may be used to give advance warning of a designated children's playground that is located adjacent to the road.

Guidance:

The Playground sign ~~may~~ should have a fluorescent yellow-green background with a black legend and border.

~~Guidance:~~

If the access to the playground area requires a roadway crossing, the application of crosswalk pavement markings (see Section 3B.18) and Nonvehicular signs (see Section 2C.52) should be considered.

Section 2C.54 NEW TRAFFIC PATTERN AHEAD Sign (W23-2)

Option:

A NEW TRAFFIC PATTERN AHEAD (W23-2) sign (see Figure 2C-6) 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:

The NEW TRAFFIC PATTERN 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 six months.

Section 2C.55 Warning Signs on Median Barriers for Preferential Lanes

Option:

When a warning sign applicable only to a preferential lane is installed on a median barrier with limited lateral clearance to the adjacent travel lanes or shoulders, the warning sign may have a vertical rectangular

shape. For a High Occupancy Vehicle lane, such signs may be used instead of using the HOV Plaque (W16-11P) (see Section 2C.64) with a standard diamond-shaped warning sign.

Standard:

When a vertical rectangular-shaped warning sign applicable only to a preferential lane is installed on a median barrier, the top portion of the sign shall be comprised of a white symbol or legend denoting the type of preferential lane (such as the diamond symbol for HOV or the legend BUS LANE) on a black background with a white border, and the bottom portion of the sign shall be comprised of the standard word message or symbol of the standard warning sign as a black legend on a yellow background with a black border (see Figure 2C-13).

Guidance:

Where lateral clearance is limited, such as when a post-mounted warning sign applicable only to a preferential lane is installed on a median barrier, the edges of the sign should not project beyond the outer edges of the barrier.

Option:

Where lateral clearance is limited, a post-mounted warning sign applicable only to a preferential lane installed on a median barrier may be skewed up to 45 degrees in order to fit within the barrier width or may be mounted at a height of 4.3 m (14 ft) or more above the roadway.

Section ~~2C.43~~ 2C.56 Use of Supplemental Warning added in this section and the next section to increase accuracy Plaques

Option:

A supplemental warning plaque may be displayed with a warning sign when engineering judgment indicates that road users require additional information beyond that contained in the main message of the warning sign.

Standard:

Supplemental warning plaques shall be used only in combination with warning or regulatory signs. They shall not be mounted alone or displayed alone. If used, a supplemental warning plaque shall be installed on the same post(s) as the warning or regulatory sign that it supplements. edited to increase clarity

Section ~~2C.44~~ 2C.57 Design of Supplemental Warning Plaques

Standard:

A supplemental warning plaque shall have the same color legend, border, and background as the warning sign with which it is displayed. Supplemental warning plaques shall be square or rectangular.

Section ~~2C.45~~ 2C.58 Distance Plaques (W16-2 series, W16-3 series, W16-4P, W7-3aP)

Option:

The Distance Ahead (W16-2 series and W16-3 series) plaques (see Figure 2C-14) may be used to inform the road user of the distance to the condition indicated by the warning sign.

The Next Distance (W7-3aP and W16-4P) plaques (see Figures 2C-4 and 2C-14) may be used to inform road users of the length of roadway over which the condition indicated by the warning sign exists.

~~**Section 2C.46 Advisory Speed Plaque (W13-1)**~~ **relocated to Section 2C.08**

Section ~~2C.47~~ 2C.59 Supplemental Arrow Plaques (W16-5P, W16-6P~~, W16-7p~~)

Guidance:

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~~, W16-7p~~) plaque (see Figure 2C-14) should be used below the warning sign.

Standard:

Supplemental Arrow plaques ~~(see Figure 2C-11)~~ deleted because figure reference is given in previous paragraph shall have the same legend design as the Advance Turn Arrow and Directional

Arrow auxiliary signs (see Sections 2D.28 and 2D.29) except that they shall have a black legend and border on a yellow or fluorescent yellow-green background, as appropriate.

Section ~~2C.48~~ 2C.60 Hill-Related Plaques (W7-2 Series, W7-3 Series)

Guidance:

Hill-Related (W7-2 series, W7-3 series) plaques (see Figure 2C-4) or other appropriate legends and larger signs should be used for emphasis or where special hill characteristics exist.

On longer grades, the use of the distance plaque (W7-3aP or W7-3bP) at periodic intervals of approximately 1.6 km (1 mi) spacing should be considered.

Section ~~2C.49~~ 2C.61 Advance Street Name Plaque (W16-8P, W16-8aP)

Option:

An Advance Street Name (W16-8P or W16-8aP) plaque (see Figure 2C-14) may be used with any Intersection sign (W2 series) or Advance Traffic Control (W3 series) sign to identify the name of the intersecting street.

Standard:

The lettering on Advance Street Name plaques shall be composed of a combination of lower-case letters with initial upper-case letters.

Guidance:

If two street names are used on the Advance Street Name plaque, the street names 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) symbol 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-14).

Section ~~2C.50~~ 2C.62 CROSS TRAFFIC DOES NOT STOP Plaque (W4-4P)

Option:

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 drivers to misinterpret the intersection as an all-way stop.

~~Alternate~~ Alternative messages (see Figure 2C-10) such as TRAFFIC FROM LEFT (RIGHT) DOES NOT STOP (W4-4aP) or ONCOMING TRAFFIC DOES NOT STOP (W4-4bP) may be used ~~on the W4-4p plaque~~ when such messages more accurately describe the traffic controls established at the intersection.

Guidance:

Plaques with the appropriate alternative messages of TRAFFIC FROM LEFT (RIGHT) DOES NOT STOP or ONCOMING TRAFFIC DOES NOT STOP should be used at intersections where STOP signs control all but one approach to the intersection.

Standard:

If ~~the~~ a W4-4P plaque or a plaque with an alternative message is used, it shall be ~~installed~~ mounted below the STOP sign.

Section ~~2C.51~~ 2C.63 SHARE THE ROAD Plaque (W16-1P)

Option:

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, golf carts, horse-drawn vehicles, or farm machinery, a SHARE THE ROAD (W16-1P) plaque (see Figure 2C-14) may be used.

Standard:

A W16-1P plaque shall not be used alone. If the W16-1P plaque is used, it shall be installed below either a Vehicular Traffic sign (see Section 2C.51) or a Nonvehicular sign (see Section 2C.52).

Section ~~2C.52~~ 2C.64 High-Occupancy Vehicle (HOV) Plaque (W16-11P)

Option:

In situations where there is a need to warn drivers in an HOV lane of a specific condition, a HOV (W16-11P) plaque (see Figure 2C-14) may be used. The HOV plaque may be used to differentiate a warning sign specific for HOV lanes when the sign is also visible to traffic on the adjoining general purpose roadway. Among the warning signs that may be possible applications of the HOV plaque are the Advisory Speed, Advisory Exit Speed, Added Lane, and Merge signs.

The diamond symbol may be used instead of the word message HOV on the W16-11P plaque. When appropriate, the words LANE or ONLY may be used on this plaque.

Support:

Section 2C.55 contains information regarding warning signs that can be mounted on barriers for HOV or other types of preferential lanes.

Section ~~2C.53~~ 2C.65 Photo Enforced Plaque (W16-10P)

Option:

A Photo Enforced (W16-10P) plaque or a PHOTO ENFORCED (W16-10aP) word message plaque (see Figure 2C-14) 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.

Standard:

If used below a warning sign, the Photo Enforced (W16-10P or W16-10aP) plaque shall be a rectangle with a black legend and border on a yellow background.

Section 2C.66 METRIC Plaque (W16-14P)

Guidance:

A METRIC (W16-14P) plaque (see Figure 2C-14) should be mounted above a Weight Limit sign that shows the load limits in metric units.

Section 2C.67 NEW Plaque (W16-15P)

Option:

A NEW (W16-15P) plaque (see Figure 2C-14) 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 new traffic regulation.

Guidance:

The NEW plaque should be removed no later than 6 months after the regulation has been in effect.

Section 2C.68 LAST EXIT BEFORE TOLL Plaque (W16-16P)

Guidance:

The LAST EXIT BEFORE TOLL (W16-16P) plaque (see Figure 2C-9) should be used to notify road users of the last exit from a highway before it becomes a facility on which toll payments are required. The plaque should be installed above or below the appropriate guide signs for the exit (see Sections 2E.29 and 2E.32).

Standard:

The W16-16P plaque shall have a black legend and border on a yellow background.

Section 2C.69 Stop Ahead Pay Toll Plaque (W9-6P)

Option:

The Stop Ahead Pay Toll (W9-6P) plaque (see Figure 2C-9) may be installed above the appropriate guide sign(s) relating to toll payment types at the 1.6 km (1 mi) and/or 800 m (0.5 mi) advance locations on the approach to a toll plaza if there is insufficient space for the W9-6 sign (see Section 2C.44) at those advance locations.

Standard:

The W9-6P plaque shall be a horizontal rectangle with black legend and border on a yellow background. The legend shall include the distance to the toll plaza and, except for toll-ticket facilities, the toll fee for passenger or 2-axle vehicles. Where the toll fee for passenger or 2-axle vehicles is variable by time of day, a changeable message element shall be incorporated into the W9-6P plaque to display the toll fee in effect.

Option:

The distance to the toll plaza may be omitted from the W9-6P plaque if the distance is displayed on the guide sign that the plaque accompanies.

CHAPTER 2D. GUIDE SIGNS—CONVENTIONAL ROADS

Section 2D.01 Scope of Conventional Road Guide Sign Standards

Standard:

~~Standards for conventional road guide signs~~ Chapter 2D shall apply to any road or street other than low-volume roads (as defined in Section 5A.01), expressways, and freeways.

Section 2D.02 Application

Support:

Guide signs are essential to direct road users along streets and highways, to inform them of intersecting routes, to direct them to cities, towns, villages, or other important destinations, to identify nearby rivers and streams, parks, forests, and historical sites, and generally to give such information as will help them along their way in the most simple, direct manner possible.

Chapter 2A addresses placement, location, and other general criteria for signs.

Section 2D.03 Color, Retroreflection, and Illumination

Support:

Requirements for illumination, retroreflection, and color are stated under the specific headings for individual guide signs or groups of signs. General provisions are given in Sections 2A.07, 2A.08, and 2A.10.

Standard:

Except where otherwise specified herein for individual signs or groups of signs, guide signs on streets and highways shall have a white message and border on a green background. All messages, borders, and legends shall be retroreflective and all backgrounds shall be retroreflective or illuminated.

Support:

Color coding is sometimes used to help road users distinguish between multiple potentially confusing destinations. Examples of valuable uses of color coding include guide signs for roadways approaching or inside an airport property with multiple terminals serving multiple airlines, and wayfinding signs for various traffic generator destinations within a community or area.

Standard:

Different color sign backgrounds shall not be used to provide color coding of destinations. The color coding shall be accomplished by the use of different colored square or rectangular sign added to increase consistency panels on the face of the guide signs.

Option:

The different colored sign added to increase consistency panels may include a black or white (whichever provides the better contrast with the panel color) letter, numeral, or other appropriate designation to identify the airport terminal or other destination.

Support:

Two examples of color-coded sign assemblies are shown in Figure 2D-1. Section 2D.52 contains specific provisions regarding Community Wayfinding signs.

Section 2D.04 Size of Signs

Standard:

Except as noted in Section 2A.11, the sizes of conventional road guide signs that have standardized designs shall be as shown in Table 2D-1.

Support:

Section 2A.11 contains information regarding the applicability of the various columns in Table 2D-1.

Option:

Signs larger than those shown in Table 2D-1 may be used (see Section 2A.11).

Support:

For ~~most~~ other guide signs, the legends are so variable that a standardized design or size is not appropriate. The sign size is determined primarily by the length of the message, and the size of lettering and

spacing necessary for proper legibility. ~~However, for signs with standardized designs, such as route signs, it is practical to use the prescribed sizes that are given in the "Standard Highway Signs" book (see Section 1A.11).~~

Option:

Reduced letter height, reduced interline spacing, and reduced edge spacing may be used on guide signs if sign size must be limited by factors such as lane width or vertical or lateral clearance.

Guidance:

Reduced spacing between the letters or words on a line of legend should not be used as a means of reducing the overall size of a guide sign, except where determined necessary by engineering judgment to meet unusual lateral space constraints. In such cases, the legibility distance of the sign legend should be the primary consideration in determining whether to reduce the spacing between the letters or the words or between the words and the sign border, or to reduce the letter height.

When a reduction in the prescribed size is necessary, the design used should be as similar as possible to the design for the standard size.

Section 2D.05 Lettering Style

Standard:

The design of upper-case letters, lower-case letters, ~~capital letters,~~ numerals, route shields, and spacing shall be as provided in the "Standard Highway Signs and Markings" book (see Section 1A.11).

The lettering for names of places, streets, and highways on conventional road guide signs shall be a combination of lower-case letters with initial upper-case letters~~, or all capital letters~~ (see Section 2A.13). ~~When a combination of upper- and lower-case letters are used,~~ The initial upper-case letters shall be approximately 1.33 times the "loop" height of the lower-case letters.

All other word legends on conventional road guide signs shall be in ~~capital~~ upper-case letters.

Section 2D.06 Size of Lettering

Support:

Sign legibility is a direct function of letter size and spacing. Legibility distance has to be sufficient to give road users enough time to read and comprehend the sign. Under optimum conditions, a guide sign message can be read and understood in a brief glance. The legibility distance ~~includes a reasonable safety factor for~~ takes into account factors such as inattention, blocking of view by other vehicles, unfavorable weather, inferior eyesight, or other causes for delayed or slow reading. Where conditions permit, repetition of guide information on successive signs gives the road user more than one opportunity to obtain the information needed.

Standard:

Design layouts for conventional road guide signs showing interline spacing, edge spacing, and other specification details shall be as shown in the "Standard Highway Signs and Markings" book (see Section 1A.11).

The principal legend on guide signs shall be in letters and numerals at least 150 mm (6 in) in height for all ~~capital~~ upper-case letters, or a combination of 150 mm (6 in) in height for upper-case letters with 113 mm (4.5 in) in height for lower-case letters. On low-volume roads (as defined in Section 5A.01) with speeds of 40 km/h (25 mph) or less, and on urban streets with speeds of 40 km/h (25 mph) or less, the principal legend shall be in letters at least 100 mm (4 in) in height.

Guidance:

Lettering sizes should be consistent on any particular class of highway.

The minimum lettering sizes specified herein should be exceeded where conditions indicate a need for greater legibility.

Section 2D.07 Amount of Legend

Support:

The longer the legend on a guide sign, the longer it will take road users to comprehend it, regardless of letter size.

Guidance:

Guide signs should be limited to no more than three lines of ~~principal legend~~ destinations, which include place names, route numbers, street names, and cardinal directions. Where two or more signs are included in the same overhead display, the amount of legend should be minimized. ~~The principal legend should include only place names, route numbers, and street names.~~ Where appropriate, action information, such as an exit number, NEXT RIGHT, and/or directional arrows, should be provided on guide signs in addition to the destinations.

Option:

~~Symbols, action information, cardinal directions, and exit numbers may be used in addition to the principal legend where sign space is available.~~ If sign space is available, pictographs may be used on guide signs in conjunction with destinations that are associated with governmental jurisdictions or agencies, military bases, universities, or other government-approved institutions.

Standard:

The maximum dimension (height or width) of a pictograph shall not exceed the size of the route shield on the guide sign. If the guide sign does not include a route shield, the maximum size of the pictograph shall not exceed two times the letter height of the destination legend.

Section 2D.08 Arrows

Support:

Arrows are used for lane assignment and to indicate the direction toward designated routes or destinations. Figure 2D-2 shows the ~~up-arrow and the down-~~ various standard arrow designs that have been approved for use on guide signs. Detailed drawings and standardized sizes based on ranges of letter heights ~~of these arrows~~ are shown for these arrows in the "Standard Highway Signs and Markings" book (see Section 1A.11).

Standard:

On overhead signs where it is desirable to indicate a lane to be followed, a down arrow shall be positioned approximately over the center of the lane and shall point vertically downward toward the approximate center of that lane. Down arrows shall be used only on overhead guide signs that restrict the use of specific lanes to traffic bound for the destination(s) and/or route(s) indicated by these arrows. Down arrows shall not be used unless an arrow can be located over and pointed to the approximate center of each lane that can be used to reach the destination ~~shown~~ displayed edited to increase consistency on the sign.

If down arrows are used, having more than one down arrow pointing to the same lane on a single overhead sign (or on multiple signs on the same overhead sign structure) shall not be permitted.

Option:

Provided that the arrow is positioned approximately over the center of the lane, a directional arrow pointing diagonally downward may be used instead of a vertical down arrow on an overhead guide sign at or near a divergence for the purpose of emphasizing a separation of diverging roadways.

Standard:

Where a roadway is leaving the through lanes, ~~an up~~ a directional arrow shall point upward at an angle ~~representative of~~ that approximates the alignment of the exit roadway.

Option:

Curved-stem arrows (see Figure 2D-9) that represent the intended driver paths to destinations involving left-turn movements may be used on guide signs on approaches to roundabouts.

Guidance:

If curved-stem arrows are used, the principles set forth in Sections 2D.28, 2D.29, and 2D.30 should be followed.

The Type A directional arrow should be used on guide signs on freeways, expressways, and conventional roads to indicate the direction to a specific destination or group of destinations, except as otherwise provided in this Section and in Section 2E.19.

When a directional arrow in a vertical, upward-pointing orientation is placed to the side of a group of destinations to indicate a through movement, the Type A directional arrow should be used. When a directional arrow in a vertical, upward-pointing orientation is placed to the side of a single destination or under a destination or group of destinations, the Type B directional arrow should be used.

The Type B directional arrow should be used on guide signs on conventional roads when placed at any angle to the side of a single destination or when placed in a horizontal orientation to the side of a group of destinations.

The Type C directional arrow should be used on conventional road guide signs placed in advance of an intersection where a turn must be made to reach a posted destination or group of destinations.

The Type D directional arrow should be used primarily for sign applications other than guide signs.

Option:

On conventional roads on the approach to an intersection where the Combination Lane Use/ Destination overhead guide sign (see Section 2D.35) is not used, the Type C directional arrow may be used beneath the legend of an overhead guide sign to indicate the fact that a turn must be made from the lane over which the sign is placed to reach the destination or destinations displayed on the sign.

The Type A-Extended directional arrow may be used on guide signs where additional emphasis regarding the direction is needed relative to the amount of legend on the sign.

The Type D directional arrow may be used on post-mounted guide signs on conventional roads with lower operating speeds if the height of the text on the sign is 200 mm (8 in) or less.

The Type C directional arrow may be used to the side of the legend of an overhead guide sign to accentuate a sharp turn maneuver from a mainline roadway (see Section 2E.32 for additional information regarding Exit Direction signs for low advisory ramp speeds).

The directional and down arrows shown in Figure 2D-2 may be used on signs other than guide signs for the purposes of providing directional guidance and lane assignment.

Guidance:

Arrows used on guide signs to indicate the directions toward designated routes or destinations should be pointed at the appropriate angle to clearly convey the direction to be taken. A horizontally oriented ~~up-arrow~~ directional arrow design should be used at right-angle intersections.

On a ~~ground-~~ post-mounted edited to increase consistency guide sign, a directional arrow for a straight-through movement should point upward. For a turn, the arrow on a guide sign should point upward and at an angle ~~related to~~ that approximates the sharpness of the turn.

Option:

Arrows may be placed below the principal sign legend or on the appropriate side of the legend.

Guidance:

At an exit, an arrow should be placed at the side of the sign ~~which~~ that will reinforce the movement of exiting traffic. The ~~up-arrow~~ directional arrow design should be used.

The width across the arrowhead for the Types A, B, and C directional arrows should be between 1.5 and 1.75 times the height of the largest letter on the sign. The width across the arrowhead for the Type D directional arrow should be at least equal to the height of the largest letter on the sign. For ~~short~~ down~~ward-pointing~~ arrows used on overhead signs, the width across the arrowhead should be ~~1.75~~ approximately two times the letter height.

Diagrammatic signing used on conventional roads, except for on approaches to roundabouts, should follow the principles set forth in Section 2E.20. Diagrammatic signing used on approaches to roundabouts should follow the principles set forth in Section 2D.40.

Section 2D.09 Numbered Highway Systems

Support:

The purpose of numbering and signing highway systems is to identify routes and facilitate travel.

The Interstate and United States (U.S.) highway systems are numbered by the American Association of State Highway and Transportation Officials (AASHTO) upon recommendations of the State highway organizations because the respective States own these systems. State and county road systems are numbered by the appropriate authorities.

The basic policy for numbering the U.S. and Interstate highway systems is contained in the following Purpose and Policy statements published by AASHTO (see Page i for AASHTO's address):

A. "Establishment and Development of United States Numbered Highways," and

B. "Establishment of a Marking System of the Routes Comprising the National System of Interstate and Defense Highways."

Guidance:

The principles of these policies should be followed in establishing the above highway systems and any other systems, with effective coordination between adjacent jurisdictions. Care should be taken to avoid the use of numbers or other designations that have been assigned to Interstate, U.S., or State routes in the same geographic area. Overlapping numbered routes should be kept to a minimum.

Standard:

Route systems shall be given preference in this order: Interstate, United States, State, and county. The preference shall be given by installing the highest-priority legend on the top or the left of the sign ~~panel~~. deleted to increase accuracy

Support:

Section 2D.55 contains information regarding the signing of unnumbered highways to enhance route guidance and facilitate travel.

Section 2D.10 Route Signs and Auxiliary Signs

Standard:

All numbered highway routes shall be identified by route signs and auxiliary signs.

The signs for each system of numbered highways, which are distinctive in shape and color, shall be used only on that system and the approaches thereto.

Route signs and any auxiliary signs that accompany them shall be retroreflective.

Option:

Route signs and auxiliary signs may be proportionally enlarged where greater legibility is needed.

Support:

Route signs are typically mounted in assemblies with auxiliary signs.

Section 2D.11 Design of Route Signs

Standard:

The "Standard Highway Signs and Markings" book (see Section 1A.11) shall be used for designing route signs. Other route sign designs shall be established by the authority having jurisdiction.

Interstate Route signs (see Figure 2D-3) shall consist of a cutout shield, with the route number in white letters on a blue background, the word INTERSTATE in white ~~capital~~ upper-case letters on a red background, and a white border. This sign shall be used on all Interstate routes and in connection with route sign assemblies on intersecting highways.

A 600 x 600 mm (24 x 24 in) minimum sign size shall be used for Interstate route numbers with one or two digits, and a 750 x 600 mm (30 x 24 in) minimum sign size shall be used for Interstate route numbers having three digits.

Option:

Interstate Route signs may contain the State name in white upper-case letters on a blue background.

Standard:

Off-Interstate Business Route signs (see Figure 2D-3) shall consist of a cutout shield carrying the number of the connecting Interstate route and the words BUSINESS and either LOOP or SPUR in ~~capital~~ upper-case letters. The legend and border shall be white on a green background, and the shield shall be the same shape and dimensions as the Interstate Route sign. In no instance shall the word INTERSTATE appear on the Off-Interstate Business Route sign.

Option:

The Off-Interstate Business Route sign may be used on a major highway that is not a part of the Interstate system, but one that serves the business area of a city from an interchange on the system.

Guidance:

When used on a green guide sign, a white square or rectangle ~~may~~ should be placed behind the shield to improve contrast.

Standard:

U.S. Route signs (see Figure 2D-3) shall consist of black numerals on a white shield surrounded by a black background without a border. This sign shall be used on all U.S. routes and in connection with route sign assemblies on intersecting highways.

A 600 x 600 mm (24 x 24 in) minimum sign size shall be used for U.S. route numbers with one or two digits, and a 750 x 600 mm (30 x 24 in) minimum sign size shall be used for U.S. route numbers having three digits.

State Route signs shall be designed by the individual State highway agencies.

Guidance:

State Route signs (see Figure 2D-3) should be rectangular and should be approximately the same size as the U.S. Route sign. State Route signs should also be similar to the U.S. Route sign by containing approximately the same size black numerals on a white area surrounded by a black background without a border. The shape of the white area should be circular in the absence of any determination to the contrary by the individual State concerned.

Standard:

If county road authorities elect to establish and identify a special system of important county roads, a statewide policy for such signing shall be established that includes a uniform numbering system to uniquely identify each route. The County Route (M1-6) sign (see Figure 2D-3) shall consist of a pentagon shape with a yellow county name and route number and border on a blue background. County Route signs displaying two digits or the equivalent (letter and numeral, or two letters) shall be a minimum size of 450 x 450 mm (18 x 18 in); those carrying three digits or the equivalent shall be a minimum size of 600 x 600 mm (24 x 24 in).

If a jurisdiction uses letters instead of numbers to identify routes, all references to numbered routes in this Chapter shall be interpreted to also include lettered routes.

Guidance:

If used with other route signs in common assemblies, the County Route sign should be of a size compatible with that of the other route signs.

Option:

When used on a green guide sign, a yellow square or rectangle may be placed behind the County Route sign to improve contrast.

Standard:

Route signs (see Figure 2D-3) for park and forest roads shall be designed with adequate distinctiveness and legibility and of a size compatible with other route signs used in common assemblies.

Section 2D.12 Design of Route Sign Auxiliaries

Standard:

Route sign auxiliaries carrying word legends, except the JCT sign, shall have a standard size of 600 x 300 mm (24 x 12 in). Those carrying arrow symbols, or the JCT sign, shall have a standard size of 525 x 375 mm (21 x 15 in). All route sign auxiliaries shall match the color combination of the route sign that they supplement.

Guidance:

Auxiliary signs carrying word messages and mounted with 750 x 600 mm (30 x 24 in) Interstate Route signs should be 750 x 375 mm (30 x 15 in). With route signs of larger sizes, auxiliary signs should be suitably enlarged, but not such that they exceed the width of the route sign.

Option:

A route sign and any auxiliary signs used with it may be combined on a single ~~panel~~ sign. edited to increase accuracy

Guidance:

If a route sign and its auxiliary signs are combined on a single sign, the background color of the sign should be green.

Standard:

If a route sign and its auxiliary signs are combined on a single sign with a green background, the auxiliary messages shall be white legends placed directly on the green background. Auxiliary signs shall not be mounted directly to a guide sign.

Section 2D.13 Junction Auxiliary Sign (M2-1)

Standard:

The Junction (M2-1) auxiliary sign (see Figure 2D-4) shall carry the abbreviated legend JCT and shall be mounted at the top of an assembly (see Section 2D.31) either directly above the route sign or above a sign for an alternative route (see Section 2D.16) that is part of the route designation. The minimum size of the Junction auxiliary sign shall be 525 x 375 mm (21 x 15 in) for compatibility with auxiliary signs carrying arrow symbols.

Section 2D.14 Combination Junction Sign (M2-2)

Option:

As an alternative to the standard Junction assembly where more than one route is to be intersected or joined, a rectangular sign may be used carrying the word JUNCTION above the route numbers.

~~Other designs may be used to accommodate State and County Route signs.~~

Standard:

The Combination Junction (M2-2) sign (see Figure 2D-4) shall have a green background with white border and lettering for the word JUNCTION.

Guidance:

Where U.S. or State Route signs are used as components of guide signs, only the ~~outline~~ white background area of the shield, or other distinctive shape, and the black route numerals should be used. The black area around the outside of the shields on the M1-4 and M1-5 signs should not be included on the M2-2 sign.

Although the size of the Combination Junction sign will depend on the number of routes involved, the numerals should be large enough for clear legibility and should be of a size comparable with those in the individual route signs.

Section 2D.15 Cardinal Direction Auxiliary Signs (M3-1 through M3-4)

Guidance:

Cardinal Direction auxiliary signs (see Figure 2D-4) carrying the legend NORTH, EAST, SOUTH, or WEST should be used to indicate the general direction of the entire route.

Standard:

To improve the readability, the first letter of the cardinal direction words shall be ten percent larger, rounded up to the nearest whole number size.

If used, the Cardinal Direction auxiliary sign shall be mounted directly above a route sign or an auxiliary sign for an alternative route.

Section 2D.16 Auxiliary Signs for Alternative Routes (M4 Series)

Option:

Auxiliary signs, carrying legends such as ALTERNATE, BY-PASS, BUSINESS, or TRUCK, may be used to indicate an alternate route of the same number between two points on that route.

Standard:

If used, the auxiliary signs for alternative routes shall be mounted directly above a route sign.

Section 2D.17 ALTERNATE Auxiliary Signs (M4-1, M4-1a)

Option:

The ALTERNATE (M4-1) or the ALT (M4-1a) auxiliary sign (see Figure 2D-4) may be used to indicate an officially designated alternate routing of a numbered route between two points on that route.

Standard:

If used, the ALTERNATE or ALT auxiliary sign shall be mounted directly above a route sign.

Guidance:

The shorter (time or distance) or better-constructed route should retain the regular route number, and the longer or worse-constructed route should be designated as the alternate route.

Section 2D.18 BY-PASS Auxiliary Sign (M4-2)

Option:

The BY-PASS (M4-2) auxiliary sign (see Figure 2D-4) may be used to designate a route that branches from the numbered route through a city, bypasses a part of the city or congested area, and rejoins the numbered route beyond the city.

Standard:

If used, the BY-PASS auxiliary sign shall be mounted directly above a route sign.

Section 2D.19 BUSINESS Auxiliary Sign (M4-3)

Option:

The BUSINESS (M4-3) auxiliary sign (see Figure 2D-4) may be used to designate an alternate route that branches from a numbered route, passes through the business portion of a city, and rejoins the numbered route beyond that area.

Standard:

If used, the BUSINESS auxiliary sign shall be mounted directly above a route sign.

Section 2D.20 TRUCK Auxiliary Sign (M4-4)

Option:

The TRUCK (M4-4) auxiliary sign (see Figure 2D-4) may be used to designate an alternate route that branches from a numbered route, when it is desirable to encourage or require commercial vehicles to use the alternate route.

Standard:

If used, the TRUCK auxiliary sign shall be mounted directly above a route sign.

Section 2D.21 TO Auxiliary Sign (M4-5)

Option:

The TO (M4-5) auxiliary sign (see Figure 2D-4) may be used to provide directional guidance to a particular road facility from other highways in the vicinity (see Section 2D.37).

Standard:

If used, the TO auxiliary sign shall be mounted directly above a route sign or an auxiliary sign for an alternative route. If a Cardinal Direction auxiliary sign is also included in the assembly, the TO auxiliary sign shall be mounted directly above the Cardinal Direction auxiliary sign.

Section 2D.22 END Auxiliary Sign (M4-6)

Guidance:

The END (M4-6) auxiliary sign (see Figure 2D-4) should be used where the route being traveled ends, usually at a junction with another route.

Standard:

If used, the END auxiliary sign shall be mounted either directly above a route sign or above a sign for an alternative route that is part of the designation of the route being terminated.

Section 2D.23 BEGIN Auxiliary Sign (M4-14)

Option:

The BEGIN (M4-14) auxiliary sign (see Figure 2D-4) may be used where a numbered route begins, usually at a junction with another route.

Standard:

If used, the BEGIN auxiliary sign shall be mounted at the top of the first Confirming assembly (see Section 2D.36) for the route that is beginning.

Guidance:

If a BEGIN auxiliary sign is included in the first Confirming assembly, a Cardinal Direction auxiliary sign should also be included in the assembly.

Standard:

If a Cardinal Direction auxiliary sign is also included in the assembly, the TO auxiliary sign shall be mounted directly above the Cardinal Direction auxiliary sign.

Section ~~2D.23~~ 2D.24 TEMPORARY Auxiliary Signs (M4-7, M4-7a)

Option:

The TEMPORARY (M4-7) or the TEMP (M4-7a) auxiliary sign (see Figure 2D-4) may be used for an interim period to designate a section of highway that is not planned as a permanent part of a numbered route, but that connects completed portions of that route.

Standard:

If used, the TEMPORARY or TEMP auxiliary sign shall be mounted ~~either~~ grammar – more than two choices directly above the route sign, above a Cardinal Direction sign, or above a sign for an alternate route that is a part of the route designation.

TEMPORARY or TEMP auxiliary signs shall be promptly removed when the temporary route is abandoned.

Section 2D.25 TOLL Auxiliary Sign (M4-15)

Standard:

The TOLL (M4-15) auxiliary sign (see Figure 2D-4) shall be mounted directly above the route sign of a numbered toll facility in any route sign assembly providing directions from a free facility or free lanes to the toll facility or to the lanes or segments of a highway on which the payment of a toll fee is required. The M4-15 auxiliary sign shall also be used above all route signs of a numbered toll facility when a parallel or nearby free facility has the same route number.

Section 2D.26 Electronic Toll Collection (ETC) Only Auxiliary Signs (M4-16 and M4-20)

Standard:

In any route sign assembly providing directions from a free highway or free lanes to a toll facility, a tolled segment of a highway, or tolled lanes of a highway where electronic toll collection (ETC) is the only payment method accepted, the ETC Only (M4-20) auxiliary sign (see Figure 2D-5) shall be mounted directly below the route sign of the numbered or named toll facility. The M4-20 auxiliary sign shall incorporate the pictograph adopted by the toll facility's ETC payment system (such as E-Z Pass or SunPass) and the word ONLY in black letters on a white background with a wide purple border.

The M4-20 auxiliary sign for an ETC only facility that accepts nationally interoperable transponders shall incorporate the nationally interoperable ETC symbol (M8-3) shown in Figure 2E-50. This symbol shall only be used on signs for ETC facilities that accept electronic payment from any toll operator's ETC transponder.

Option:

The NO CASH (M4-16) auxiliary sign (see Figure 2D-5) may be used in a route sign assembly directly below the M4-20 auxiliary sign.

Section ~~2D.24~~ 2D.27 Temporary Detour and Auxiliary Signs

Support:

Chapter 6F contains information regarding Temporary Detour and Auxiliary signs.

Section ~~2D.25~~ 2D.28 Advance Turn Arrow Auxiliary Signs (M5-1, M5-2)

Standard:

If used, the Advance Turn Arrow auxiliary sign (see Figure 2D-6) shall be mounted directly below the route sign in Advance Route Turn assemblies, and displays a right or left arrow, the shaft of which is bent at a 90-degree angle (M5-1) or at a 45-degree angle (M5-2).

Section ~~2D.26~~ 2D.29 Directional Arrow Auxiliary Signs (M6 Series)

Standard:

If used, the Directional Arrow auxiliary sign (see Figure 2D-6) shall be mounted below the route sign in directional assemblies, and displays a single- or double-headed arrow pointing in the general direction that the route follows.

A Directional Arrow auxiliary sign that displays a double-headed arrow shall not be mounted below a route sign in advance of or at a roundabout.

Section ~~2D.27~~ 2D.30 Route Sign Assemblies

Standard:

A Route Sign assembly shall consist of a route sign and auxiliary signs that further identify the route and indicate the direction. Route Sign assemblies shall be installed on all approaches to numbered routes that intersect with other numbered routes.

Where two or more routes follow the same section of highway, the route signs for Interstate, U.S., State, and county routes shall be mounted in that order from the left in horizontal arrangements and from the top in vertical arrangements. Subject to this order of precedence, route signs for lower-numbered routes shall be placed at the left or top.

Within groups of assemblies, information for routes intersecting from the left shall be mounted at the left in horizontal arrangements and at the top or center of vertical arrangements. Similarly, information for routes intersecting from the right shall be at the right or bottom, and for straight-through routes at the center in horizontal arrangements or top in vertical arrangements.

Route Sign assemblies shall be mounted in accordance with the general specifications for ~~highway~~ deleted to increase consistency signs (Chapter 2A), with the lowest sign in the assembly at the height prescribed for single signs.

Guidance:

Assemblies for two or more routes, or for different directions on the same route, should be mounted in groups on a common support.

Option:

Route Sign assemblies may be installed on the approaches to numbered routes on unnumbered roads and streets that carry an appreciable amount of traffic destined for the numbered route.

The diagrammatic route sign format, such as the D1-4 sign shown in Figure 2D-9, may be used on approaches to roundabouts.

If engineering judgment indicates that groups of assemblies that include overlapping routes or multiple turns might be confusing, route signs or auxiliary signs may be omitted or combined, provided that clear directions are given to road users.

Support:

Figure 2D-7 shows typical placements of route signs.

Section ~~2D.28~~ 2D.31 Junction Assembly

Standard:

A Junction assembly shall consist of a Junction auxiliary sign and a route sign. The route sign shall carry the number of the intersected or joined route.

The Junction assembly shall be installed in advance of every intersection where a numbered route is intersected or joined by another numbered route.

Guidance:

In urban areas, ~~it~~ the Junction assembly ~~shall~~ should be installed in the block preceding the intersection~~.~~ ~~and~~. In urban areas where speeds are low, the Junction assembly should not be installed more than 90 m (300 ft) in advance of the intersection. relocated from below to improve continuity

In rural areas, ~~it~~ the Junction assembly ~~shall~~ should be installed at least 120 m (400 ft) in advance of the intersection. In rural areas, the minimum distance between ~~the~~ a Junction assembly and a Destination sign ~~and the~~ or an Advance Route Turn assembly ~~shall~~ should be 60 m (200 ft)~~, and the minimum distance between the Route Turn assembly and the Junction assembly shall be 60 m (200 ft)~~.

~~Guidance:~~

~~In urban areas where speeds are low, the Junction assembly should not be installed more than 90 m (300 ft) in advance of the intersection.~~ relocated to above to improve continuity

Where prevailing speeds are high, greater spacings should be used.

Option:

Where two or more routes are to be indicated, a single Junction auxiliary sign may be used for the assembly and all route signs grouped in a single mounting, or a Combination Junction (M2-2) added to increase clarity sign (see Section 2D.14) may be used.

Section ~~2D.29~~ 2D.32 Advance Route Turn Assembly

Standard:

An Advance Route Turn assembly shall consist of a route sign, an Advance Turn Arrow or word message auxiliary sign, and a Cardinal Direction auxiliary sign, if needed. It shall be installed in advance of an intersection where a turn must be made to remain on the indicated route.

Option:

The Advance Route Turn assembly may be used to supplement the required Junction assembly in advance of intersecting routes.

Guidance:

Where a multiple-lane highway approaches an interchange or intersection with a numbered route, the Advance Route Turn assembly should be used to pre-position turning vehicles in the correct lanes from which to make their turn.

Option:

Lane Designation auxiliary signs (see Section 2D.33) may be used in Advance Route Turn Assemblies where engineering judgment indicates that specific lane information associated with each route is needed and overhead signing is not practical. An assembly with the Lane Designation auxiliary signs may supplement or substitute for an assembly with Advance Turn Arrow auxiliary signs.

Guidance:

In low-speed areas, the Advance Route Turn assembly should be installed not less than 60 m (200 ft) in advance of the turn. In high-speed areas, the Advance Route Turn assembly should be installed not less than 90 m (300 ft) in advance of the turn. In rural areas, the minimum distance between an Advance Route Turn assembly and a Destination sign or a Junction assembly should be 60 m (200 ft).

Standard:

An assembly that includes an Advance Turn Arrow auxiliary sign shall not be placed where there is an intersection between it and the designated turn.

Guidance:

Sufficient distance should be allowed between the assembly and any preceding intersection that could be mistaken for the indicated turn.

Section 2D.33 Lane Designation Auxiliary Signs (M5-3, M5-4, and M5-5)

Option:

A Lane Designation (M5-3, M5-4, or M5-5) auxiliary sign (see Figure 2D-6) may be mounted directly below the route sign in an Advance Route Turn assembly on multi-lane roadways to allow road users to move into the appropriate lane prior to reaching the intersection or interchange.

Section ~~2D.30~~ 2D.34 Directional Assembly

Standard:

A Directional assembly shall consist of a Cardinal Direction auxiliary sign, if needed, a route sign, and a Directional Arrow auxiliary sign~~, and a Cardinal Direction auxiliary sign, if needed~~. The various uses of Directional assemblies shall be as outlined below:

A. Turn movements (indicated in advance by an Advance Route Turn assembly) shall be marked by a Directional assembly with a route sign displaying the number of the turning route and a single-headed arrow pointing in the direction of the turn.

B. The beginning of a route (indicated in advance by a Junction assembly) shall be marked by a Directional assembly with a route sign displaying the number of that route and a single-headed arrow pointing in the direction of the route.

C. The end of a route shall be marked by a Directional assembly with an END auxiliary sign and a route sign displaying the number of that route.

D. An intersected route (indicated in advance by a Junction assembly) shall be designated by:

1. Two Directional assemblies, each with a route sign displaying the number of the intersected route, a Cardinal Direction auxiliary sign, and a single-headed arrow pointing in the direction of movement on that route; or

2. A Directional assembly with a route sign displaying the number of the intersected route and a double-headed arrow, pointing at appropriate angles to the left, right, or ahead.

Guidance:

Straight-through movements should be indicated by a Directional assembly with a route sign displaying the number of the continuing route and a vertical arrow. A Directional assembly should not be used for a straight-through movement in the absence of other assemblies indicating right or left turns, as the Confirming assembly sign beyond the intersection normally provides adequate guidance.

Directional assemblies should be located on the near right corner of the intersection. At major intersections and at Y or offset intersections, additional Directional assemblies should be installed on the far right or left corner to confirm the near-side assemblies. When the near-corner position is not practical for Directional assemblies, the far right corner should be the preferred alternative, with oversized signs, if necessary, for legibility. Where unusual conditions exist, the location of a Directional assembly should be determined by engineering judgment with the goal being to provide the best possible combination of view and safety.

Support:

It is more important that guide signs be readable at the ~~right~~ appropriate edited to increase clarity time and place than to be located with absolute uniformity.

Figure 2D-7 shows typical placements of Directional assemblies.

Section 2D.35 Combination Lane Use/Destination Overhead Guide Sign (D15-1)

Option:

At complex intersection approaches involving multiple turn lanes and destinations, a Combination Lane Use/Destination (D15-1) overhead guide sign that combines a lane-use regulatory sign with destination information such as a cardinal direction, a route number, a street name, and/or a place name may be used.

Support:

At such locations, the combined information on the D15-1 signs can be even more effective than separate lane use and guide signs for conveying to unfamiliar drivers which lane or lanes to use for a particular destination.

Figure 2D-8 shows an example of a D15-1 sign that combines lane use and route number information and an example of a D15-1 sign that combines lane use and street name information.

Guidance:

The Combination Lane Use/Destination (D15-1) overhead guide sign should have a green background with a white border. As shown in Figure 2D-8, the lane-use sign (see Chapter 2B) should be placed near the bottom of the sign and the destination information should be placed near the top of the sign. The D15-1 sign should be located approximately over the center of the lane to which it applies.

Section ~~2D.31~~ 2D.36 Confirming or Reassurance Assemblies

Standard:

If used, Confirming or Reassurance assemblies shall consist of a Cardinal Direction auxiliary sign and a route sign.

Guidance:

A Confirming assembly should be installed just beyond intersections of numbered routes. It should be placed 7.6 to 60 m (25 to 200 ft) beyond the far shoulder or curb line of the intersected highway.

If used, Reassurance assemblies should be installed between intersections in urban ~~districts~~ areas edited to increase consistency as needed, and beyond the built-up area of any incorporated city or town.

Route signs for either confirming or reassurance purposes should be spaced at such intervals as necessary to keep road users informed of their routes.

~~Support:~~

~~Confirming and Reassurance assemblies are considered to be a type of Directional assembly.~~

Section ~~2D.32~~ 2D.37 Trailblazer Assembly

Support:

Trailblazer assemblies provide directional guidance to a particular road facility from other highways in the vicinity. This is accomplished by installing Trailblazer assemblies at strategic locations to indicate the direction to the nearest or most convenient point of access. The use of the word TO indicates that the road or street where the sign is posted is not a part of the indicated route, and that a road user is merely being directed progressively to the route.

Standard:

A Trailblazer assembly shall consist of a TO auxiliary sign, a route sign (or a special road facility symbol), and a single-headed Directional Arrow auxiliary sign pointing in the direction leading to the route.

Guidance:

If shields or other similar signs are used to provide route guidance in following a trail (see Section 2I.07), they should be designed in accordance with the sizes and other design principles for route signs, such as those described in Sections 2D.10 through 2D.12.

Option:

A Cardinal Direction auxiliary sign may be used with a Trailblazer assembly.

Guidance:

The TO auxiliary sign, Cardinal Direction auxiliary sign, and Directional Arrow auxiliary sign should be of the standard size specified for auxiliary signs of their respective type. The route sign should be the size specified in Section 2D.11.

Option:

Trailblazer assemblies may be installed with other Route Sign assemblies, or alone, in the immediate vicinity of the designated facilities.

Section ~~2D.33~~ 2D.38 Destination and Distance Signs

Support:

In addition to guidance by route numbers, it is desirable to supply the road user information concerning the destinations that can be reached by way of numbered or unnumbered routes. This is done by means of Destination signs and Distance signs.

Option:

Route ~~and Cardinal Direction auxiliary~~ signs and cardinal directions may be included on the Destination sign ~~panel~~ edited to increase accuracy with the destinations and arrows.

Guidance:

If Route signs and cardinal directions are included on a Destination sign, the ~~size of the~~ Route signs ~~and Cardinal Direction auxiliary signs~~ should be at least the minimum size specified for these signs, and the cardinal directions should be in all upper-case letters that are at least the minimum height specified for these signs.

Section ~~2D.34~~ 2D.39 Destination Signs (D1 Series)

Standard:

Except ~~where special~~ on approaches to interchanges ~~signing is prescribed~~ (see Section 2D.47), the Destination (D1-1 through D1-3) sign (see Figure 2D-8), if used, shall be a horizontal rectangle carrying the name of a city, town, village, or other traffic generator, and a directional arrow.

Option:

The distance (see Section 2D.43) to the place named may also be ~~shown~~ displayed edited to increase consistency on the Destination (D1-1a through D1-3a) sign (see Figure 2D-8). If several destinations are to be ~~shown~~ displayed edited to increase consistency at a single point, the several names may be placed on a single ~~panel~~ sign edited to increase accuracy with an arrow (and the distance, if desired) for each name. If more than one destination lies in the same direction, a single arrow may be used for such a group of destinations.

Guidance:

Adequate separation should be made between any destinations or group of destinations in one direction and those in other directions by suitable design of the arrow, spacing of lines of legend, heavy lines entirely across the ~~panel~~ sign, or separate ~~panels~~ signs. edited to increase accuracy

Standard:

An arrow pointing to the right shall be at the extreme right of the sign, and an arrow pointing left or up shall be at the extreme left. The distance figures, if used, shall be placed to the right of the destination names.

Guidance:

Unless a sloping arrow will convey a clearer indication of the direction to be followed, the directional arrows should be horizontal or vertical.

If several individual name ~~panels~~ signs edited to increase accuracy are assembled into a group, all ~~panels~~ signs edited to increase accuracy in the assembly should be of the same ~~length~~ horizontal width. edited to increase clarity

Destination signs should be used:

A. At the intersections of U.S. or State numbered routes with Interstate, U.S., or State numbered routes; and
B. At points where they serve to direct traffic from U.S. or State numbered routes to the business section of towns, or to other destinations reached by unnumbered routes.

Standard:

Where a total of three or less destinations are provided on the Advance Guide (see Section 2E.29) and Supplemental Guide (see Section 2E.31) signs, not more than three destination names shall be used on a Destination sign. Where four destinations are provided by the Advance Guide and Supplemental Guide signs, not more than four destination names shall be used on a Destination sign.

Guidance:

If space permits, four destinations should be displayed as two separate signs ~~panels~~ edited to increase accuracy at two separate locations.

Option:

Where space does not permit, or where all four destinations are in one direction, a single sign ~~assembly~~ deleted to increase accuracy may be used.

Standard:

Where a single four-name sign assembly is used, a heavy line entirely across the ~~panel~~ sign edited to increase accuracy or separated signs ~~panels~~ edited to increase accuracy shall be used to separate destinations by direction.

Guidance:

The next closest destination lying straight ahead should be at the top of the sign or assembly, and below it the closest destinations to the left and to the right, in that order. The destination ~~shown~~ displayed edited to increase consistency for each direction should ordinarily be the next county seat or the next principal city, rather than a more distant destination. In the case of overlapping routes, ~~there~~ only one destination should be ~~shown~~ displayed edited to increase consistency ~~only one destination~~ in each direction for each route.

Standard:

If ~~there is~~ more than one destination is ~~shown~~ displayed edited to increase consistency in the same direction, the name of the nearest destination shall appear above the names of any destinations that are farther away.

Section 2D.40 Destination Signs at Roundabouts

Standard:

Destination signs that are used at roundabouts shall comply with the provisions of Section 2D.39, except as indicated in this Section.

Option:

Exit destination (D1-1d, D1-1e) signs (see Figure 2D-9) with diagonal upward pointing arrows may be used to designate a particular exit of a roundabout.

Exit destination (D1-2d, D1-3d) signs (see Figure 2D-9) with curved-stem arrows may be used on approaches to roundabouts to represent the left-turn movements.

Curved-stem arrows on roundabout destination signs may point in diagonal directions.

Exit destination (D1-4) signs (see Figure 2D-9) with a diagram of the roundabout may be used on approaches to roundabouts.

Support:

Figure 2D-10 illustrates two examples of guide signing for roundabouts.

Diagrammatic signs might be preferable where space is available and where the geometry of the roundabout is non-typical, such as where more than four legs are present or where the legs are not at 90-degree angles to each other.

Chapter 2B contains information regarding regulatory signs at roundabouts, Chapter 2C contains information regarding warning signs at roundabouts, and Chapter 3C contains information regarding pavement markings at roundabouts.

Section 2D.41 Destination Signs at Jughandles

Standard:

Destination signs that are used at jughandles shall comply with the provisions of Section 2D.39, except as indicated in this Section.

Option:

If engineering judgment indicates that standard destination signs alone are insufficient to direct road users to their destinations at a jughandle, a diagrammatic sign depicting the appropriate geometry may be used to supplement the normal destination signs.

Support:

Section 2B.33 contains information regarding regulatory signs for jughandle turns. Figure 2B-12 shows examples of regulatory and destination guide signing for various types of jughandle turns.

Section ~~2D.35~~ 2D.42 Location of Destination Signs

Guidance:

When used in high-speed areas, Destination signs should be located 60 m (200 ft) or more in advance of the intersection, and following any Junction or Advance Route Turn assemblies that ~~may~~ might edited to increase consistency be required. In rural areas, the minimum distance between a Destination sign and an Advance Route Turn assembly or a Junction assembly should be 60 m (200 ft).

Option:

In urban areas, shorter advance distances may be used.

Because the Destination sign is of lesser importance than the Junction, Advance Route Turn, or Directional assemblies, the Destination sign may be eliminated when sign spacing is critical.

Support:

Figure 2D-7 shows typical placements of Destination signs.

Section ~~2D.36~~ 2D.43 Distance Signs (D2 Series)

Standard:

If used, the Distance (D2-1 through D2-3) sign (see Figure 2D-8) shall be a horizontal rectangle of a size appropriate for the required legend, carrying the names of not more than three Cities, towns, junctions, or other traffic generators, and the distance (to the nearest kilometer or mile) to those places.

Guidance:

The distance ~~shown~~ displayed edited to increase consistency should be selected on a case-by-case basis by the jurisdiction that owns the road or by statewide policy. A well-defined central area or central business district should be used where one exists. In other cases, the layout of the community should be considered in relation to the highway being signed and the decision based on where it appears that most drivers would feel that they are in the center of the community in question.

The top name on the Distance sign should be that of the next place on the route having a post office or a railroad station, a route number or name of an intersected highway, or any other significant geographical

identity. The bottom name on the sign should be that of the next major destination or control city. If three destinations are ~~shown~~ displayed, edited to increase consistency the middle line should be used to indicate communities of general interest along the route or important route junctions.

Option:

The choice of names for the middle line may be varied on successive Distance signs to give road users additional information concerning communities served by the route.

Guidance:

The control city should remain the same on all successive Distance signs throughout the length of the route until that city is reached.

Option:

If more than one distant point may properly be designated, such as where the route divides at some distance ahead to serve two destinations of similar importance, and if these two destinations cannot appear on the same sign, the two names may be alternated on successive signs.

On a route continuing into another State, destinations in the adjacent State may be ~~shown~~ displayed. edited to increase consistency

Section ~~2D.37~~ 2D.44 Location of Distance Signs

Guidance:

If used, Distance signs should be installed on important routes leaving municipalities and just beyond intersections of numbered routes in rural areas. If used, they should be placed just outside the municipal limits or at the edge of the built-up ~~district~~ area if it extends beyond the limits.

Where overlapping routes separate a short distance from the municipal limits, the Distance sign at the municipal limits should be omitted. The Distance sign should be installed approximately 90 m (300 ft) beyond the separation of the two routes.

Where, just outside of an incorporated municipality, two routes are concurrent and continue concurrently to the next incorporated municipality, the top name on the Distance sign should be that of the place where the routes separate; the bottom name should be that of the city to which the greater part of the through traffic is destined.

Support:

Figure 2D-7 shows typical placements of Distance signs.

Section ~~2D.38~~ 2D.45 Street Name Signs (D3-1 or D3-1a)

Guidance:

Street Name (D3-1 or D3-1a) signs (see Figure 2D-11) should be installed in urban areas at all street intersections regardless of other route signs that ~~may~~ might be present and should be installed in rural areas to identify important roads that are not otherwise signed.

Option:

For streets that are part of a U.S., State, or county numbered route, a D3-1a Street Name sign (see Figure 2D-11) that incorporates a route shield may be used to assist road users who might not otherwise be able to associate the name of the street with the route number.

Standard:

The lettering for names of streets and highways on Street Name signs shall be composed of a combination of lower-case letters with initial upper-case letters (see Section 2A.13).

Guidance:

Lettering on ~~ground-~~ post-mounted edited to increase consistency Street Name signs should be ~~at least 150 mm (6 in) high in capital letters, or 150 mm (6 in) upper-case letters with 113 mm (4.5 in)~~ composed of lower-case letters at least 113 mm (4.5 in) in height with initial upper-case letters at least 150 mm (6 in) in height.

On multi-lane streets with speed limits greater than 60 km/h (40 mph), the lettering on ~~ground-~~ post-mounted edited to increase consistency Street Name signs should be ~~at least 200 mm (8 in) high in capital letters, or 200 mm (8 in) upper-case letters with 150 mm (6 in)~~ composed of lower-case letters at least 150 mm (6 in) in height with initial upper-case letters at least 200 mm (8 in) in height.

Option:

For local roads with speed limits of 40 km/h (25 mph) or less, the lettering ~~height~~ on post-mounted Street Name signs may be ~~a minimum~~ composed of lower-case letters at least 75 mm (3 in) in height with initial upper-case letters at least 100 mm (4 in) in height.

Guidance:

If overhead Street Name signs are used, the lettering should be ~~at least 300 mm (12 in) high in capital letters, or 300 mm (12 in) upper-case letters with 225 mm (9 in)~~ composed of lower-case letters at least 225 mm (9 in) in height with initial upper-case letters at least 300 mm (12 in) in height. relocated from 2nd to last paragraph of this section

Support:

The recommended minimum letter heights for Street Name signs are summarized in Table 2D-2.

Option:

Supplementary lettering to indicate the type of street (such as Street, Avenue, or Road) or the section of the city (such as NW) may be in smaller lettering, at least 75 mm (3 in) high. Conventional abbreviations (see Section 1A.15) may be used except for the street name itself.

A ~~symbol or letter designation~~ pictograph may be used on a Street Name sign to identify ~~the~~ a governmental jurisdiction, an area of jurisdiction, a governmental agency, a military base or branch of service, a governmental-approved university or college, or ~~other~~ a government-approved institution.

Standard:

If a ~~symbol or letter designation~~ pictograph is used, the height and width of the ~~symbol or letter designation~~ pictograph shall not exceed the letter height of the sign.

Guidance:

The ~~symbol or letter designation~~ pictograph should be positioned to the ~~left~~ right of the street name.

Standard:

The Street Name sign shall be retroreflective or illuminated to show the same shape and similar color both day and night. The legend and background shall be of contrasting colors.

~~Guidance:~~

~~Street Name signs should have a white legend on a green background. A border, if used, should be the same color as the legend.~~

Option:

The border may be omitted from a Street Name sign.

An alternative background color other than the normal guide sign color of green may be used for Street Name (D3-1 or D3-1a) signs where the highway agency determines this is necessary to assist road users in determining jurisdictional authority for roads.

Standard:

Alternative background colors shall not be used for Advance Street Name (D3-2) signs (see Section 2D.46).

The only acceptable alternative background colors for Street Name (D3-1 or D3-1a) signs shall be blue, brown, or black. Regardless of whether green, blue, brown, or black is used as the background color for Street Name (D3-1 or D3-1a) signs, the legend (and border, if used) shall be white.

Guidance:

An alternative background color for Street Name signs, if used, should be applied to the Street Name (D3-1 or D3-1a) signs on all roadways under the jurisdiction of a particular highway agency.

In business or commercial ~~districts~~ areas and on principal arterials, Street Name signs should be placed at least on diagonally opposite corners. In residential areas, at least one Street Name sign should be mounted at each intersection. Signs naming both streets should be installed at each intersection. They should be mounted with their faces parallel to the streets they name.

Option:

To optimize visibility, Street Name signs may be mounted overhead. Street Name signs may also be placed above a regulatory or STOP or YIELD sign with no required vertical separation.

Guidance:

In urban or suburban areas, especially where Advance Street Name signs for signalized and other major intersections are not used, the use of overhead ~~-mounted~~ edited to increase consistency Street Name signs should be strongly considered.

Option:

At intersection crossroads where the same road has two different street names for each direction of travel, both street names may be ~~shown~~ displayed edited to increase consistency on the same sign along with directional arrows.

Support:

Information regarding the use of street names on supplemental plaques for use with intersection-related warning signs is contained in Section 2C.61.

Section ~~2D.39~~ 2D.46 Advance Street Name Signs (D3-2)

Support:

Advance Street Name (D3-2) signs (see Figure 2D-11) identify an upcoming intersection. Although this is often the next intersection, it could also be several intersections away in cases where the next signalized intersection is referenced.

Standard:

Advance Street Name (D3-2) signs, if used, shall supplement rather than be used instead of the Street Name (D3-1) signs at the intersection.

Option:

Advance Street Name (D3-2) signs may be installed in advance of signalized or unsignalized intersections to provide road users with advance information to identify the name(s) of the next intersecting street to prepare for crossing traffic and to facilitate timely deceleration and/or lane changing in preparation for a turn.

Guidance:

On arterial highways in rural areas, Advance Street Name signs should be used in advance of all signalized intersections and in advance of all intersections with exclusive turn lanes.

In urban areas, Advance Street Name signs should be used in advance of all signalized intersections on major arterial streets, except where signalized intersections are so closely spaced that advance placement of the signs is impractical.

The heights of the letters on Advance Street Name signs should be the same as those used for Street Name signs (see Section 2D.45).

Standard:

If used, Advance Street Name signs shall have a white legend and border on a green background.

If used, Advance Street Name signs shall provide the name(s) of the intersecting street(s) on the top line(s) of the legend and the distance to the intersecting streets or messages such as NEXT SIGNAL, NEXT INTERSECTION, NEXT ROUNDABOUT, or directional arrow(s) on the bottom line of the legend.

Option:

Directional arrow(s) may be placed to the right or left of the street name or message such as NEXT SIGNAL, as appropriate, rather than on the bottom line of the legend. Curved-stem arrows may be used on Advance Street Name signs on approaches to roundabouts.

For intersecting crossroads where the same road has a different street name for each direction of travel, the different street names may be ~~shown~~ displayed edited to increase consistency on the same Advance Street Name sign along with directional arrows.

In advance of two closely spaced intersections where it is not practical to install separate Advance Street Name signs, the Advance Street Name sign may include the street names for both intersections along with appropriate supplemental legends for both street names, such as NEXT INTERSECTION, 2ND INTERSECTION, or NEXT LEFT and NEXT RIGHT, or ~~advance~~ directional arrows.

An Advance Street Name (W16-8P) plaque (see Section 2C.61) with black legend on a yellow background, installed supplemental to an Intersection (W2) or Advance Traffic Control (W3) series warning sign may be used instead of an Advance Street Name guide sign ~~(see Section 2C.61)~~.

Guidance:

If two street names are used on the Advance Street Name plaque, the street names should be displayed in the following order:

A. For a single intersection where the same road has a different street name for each direction of travel, the name of the street to the left should be displayed above the name of the street to the right; or
B. For two closely spaced intersections, 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-14).

Section 2D.47 Signing on Conventional Roads on Approaches to Interchanges text for this new Section was relocated from Section 2E.49

Support:

Because there are a number of different ramp configurations that are commonly used at interchanges with conventional roads, drivers on the conventional road cannot reliably predict whether they will be required to turn left or right in order to enter the correct ramp to access the freeway or expressway in the desired direction of travel. Consistently applied signing for conventional road approaches to freeway or expressway interchanges is highly desirable.

Standard:

On multi-lane conventional roads approaching an interchange, guide signs shall be provided to identify which direction of turn is to be made and/or which specific lane to use for ramp access to each direction of the freeway or expressway.

Guidance:

The signing of conventional roads with one lane of traffic approaching an interchange should consist of a sequence containing the following signs (see Figure 2D-12):

A. Junction Assembly
B. Destination sign
C. Directional Assembly or Entrance Direction sign for the first ramp
D. Advance Route Turn Assembly or Advance Entrance Direction sign with an advance turn arrow
E. Directional Assembly or Entrance Direction sign for the second ramp

Standard:

If used, the Entrance Direction sign shall consist of a white legend and border on a green background. It shall contain the freeway or expressway route shield(s), cardinal direction, and directional arrow(s).

Option:

The Entrance Direction sign may contain a destination(s) and/or an action message such as NEXT RIGHT.

At minor interchanges, the following sequence of signs may be used (see Figure 2D-13):

A. Junction Assembly
B. Directional Assembly for the first ramp
C. Directional Assembly for the second ramp

Guidance:

On multi-lane conventional roads approaching an interchange, the sign sequence should contain the following signs (see Figures 2D-14, 2D-15, and 2D-16):

A. Junction Assembly
B. Advance Entrance Direction sign(s) for both directions (if applicable) of travel on the freeway or expressway
C. Entrance Direction sign for first ramp
D. Advance Turn Assembly
E. Entrance Direction sign for the second ramp

Support:

Advance Entrance Direction added to increase consistency signs are used to direct road users to the appropriate lane(s).

Standard:

The Advance Entrance Direction added to increase consistency sign shall consist of a white legend and border on a green background. It shall contain the freeway or expressway route shield(s) and cardinal direction(s).

Option:

The Advance Entrance Direction added to increase consistency sign may have destinations, directional arrows, and/or an action message such as LEFT LANE, NEXT LEFT, or SECOND RIGHT. Signs in this sequence may be mounted overhead to improve visibility.

Section 2D.48 Freeway Entrance Signs (D13-3 and D13-3a) text relocated from Section 2E.50

Option:

~~Guide~~ FREEWAY ENTRANCE (D13-3) signs or FREEWAY ENTRANCE with downward pointing diagonal arrow (D13-3a) signs (see Figure 2D-15) may be used on entrance ramps near the crossroad to inform road users of the freeway or expressway entrance, as appropriate ~~(see Figure 2E-37)~~.

Support:

Section 2B.48 contains information regarding the use of regulatory signs to deter wrong-way movements at intersections of freeway or expressway ramps with conventional roads, and in the area where entrance ramps intersect with the mainline lanes.

Section ~~2D.40~~ 2D.49 Parking Area or Parking Wayfinding Sign (D4-1 and D4-1a)

Option:

The Parking Area (D4-1) sign or Parking Wayfinding (D4-1a) sign (see Figure 2D-11) may be used to show the direction to a nearby public parking area or parking facility.

Standard:

If used, the Parking Area (D4-1) sign shall be a horizontal rectangle with a standard size of 750 x 600 mm (30 x 24 in), or with a smaller size of 450 x 375 mm (18 x 15 in) for minor, low-speed streets. It shall carry the word PARKING, with the letter P five times the height of the remaining letters, and a directional arrow. The legend and border shall be green on a retroreflectorized white background.

If used, the Parking Wayfinding (D4-1a) sign shall be a vertical rectangle with a white letter P in a blue circle symbol at the top of the sign and a blue directional arrow at the bottom of the sign. The edge of the blue circular symbol shall be separated by 25 mm (1 in) from the blue border of the sign.

Guidance:

If used, the Parking Area or Parking Wayfinding sign should be installed on major thoroughfares at the nearest point of access to the parking facility and where it can advise drivers of a place to park. The sign should not be used more than four blocks from the parking area.

Section ~~2D.41~~ 2D.50 PARK & RIDE Sign (D4-2)

Option:

PARK & RIDE (D4-2) signs (see Figure 2D-11) may be used to direct road users to park and ride facilities.

Standard:

The signs shall contain the word message PARK & RIDE and direction information (arrow or word message).

Option:

PARK & RIDE signs may contain the local transit ~~logo~~ pictograph and/or carpool symbol within the sign border.

Standard:

If used, the local transit ~~logo~~ pictograph and/or carpool symbol shall be located in the top part of the sign above the message PARK & RIDE. In no case shall the vertical dimension of the local transit ~~logo~~ pictograph and/or carpool symbol exceed 450 mm (18 in).

Guidance:

If the function of the parking facility is to provide parking for persons using public transportation, the local transit ~~logo symbol~~ pictograph should be used on the guide sign. If the function of the parking facility is

to serve carpool riders, the carpool symbol should be used on the guide sign. If the parking facility serves both functions, both the ~~logo~~ pictograph and carpool symbol should be used.

Standard:

These signs shall have a retroreflective white legend and border on a rectangular green background. The carpool symbol shall be as shown for the D4-2 sign ~~D4-2~~. edited to increase consistency The color of the local transit ~~logo~~ pictograph shall be selected by the local transit authority.

Option:

To increase the target value and contrast of the local transit ~~logo~~ pictograph, and to allow the local transit ~~logo~~ pictograph to retain its distinctive color and shape, the ~~logo~~ pictograph may be included within a white border or placed on a white background.

~~**Section 2D.42 Rest Area Signs (D5 Series)**~~ **relocated to new Chapter 2F**

~~**Section 2D.43 Scenic Area Signs (D6 Series)**~~ **relocated to new Chapter 2F**

Section ~~2D.44~~ 2D.51 Weigh Station Signing (D8 Series)

Support:

The general concept for Weigh Station signing is similar to Rest Area signing (see Section 2F.05) because in both cases traffic using either area remains within the right-of-way.

Standard:

The standard installation for Weigh Station signing shall include three basic signs:

A. Advance sign (D8-1),
B. Exit Direction sign (D8-2), and
C. Gore sign (D8-3).

Support:

Example locations of these signs are shown in Figure 2D-17.

Option:

Where State law requires a regulatory sign (R13-1) in advance of the Weigh Station, a fourth sign (see Section 2B.65) may be located following the Advance sign.

Guidance:

The Exit Direction sign (D8-2) or the Advance sign (D8-1) should display, either within the sign border or on a supplemental sign added to increase consistency panel, the changeable message OPEN or CLOSED.

~~**Section 2D.45 General Service Signs (D9 Series)**~~ **relocated to new Chapter 2F**

~~**Section 2D.46 Reference Location Signs (D10-1 through D10-3) and Intermediate Reference Location Signs (D10-1a through D10-3a)**~~ **relocated to new Chapter 2I**

~~**Section 2D.47 Traffic Signal Speed Sign (I1-1)**~~ **relocated to new Chapter 2I**

~~**Section 2D.48 General Information Signs (I Series)**~~ **relocated to new Chapter 2I**

Section 2D.52 Community Wayfinding Signs

Support:

Community wayfinding guide signs direct tourists and other road users to key civic, cultural, visitor, and recreational attractions and other destinations within a city or a local urbanized or downtown area.

Color coding is sometimes used on community wayfinding signs to help road users distinguish between multiple potentially confusing traffic generator destinations within a community or area.

Community wayfinding guide signs are a type of destination guide sign for conventional roads with a common color and/or enhancement marker identifier for destinations within an overall wayfinding guide sign plan for an area.

Standard:

Because regulatory, warning, and other guide signs have a higher priority, community wayfinding guide signs shall only be installed where adequate spacing is available between the community

wayfinding guide sign and other higher priority signs. Community wayfinding guide signs shall not be installed in a position where they would obscure the road users' view of other traffic control devices.

At the boundaries of the geographical area within which community wayfinding guide signing is used, informational guide signs shall be posted to inform road users about the presence of wayfinding signing and to identify the meanings of the various color codes or pictographs that are being used. These informational guide signs shall have a white legend and border on a green background and shall have a design similar to that illustrated in Figure 2D-1. These informational guide signs shall not be installed on freeway mainlines.

Option:

The informational guide signs described in the previous paragraph may be installed on expressways and on freeway exit ramps near the downstream end of the ramp.

Standard:

The color coding and enhancement markers of the community wayfinding guide signing system shall be included on the informational guide sign posted at the boundary of the wayfinding guide sign area. The color coding shall be accomplished by the use of different colored square or rectangular panels on the face of the informational guide sign. The size of the colored square or rectangular panels shall be in accordance with the size requirements for pictographs (see Section 2D.07).

Option:

The different colored square or rectangular panels may include either a black or a white (whichever provides the better contrast with the color of the panel) letter, numeral, or other appropriate designation to identify the destination.

Except for the informational guide sign posted at the boundary of the wayfinding guide sign area, community wayfinding guide signs may include panels that have background colors other than green in order to provide a color "identity" for the wayfinding destinations by type or group of destinations or by geographical area within the overall wayfinding guide signing system. Except as noted in the Standard below, in addition to the colors that are approved in the MUTCD for use on official traffic control signs (see Section 2A.10), other colors may also be used for the color coding of individual panels on community wayfinding guide signs.

Standard:

The MUTCD standard colors of red, orange, and yellow shall not be used as background colors (color coding) for community wayfinding guide signs, in order to minimize possible confusion with crucial regulatory and warning sign color meanings readily understood by motorists.

The minimum contrast value of legend color to background color for community wayfinding guide signs shall be at least 0.70 (or 70%).

All messages, borders, and legends of community wayfinding guide signs shall be retroreflective and all backgrounds shall be retroreflective or illuminated.

Guidance:

Wayfinding guide signs should be rectangular in shape. Simplicity and uniformity in design, position, and application as described in Section 2A.06 are important and should be incorporated into the wayfinding guide sign design and location plans for the area.

Wayfinding signs should be limited to 3 destinations per sign (see Section 2D.07).

Abbreviations (see Section 1A.15) should be kept to a minimum, and should include only those that are commonly recognized and understood, such as AVE (for Avenue), BLVD (for Boulevard), N (for North), or JCT (for junction).

Option:

White or black (whichever provides the better contrast with the color of the panel) horizontal lines may be used to separate destinations that have the same wayfinding background panel color from each other.

Support:

The basic requirement for all highway signs is that they be legible to those for whom they are intended and that they be understandable in time to permit a proper response. Among the desirable attributes of a sign are high visibility by day and night, high legibility (adequately sized letters or symbols), and a short legend for quick comprehension by the road user approaching the sign.

Standard:

Except as noted in the Option below, all of the lettering on community wayfinding guide signs shall be in the fonts provided in the "Standard Highway Signs and Markings" book (see Section 1A.11) in order to provide optimum legibility.

Option:

A font other than those provided in the "Standard Highway Signs and Markings" book may be used on community wayfinding guide signs if an engineering study determines that the legibility and recognition values for the chosen font meet or exceed the values for the fonts provided in the "Standard Highway Signs and Markings" book for the same legend height and brush stroke width.

Standard:

Except for signs that are intended to be viewed only by pedestrians, bicyclists, or occupants of parked vehicles, Internet and e-mail addresses shall not be shown on any community wayfinding guide sign, including on any supplemental plaques, sign panels, or changeable message signs that are associated with the sign.

The lettering for street names and destinations on community wayfinding guide signs shall be a combination of lower-case letters with initial upper-case letters (see Section 2D.05). All other word messages on wayfinding guide signs shall be in upper-case letters.

Guidance:

Word messages should be as brief as possible and the lettering should be large enough to provide the necessary legibility distance.

A minimum specific ratio of 25 mm (1 in) of letter height per 9 m (30 ft) of legibility distance, should be used. Except as noted in the Option below, the minimum letter height for community wayfinding guide sign legends should be 150 mm (6 in).

Option:

On local streets that have a speed limit of 40 km/h (25 mph) or less, a minimum letter height of 100 mm (4 in) may be used for community wayfinding guide sign legends.

Guidance:

The arrow location and priority order should follow the provisions described in Sections 2D.08 and 2D.34. Except as noted in the Option below, arrowheads should be the same design as that specified in Section 2D.08.

Option:

The alternative arrow designs that are shown in Figure 2D-18 may be used on community wayfinding guide signs.

Standard:

If the alternative arrow designs that are shown in Figure 2D-18 are used, they shall be the same overall size as the prescribed standard arrows.

Option:

Pictographs (see Section 1A.13) that comply with the size and design provisions of Section 2D.07 may be used on community wayfinding guide signs.

Standard:

Except for the pictographs described in the previous paragraph, symbols that are not approved in the MUTCD for use on guide signs shall not be used on community wayfinding guide signs.

Commercial graphics (logos) for businesses shall not be used on community wayfinding guide signs, including within the pictographs.

Option:

Other graphics that specifically identify the wayfinding system, including enhancement markers, may be used on the overall signing assembly and sign posts.

Support:

An enhancement marker consists of a shape, color, and/or pictograph that is used as an aesthetic identifier for the community wayfinding guide signing system for an area as a whole. Figure 2D-19 shows examples of enhancement marker designs that can be used with community wayfinding signs.

Option:

An enhancement marker may be used with community wayfinding guide signs, or may be incorporated into the overall design of a wayfinding guide sign, as a means of aesthetically identifying the wayfinding guide sign.

Standard:

The sizes and shapes of enhancement markers shall be smaller than the community wayfinding signs themselves. Enhancement markers shall not be designed to have an appearance that could be mistaken by road users as being a traffic control device.

Section 2D.53 Truck, Passing, or Climbing Lane Signs (D17-1 and D17-2)

Guidance:

If an extra lane has been provided for trucks and other slow-moving traffic, a NEXT TRUCK LANE XX km (MILES) (D17-1) sign and/or a TRUCK LANE XX km (MILES) (D17-2) sign (see Figure 2D-20) should be installed in advance of the lane.

Option:

Alternative legends such as PASSING LANE or CLIMBING LANE may be used instead of TRUCK LANE.

Option:

Section 2B.39 contains information regarding regulatory signs for these types of lanes.

Section 2D.54 Slow Vehicle Turn-Out Sign (D17-7)

Guidance:

If a slow vehicle turn-out area has been provided for slow-moving traffic, a SLOW VEHICLE TURN-OUT XX km (MILES) (D17-7) sign (see Figure 2D-20) should be installed in advance of the turn-out area.

Option:

Section 2B.43 contains information regarding regulatory signs for slow vehicle turn-out areas.

Section ~~2D.49~~ 2D.55 Signing of Named Highways the first four paragraphs have been relocated to new Section 2I.07

Option:

Guide signs may contain street or highway names if the purpose is to enhance driver communication and guidance; however, they are to be considered as supplemental information to route numbers.

Standard:

Highway names shall not replace official numeral designations.

Memorial names (see Section 2I.07) shall not appear on supplemental signs or on any other information sign ~~either~~ grammar – more than two choices on or along the highway or its intersecting routes.

The use of route signs shall be restricted to signs officially used for guidance of traffic in accordance with this Manual and the "Purpose and Policy" statement of the American Association of State Highway and Transportation Officials that applies to Interstate and U.S. numbered routes (see Page i for AASHTO's address).

Option:

Unnumbered routes having major importance to proper guidance of traffic may be signed if carried out in accordance with the aforementioned policies. For unnumbered highways, a name to enhance route guidance may be used where the name is applied consistently throughout its length.

Guidance:

Only one name should be used to identify any highway, whether numbered or unnumbered.

~~Section 2D.50 Trail Signs~~ relocated to new Chapter 2I

Section ~~2D.51~~ 2D.56 Crossover Signs (D13-1 ~~Series~~ and D13-2)

Option:

Crossover signs may be installed on divided highways to identify median openings not otherwise identified by warning or other guide signs.

Standard:

A CROSSOVER (D13-1) sign (see Figure 2D-20) shall not be used to identify a median opening that is permitted to be used only by official or authorized vehicles. If used, the sign shall be a horizontal rectangle of appropriate size to carry the word CROSSOVER and a horizontal directional arrow. The CROSSOVER sign shall have a white legend and border on a green background.

Guidance:

If used, the CROSSOVER sign should be installed immediately beyond the median opening, either on the right-hand edited to increase clarity side of the roadway or in the median.

Option:

The Advance Crossover (D13-2) sign (see Figure 2D-20) may be installed in advance of the CROSSOVER sign to provide advance notice of the crossover.

Standard:

If used, the Advance Crossover sign shall be a horizontal rectangle of appropriate size to carry the word CROSSOVER and the distance to the median opening. The sign shall have white legend and border on a green background.

Guidance:

The distance ~~shown~~ displayed edited to increase consistency on the Advance Crossover sign should be 2 km, 1 km, or 500 m (or should be 1 MILE, 1/2 MILE, or 1/4 MILE), unless unusual conditions require some other distance. If used, the sign should be installed either on the right-hand edited to increase clarity side of the roadway or in the median at approximately the distance ~~shown~~ displayed edited to increase consistency on the sign.

Section ~~2D.52~~ 2D.57 National Scenic Byways Signs (D6-4, D6-4a)

Support:

Certain roads have been designated by the U.S. Secretary of Transportation as National Scenic Byways or All-American Roads based on their archeological, cultural, historic, natural, recreational, or scenic qualities.

Option:

State and local highway agencies may install the National Scenic Byways (D6-4 or D6-4a) signs at entrance points to a route that has been recognized by the U.S. Secretary of Transportation as a National Scenic Byway or an All-American Road. The D6-4 or D6-4a sign may be installed on route sign assemblies (see Figure 2D-21) or as part of larger roadside structures. National Scenic Byways signs may also be installed at periodic intervals along the designated route and at intersections where the designated route turns or follows a different numbered highway. At locations where roadside features have been developed to enhance the traveler's experience such as rest areas, historic sites, interpretive facilities, or scenic overlooks, the National Scenic Byways sign may be placed on the associated sign assembly to inform travelers that the site contributes to the byway travel experience.

Standard:

When a National Scenic Byways sign is installed on a National Scenic Byway or an All-American Road, the design shown for the D6-4 or D6-4a sign in Figure 2D-21 shall be used. Use of this design shall be limited to routes that have been designated as a National Scenic Byway or All-American Road by the U.S. Secretary of Transportation.

If used, the D6-4 or D6-4a sign shall be placed such that the roadway route signs have primary visibility for the road user.

CHAPTER 2E. GUIDE SIGNS—FREEWAYS AND EXPRESSWAYS

Section 2E.01 Scope of Freeway and Expressway Guide Sign Standards

Support:

~~These standards~~ The provisions of Chapter 4E provide a uniform and effective system of ~~highway~~ deleted to increase consistency signing for high-volume, high-speed motor vehicle traffic on freeways and expressways. The requirements and specifications for expressway signing exceed those for conventional roads (see Chapter 2D), but are less than those for freeway signing. Since there are many geometric design variables to be found in existing roads, a signing concept commensurate with prevailing conditions is the primary consideration. Section 2A.01 includes definitions of freeway and expressway.

Guide signs for freeways and expressways are primarily identified by the name of the sign rather than by an assigned sign ~~code~~ designation. Guidelines for the design of guide signs for freeways and expressways are provided in Chapter 8 (Design Guidelines) of the "Standard Highway Signs and Markings" book (see Section 1A.11).

Standard:

~~The standards prescribed herein for freeway or expressway guide signing~~ Chapter 2E shall apply to any highway that meets the definition of ~~such~~ freeway or expressway facilities.

Section 2E.02 Freeway and Expressway Signing Principles

Support:

The development of a signing system for freeways and expressways is approached on the premise that the signing is primarily for the benefit and direction of road users who are not familiar with the route or area. The signing furnishes road users with clear instructions for orderly progress to their destinations. Sign installations are an integral part of the facility and, as such, are best planned concurrently with the development of highway location and geometric design. For optimal results, plans for signing are analyzed during the earliest stages of preliminary design, and details are correlated as final design is developed. The excessive signing found on many major highways usually is the result of using a multitude of signs that are too small and that are poorly designed and placed to accomplish the intended purpose.

Freeway and expressway signing is to be considered and developed as a planned system of installations. An engineering study is sometimes necessary for proper solution of the problems of many individual locations, but, in addition, consideration of an entire route is necessary.

Guidance:

Road users should be guided with consistent signing on the approaches to interchanges, when they drive from one State to another, and when driving through rural or urban areas. Because geographical, geometric, and operating factors regularly create significant differences between urban and rural conditions, the signing should take these conditions into account.

Guide signs on freeways and expressways should serve distinct functions as follows:

A. Give directions to destinations, or to streets or highway routes, at intersections or interchanges;
B. Furnish advance notice of the approach to intersections or interchanges;
C. Direct road users into appropriate lanes in advance of diverging or merging movements;
D. Identify routes and directions on those routes;
E. Show distances to destinations;
F. Indicate access to general motorist services, rest, scenic, and recreational areas; and
G. Provide other information of value to the road user.

Section ~~2E.24~~ 2E.03 Guide Sign Classification

Support:

Freeway and expressway guide signs are classified and treated in the following categories:

A. Route signs and Trailblazer Assemblies (see Section 2E.24),
B. At-Grade Intersection signs (see Section 2E.25),
C. Interchange signs (see Sections 2E.26 through 2E.35),
D. Interchange Sequence signs (see Section 2E.36),
E. Community Interchanges Identification signs (see Section 2E.37),
F. NEXT XX EXITS signs (see Section 2E.38),

G. Weigh Station signing (see Section 2E.50),
H. General Service signs (see ~~Section 2E.51~~ Chapter 2F),
I. Rest and Scenic Area signs (see Section 2F.05),
J. Tourist Information and Welcome Center signs (see Section 2F.06),
K. Radio Information signing (see Section 2F.07),
L. Carpool and Ridesharing signing (see Section 2F.09),
M. Specific Service signs (see Chapter 2G), and
N. Reference Location signs (see Section 2I.02),
O. Miscellaneous guide signs (see Section 2I.06), and
P. Recreational and Cultural Interest Area signs (see Chapter 2J).

Section ~~2E.03~~ 2E.04 General

Support:

Signs are designed so that they are legible to road users approaching them and readable in time to permit proper responses. Desired design characteristics include: (a) long visibility distances, (b) large lettering and symbols, and (c) short legends for quick comprehension.

Standard:

Standard shapes and colors shall be used so that traffic signs can be promptly recognized by road users.

Section ~~2E.04~~ 2E.05 Color of Guide Signs

Standard:

Guide signs on freeways and expressways, except as noted herein, shall have white letters, symbols, and borders on a green background.

Support:

Color requirements for route signs and trailblazers, signs with blank-out or changeable messages, signs for services, rest areas, park and recreational areas, and for certain miscellaneous signs are specified in the individual sections dealing with the particular sign or sign group.

Section ~~2E.05~~ 2E.06 Retroreflection or Illumination

Standard:

Letters, numerals, symbols, and borders of all guide signs shall be retroreflectorized. The background of all guide signs that are not independently illuminated shall be retroreflective.

Support:

Where there is no serious interference from extraneous light sources, retroreflectorized ~~ground-~~ post-mounted edited to increase consistency signs usually provide adequate nighttime visibility.

On freeways and expressways where much driving at night is done with low-beam headlights, the amount of headlight illumination incident to an overhead sign display is relatively small.

Guidance:

Overhead sign installations should be illuminated unless an engineering study shows that retroreflectorization alone will perform effectively. The type of illumination chosen should provide effective and reasonably uniform illumination of the sign face and message.

Section ~~2E.06~~ 2E.07 Characteristics of Urban Signing

Support:

Urban conditions are characterized not so much by city limits or other arbitrary boundaries, as by the following features:

A. Mainline roadways with more than two lanes in each direction;
B. High traffic volumes on the through roadways;
C. High volumes of traffic entering and leaving interchanges;
D. Interchanges closely spaced;
E. Roadway and interchange lighting;
F. Three or more interchanges serving the major city;
G. A loop, circumferential, or spur serving a sizable portion of the urban population; and

H. Visual clutter from roadside development.

Operating conditions and road geometrics on urban freeways and expressways usually make special sign treatments desirable, including:

A. Use of Interchange Sequence signs (see Section 2E.36);
B. Use of sign spreading to the maximum extent possible (see Section 2E.11);
C. Elimination of General Service signing (see ~~Section 2E.51~~ Chapter 2F);
D. Reduction to a minimum of post-interchange signs (see Section 2E.34);
E. Display of advance signs at distances closer to the interchange, with appropriate adjustments in the legend (see Section 2E.29);
F. Use of overhead signs on roadway structures and independent sign supports (see Section 2E.22);
G. Use of diagrammatic signs in advance of intersections and interchanges (see Section 2E.20); and
H. Frequent use of street names as the principal message in guide signs.

Lower speeds which are often characteristic of urban operations do not justify lower signing standards. Typical traffic patterns are more complex for the road user to negotiate, and large, easy-to-read legends are, therefore, just as necessary as on rural highways.

Section ~~2E.07~~ 2E.08 Characteristics of Rural Signing

Support:

Rural areas ordinarily have greater distances between interchanges, which permits adequate spacing for the sequences of signs on the approach to and departure from each interchange. However, the absence of traffic in adjoining lanes and on entering or exiting ramps often adds monotony or inattention to rural driving. This increases the importance of signs that call for decisions or actions.

Guidance:

Where there are long distances between interchanges and the alignment is relatively unchanging, signs should be positioned for their best effect on road users. The tendency to group all signing in the immediate vicinity of rural interchanges should be avoided by considering the entire route in the development of sign plans. Extra effort should be given to the placement of signs at natural target locations to command the attention of the road user, particularly when the message requires an action by the road user.

Section ~~2E.08~~ 2E.09 ~~Memorial Highway~~ Signing of Named Highways **the previous text in this section is now contained in Section 2I.07 – overlap with Section 2D.49 of the 2003 MUTCD has been eliminated**

Support:

Section 2D.55 contains information, which is also applicable to freeways and expressways, regarding the use of highway names on the signing for unnumbered highways to enhance route guidance and facilitate travel.

Section 2I.07 contains information regarding memorial signing of routes, bridges, or highway components.

~~Guidance:~~

~~Freeways and expressways should not be signed as memorial highways. If a route, bridge, or highway component is officially designated as a memorial, and if notification of the memorial is to be made on the highway right-of-way, such notification should consist of installing a memorial plaque in a rest area, scenic overlook, recreational area, or other appropriate location where parking is provided with the signing inconspicuously located relative to vehicle operations along the highway.~~

~~Option:~~

~~If the installation of a memorial plaque off the main roadway is not practical, a memorial sign may be installed on the mainline.~~

~~**Standard:**~~

~~**Where such memorial signs are installed on the mainline, (1) memorial names shall not appear on directional guide signs, (2) memorial signs shall not interfere with the placement of any other necessary highway signing, and (3) memorial signs shall not compromise the safety or efficiency of traffic flow. The memorial signing shall be limited to one sign at an appropriate location in each route direction.**~~

Section ~~2E.09~~ 2E.10 Amount of Legend on Guide Signs

Guidance:

No more than two destination names or street names should be ~~shown~~ displayed edited to increase consistency on any Advance Guide sign or Exit Direction sign. A city name and street name on the same sign should be avoided. Where two or three signs are placed on the same supports, destinations or names should be limited to one per sign, or to a total of three in the display. Sign legends should not exceed three lines of copy, including route numbers and exit instructions.

Option:

~~Sign legends may include symbols, route numbers, arrows, cardinal directions, and exit instructions.~~

If sign space is available, pictographs may be used on guide signs in conjunction with destinations that are associated with governmental jurisdictions or agencies, military bases, universities, or other government-approved institutions.

Standard:

The maximum dimension (height or width) of a pictograph shall not exceed the size of the route shield on the guide sign. If the guide sign does not include a route shield, the maximum size of the pictograph shall not exceed two times the letter height of the destination legend.

Section ~~2E.10~~ 2E.11 Number of Signs at an Overhead Installation and Sign Spreading

Guidance:

If overhead signs are warranted, as set forth in Section 2A.17, the number of signs at these locations should be limited to only those essential in communicating pertinent destination information to the road user. Exit Direction signs for a single exit and the Advance Guide signs should have only one ~~panel~~ sign edited to increase consistency with one or two destinations. Regulatory signs, such as speed limits, should not be used in conjunction with overhead guide sign installations. Because road users have limited time to read and comprehend sign messages, there should not be more than three guide signs displayed at any one location either on the overhead structure or its support.

Option:

At overhead locations, more than one sign may be installed to advise of a multiple exit condition at an interchange. If the roadway ramp or crossing roadway has complex or unusual geometrics, additional signs with confirming messages may be provided to properly guide the road user.

Support:

Sign spreading is a concept where major overhead signs are spaced so that road users are not overloaded with a group of signs at a single location. Figure 2E-1 illustrates an example of sign spreading.

Guidance:

Where overhead signing is used, sign spreading should be used at all single exit interchanges and to the extent possible at multi-exit interchanges. Sign spreading should be accomplished by use of the following:

A. The Exit Direction sign should be the only sign used in the vicinity of the gore (other than the Gore sign). It should be located overhead near the theoretical gore and generally on an overhead sign support structure.
B. The Advance Guide sign to indicate the next interchange exit should be placed near the crossroad location. If the crossroad goes over the mainline, the Advance Guide sign should be placed on the overcrossing structure.

Section ~~2E.11~~ 2E.12 Pull-Through Signs (E6-2, E6-2a)

Support:

Pull-Through (E6-2, E6-2a) signs (see Figure 2E-2) are overhead lane-use signs intended for through traffic.

Guidance:

Pull-Through signs should be used where the geometrics of a given interchange are such that it is not clear to the road user as to which is the through roadway, or where additional route guidance is desired. Pull-Through signs with down arrows should be used where the alignment of the through lanes is curved and the exit direction is straight ahead, where the number of through lanes is not readily evident, and at multi-lane exits where there is a reduction in the number of through lanes.

Support:

Sections 2E.20, 2E.21, and 2E.32 contain information regarding the use of diagrammatic signs at multi-lane exits where there is a reduction in the number of through lanes or where a through lane becomes an option lane for through or exiting traffic.

Section ~~2E.12~~ 2E.13 Designation of Destinations

Standard:

The direction of a freeway and the major destinations or control cities ~~(see Section 2D.39)~~ along it shall be clearly identified through the use of appropriate destination legends (see Section 2D.39). Successive freeway guide signs shall provide continuity in destination names and consistency with available map information. At any decision point, a given destination shall be indicated by way of only one route.

Guidance:

Control city legends should be used in the following situations along a freeway:

A. At interchanges between freeways;
B. At separation points of overlapping freeway routes;
C. On directional signs on intersecting routes, to guide traffic entering the freeway;
D. On Pull-Through signs; and
E. On the bottom line of post-interchange distance signs.

Support:

Continuity of destination names is also useful on expressways serving long-distance or intrastate travel.

The determination of major destinations or control cities is important to the quality of service provided by the freeway. Control cities on freeway guide signs are selected by the States and are contained in the "Guidelines for the Selection of Supplemental Guide Signs for Traffic Generators Adjacent to Freeways, 4th Edition / Guide Signs, Part II: Guidelines for Airport Guide Signing / Guide Signs, Part III: edited to increase accuracy List of Control Cities for Use in Guide Signs on Interstate Highways," published and available from American Association of State and Highway Transportation Officials (see ~~Page i for AASHTO's address~~ Section 1A.11 edited to increase consistency).

Section ~~2E.13~~ 2E.14 Size and Style of Letters and Signs

Standard:

Except as noted in Section 2A.11, the sizes of freeway and expressway guide signs that have standardized designs shall be as shown in Table 2E-1.

Support:

Section 2A.11 contains information regarding the applicability of the various columns in Table 2E-1.

Option:

Signs larger than those shown in Table 2E-1 may be used (see Section 2A.11).

Standard:

~~With~~ For all freeway and expressway signs that do not have a standardized design, the message dimensions shall be determined first, and the outside sign dimensions secondarily. Word messages in the legend of expressway guide signs shall be in letters at least 200 mm (8 in) high. Larger lettering shall be used for major guide signs at or in advance of interchanges and for all overhead signs. Minimum numeral and letter sizes for expressway guide signs according to interchange classification, type of sign, and component of sign legend ~~are~~ shall be as shown in Tables 2E-2 and 2E-3. Minimum numeral and letter sizes for freeway guide signs according to interchange classification, type of sign, and component of sign legend ~~appear~~ shall be as shown in Tables 2E-4 and 2E-5. All names of places, streets, and highways on freeway and expressway guide signs shall be composed of lower-case letters with initial upper-case letters. The letters and the numerals used shall be Series E(M) of the "Standard Highway Signs and Markings" book (see Section 1A.11). Other word legends shall be in ~~capital~~ upper-case letters. Interline and edge spacing shall be as specified in Section 2E.15.

Lettering size on freeway and expressway signs shall be the same for both rural and urban conditions.

Support:

Sign size is determined primarily in terms of the length of the message and the size of the lettering necessary for proper legibility. Letter style and height, and arrow design have been standardized for freeway and expressway signs to assure uniform and effective application.

Designs for upper-case~~,~~ and lower-case~~, and capital~~ alphabets together with tables of recommended letter spacing, are shown in the "Standard Highway Signs and Markings" book (see Section 1A.11).

Guidance:

Where upper- and lower-case lettering is used, the initial upper-case letters should be approximately 1.33 times the "loop" height of the lower-case letters. Freeway lettering sizes (see Tables 2E-4 and 2E-5) should be used when expressway geometric design is comparable to freeway standards.

Other sign letter size requirements not specifically identified elsewhere in this Manual should be guided by these specifications. Abbreviations (see Section 2E.17) should be kept to a minimum.

Support:

A sign mounted over a particular roadway lane to which it applies might have to be limited in horizontal dimension to the width of the lane, so that another sign can be placed over an adjacent lane. The necessity to maintain proper vertical clearance might also place a further limitation on the size of the overhead sign and the legend that can be accommodated.

Section ~~2E.14~~ 2E.15 Interline and Edge Spacing

Guidance:

Interline spacing of upper-case letters should be approximately three-fourths the average of upper-case letter heights in adjacent lines of letters.

The spacings to the top and bottom borders should be equal to the average of the letter height of the adjacent line of letters. The lateral spacing to the vertical borders should be essentially the same as the height of the largest letter.

Section ~~2E.15~~ 2E.16 Sign Borders

Standard:

Signs shall have a border of the same color as the legend in order to outline their distinctive shape and thereby give them easy recognition and a finished appearance.

Guidance:

For guide signs larger than 3000 x 1800 mm (120 x 72 in), the border should have a width of 50 mm (2 in). For smaller guide signs, a border width of 31 mm (1.25 in) should be used, but the width should not exceed the stroke width of the major lettering on the sign.

Corner radii of sign borders should be one-eighth of the minimum sign dimension on guide signs, except that the radii should not exceed 300 mm (12 in) on any sign.

Option:

The sign material in the area outside of the corner radius may be trimmed.

Section ~~2E.16~~ 2E.17 Abbreviations

Guidance:

Abbreviations should be kept to a minimum; however, they are useful when complete destination messages produce excessively long signs. If used, abbreviations should be unmistakably recognized by road users (see Section 1A.15).

Periods, apostrophes, question marks, ampersands, or other punctuation or characters that are not letters or numerals (except as otherwise provided in Table 1A-1) should not be used in abbreviations, unless ~~a cardinal direction is abbreviated as part of a destination name~~ absolutely necessary to avoid confusion.

Standard:

The words NORTH, SOUTH, EAST, and WEST shall not be abbreviated when used with route signs to indicate cardinal directions on guide signs.

Section ~~2E.17~~ 2E.18 Symbols

Standard:

Symbol designs shall be essentially like those shown in this Manual and in the "Standard Highway Signs and Markings" book (see Section 1A.11).

Guidance:

A special effort should be made to balance legend components for maximum legibility of the symbol with the rest of the sign.

Option:

Educational plaques may be used below symbol signs where needed.

Section ~~2E.18~~ 2E.19 Arrows for Interchange Guide Signs

Standard:

Arrows used on interchange guide signs shall be of the types shown in Figure 2D-2 and shall conform to the provisions of this Section and Section 2D.08.

~~On all~~ Except on diagrammatic Exit Direction signs (see Section 2E.20) and on Exit Direction signs for lane drops (see Section 2E.21), directional arrows on ~~both~~ all overhead and ~~ground-~~ post-mounted edited to increase consistency ~~, arrows~~ Exit Direction signs shall be upward slanting and shall be located on the side of the sign consistent with the direction of the exiting movement.

Option:

On post-mounted non-diagrammatic Exit Direction signs that are located where a directional arrow to the side of the legend farthest from the roadway might create an unusually wide sign that limits the road user's view of the arrow, the directional arrow may be placed at the bottom portion of the sign, centered under the legend.

Standard:

~~**Downward pointing arrows shall be used only for overhead guide signs to prescribe lane assignment for traffic bound for a destination or route that can be reached only by being in the designated lane(s).**~~

On overhead signs where it is desirable to indicate a lane to be followed, a down arrow shall be positioned approximately over the center of the lane and shall point vertically downward toward the approximate center of that lane. Down arrows shall be used only on overhead guide signs that restrict the use of specific lanes to traffic bound for the destination(s) and/or route(s) indicated by these arrows. Down arrows shall not be used unless an arrow can be located over and pointed to the approximate center of each lane that can be used to reach the destination displayed on the sign.

If down arrows are used, having more than one down arrow pointing to the same lane on a single overhead sign (or on multiple signs on the same overhead sign structure) shall not be permitted.

Option:

~~Downward pointing arrows may be tilted where it is desired to emphasize the separation of roadways.~~

Provided that the arrow is positioned approximately over the center of the lane, a directional arrow pointing diagonally downward may be used instead of a vertical down arrow on an overhead guide sign for the purpose of emphasizing a separation of diverging roadways.

Support:

~~Examples of~~ Arrows for use on guide signs are shown in Figure 2D-2. Detailed ~~dimensions of~~ drawings and standardized sizes based on ranges of letter heights for these arrows are provided in the "Standard Highway Signs and Markings" book (see Section 1A.11).

Section ~~2E.19~~ 2E.20 Diagrammatic Signs

Support:

Diagrammatic signs are guide signs that show a graphic view of the exit arrangement in relationship to the main highway. Use of such guide signs has been shown to be superior to conventional guide signs for some interchanges.

Standard:

On freeways and expressways, diagrammatic signs (see Figure 2E-3) shall be used for the Advance Guide and Exit Direction signs for all multi-lane exits that have an optional exit lane that also carries the through route (see Figures 2E-4 and 2E-5) and for all splits that include an option lane (see Figure 2E-6). Diagrammatic signs shall not be used on freeways and expressways for any other types of exits or splits, including single-lane exits and splits that do not have an option lane.

Diagrammatic signs used on freeways and expressways shall include one arrow for each lane and shall be designed in accordance with the following criteria:

~~A. The graphic legend shall be of a plan view showing the off-ramp arrangement (see Figure 2E-3).~~
~~B. No other symbols or route shields shall be used as a substitute for arrowheads.~~
~~C. They shall not be installed at the exit direction location (see Section 2E.33).~~
~~D. The EXIT ONLY panel shall not be used on diagrammatic signs at any major split.~~

A. The sign shall include an upward pointing arrow for each lane of the approach to the split or exit, and the shaft of each arrow shall be located approximately over the center of the lane to which it applies.

B. Arrows for continuing through lanes shall be vertically upward pointing unless those lanes are on a significantly curved alignment beyond the theoretical gore, in which case the arrows for the continuing through lanes shall indicate the approximate degree of curvature (see Figure 2E-5).

C. The arrow for a lane that must exit shall be curved in the direction of the exit and shall be accompanied by black-on-yellow EXIT and ONLY (E11-1b) sign panels adjacent to the lower end of the arrow shaft. The E11-1b sign panels shall not be used for a split of two overlapping routes when neither of the diverging routes is designated as an exit. Where the through lanes curve and the exit continues on a straight alignment, upward pointing vertical arrows shall be used for the exiting movement and curved arrows for the through movement.

D. The arrow for an optional exit lane that also carries the through route shall have a single shaft that bifurcates into a vertically upward-pointing arrow and a curving arrow corresponding to the configuration of the through and exit lanes.

E. For splits with an option lane, the arrow for the lane from which either direction of the split can be accessed shall have a single shaft that bifurcates into two upward-pointing curving arrows showing the approximate degrees of curvature of the two roadways beyond the theoretical gore (see Figure 2E-6).

F. A vertical white line shall be used to separate the route shields and destinations for the two diverging movements from each other.

Guidance:

Diagrammatic signs used on freeways and expressways should be designed in accordance with the following additional criteria:

~~A. The graphic should not depict deceleration lanes.~~

A. No more than one destination should be ~~shown~~ displayed edited to increase consistency for each ~~arrowhead~~ movement, and no more than two destinations should be ~~shown~~ displayed edited to increase consistency per sign.

~~C. A black on yellow EXIT ONLY panel should be used to supplement a lane drop graphic.~~

B. The ~~shaft~~ arrowhead(s) for the ~~exit ramp~~ diverging movement should be ~~shorter than, but not separated from, the through movement graphic~~ positioned lower on the sign than the arrowhead(s) for the movement that continues straight ahead, independent of which movement carries the through route. Where the movements are freeway or expressway splits rather than exits, the ~~shafts~~ arrowheads should be ~~equal in length~~ positioned at approximately the same height on the sign.

~~E. Arrow shafts should contain lane lines where appropriate.~~

C. Route shields, cardinal directions, and destinations should be positioned on the sign such that they are clearly related to the arrowhead(s)~~, and the arrowhead should point toward the route shield~~ for the ~~off~~ movement to which they apply.

D. The cardinal direction should be placed adjacent to the route shield~~, and the destination should be placed below and justified with the route shield~~ for exits or splits leading in a single cardinal direction.

E. The vertical white line that is used to separate the route shields and destinations for the two diverging movements from each other should not descend below the top of the arrowheads for the through lanes, and should be positioned approximately halfway between the diverging arrowheads for the optional movement lane (see Figure 2E-3).

~~Diagrammatic signs should be used at the Advance Guide sign location(s) for the following:~~

~~A. Left exits (see Figure 2E-3).~~
~~B. Splits where the off-route movement is to the left (see Figure 2E-4).~~
~~C. Optional lane splits for non-overlapping routes (see Figure 2E-5).~~

~~D. Where a two-lane exit has an optional lane that carries the through route (see Figures 2E-6 and 2E-7). These interchanges create serious expectancy problems for drivers who are unfamiliar with the interchange.~~

~~E. Left exit interchange lane drop situations. In this situation, an EXIT ONLY (E11-1c) panel should be used without a down arrow for Advance Guide signs (see Figure 2E-8).~~

Standard:

Diagrammatic signs ~~have been shown to be inferior to conventional signs~~ shall not be used at cloverleaf interchanges ~~and shall not be used at these locations.~~ except in the following cases for which diagrammatic signs shall be used:

A. Where the outer (non-loop) exit ramp of the cloverleaf is a multi-lane exit having an optional exit lane that also carries the through route; and

B. At cloverleaf interchanges that include collector-distributor roadways, such as those illustrated in Figure 2E-30, that are accessed from the mainline by a multi-lane exit having an optional exit lane that also carries the through route. In this case, the diagrammatic sign shall only show the configuration of the lanes at the exit point to the collector-distributor roadway and not the entire interchange configuration.

Support:

Specific guidelines for more detailed design of diagrammatic signs are contained in the "Standard Highway Signs and Markings" book (see Section 1A.11).

Option:

Where extra emphasis of an especially low advisory ramp speed is needed, an EXIT XX km/h (MPH) legend (see Section 2E.32 and Figure 2E-21) may be shown at the bottom of the diagrammatic sign to supplement, but not to replace, the exit or ramp advisory speed warning signs.

Section ~~2E.20~~ 2E.21 Signing for Interchange Lane Drops

Standard:

The provisions of this Section shall only apply to lane drops at exits that do not have an optional exit lane. At exits that have an optional exit lane in addition to the dropped lane, diagrammatic signs (see Section 2E.20) shall be used.

Major guide signs for all lane drops at interchanges shall be mounted overhead. An EXIT ONLY sign added to increase consistency panel shall be used for all interchange lane drops at which the through route is carried on the mainline.

~~Guidance:~~

The EXIT ONLY (down arrow) (E11-1 or E11-1f) sign added to increase consistency panel (see Figure 2E-7) ~~should~~ shall be used on all signing of lane drops on all non-diagrammatic overhead Advance Guide signs ~~for right exits~~ (see Figures 2E-8 through 2E-10). ~~For lane drops on the left side, diagrammatic signing with the EXIT ONLY (E11-1c) panel (see Figure 2E-9) should be used without a down arrow for Advance Guide signs (see Figure 2E-8).~~

~~Standard:~~

For lane drops, the Exit Direction sign (see Section 2E.32 and Figure 2E-20) ~~and E11-1a panel (see Figure 2E-9)~~ shall be of the format shown in Figures 2E-8 ~~and~~ through 2E-10 ~~for all lane drops~~. ~~The standard slanted up arrow (left or right side) shall be included on the Exit Direction sign.~~ The bottom portion of the Exit Direction sign shall be yellow with a black border and shall include an upward diagonal black arrow (left or right) for each lane dropped at the exit, with the sign designed and placed so that each arrow is located over the approximate center of each lane being dropped. The words EXIT and ONLY shall be positioned to the left and right, respectively, of the arrow on the E11-1d sign panel for a single-lane drop. For a two-lane drop, the words EXIT ONLY shall be located between the two arrows on the E11-1e sign panel.

Option:

EXIT ONLY messages of either E11-1b or E11-1c formats may be used to retrofit existing signing to warn of a lane drop situation ahead.

Standard:

If used ~~on~~ to retrofit an existing Advance Guide sign, the E11-1b sign added to increase consistency panel (see Figure 2E-7) shall be placed on either side of a white down arrow. The E11-1c sign added to increase consistency panel, if used ~~on~~ to retrofit an existing nondiagrammatic sign, shall be placed between the lower destination message and the white down arrow.

Guidance:

Advance Guide signs for lane drops within 2 km or 1 mile of the interchange should not contain the distance message.

Where the dropped lane is an auxiliary lane that is provided between successive entrance and exit ramps of two separate interchanges and the distance between the two ramps is less than 2 km or 1 mile, the first Advance Guide sign in the sequence downstream from the entrance ramp should contain the distance message.

Wherever the dropped lane carries the through route, ~~diagrammatic~~ signs should be used without the EXIT ONLY panel.

Support:

Section 2B.23 contains information regarding regulatory signing that can also be used for freeway lane drop situations and Section 2C.42 contains information regarding the advance guide signing that can also be used for freeway lane drop situations.

~~Section 2E.21 Changeable Message Signs~~ **the text from this Section has been relocated to new Chapter 2M**

Section 2E.22 Overhead Sign Installations

Support:

Specifications for the design and construction of structural supports for ~~highway~~ deleted to increase consistency signs have been standardized by the American Association of State Highway and Transportation Officials (AASHTO). Overcrossing structures can often serve for the support of overhead signs, and might in some cases be the only practical location that will provide adequate viewing distance. Use of these structures as sign supports will eliminate the need for additional sign supports along the roadside. Factors justifying the installation of overhead signs are given in Section 2A.17. Vertical clearance of overhead signs is discussed in Section 2A.18.

Section 2E.23 Lateral Offset

Standard:

The minimum lateral ~~clearance~~ offset edited to increase consistency outside the usable roadway shoulder for ~~ground-~~ post-mounted edited to increase consistency freeway and expressway signs or for overhead sign supports, either to the right-hand edited to increase clarity or left-hand edited to increase clarity side of the roadway, shall be 1.8 m (6 ft). This minimum clearance shall also apply outside of a ~~barrier~~ curb. If located within the clear zone, the signs shall be mounted on crashworthy supports or shielded by appropriate crashworthy barriers.

Guidance:

Where practical, a sign should not be less than 3 m (10 ft) from the edge of the nearest traffic lane. Large guide signs especially should be farther removed, preferably 9 m (30 ft) or more from the nearest traffic lane.

Where an expressway median is 3.7 m (12 ft) or less in width, consideration should be given to spanning both roadways without a center support.

Where overhead sign supports cannot be placed ~~a reasonably safe distance~~ sufficiently far away from the line of traffic or in an otherwise protected site, they should either be designed to minimize the impact forces, or be adequately shielded by a ~~physical~~ traffic barrier ~~or guardrail~~ of suitable design.

Standard:

Butterfly-type sign supports and other overhead noncrashworthy sign supports shall not be installed in gores or other unprotected locations within the clear zone.

Option:

Lesser clearances, but not generally less than 1.8 m (6 ft), may be used on connecting roadways or ramps at interchanges.

Section ~~2E.25~~ 2E.24 Route Signs and Trailblazer Assemblies

Standard:

The official Route sign for the Interstate Highway System shall be the red, white, and blue retroreflective distinctive shield adopted by the American Association of State Highway and Transportation Officials (see Section 2D.11).

Guidance:

Route signs (see Figure 2E-11) should be incorporated as cut-out shields or other distinctive shapes on large directional guide signs. Where the Interstate shield is displayed in an assembly or on the face of a guide sign with U.S. or State Route signs, the Interstate numeral should be at least equal in size to the numerals on the other Route signs. The use of independent Route signs should be limited primarily to route confirmation assemblies.

Route signs and auxiliary signs showing junctions and turns should be used for guidance on approach roads, for route confirmation just beyond entrances and exits, and for reassurance along the freeway or expressway. When used along the freeway or expressway, the Route signs should be enlarged to a 900 mm x 900 mm (36 x 36 in) minimum size for routes with one or two digits and to a 1125 x 900 mm (45 x 36 in) minimum size for routes with three digits as shown in the "Standard Highway Signs and Markings" book (see Section 1A.11). When independently mounted Route signs are used in place of Pull-Through signs, they should be located just beyond the exit.

Option:

The standard Trailblazer Assembly (see Section 2D.37) may be used on roads leading to the freeway or expressway. Component parts of the Trailblazer Assembly may be included on a single sign ~~panel~~. deleted to increase accuracy Independently mounted Route signs may be used instead of Pull-Through signs (see Section 2E.12) as confirmation information ~~(see Section 2E.12)~~.

Guidance:

If shields or other similar signs are used to provide route guidance in following a trail (see Section 2I.08), they should be designed in accordance with the sizes and other design principles for route signs, such as those described in Sections 2D.10 through 2D.12.

Option:

The commonly used name or trailblazer symbol for a toll facility may be displayed on nontoll sections of the Interstate Highway System at:

A. The last exit before entering a toll section of the Interstate Highway System;
B. The interchange or connection with a toll facility, whether or not the toll facility is a part of the Interstate Highway System; and
C. Other locations within a reasonable approach distance of toll facilities when the name or trailblazer symbol for the toll facility would provide better guidance to road users unfamiliar with the area than would place names and route numbers.

The toll facility name or symbol may be included as a part of the guide sign installations on intersecting highways and approach roads to indicate the interchange with a toll section of an Interstate route. Where needed for the proper direction of traffic, a trailblazer for a toll facility that is part of the Interstate Highway System may be displayed with the Interstate Trailblazer Assembly.

Section ~~2E.26~~ 2E.25 Signs for Intersections at Grade

Guidance:

If there are intersections at grade within the limits of an expressway, guide sign types specified in Chapter 2D should be used. However, such signs should be of a size compatible with the size of other signing on the expressway.

Option:

Advance Guide signs for intersections at grade may take the form of diagrammatic layouts depicting the geometrics of the intersection along with essential directional information.

Section ~~2E.27~~ 2E.26 Interchange Guide Signs

Standard:

The signs at interchanges and on their approaches shall include Advance Guide signs and Exit Direction signs. Consistent destination messages shall be displayed on these signs.

Guidance:

New destination information should not be introduced into the major sign sequence for one interchange, nor should destination information be dropped.

Reference should be made to Section 2E.11 and Sections 2E.29 through 2E.38 for a detailed description of the signs in the order that they should appear at the approach to and beyond each interchange. Guide signs placed in advance of an interchange deceleration lane should be spaced at least 245 m (800 ft) apart.

Supplemental guide signing should be used sparingly as provided in Section 2E.31.

Section ~~2E.28~~ 2E.27 Interchange Exit Numbering

Support:

Interchange exit numbering provides valuable orientation for the road user on a freeway or expressway. The feasibility of numbering interchanges or exits on an expressway will depend largely on the extent to which grade separations are provided. Where there is appreciable continuity of interchange facilities, interrupted only by an occasional intersection at grade, the numbering will be helpful to the expressway user.

Standard:

Interchange numbering shall be used in signing each freeway interchange exit. Interchange exit numbers shall be displayed with each Advance Guide sign, Exit Direction sign, and Gore sign. The exit number shall be displayed on a separate plaque at the top of the Advance Guide or Exit Direction sign. The ~~standard~~ exit number (E1-5P) plaque (see Figure 2E-15) shall be 750 mm (30 in) in height and shall include the word EXIT~~,~~ and the appropriate exit number~~, and the suffix letter (on multi-exit interchanges) separated from the exit number by a space~~ in a single-line format ~~on a plaque 750 mm (30 in) in height~~. If suffix letters are used for exit numbering at a multi-exit interchange, the suffix letter shall also be included on the exit number plaque and shall be separated from the exit number by a space having a width of at least half of the height of the suffix letter. Exit numbers shall not include the cardinal initials corresponding to the directions of the cross route. Minimum numeral and letter sizes are given in Tables 2E-2 through 2E-5. If used, the interchange numbering system for expressways shall ~~conform to~~ comply with the provisions prescribed for freeways.

If suffix letters are used for exit numbering at a multi-exit interchange, then an exit of the same number without a suffix letter shall not be used. For example, if an exit is designated as EXIT 256 A, then there shall not be an exit designated as EXIT 256 in the same vicinity.

~~Option:~~

~~**There are two approaches to** **Interchange exit numbering ~~that the State and local highway agencies may~~ shall use~~: (1)~~ the reference location sign exit numbering method. ~~or (2)~~ The consecutive exit numbering method shall not be used.**

Support:

Reference location sign exit numbering ~~is preferred over consecutive exit numbering for two reasons: (1) if new interchanges are added to a route, the highway agencies do not have to change the numbering sequence; and (2) reference location sign numbering~~ assists road users in determining their destination distances and travel mileage, and assists highway agencies because the exit numbering sequence does not have to be changed if new interchanges are added to a route.

Option:

Exit numbers may also be used with Supplemental Guide signs and ~~Road User~~ Motorist Service signs.

Guidance:

Exit number (E1-5P) plaques should be ~~located~~ added to~~ward~~ the top ~~left edge of the sign for a left exit and toward the top~~ right-hand edge for ~~right exits~~ an exit to the right. edited to increase clarity

Standard:

Because road users might not expect ~~a left~~ an exit to the left edited to increase clarity and might have difficulty in maneuvering to the left, ~~the word LEFT should be added to the~~ a left exit number (E1-5bP) plaque (see Figure 2E-15) shall be added to the top left-hand edge for all left-hand exits (see Figures 2E-8 and 2E-9). ~~Where a left exit is not numbered (no exit number plaque), a plaque with the word LEFT should be added to the top left edge of the sign.~~ The ~~portion of the exit number plaque~~

~~containing the~~ **word LEFT** on the E1-5bP **plaque** ~~may~~ shall ~~have~~ be **a black legend** ~~and border~~ **on a yellow** rectangular **background** and shall be centered above the word EXIT. **the last sentence was formerly an Option paragraph**

Support:

Example exit number plaque designs are shown in Figure~~s 2E-3 and~~ 2E-15. Figures ~~2E-1, 2E-20, 2E-24, 2E-28 through 2E-33, and 2E-42~~ 2E-15, 2E-19, and 2E-21 illustrate the incorporation of exit number plaques on guide signs. relocated ahead of subsequent paragraph to increase continuity

The general plan for numbering interchange exits is shown in Figures 2E-12 through 2E-14. Figure 2E-12 shows a circumferential route, which is a route that makes a complete circle around a city or town and usually has two interchanges (one on each side of the city or town) with each of the mainline routes that travel through the city or town. Figure 2E-13 shows a loop route, which is a route that departs from a mainline route and then rejoins the same mainline route at a subsequent point downstream, and a spur route, which is a route that departs from a mainline route and never rejoins the same mainline route. Figure 2E-14 shows two mainline routes that overlap each other.

Standard:

~~Where~~ Regardless of whether a mainline route originates within a State or crosses into a State from another State, edited to increase accuracy the southernmost or westernmost terminus within that State shall be the beginning point for interchange numbering. edited to increase consistency ~~If a loop, spur, or circumferential route crosses State boundaries, the sequence of numbering shall be coordinated by the States to provide continuous numbering.~~ relocated to three paragraphs below to increase continuity

For circumferential routes, ~~the~~ interchange numbering ~~of interchanges~~ edited to increase consistency shall be in a clockwise direction. The numbering shall begin with the first interchange west of the south end of an imaginary north-south line bisecting the circumferential route, at a radial freeway or other Interstate route, or some other conspicuous landmark in the circumferential route near a south polar location (see Figure 2E-12).

The interchange numbers on loop routes shall begin at the loop interchange nearest the south or west mainline junction and increase in magnitude toward the north or east mainline junction (see Figure 2E-13).

Spur route interchanges shall be numbered in ascending order starting at the interchange where the spur leaves the mainline ~~of the principal~~ edited to increase consistency route (see Figure 2E-13).

If a circumferential, loop, or spur route crosses State boundaries, the numbering sequence shall be coordinated by the States to provide continuous interchange numbering. relocated from three paragraphs above to increase continuity

Where numbered routes overlap, continuity of interchange numbering shall be established for only one of the routes (see Figure 2E-14). If one of the routes is an Interstate and the other route is not an Interstate, added to increase clarity the Interstate route shall maintain continuity of interchange numbering.

Guidance:

The route chosen for continuity of interchange numbering should also have reference location sign continuity (see Figure 2E-14).

Section ~~2E.29~~ 2E.28 Interchange Classification

Support:

For signing purposes, interchanges are classified as major, intermediate, and minor. The minimum alphabet sizes contained in Tables 2E-2 and 2E-4 are based on this classification. Descriptions of these classifications are as follows:

A. Major interchanges are subdivided into two categories: (a) interchanges with other expressways or freeways, or (b) interchanges with high-volume multi-lane highways, principal urban arterials, or major rural routes where the volume of interchanging traffic is heavy or includes many road users unfamiliar with the area.
B. Intermediate interchanges are those with urban and rural routes not in the category of major or minor interchanges.

C. Minor interchanges include those where traffic is local and very light, such as interchanges with land service access roads. Where the sum of exit volumes is estimated to be lower than 100 vehicles per day in the design year, the interchange is classified as minor.

Section ~~2E.30~~ 2E.29 Advance Guide Signs (E1-1, E1-1a, E1-2, and E1-2a)

Support:

The Advance Guide (E1-1, E1-1a, E1-2, and E1-2a) sign (see Figure 2E-15) gives notice well in advance of the exit point of the principal destinations served by the next interchange and the distance to that interchange ~~(see Figure 2E-15)~~.

Guidance:

For major and intermediate interchanges (see Section 2E.28), Advance Guide signs should be placed at 1 km or 0.5 miles and at 2 km or 1 mile in advance of the exit with a third Advance Guide sign placed at 4 km (2 mi) in advance of the exit if spacing permits. At minor interchanges, only one Advance Guide sign should be used. It should be located 1 to 2 km or 0.5 to 1 mile from the exit gore. If the sign is located less than 1 km or 0.5 miles from the exit, the distance ~~shown~~ displayed edited to increase consistency should be to the nearest 400 m or 1/4 mile. Fractions of kilometers or decimals of kilometers should not be used. Fractions of a mile, rather than decimals, should be ~~shown~~ displayed edited to increase consistency in all cases.

Standard:

Instead of an exit number (E1-5P) plaque, a LEFT (E1-5aP) plaque (see Figure 2E-15) shall be added to the top left edge of the sign for non-numbered exits to the left.

Support:

Section 2E.29 contains information regarding Advance Guide signs for numbered exits to the left.

Standard:

~~**Where**~~ **Advance Guide signs** ~~**are provided for a left exit,**~~ **for multi-lane exits having an optional exit lane that also carries the through route (see Figures 2E-4 and 2E-5) and for splits with an option lane (see Figure 2E-6) shall be diagrammatic signs** ~~**should be used (see Figure 2E-3)**~~ **designed in accordance with Section 2E.20.**

~~**Standard:**~~

When used, Advance Guide signs shall contain the distance message. The legend on the Advance Guide signs shall be the same as the legend on the Exit Direction sign, except that the last line shall read EXIT XX km (~~EXIT X~~ MILES). If the interchange has two or more exit roadways, the bottom line shall read EXITS XX km (~~EXITS X~~ MILES).

Guidance:

Where interchange exit numbers are used, the word EXIT(S) ~~may~~ should be omitted from the bottom line.

Option:

Where the distance between interchanges is more than 2 km or 1 mile, but less than 4 km or 2 miles, the first Advance Guide sign may be closer than 4 km or 2 miles, but not placed so as to overlap the signing for the previous exit. Duplicate Advance Guide signs or Interchange Sequence Series signs may be placed in the median on the opposite side of the roadway and are not included in the minimum requirements of interchange signing.

Guidance:

Where there is less than 245 m (800 ft) between interchanges, Interchange Sequence Series signs (see Section 2E.36) should be used instead of Advance Guide signs for the affected interchanges.

The Advance Guide signs for the last exit from a highway before it becomes a facility on which toll payments are required should include the LAST EXIT BEFORE TOLL (W16-16P) plaque (see Section 2C.68 and Figure 2C-9). The plaque should be installed above the Advance Guide signs.

Option:

If there is insufficient space above the Advance Guide sign because of the presence of an exit number plaque, the W16-16P plaque may be installed below the Advance Guide sign.

Section ~~2E.31~~ 2E.30 Next Exit Supplemental Signs (E2-1 and E2-1a)

Option:

Where the distance to the next interchange is unusually long, Next Exit (E2-1 and E2-1a) supplemental signs (see Figure 2E-16) may be installed to inform road users of the distance to the next interchange ~~(see Figure 2E-16)~~.

Guidance:

The Next Exit supplemental sign should not be used unless the distance between successive interchanges is more than 8 km (5 mi).

Standard:

The Next Exit supplemental sign shall carry the legend NEXT EXIT XX km (~~X~~ MILES). If the Next Exit supplemental sign is used, it shall be placed below the Advance Guide sign nearest the interchange. It shall be mounted so as to not adversely affect the breakaway feature of the sign support structure.

Option:

The legend for the Next Exit supplemental sign may be displayed in either one or two lines. The one-line message is the more desirable choice unless the message causes the sign to have a horizontal dimension greater than that of the Advance Guide sign.

Section ~~2E.32~~ 2E.31 Other Supplemental Guide Signs

Support:

Supplemental Guide signs can be used to provide information regarding destinations accessible from an interchange, other than places ~~shown~~ displayed edited to increase consistency on the standard interchange signing. However, such Supplemental Guide signing can reduce the effectiveness of other more important guide signing because of the possibility of overloading the road user's capacity to receive visual messages and make appropriate decisions. "The AASHTO Guidelines for the Selection of Supplemental Guide Signs for Traffic Generators Adjacent to Freeways" is incorporated by reference in this section (see Page i for AASHTO's address).

Guidance:

No more than one Supplemental Guide sign should be used on each interchange approach.

A Supplemental Guide sign (see Figure 2E-17) should not list more than two destinations. Destination names should be followed by the interchange number (and suffix), or if interchanges are not numbered, by the legend NEXT RIGHT or SECOND RIGHT or both, as appropriate. The Supplemental Guide sign should be installed as an independent guide sign assembly.

Where two or more Advance Guide signs are used, the Supplemental Guide sign should be installed approximately midway between two of the Advance Guide signs. If only one Advance Guide sign is used, the Supplemental Guide sign should follow it by at least 245 m (800 feet). If the interchanges are numbered, the interchange number should be used for the action message.

States and other agencies should adopt an appropriate policy for installing supplemental signs using "The AASHTO Guidelines for the Selection of Supplemental Guide Signs for Traffic Generators Adjacent to Freeways." In developing policies for such signing, such items as population, amount of traffic generated, distance from the route, and the significance of the destination should be taken into account.

Standard:

Guide signs directing drivers to park and ride facilities shall be considered as Supplemental Guide signs (see Figures 2E-18 and 2E-19).

Section ~~2E.33~~ 2E.32 Exit Direction Signs

Support:

The Exit Direction sign (see Figure 2E-20) repeats the route and destination information that was ~~shown~~ displayed edited to increase consistency on the Advance Guide sign(s) for the next exit, and thereby assures road users of the destination served and indicates whether they exit to the right or ~~the~~ deleted to improve grammar left for that destination.

Standard:

Exit Direction signs ~~(see Figure 2E-20)~~ shall be used at major and intermediate interchanges. Population figures or other similar information shall not be used on Exit Direction signs.

Guidance:

Exit Direction signs should be used at minor interchanges.

~~Ground-~~ Post-mounted edited to increase consistency Exit Direction signs should be installed at the beginning of the deceleration lane. If there is less than 90 m (300 ft) from the beginning of the deceleration lane to the theoretical gore (see Figure 3B-8), the Exit Direction sign should be installed overhead over the exiting lane in the vicinity of the theoretical gore.

Standard:

Except where diagrammatic signs are required (see Section 2E.20), where a through lane is being terminated (dropped) at an exit, the Exit Direction sign shall be placed overhead at the theoretical gore (see Figures 2E-5, 2E-6, and 2E-8 through 2E-10).

Where diagrammatic signs are used for the Advance Guide sign(s) for a multi-lane exit having an optional exit lane that also carries the through route or for a split with an option lane (see Section 2E.20), a diagrammatic sign shall also be used instead of the Exit Direction sign. This diagrammatic sign shall include the exit number (E1-5P) plaque (if a numbered exit) and it shall be located near, but not beyond, the point where the outside edge of the dropped lane begins to diverge from the mainline (see Figures 2E-4 and 2E-5).

The following provisions shall govern the design and application of ~~the~~ overhead non-diagrammatic Exit Direction signs:

- **A. The sign shall carry the exit number (if used), the route number, cardinal direction, and destination with an appropriate upward slanting arrow (see Figure 2E-20).**
- **B. The message EXIT ONLY in black on a yellow sign added to increase consistency panel (E11-1e or E11-1f) shall be used on the overhead Exit Direction sign to advise road users of a lane drop situation (see Figures 2E-8 through 2E-10). The sign shall ~~conform to~~ comply with the provisions of Section 2E.21.**
- ~~**C. Diagrammatic signs shall not be employed at the exit direction location.**~~

Guidance:

For numbered exits to the right, an exit number (E1-5P) plaque~~s~~ (see Figure 2E-15) should be ~~located~~ added to~~ward~~ the ~~left edge of the sign for a left exit and toward the~~ top right-hand edge of the sign ~~for right exits~~.

Standard:

For numbered exits to the left, a left exit number (E1-5bP) plaque (see Figure 2E-15) shall be added to the top left-hand edge of the sign.

For non-numbered exits to the left, a LEFT (E1-5aP) plaque (see Figure 2E-15) shall be added to the top left-hand edge of the sign.

Support:

Section 2E.29 contains information regarding Advance Guide signs for numbered exits to the left.

Option:

In some cases, principally in urban areas, where restricted sight distance because of structures or unusual alignment make it impossible to locate the Exit Direction sign without violating the required minimum spacing (see Section 2E.29) between major guide signs, Interchange Sequence signs (see Section 2E.36) may be substituted for an Advance Guide sign.

Guidance:

At multi-exit interchanges, the Exit Direction sign should be located directly over the exiting lane for the first exit. At the same location, and normally over the right-hand through lane, an Advance Guide sign for the second exit should be located. Only for those conditions where the through movement is not evident should a confirmatory message (Pull-Through sign as shown in Figure 2E-2) be used over the left lane(s) to guide road users traveling through an interchange. In the interest of sign spreading, three signs on one structure should not be used. When the freeway or expressway is on an overpass, the Exit Direction sign should be installed on an overhead support over the exit lane in advance of the gore point.

Option:

If the second exit is beyond an underpass, the Exit Direction sign may be mounted on the face of the overhead structure.

Where extra emphasis of an especially low advisory ramp speed is needed, an EXIT XX km/h (MPH) legend may be shown at the bottom the Exit Direction sign to supplement, but not replace, the exit or ramp

advisory speed warning signs by adding an EXIT XX km/h (MPH) (E13-2) sign panel to the face of the Exit Direction sign near the bottom of the sign (see Figure 2E-21).

Guidance:

At the last exit from a highway before it becomes a facility on which toll payments are required, the LAST EXIT BEFORE TOLL (W16-16P) plaque (see Section 2C.68 and Figure 2C-9) should be installed above the Exit Direction sign.

Option:

If there is insufficient space above the Exit Direction sign because of the presence of an Exit Number (E1-5P) plaque, the W16-16P plaque may be installed below the Exit Direction sign.

Section ~~2E.34~~ 2E.33 Exit Gore Signs (E5-1 and E5-1a)

Support:

The Exit Gore (E5-1 or E5-1a) sign (see Figure 2E-22) in the gore indicates the exiting point or the place of departure from the main roadway. Consistent application of this sign at each exit is important.

Standard:

The gore shall be defined as the area located between the main roadway and the ramp just beyond where the ramp branches from the main roadway. The Exit Gore sign shall be located in the gore and shall carry the word EXIT or EXIT XX (if interchange numbering is used) and an appropriate upward slanting arrow ~~(see Figure 2E-22)~~. If suffix letters are used for exit numbering at a multi-exit interchange, the suffix letter shall also be included on the Exit Gore sign and shall be separated from the exit number by a space having a width of at least half of the height of the suffix letter. Breakaway or yielding supports shall be used.

Guidance:

The arrow should be aligned to approximate the angle of departure. Each gore should be treated similarly, whether the interchange has one exit roadway or multiple exits.

Option:

Where extra emphasis of an especially low advisory ramp speed is needed, an E13-1P ~~panel~~ plaque edited to increase accuracy indicating the advisory speed may be mounted below the Exit Gore sign (see Figure 2E-22) to supplement, but not to replace, the exit or ramp advisory speed warning signs.

To improve the visibility of the gore for exiting drivers, a Type 1 object marker (see Chapter 2L) may be installed on each sign support below the Exit Gore sign.

For narrow gore areas of limited width, the Exit Gore (E5-1a) sign may be in the shape of a vertical rectangle with the arrow placed below the exit number.

An Exit Number (E5-1bP) plaque (see Figure 2E-22) may be installed above an existing Exit Gore (E5-1) sign when a non-numbered exit is converted to a numbered exit.

Standard:

An Exit Gore (E5-1a) sign shall be used when the replacement of an existing assembly of an E5-1 sign and an E5-1bP plaque becomes necessary.

Section ~~2E.35~~ 2E.34 Post-Interchange Signs

Guidance:

If space between interchanges permits, as in rural areas, and where undue repetition of messages will not occur, a fixed sequence of signs should be displayed beginning 150 m (500 ft) beyond the downstream end of the acceleration lane. At this point a Route sign assembly should be installed followed by a Speed Limit sign and a Distance sign, each at a spacing of 300 m (1,000 ft).

If space between interchanges does not permit placement of these three post-interchange signs without encroaching on or overlapping the Advance Guide signs necessary for the next interchange, or in rural areas where the interchanging traffic is primarily local, one or more of the post-interchange signs should be omitted.

Option:

Usually the Distance sign will be of less importance than the other two signs and may be omitted, especially if Interchange Sequence signs are used. If the sign for through traffic on an overhead assembly already contains the route sign, the post-interchange route sign assembly may also be omitted.

Section ~~2E.36~~ 2E.35 Distance Signs

Standard:

If used, the Post-Interchange Distance sign shall consist of a two- or three-line sign carrying the names of significant destination points and the distances to those points. The top line of the sign shall identify the next meaningful interchange with the name of the community near or through which the route passes, or if there is no community, the route number or name of the intersected highway (see Figure 2E-23).

Support:

The minimum sizes of the route shields identifying a significant destination point are prescribed in Tables ~~2E-1 through~~ 2E-3 and 2E-5.

Option:

The text identification of a route may be ~~shown~~ displayed edited to increase consistency instead of a route shield, such as "US XX," "State Route XX," or "County Route XX."

Guidance:

If a second line is used, it should be reserved for communities of general interest that are located on or immediately adjacent to the route or for major traffic generators along the route.

Option:

The choice of names for the second line, if it is used, may be varied on successive Distance signs to give road users maximum information concerning communities served by the route.

Standard:

The third, or bottom line, shall contain the name and distance to a control city (if any) that has national significance for travelers using the route.

Guidance:

Distances to the same destinations should not be shown more frequently than at 8 km (5 mi) intervals. The distances displayed on these signs should be the actual distance to the destination points and not to the exit from the freeway or expressway. A well-defined central area or central business district should be used where one exists. In other cases, the layout of the community should be considered in relation to the highway being signed and the decision based on where it appears that most drivers would feel that they are in the center of the community in question.

Section ~~2E.37~~ 2E.36 Interchange Sequence Signs

Option:

If interchanges are closely spaced, particularly through large urban areas, so that guide signs cannot be adequately spaced, Interchange Sequence signs identifying the next two or three interchanges may be used. the sequence of this paragraph and the next two paragraphs was rearranged to increase clarity

Guidance:

If used, Interchange Sequence signs should be used over the entire length of a route in an urban area. Except as noted in the next paragraph, they should not be used on a single interchange basis.

If there is less than 245 m (800 ft) between interchanges, Interchange Sequence signs should be used instead of the Advance Guide signs for the affected interchanges.

Support:

Interchange Sequence signs are generally supplemental to Advance Guide signs. Signing of this type is illustrated in Figures 2E-24 and 2E-25, and is compatible with the sign spreading concept.

These signs are installed in a series and display the next two or three interchanges by name or route number with distances to the nearest 400 m or 1/4 mile.

Standard:

If used, the first sign in the series shall be located in advance of the first Advance Guide sign for the first interchange.

Where the exit direction is to the left, a LEFT EXIT (E11-2) sign panel or a LEFT (E11-2a) sign panel (see Figure 2E-7) shall be displayed on the same line immediately to the right of the interchange name~~s~~ or route number~~s shown on such signs shall be followed by the legend LEFT or LEFT EXIT in black letters on a yellow rectangular background~~.

Interchange Sequence signs shall not be substituted for Exit Direction signs.

Guidance:

Interchange Sequence signs should be located in the median. After the first of the series, Interchange Sequence signs should be placed approximately midway between interchanges.

Standard:

Interchange Sequence signs located in the median shall be installed at overhead sign height.

Option:

Interchange numbers may be ~~shown~~ displayed edited to increase consistency to the left of the interchange name or route number.

Section ~~2E.38~~ 2E.37 Community Interchanges Identification Signs

Support:

For suburban or rural communities served by two or three interchanges, Community Interchanges Identification signs are useful (see Figure 2E-26).

Guidance:

In these cases, the name of the community followed by the word EXITS should be ~~shown~~ displayed edited to increase consistency on the top line; the lines below should display the destination, road name or route number, and the corresponding distances to the nearest 400 m or 1/4 mile.

The sign should be located in advance of the first Advance Guide sign for the first interchange within the community.

Option:

If interchanges are not conveniently identifiable or if there are more than three interchanges to be identified, the NEXT XX EXITS sign (see Section 2E.38) may be used.

Section ~~2E.39~~ 2E.38 NEXT XX EXITS Sign

Support:

Many freeways or expressways pass through historical or recreational regions, or urban areas served by a succession of several interchanges.

Option:

Such regions or areas may be indicated by a NEXT XX EXITS sign (see Figure 2E-27) located in advance of the Advance Guide sign or signs for the first interchange.

Guidance:

The sign legend should identify the region or area followed by the words NEXT XX EXITS.

Section ~~2E.40~~ 2E.39 Signing by Type of Interchange

Support:

Road users need signs to help identify the location of the exit, as well as to obtain route, direction, and destination information for specific exit ramps. Figures 2E-28 through 2E-33 show examples of guide signs for common types of interchanges. The interchange layouts shown in most of the figures illustrate only the major guide signs for one direction of traffic on the ~~through road~~ freeway and on the ~~crossroad~~ exit ramps. Section 2D.47 contains information regarding the signing of the crossroad approaches and connecting roadways to freeways and expressways.

Standard:

Interchange guide signing shall be consistent for each type of interchange along a route.

Guidance:

The signing layout for all interchanges having only one exit ramp in the direction of travel should be similar, regardless of the interchange type (see Figures 2E-9, 2E-10, and Figures 2E-28 through 2E-33). For the sake of uniform application, the significant features of the signing plan for each of the more frequent kinds of interchanges (illustrated in Figures 2E-28 through 2E-33) should be followed as closely as possible. Even when unusual geometric features exist, variations in signing layout should be held to a minimum.

Section ~~2E.41~~ 2E.40 Freeway-to-Freeway Interchange

Support:

Freeway-to-freeway interchanges are major decision points where the effect of taking a wrong ramp cannot be easily corrected. Reversing direction on the connecting freeway or reentering to continue on the intended course is usually not possible. Figure 2E-28 shows examples of guide signs at a freeway-to-freeway interchange.

Guidance:

The sign messages should contain only the route shield, cardinal direction, and the name of the next control city on the route. Arrows should point as indicated in Section 2D.08, unless a diagrammatic representation of the interchange layout requires otherwise (see Section 2E.20).

Support:

At splits where the off-route movement is to the left or where there is an optional lane split, expectancy problems usually result~~, and diagrammatic signs should be used at the Advance Guide sign location~~.

Standard:

At splits where the off-route movement is to the left, the word LEFT shall be added to the exit number (E1-5P) plaque (see Section 2E.27). Diagrammatic signs (see Section 2E.20) ~~also should~~ shall be used ~~at the Advance Guide sign locations~~ for ~~interchanges where two-lane exits with an optional lane carry the through route on the exiting lanes~~ freeway splits with an option lane and for multi-lane freeway-to-freeway exits having an option lane.

~~**Standard:**~~

Overhead signs shall be used at a distance of 2 km or 1 mile and at the theoretical gore of each connecting ramp. When diagrammatic signs are used, they shall ~~conform to~~ comply with the provisions of Section 2E.20.

Option:

Overhead signs may also be used at the 1 km or 0.5 mile and 4 km or 2 mile points.

The arrow and/or the name of the control city may be omitted on signs that indicate the straight-ahead continuation of a route.

An Exit Speed sign may be used where an engineering study shows that it is necessary to display a speed reduction message for ramp signing (see Section 2C.14).

Section ~~2E.42~~ 2E.41 Cloverleaf Interchange

Support:

A cloverleaf interchange has two exits for each direction of travel. The exits are closely spaced and have common Advance Guide signs. Examples of guide signs for cloverleaf interchanges are shown in Figure 2E-29.

Guidance:

The Advance Guide signs should include two place names, one corresponding to each exit ramp, with the name of the place served by the first exit on the upper line.

Standard:

An overhead guide sign shall be placed at the theoretical gore point of the first exit ramp, with an upward slanting arrow on the Exit Direction sign for that exit and the message XX km (~~XX~~ MILE), or EXIT XX km (MILE) if interchange numbering is not used, on the Advance Guide sign for the second exit, as shown in Figure 2E-29. The second exit shall be indicated by an overhead Exit Direction sign over the auxiliary lane. An Exit sign shall also be used at each gore (see Section 2E.33).

Interchanges with more than one exit from the main line shall be numbered as described in Section 2E.27 with an appropriate suffix.

Diagrammatic signs shall not be used for cloverleaf interchanges except as otherwise noted in Section 2E.20.

Guidance:

As shown in Figure 2E-29, the overhead Exit Direction sign for the second exit should be mounted on the structure if the mainline passes under the crossroad and the exit roadway is located beyond the crossroad structure.

Option:

The Exit Direction sign for the second exit may be mounted on an overhead support in front of and as close as practical to the crossroad structure if it is not feasible to mount the Exit Direction sign directly on the crossroad structure.

Section ~~2E.43~~ 2E.42 Cloverleaf Interchange with Collector-Distributor Roadways

Support:

Examples of guide signs for full cloverleaf interchanges with collector-distributor roadways are shown in Figure 2E-30.

Guidance:

Signing on the collector-distributor roadways should be the same as the signing on the mainline of a cloverleaf interchange.

Standard:

Guide signs at exits from the collector-distributor roadways shall be overhead and located at the theoretical gore of the collector-distributor roadway and the exit ramp.

Option:

Exits from the collector-distributor roadways may be numbered with an appropriate suffix. If the exits from a collector-distributor roadway are numbered with suffixes, the Advance Guide signs on the mainline may include two place names and their corresponding exit numbers with the plural EXITS. If only the exit from the mainline is numbered or if interchange numbering is not used, the Advance Guide signs on the mainline ~~or~~ may use the singular EXIT.

Section ~~2E.44~~ 2E.43 Partial Cloverleaf Interchange

Support:

Examples of guide signs for partial cloverleaf interchanges are shown in Figure 2E-31.

Guidance:

As shown in Figure 2E-31, the overhead Exit Direction sign should be placed on the structure if the mainline passes under the crossroad and the exit roadway is located beyond the crossroad structure.

Option:

The Exit Direction sign for the second exit may be mounted on an overhead support in front of and as close as practical to the crossroad structure if it is not feasible to mount the Exit Direction sign directly on the crossroad structure.

Standard:

A ~~ground-~~ post-mounted edited to increase consistency Exit Gore sign shall also be installed in the ramp gore.

Section ~~2E.45~~ 2E.44 Diamond Interchange

Support:

Examples of guide signs for diamond interchanges are shown in Figure 2E-32.

Standard:

The singular message EXIT shall be used on the Advance Guide and Exit Direction signs. ~~Exit numbers shall not include the cardinal initials corresponding to the direction of the cross route.~~

Support:

The typical diamond interchange ramp departs from the mainline roadway such that a speed reduction generally is not necessary in order for a driver to ~~reasonably safely~~ negotiate an exit maneuver from the mainline onto the ramp roadway.

Guidance:

When a speed reduction is not necessary, an exit speed sign should not be used.

Option:

An Exit Speed sign may be used where an engineering study shows that it is necessary to display a speed reduction message for ramp signing (see Section 2C.14).

Guidance:

The Exit Speed sign should be located along the deceleration lane or along the ramp such that it is visible to the driver far enough in advance ~~so that a reasonably safe slowing and~~ to allow the driver to decelerate before reaching the curve associated with the exiting maneuver ~~can be made~~.

Option:

A Stop Ahead or Signal Ahead warning sign may be placed, where engineering judgment indicates a need, along the ramp in advance of the cross street, to give notice to the driver (see Section 2C.35).

Guidance:

When used on two-lane ramps, Stop Ahead or Signal Ahead signs should be used in pairs with one sign on each side of the ramp.

Section ~~2E.46~~ 2E.45 Diamond Interchange in Urban Area

Support:

Examples of guide signs for diamond interchanges in an urban area are shown in Figure 2E-33. This example includes the use of the Community Interchanges Identification sign (see Section 2E.37), which might be useful if two or more interchanges serve the same community.

In urban areas, street names are often ~~shown~~ displayed edited to increase consistency as the principal message in destination signs.

Option:

If interchanges are too closely spaced to properly locate the Advance Guide signs, they may be placed closer to the exit, and the distance figures adjusted accordingly.

Section ~~2E.47~~ 2E.46 Closely Spaced Interchanges

Option:

When a series of interchanges is closely spaced, the advance guide sign for the next interchange may be mounted on an overhead structure located downstream from the gore of the preceding interchange.

Guidance:

Interchange Sequence signs (see Section 2E.36) should be used at closely spaced interchanges. When used, they should identify and show street names and distances for the next two or three exits as shown in Figure 2E-24.

Standard:

Advance Guide signs for closely spaced interchanges shall show information for only one interchange.

Section ~~2E.48~~ 2E.47 Minor Interchange

Option:

Less signing may be used for minor interchanges because such interchanges customarily serve low volumes of local traffic.

Support:

Examples of guide signs for minor interchanges are shown in Figure 2E-34.

Standard:

At least one Advance Guide sign and an Exit Gore sign shall be placed at a minor interchange.

Guidance:

An Exit Direction sign should also be used.

Section ~~2E.49~~ 2E.48 Signing ~~of~~ on Conventional Road Approaches and Connecting Roadways

text of this Section was relocated to Chapter 2D

Support:

Section 2D.47 contains information regarding the signing on conventional roads on the approaches to interchanges and the signing on connecting roadways.

Section ~~2E.50~~ 2E.49 Wrong-Way Traffic Control at Interchange Ramps text of this Section was relocated to Section 2B.48 because it relates more to regulatory signs rather than guide signs

Support:

Section 2B.48 contains information regarding the use of regulatory signs to deter wrong-way movements at intersections of freeway or expressway ramps with conventional roads, and in the area where entrance ramps intersect with the mainline lanes.

~~**Section 2E.51 General Service Signs**~~ **relocated to new Chapter 2F**

~~**Section 2E.52 Rest and Scenic Area Signs**~~ **relocated to new Chapter 2F**

~~**Section 2E.53 Tourist Information and Welcome Center Signs**~~ **relocated to new Chapter 2F**

~~**Section 2E.54 Reference Location Signs and Enhanced Reference Location Signs (D10-4, D10-5)**~~ **relocated to new Chapter 2I**

~~**Section 2E.55 Miscellaneous Guide Signs**~~ **relocated to new Chapter 2I**

~~**Section 2E.56 Radio Information Signing**~~ **relocated to new Chapter 2F**

~~**Section 2E.57 Carpool and Ridesharing Signing**~~ **relocated to new Chapter 2F**

Section ~~2E.58~~ 2E.50 Weigh Station Signing

Standard:

Weigh Station signing on freeways and expressways shall be the same as that specified in Section 2D.51, except for lettering size and the advance posting distance for the Exit Direction sign, which shall be located a minimum of 450 m (1,500 ft) in advance of the gore.

Support:

Weigh Station sign layouts for freeway and expressway applications are shown in the "Standard Highway Signs and Markings" book (see Section 1A.11).

Section ~~2E.59~~ 2E.51 Preferential ~~Only~~ Lane Guide Signs – General existing Section 2E.59 was split into four sections and substantially edited

Support:

Preferential lanes are used on freeways, expressways, and conventional roads. Except as otherwise noted, Sections 2E.51 through 2E.54 apply only to guide signs for preferential lanes on freeways and expressways.

Guidance:

On conventional roads, guide signs applicable only to preferential lanes are ordinarily not needed, but if used they should conform to the provisions for guide signs in Chapter 2D and any principles for Preferential Lane guide signs in Sections 2E.51 through 2E.54 that engineering judgment finds to be appropriate for the conditions.

Support:

Consistency in signs and pavement markings for preferential lanes plays a critical role in building public awareness, understanding, and acceptance, and makes enforcement more effective.

Additional guidance and standards related to the designation, operational considerations, ~~signing~~ signs, pavement markings, and other considerations for preferential ~~only~~ lanes is provided in Sections 2B.26 through 2B.30, 2C.64, 3B.24, and 3B.25.

Guidance:

~~Because consistency in signing and pavement markings for preferential only lanes within a State or metropolitan area plays a critical role in building public awareness, understanding, and acceptance, and makes enforcement more effective, an engineering study should be conducted to determine~~ The appropriate combinations of pavement markings and standard overhead ~~signs,~~ and ~~ground~~ post-mounted edited to increase consistency regulatory, warning, and guide signs ~~and pavement markings~~ for a specific preferential ~~only~~ lane application should be selected based on an engineering study.

If overhead signs applicable only to a preferential lane are located in approximately the same longitudinal position along the highway as overhead signs applicable only to the general purpose lanes, the signs for the preferential lane should be separated laterally from the signs for the general purpose lanes to the maximum extent practical to minimize conflicting information.

The Preferential ~~Only~~ Lane ~~signing~~ signs should be designed and located to avoid overloading the road user. Based on the importance of the sign, ~~the following priority~~ regulatory signs should be given~~: regulatory, advance regulatory,~~ priority over guide~~, then~~ signs. The order of priority of guide signs should be Advance Guide, Preferential Lane Entrance Direction, and finally ~~next~~ Preferential Lane Exit Destination supplemental guide signs.

Standard:

Signs applicable only to a preferential lane shall be distinguished from signs applicable to general purpose lanes by the inclusion of the applicable symbol(s) and/or word(s).

Support:

The symbol and/or word message that appears on a particular guide sign applicable only to a preferential lane will vary based on the specific type of allowed traffic and on other related operational constraints that have been established for a particular lane, such as an HOV lane, a bus lane, or a taxi lane. Sections 2E.56 through 2E.60 contain additional provisions regarding signs, symbols, and pictographs that are used with ETC Only lanes.

Standard:

For HOV lanes and managed lanes that incorporate a vehicle occupancy requirement, the diamond symbol shall appear on each Advance Guide sign, Preferential Lane Entrance Direction sign, and Preferential Lane Entrance Gore sign, as shown in Figures 2E-35 through 2E-38 and Figures 2E-41 through 2E-43, for the designated entry and exit points for barrier- and buffer-separated geometric configurations and direct access ramps to or from such lanes. The diamond symbol shall not be used with preferential lanes for other types of traffic, such as bus lanes or taxi lanes.

~~Either the HOV abbreviation or~~ The diamond symbol shall appear in the legend of each preferential ~~only~~ lane guide sign at the designated entry and exit points for all types of HOV lanes (including barrier- and buffer-separated, ~~concurrent flow~~ contiguous, and direct access ramps) in order to alert motorists that there is a minimum allowable vehicle occupancy requirement for vehicles to use the HOV lanes ~~and to inform them of the times during which these vehicle occupancy requirements are in effect~~. Guide signs shall not display the occupancy requirement for the preferential lane.

A combination of guide and regulatory signs shall be used in advance of and at the initial entry point and all intermediate entry points from general purpose lanes or facilities to ~~all~~ barrier- and buffer-separated preferential ~~only~~ lanes. ~~The Advance Guide signs for preferential only lanes shall be consistent with the requirements of Section 2E.30.~~ The regulatory signs shall comply with the provisions of Sections 2B.26 through 2B.30.

Regulatory signs alone shall be used in advance of, at the beginning of, and at all intermediate entry points from the adjoining general purpose lanes to contiguous preferential lanes (see Figures 2E-39 and 2E-40). The design and placement of the regulatory signs shall comply with the provisions of Sections 2B.26 through 2B.30.

Except as otherwise provided in Sections 2E.51 through 2E.54, guide signs applicable to a preferential lane with a vehicle occupancy requirement shall be distinguished from those applicable to general purpose lanes by displaying the white diamond symbol on a black background at the left-hand edge of these signs.

Option:

When post-mounted guide signs applicable only to a preferential lane are installed on a median barrier with limited lateral clearance to the adjacent travel lanes or shoulders, the guide signs may have a vertical rectangular shape.

Standard:

When vertical rectangular shaped guide signs applicable only to a preferential lane are installed on a median barrier, the top portion of the signs shall be comprised of the applicable white symbol or white word message that identifies the type of preferential lane (such as the diamond symbol for an HOV lane) on a black background with a white border, and the bottom portion of the sign shall be

comprised of the appropriate guide sign legend on a green background with a white border (see Figures 2E-44, 2E-47, and 2E-48).

Guidance:

Where lateral clearance is limited, such as when a ~~ground-~~ post-mounted edited to increase consistency Preferential ~~Only~~ Lane guide sign is installed on a median barrier, the edges of the sign should not project beyond the outer edges of the barrier.

Option:

Where lateral clearance is limited, Preferential ~~Only~~ Lane ~~(R3-10, R3-11, and R3-12 series)~~ guide signs that are 1800 mm (72 in) or less in width may be skewed up to 45 degrees in order to fit within the barrier width or may be mounted ~~at a height of~~ with a vertical clearance of not less than 4.3 m (14 ft) ~~or more above the roadway~~ to the sign, light fixture, or structural support, over the entire width of the pavement and shoulders.

Guidance:

Where lateral clearance is limited, Preferential ~~Only~~ Lane guide signs that are wider than 1800 mm (72 in) should be mounted ~~at a height of at least~~ with a vertical clearance of not less than 4.3 m (14 ft) ~~above the roadway~~ to the sign, light fixture, or structural support, over the entire width of the pavement and shoulders.

Option:

Lane-use control signals (see Chapter 4M) may be used at access points to preferential lanes to indicate that a ramp or access roadway leading to or from the preferential lane or facility, or one or more specific lanes of the facility, are open or closed.

Changeable message signs may be used ~~to supplement~~ in combination with or as substitutes for static guide signs where travel conditions change or where multiple types of operational strategies (such as variable occupancy requirements, vehicle types, or pricing policies) are used and varied throughout the day or week to manage the use of, control of, or access to preferential ~~only~~ lanes.

Standard:

When changeable message signs (see ~~Section 2A.07~~ Chapter 2M) are used as ~~regulatory or~~ guide signs for preferential ~~only~~ lanes, they shall be the required sign size and shall display the required letter height and legend format that corresponds to the type of roadway facility and design speed.

Advance Guide signs, Preferential Lane Entrance Direction signs, and Preferential Lane Entrance Gore signs for the initial entry point and intermediate entry points into a preferential lane from the general purpose lanes shall not identify the entry point as an exit by using the word "EXIT" on the sign or on a plaque.

Guidance:

Advance Guide signs and Preferential Lane Entrance Direction signs for initial and intermediate entry points into a preferential lane should use the word "ENTRANCE," such as "HOV LANE ENTRANCE" (see Figures 2E-45 and 2E-46).

Preferential Lane Entrance Gore signs at the initial entry point to a preferential lane should use the word "ENTRANCE" (see Figures 2E-35 and 2E-44). Preferential Lane Entrance Gore signs at intermediate entry points to a barrier-separated preferential lane where the sign would be located immediately adjacent to and directly viewed by traffic in the preferential lane should not use the word "ENTRANCE" (see Figures 2E-36 and 2E-44).

Standard:

When the entry point is on the left-hand side of the general purpose lanes, a LEFT (E1-5aP) plaque (see Figure 2E-15) shall be added to the top left edge of the Advance Guide and Preferential Lane Entrance Direction signs. The LEFT plaque shall not be used on a preferential lane regulatory sign.

~~Reversible flow or express lanes that do not have any specific vehicle occupancy or designation restrictions shall be consistent with the requirements of Chapters 2B and 3B.~~

~~Overhead preferential only lane guide signs shall be used only as a supplement to ground-mounted preferential only lane guide signs unless an engineering study identifies that ground-mounted guide signs are not appropriate for a particular situation or location.~~

~~Guidance:~~

~~Existing sign and bridge structures should be used to the extent practical for the installation of preferential only lane signs. Where possible, advance guide and guide signs that are provided for preferential only lanes should share sign structures spanning the preferential only lanes and the adjoining freeway facility.~~

~~**Standard:**~~

~~**Ground-mounted and overhead advance guide signs, guide signs, and exit signs applicable to HOV lanes and direct access ramps to HOV lanes shall contain the HOV diamond symbol in the upper left corner of the sign as shown in Figures 2E-46 through 2E-52. The diamond symbol shall not be used with lanes designated for bus or taxi traffic.**~~

~~Option:~~

~~Agencies may select from either the HOV abbreviation or the diamond symbol to reference the HOV lane designation.~~

~~**Standard:**~~

~~**For concurrent flow preferential only lanes, including those where a preferential only lane is added to the roadway (see Figure 2E-48 for HOV lanes) and those where a general purpose lane transitions into a preferential only lane on the roadway (see Figure 2E-49 for HOV lanes), an overhead regulatory (R3-14 or R3-14a) sign shall be used.**~~

Section 2E.52 Guide Signs for Initial Entry Points to Preferential Lanes relocated from existing Section 2E.59

Standard:

~~**Ground-mounted**~~ **Except where a contiguous preferential lane is added or where a general purpose lane becomes a contiguous preferential lane as illustrated in Figures 2E-39 and 2E-40, an Advance Guide sign~~~~s~~ **shall be provided at least 800 m (0.5 mi) prior to the ~~beginning or~~ initial entry point to all types of preferential ~~only~~ lanes in any type of geometric configuration ~~(including barrier-separated, buffer-separated, and concurrent flow)~~. ~~Ground-mounted guide signs shall be provided at the beginning or initial entry point and at intermediate access points to all types of preferential only lanes.~~ A Preferential Lane Entrance Direction sign shall also be provided at the initial entry point. Advance Guide and Preferential Lane Entrance Direction signs for such entry points shall not use the word "EXIT" (see Section 2E.51).**

Guidance:

An Advance Guide sign should also be installed and located approximately 1.6 km (1 mi) in advance of the initial entry point to a barrier- or buffer-separated preferential lane.

Option:

~~Overhead advance guide signs and overhead guide signs may be used in advance of, at the beginning or initial entry point, and at designated intermediate access points to any type of preferential only lane.~~ An Advance Guide sign~~s~~ may also be installed and located approximately ~~1.6 km (1 mi) and~~ 3.2 km (2 mi) in advance of the ~~beginning or~~ initial entry point to ~~any type of~~ a barrier- or buffer-separated preferential ~~only~~ lane.

Standard:

For barrier- or buffer-separated separated preferential ~~only~~ lanes, ~~overhead~~ the Advance Guide and ~~overhead guide~~ Preferential Lane Entrance Direction signs shall be ~~provided in advance of and at the beginning or initial entry point to the preferential only lanes (see Figure 2E-46 for HOV lanes)~~ overhead. ~~Overhead guide signs shall also be used at all intermediate entry points to barrier-separated preferential only lanes (see Figure 2E-47 for HOV lanes).~~

Guidance:

~~Advance~~ Preferential Lane Exit Destination guide signs, identifying final destination and downstream exit locations accessible from the preferential lane (see Figures 2E-35, 2E-41 through 2E-43, and 2E-49), should be installed in advance of ~~designated~~ the initial entry points ~~and along the length of~~ to access restricted preferential ~~only~~ lanes (such as barrier- and buffer-separated). ~~In addition to the routes that typically appear on advance destination guide signs, these signs should also include destinations.~~ These signs should be located based on the priority of the message, the available space, the existing signs on adjoining general purpose traffic lanes, roadway and traffic characteristics, the proximity to existing overhead signs, the ability to install overhead signs, and other unique local factors.

Standard:

Advance destination guide signs for preferential lanes shall include an upper section displaying a black legend that includes the type of preferential lane and the word "EXITS," such as "HOV EXITS," on a white background. For preferential lanes that incorporate a vehicle occupancy requirement, the white diamond symbol on a black background shall be displayed at the left edge of this upper section (see Figure 2E-49).

Support:

Figure 2E-35 shows an example of signs for the initial entry point to a preferential lane.

~~Guidance:~~

~~Where conditions restrict the ability to provide more than one advance guide sign in advance of any type of preferential only lane, the advance guide sign that is installed should be placed at least 800 m (0.5 mi) in advance of the beginning or entry point to the preferential only lane.~~

~~Option:~~

~~Advance guide signs may be provided for preferential only lanes with unrestricted access, such as concurrent flow preferential only lanes.~~

~~Guidance:~~

~~For barrier-separated preferential only lanes where conditions restrict the ability to provide more than one advance guide sign prior to the entrance to the preferential only lane, the sign should be placed approximately 800 m (0.5 mi) in advance of the exit. In these situations, the installation of the corresponding regulatory and next exit supplemental signs should be located based on the priority of the message and the available space.~~

Section 2E.53 Guide Signs for Intermediate Entry Points to Preferential Lanes relocated from existing Section 2E.59

Standard:

For barrier-separated and buffer-separated preferential lanes where entry is restricted only to designated points, an overhead Preferential Lane Entrance Direction sign shall be provided at intermediate entry points to the preferential lane from the general purpose lanes.

Guidance:

The Preferential Lane Entrance Direction sign should be located between one-half and one-quarter of the length of the designated entry area, as measured from the downstream end of the entry area (see Figure 2E-38).

Standard:

For barrier- and buffer-separated preferential lanes, the Advance Guide signs, if used for intermediate entry points to a preferential lane from the general purpose lanes, shall be overhead.

Option:

Advance Guide signs may be provided at approximately 800 m (0.5 mi), 1.6 km (1 mi), and 3.2 km (2 mi) in advance of intermediate entry points from the general purpose lanes to a barrier- or buffer-separated preferential lane.

Guidance:

For barrier- and buffer-separated preferential lanes where intermediate entry from the general purpose lanes is via a separate lane or ramp, at least one Advance Guide sign should be provided in addition to the Preferential Lane Entrance Direction sign.

Standard:

Advance Guide and Preferential Lane Entrance Direction signs for intermediate entry points shall not include the word "EXIT" (see Section 2E.51).

Guidance:

Advance destination guide signs, identifying the final destination and downstream exit locations accessible from the preferential lane, should be installed in advance of intermediate entry points from the general purpose lanes to barrier- and buffer-separated preferential lanes.

Support:

Section 2E.52 contains information on the design of Preferential Lane Exit Destination guide signs. Figures 2E-36 through 2E-38 show examples of signs for various geometric configurations of intermediate entry to and exit from a barrier- or buffer-separated preferential lane.

Standard:

For direct access ramps to ~~HOV~~ preferential lanes~~, advance guide signs shall be provided along the adjoining surface streets to direct traffic into~~ from a transit facility (such as a park & ride lot or a transit station or terminal) that ~~ultimately leads to HOV lanes~~ is accessible from surface streets, advance guide signs shall be provided along the adjoining surface streets to direct traffic into and through the transit facility to the preferential lane (see Figure 2E-41 ~~for HOV lanes~~).

Support:

Figures 2E-41 and 2E-42 provide examples of recommended uses and layouts of signs for HOV lanes for direct access ramps, park & ride lots, and access from surface streets~~, and exclusive preferential only lane ramps at interchanges that directly connect two freeway facilities~~. ~~Direct access ramps to preferential only lanes sometimes form a three or four-legged intersection that is controlled by either static signs or traffic control signals.~~

Section 2E.54 Guide Signs for Exits from Preferential Lanes to General Purpose Lanes or Directly to Another Highway relocated from existing Section 2E.59

Standard:

For barrier-separated and buffer-separated preferential only lanes where egress is restricted only to designated points, ~~ground-~~ post-mounted edited to increase consistency Advance ~~exit~~ Guide and ~~ground-~~ post-mounted edited to increase consistency Exit Direction signs shall be installed ~~prior to and at the intermediate exit points of the preferential only lanes (see Figure 2E-47 for HOV lanes). Ground-mounted guide signs shall be mounted~~ in the median or on median barriers that separate two directions of traffic prior to and at the intermediate exit points from the preferential lanes to the general purpose lanes (see Figures 2E-38 and 2E-48).

The Exit Direction signs for egress from the preferential lanes to the general purpose lanes shall not refer to the egress as an exit. The legends of these signs shall refer to the next general purpose exit or exits by displaying the appropriate destination information, exit number(s), or both.

Support:

Section 2E.51 contains information on the design of post-mounted guide signs applicable to a preferential lane when installed on a median barrier.

Guidance:

For barrier-separated and buffer-separated preferential lanes where egress from a preferential lane to the general purpose lanes is restricted only to designated points via a separate lane or ramp, the Advance Guide and Exit Direction signs for the egress should be mounted overhead and a Pull-Through sign should be mounted with the Exit Direction sign (see Figure 2E-37).

Standard:

For preferential lanes that incorporate a vehicle occupancy requirement, the design of the overhead Advance Guide and Exit Direction signs for intermediate egress from the preferential lanes to the general purpose lanes shall display a white diamond symbol on a black background at the left-hand edge of the signs.

The design of Pull-Through signs when used in conjunction with an Exit Direction sign at an intermediate egress from the preferential lanes to the general purpose lanes shall be distinguished from those applicable to general purpose lanes by inclusion of an upper section with the applicable black legend on a white background, such as HOV LANE. For preferential lanes that incorporate a vehicle occupancy requirement, the white diamond symbol on a black background shall be displayed at the left-hand edge of this upper section.

~~Option:~~

~~For barrier-separated preferential only lanes, an advance destination guide sign may be used in the vicinity of designated intermediate entry and exit points.~~

~~Standard:~~

~~For buffer-separated preferential only lanes (painted buffer of 0.6 m (2 ft) or more) where access is restricted to designated entry points, ground-mounted guide signs shall be mounted in the median or on median barriers separating two directions of traffic. Ground-mounted advance exit and ground-mounted exit signs shall be installed prior to and at the intermediate exit points of buffer-separated preferential only lanes (see Figure 2E-47 for HOV lanes).~~

~~Option:~~

~~For buffer-separated preferential only lanes, an advance destination guide sign may be used in the vicinity of designated intermediate entry and exit points.~~

~~Guidance:~~

~~For buffer-separated HOV lanes, guide and regulatory signs should be provided to alert HOV lane users and non-users of the minimum allowable vehicle occupancy requirement and the locations of the designated entry and exit points.~~

For ~~concurrent flow~~ contiguous ~~HOV~~ preferential lanes on the left-hand side of the roadway ~~with unrestricted access~~, Advance Guide ~~and guide~~ signs, Exit Direction signs, and Exit Gore signs specifically applicable to the preferential lanes shall ~~only~~ be used ~~on~~ for exits to direct access ramps, such as HOV lane ~~only~~ ramps or ramps to park & ride lots (see Figure~~s 2E-41 and~~ 2E-42 ~~for HOV lanes~~).

The design of Advance Guide, Exit Direction, and Pull-Through signs for direct exits from preferential lanes shall be distinguished from those applicable to general purpose lanes by inclusion of an upper section with the applicable black legend on a white background, such as HOV LANE (for Pull-Through signs) or HOV EXIT (for Advance Guide and Exit Direction signs). For preferential lanes that incorporate a vehicle occupancy requirement, the white diamond symbol on a black background shall be displayed at the left-hand edge of this upper section (see Figures 2E-42 and 2E-43).

Guidance:

Advance Guide and Exit Direction signs for exits to direct access ramps from a preferential lane should be mounted overhead. A Pull-Through sign should be used with the Exit Direction sign at exits to direct access ramps.

Standard:

Post-mounted guide signs in a vertical rectangular shape installed on a median barrier shall not be used for the Advance Guide and Exit Direction signs for exits to direct access ramps.

Because direct access ramps for preferential ~~only~~ lanes at interchanges connecting two freeways are typically left-hand side exits and typically have design speeds similar to the preferential ~~only~~ lane, overhead Advance Guide signs and overhead ~~guide~~ Exit Direction signs shall be provided in advance of and at the entry point to each freeway-to-freeway preferential ~~only~~ lane ramp (see Figure 2E-43 ~~for HOV lanes~~).

Guidance:

The use of guide signs for preferential ~~only~~ lanes at freeway interchanges should ~~conform to~~ comply with the provisions for ~~regulatory and~~ guide sign~~s requirements~~ established in this Manual.

Support:

~~The use of advance guide and~~ Guide signs for direct access ramps for preferential ~~only~~ lanes at interchanges connecting two freeways is similar to a connecting ramp between two freeway facilities.

Section 2E.55 Toll Facility and Toll Plaza Guide Signs - General

Support:

Toll plazas are used on many toll highways, bridges, and tunnels for collection of toll fees from road users. Managed lanes often require the payment of a fixed or variable toll fee for use of one or more lanes on an otherwise free facility.

Attended lanes (also sometimes called Manual lanes) at toll plazas have booths with human toll collection personnel who make change, issue receipts, and perform other toll-related functions. Exact Change lanes (also sometimes called Automatic lanes) are non-attended and have receptacles into which road users deposit coins totaling the exact amount of the toll fee. Attended lanes and Exact Change lanes at toll plazas typically require vehicles to stop to pay the toll.

Electronic Toll Collection (ETC) lanes are non-attended and have equipment that communicates wirelessly with transponders mounted in vehicles (moving or stopped) to automatically deduct the toll fee from a pre-paid toll account.

Open Road ETC lanes (also sometimes called Express ETC lanes) are designed to allow ETC toll fee collection 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. Open Road ETC toll collection is also typically used on managed lanes and on toll facilities that only accept payment by ETC.

Some of the guide signs in Sections 2E.51 through 2E.61 include regulatory and/or warning messages in the form of plaques, header panels, or rectangular panels incorporated within the guide sign. See Section 2B.31 for other regulatory signs for toll plazas. Sections 2C.43, 2C.44, 2C.68, and 2C.69 contain information regarding other warning signs and plaques for toll facilities and toll plazas.

Sections 2D.25 and 2D.26 contain information regarding other guide signs for conventional roads involving directions to toll facilities.

Section 3B.29 contains information regarding pavement markings for certain toll plaza applications.

Standard:

Directional signs for entrances to a toll facility or managed lanes on which tolls are charged, or to a road leading directly to such facilities, shall clearly indicate that the facility is a toll facility. The TOLL (M4-8) auxiliary sign (see Section 2D.25) shall be used above the route sign of a numbered toll facility in any route sign assembly that provides directions to the toll route. The M4-8 auxiliary sign shall also be used above all route signs of a numbered toll facility when a parallel or nearby free facility has the same route number. A rectangular panel with the black legend TOLL on a white background shall be incorporated into the guide signs leading road users to a toll facility.

Guide signs for toll facilities, tolled managed lanes, and toll plazas shall have white legend and border on a green background, except as specifically provided by Sections 2E.58 through 2E.61.

Option:

Where conditions do not permit separate signs, or where it is important to associate a particular regulatory or warning message with specific guidance information, regulatory and/or warning messages may be combined with guide signs for toll plazas using plaques, header panels, or rectangular regulatory or warning panels incorporated within the guide signs, as long as the proper legend and background colors are preserved.

Standard:

When regulatory messages are incorporated within a guide sign, they shall be on a rectangular panel with black legend on a white background. When warning messages are incorporated within a guide sign, they shall be on a rectangular panel with black legend on a yellow background.

Guidance:

Guide signs for toll plazas should be designed in accordance with the general principles of guide signs and the specific provisions of other sections in Chapter 2E.

Signs for toll plazas should systematically provide road users with advance and toll plaza lane-specific information regarding:

A. The amount of the toll fee, the types of payment accepted, and the type(s) of ETC transponder(s) accepted for payment;
B. Which lane or lanes are required or allowed to be used for each available payment type; and
C. Restrictions on the use of a toll plaza lane or lanes by certain types of vehicles (such as cars only or no trucks).

Standard:

Signs for Attended lanes at toll plazas shall incorporate the Toll Taker (M4-17) symbol (see Figures 2E-50 and 2E-51) in a size that makes the symbol the predominant feature of the sign.

Option:

Signs for Attended lanes at toll plazas may include word messages such as FULL SERVICE, CASH, CHANGE, or RECEIPTS to supplement the Toll Taker symbol.

Standard:

Signs for Exact Change lanes at toll plazas shall incorporate the Exact Change (M4-18) symbol in a size that makes the symbol the predominant feature of the sign accompanied by the word message "EXACT CHANGE" and the amount of the toll fee for passenger vehicles (see Figures 2E-50 and 2E-51).

If only ETC-equipped vehicles are allowed to use a toll plaza lane, a tolled managed lane on an otherwise free facility, or all lanes of a toll highway, the signs for such lanes shall incorporate the pictograph adopted by the toll facility's ETC payment system (such as E-Z Pass or SunPass) and the

word ONLY (see Figures 2E-50 and 2E-51). If incorporated within the green background of a guide sign, the ETC pictograph shall be on a white rectangular or square panel set on a purple backplate with a white border. If used on a separate plaque with a guide sign or on a header panel within a guide sign, the ETC pictograph shall have a white border and the plaque or the header panel shall have a purple background with a white border.

Purple backplates for ETC pictographs or purple backgrounds for plaques and header panels shall only be used in the manner described above to distinguish signs for lanes reserved exclusively for ETC-equipped vehicles from signs for other lanes on the same facility, and on directional signs to an ETC-Only facility from a free facility or from a toll facility that accepts multiple payment forms.

Option:

A rectangular panel with the black legend NO CASH on a white background may be included within guide signs for toll plaza lanes, tolled managed lanes on an otherwise free facility, and toll highways when such lanes or entire highways are restricted to ETC-equipped vehicles only.

The ETC payment system's pictograph, without a purple backplate or purple header panel, may be used on signs for Exact Change or attended lanes at toll plazas to indicate that ETC-equipped vehicles may also use those lanes (see Figure 2E-50).

Support:

Many different ETC payment systems are used by the various toll facility and managed lane operators. Most of these existing systems will not accept payment from other systems' transponders. Toll facility and managed lane operators are working toward a nationally interoperable ETC payment system in which a road user's transponder will be accepted for ETC toll fee deduction from the user's pre-paid account on all toll facilities that are participating in the nationally interoperable ETC payment system.

Standard:

Signs for an ETC payment system that is nationally interoperable with all other ETC payment system transponders shall incorporate the Nationally Interoperable ETC (M8-3) symbol (see Figure 2E-50). This symbol shall only be used on signs for ETC lanes that accept electronic payment from any toll operator's ETC transponder.

Support:

Sections 2B.32, 2D.25, 2D.26, 2E.51 through 2E.54, and 2E.59 contain additional provisions regarding signs for tolled managed lanes and toll facilities that only accept ETC toll payments.

Section 2E.56 Advance Signs for Conventional Toll Plazas

Guidance:

For conventional toll plazas (those without a divergence onto a separate alignment from mainline-aligned ETC Only lanes), one or more sets of overhead advance guide signs complying with the provisions of Section 2E.56 should be provided. The advance guide signs for multi-lane toll plazas should provide information regarding which lanes to use for all of the toll payment methods accepted at the toll plaza. These signs should include toll plaza lane numbers (if used), or phrases such as LEFT LANE(S), CENTER LANE(S), RIGHT LANE(S), or downward pointing arrows over the approximate center of each applicable lane. These signs should also incorporate regulatory messages indicating any restrictions or prohibitions on the use of the lanes associated with the various types of payment methods by certain types of vehicles. For mainline toll plazas, these signs should be at least 800 m (0.5 mi) in advance of the toll plaza, and farther if practical.

Additional guide signs with lane information for the toll payment types should be provided between approximately 400 m (0.25 mi) and 245 m (800 ft) in advance of the toll plaza at a location that avoids or minimizes obstruction of toll plaza canopy signs (see Section 2E.58) and lane-use control signals.

The number and/or spacing of sets of advance signs for approaches to toll plazas on ramps, toll bridges, or tunnels, to accommodate a limited distance to the plaza from an intersection or from the start of the approach road to the bridge or tunnel, should be based on an engineering study or engineering judgment.

Support:

Figure 2E-51 shows an example of advance signs for a conventional toll plaza.

Section 2E.57 Advance Signs for Toll Plazas on Diverging Alignments from Open Road ETC Only Lanes

Support:

Open Road ETC Only lanes are sometimes located on the normal mainline alignment while the lanes for other toll payment methods are located at a toll plaza on a separate alignment (see Figure 2E-52). Since road users paying cash tolls must diverge from the mainline alignment, similar to a movement for an exit, it is important that the guide signs in advance of and at the point of divergence clearly indicate the required lane use and/or movements.

Guidance:

For toll plazas located on a separate alignment that diverges from mainline-aligned Open Road ETC Only lanes, overhead advance signs should be provided at approximately 1.6 km (1 mi) and 800 m (0.5 mi) in advance of the divergence point. Both the 1.6 km (1 mi) and 800 m (0.5 mi) advance signs should include:

A. The ETC (pictograph) ONLY – NO CASH (R3-16) regulatory sign (see Section 2B.32) with a downward pointing arrow over the center of each lane that will become an Open Road ETC lane;
B. For the lane or lanes which will diverge to a toll plaza, guide signs conforming to the provisions of Section 2E.55, indicating which lane or lanes will diverge to the toll plaza for the various cash toll payment methods; and
C. Regulatory signs, plaques, or panels within the guide signs, indicating any restrictions or prohibitions of certain types of vehicles from toll plaza lanes associated with the various types of payment methods.

At or near the theoretical gore of the divergence point, an additional set of overhead guide signs should be provided and should include:

A. The ETC (pictograph) ONLY – NO CASH (R3-16) regulatory sign (see Section 2B.32) with a downward pointing arrow over the center of each Open Road ETC lane;
B. Guide signs conforming to the provisions of Section 2E.55, with directional arrow(s) indicating the direction of the divergence, and providing lane information for all types of payment methods accepted at the toll plaza. These signs should include toll plaza lane numbers (if used), or phrases such as LEFT LANE(S), CENTER LANE(S), RIGHT LANE(S), or diagonally upward pointing arrows over the center of the appropriate lanes; and
C. Regulatory signs, plaques, or panels within the guide signs, indicating any restrictions or prohibitions on the use of the toll plaza lanes associated with the various types of payment methods by certain types of vehicles.

Approximately 245 m (800 ft) in advance of the toll plaza at a location that avoids or minimizes any obstruction of the toll plaza canopy signs (see Section 2E.58) and lane-use control signals, an additional set of overhead advance signs with lane information for the toll payment types should be provided.

Support:

Figure 2E-52 shows an example of advance signs for toll plazas on a diverging alignment from Open Road ETC Only Lanes.

Section 2E.58 Toll Plaza Canopy Signs

Standard:

A sign complying with the provisions of Section 2E.55 shall be provided above the center of each lane that is not an Open Road ETC Only lane, mounted on or suspended from the toll plaza canopy, or on a separate structure immediately in advance of the plaza, indicating the payment type(s) accepted in the lane and any restrictions or prohibitions of certain types of vehicles that apply to the lane. The toll fee for passenger or 2-axle vehicles shall be included on the canopy sign or on a separate sign mounted on the upstream side of the tollbooth.

Option:

One or two flashing yellow beacons (see Section 4L.03) may supplement a canopy sign over an ETC Only lane to call special attention to the location of the ETC Only lane within the plaza.

Standard:

Flashing beacons supplementing a canopy sign over an ETC Only lane shall be mounted directly above or alongside the sign in a manner that is separated from any lane-use control signals for that lane (see Figure 2E-50).

For multi-lane toll plazas, lane-use control signals that can display a steady RED X signal indication and a steady DOWNWARD GREEN ARROW signal indication in compliance with Chapter 4M shall be provided above the center of each toll plaza lane that is not an Open Road ETC Only lane to indicate

the open or closed status of each lane. Lane-use control signals shall not be used to call attention to a lane for a specific toll payment type such as ETC Only lanes.

Option:

Lane-use control signals may also be provided above the center of each Open Road ETC Only lane to indicate the open or closed status of the lane.

Support:

Section 2B.31 contains provisions regarding regulatory signs for toll plazas and Sections 2C.43, 2C.44, 2C.68, and 2C.69 contain provisions regarding warning signs for toll plazas.

Figure 2E-50 shows examples of toll plaza canopy signs.

Section 2E.59 Guide Signs for Entrances to ETC-Only Facilities

Support:

Some toll highways, bridges, tunnels, and managed lanes are restricted to use only by vehicles equipped with a specific type of ETC transponder.

Standard:

Guide signs for an ETC Only facility or ETC Only managed lane shall comply with the applicable provisions of Chapter 2E and specifically with the applicable provisions of Section 2E.55.

Guide signs for the entrance ramps to ETC Only facilities and for the initial and intermediate entry points to ETC Only managed lanes (including direct access ramps) shall incorporate the pictograph of the toll facility's ETC payment system and the word "ONLY" designed in accordance with the provisions of Section 2E.55 (see Figure 2E-53).

Support:

Section 2D.26 contains information regarding ETC Only auxiliary signs for use with route signs in route sign assemblies.

Section 2E.60 ETC Program Information Signs

Standard:

Signs that inform road users of telephone numbers, Internet addresses, or e-mail addresses for enrolling in an ETC program of a toll facility or managed lane, obtaining an ETC transponder, and/or obtaining ETC program information shall only be installed in rest areas, in parking areas, or on low-speed roadways in accordance with the provisions of Section 2A.06.

Section 2E.61 Guide Signs for Managed Lanes

Support:

Managed lanes are preferential lanes for which operational strategies such as tolls, vehicle occupancy requirements, and vehicle type restrictions are variable and put into effect on a real-time basis as might be needed to respond to changing conditions. Managed lanes are typically barrier-separated lanes parallel to the general purpose lanes of a highway. There are also some highways on which all lanes are managed.

Standard:

Except as otherwise noted in this Section, guide signs for barrier-separated, buffer-separated, and contiguous managed lanes shall follow the specific provisions for Preferential Lane guide signs contained in Sections 2E.51 through 2E.54. Except as otherwise noted in this Section, guide signs for highways on which all lanes are managed shall follow the general provisions for freeway and expressway guide signs as contained in Chapter 2E as a whole.

If fixed or variable toll fees are used as an operational strategy for a managed lane, the guide signs shall comply with the provisions of Sections 2E.55 through 2E.60.

Guidance:

For managed lanes that are available as an alternative to travel on parallel general purpose lanes or on a nearby non-managed highway, changeable message signs indicating the comparative travel times or congestion levels using the managed lanes versus the general purpose lanes or alternate highway (see Figure 2E-54) should be installed in advance of the initial and intermediate entry points to the managed lanes and in advance of exit points from the managed lanes.

Support:

As managed lanes become more prevalent as an operational strategy, it will be important to establish a uniform naming convention to distinguish those lanes that are an alternative to travel on parallel general purpose lanes to effectively communicate to motorists the requirements for similar facilities in different regions.

Standard:

Guide signs at the initial and intermediate entry points to a managed lane that allows all vehicles regardless of occupancy shall include the legend EXPRESS or EXPRESS LANE(S). Guide signs at the initial and intermediate entry points to a managed lane that uses fixed or variable toll fees as an operational strategy, but allows HOV traffic without charging a toll, shall include the legend EXPRESS or EXPRESS LANE(S) and shall incorporate the HOV diamond symbol. Guide signs at the initial and intermediate entry points to a managed lane that allows only HOV traffic with either a fixed or variable occupancy requirement shall follow the provisions of Sections 2E.51 through 2E.54.

Guidance:

The legends EXPRESS and EXPRESS LANE(S) should not be used on guide signs for entrances to facilities on which all lanes are managed and there are no parallel general purpose lanes.

CHAPTER 2F. GENERAL SERVICE SIGNS new chapter with relocated text from Chapters 2D and 2E

Section 2F.01 Sizes of General Service Signs

Standard:

Except as noted in Section 2A.11, the sizes of General Service signs that have a standardized design shall be as shown in Table 2F-1.

Support:

Section 2A.11 contains information regarding the applicability of the various columns in Table 2F-1.

Option:

Signs larger than those shown in Table 2F-1 may be used (see Section 2A.11).

Section ~~2D.45~~ 2F.02 General Service Signs ~~(D9 Series)~~ for Conventional Roads

Support:

On conventional roads, commercial services such as gas, food, and lodging generally are within sight and are available to the road user at reasonably frequent intervals along the route. Consequently, on this class of road there usually is no need for special signs calling attention to these services. Moreover, General Service signing is usually not required in urban areas except for hospitals, law enforcement assistance, tourist information centers, and camping.

Option:

General Service signs (see Figure 2F-1) may be used where such services are infrequent and are found only on an intersecting highway or crossroad.

Standard:

All General Service signs and supplemental sign added to increase consistency panels shall have white letters, symbols, and borders on a blue background.

Guidance:

General Service signs should be installed at a suitable distance in advance of the turn-off point or intersecting highway.

States that elect to provide General Service signing should establish a statewide policy or warrant for its use, and criteria for the availability of services. Local jurisdictions electing to use such signing should follow State policy for the sake of uniformity.

Option:

Individual States may sign for whatever alternative fuels are available at appropriate locations.

Standard:

General Service signs, if used at intersections, shall be accompanied by a directional message.

Option:

The General Service legends may be either symbols or word messages.

Standard:

Symbols and word message General Service legends shall not be intermixed on the same sign. The Pharmacy (D9-20) sign shall only be used to indicate the availability of a pharmacy that is open, with a State-licensed pharmacist present and on duty, 24 hours per day, 7 days per week, and that is located within 4.8 km (3 mi) of an interchange on the Federal-aid system. The D9-20 sign shall have a 24 HR (D9-20aP) plaque mounted below it.

Guidance:

If used, the ~~word message~~ Truck Parking (D9-16) sign should be placed on a separate ~~panel~~ sign edited to increase consistency below the other general motorist services.

Support:

Formats for displaying different combinations of these services are presented in Section 2F.03.

Option:

If the distance to the next point at which services are available is 16 km (10 mi) or more, a sign NEXT SERVICES XX km (~~XX~~ MILES) (D9-17) may be used as a separate ~~panel~~ sign edited to increase consistency installed below the General Service sign (see Figure 2F-2).

The International Symbol of Accessibility for the Handicapped (D9-6) sign may be used beneath General Service signs where paved ramps and rest room facilities accessible to, and usable by, the physically handicapped are provided.

The Recreational Vehicle Sanitary Station (D9-12) sign may be used as needed to indicate the availability of facilities designed for the use of dumping wastes from recreational vehicle holding tanks.

The Litter Container (D9-4) sign may be placed in advance of roadside turnouts or rest areas, unless it distracts the driver's attention from other more important regulatory, warning, or directional signs.

~~A Carpool Information (D12-2) sign (see Figure 2D-12) may be installed as needed (see Section 2E.57).~~

~~Option:~~

The Emergency Medical Services (D9-13) symbol sign may be used to identify medical service facilities that have been included in the Emergency Medical Services system under a signing policy developed by the State and/or local highway agency.

Standard:

The Emergency Medical Services symbol sign shall not be used to identify services other than qualified hospitals, ambulance stations, and qualified free-standing emergency medical treatment centers. If used, the Emergency Medical Services symbol shall be supplemented by a sign identifying the type of service provided.

Option:

The Emergency Medical Services symbol sign may be used above the HOSPITAL (D9-13a) word message sign or H (D9-2) symbol sign or above a sign with either the legend AMBULANCE STATION (D9-13b), ~~or~~ EMERGENCY MEDICAL CARE (D9-13c), or TRAUMA CENTER (D9-13d). The Emergency Medical Services symbol sign may also be used to supplement Telephone (D9-1), Channel 9 Monitored (D12-3), or POLICE (D9-14) signs.

Standard:

The legend EMERGENCY MEDICAL CARE shall not be used for services other than qualified free-standing emergency medical treatment centers.

Guidance:

Each State should develop guidelines for the implementation of the Emergency Medical Services symbol sign.

The State should consider the following guidelines in the preparation of its policy:

A. AMBULANCE
   1. 24-hour service, 7 days per week.
   2. Staffed by two State-certified persons trained at least to the basic level.
   3. Vehicular communications with a hospital emergency department.
   4. Operator should have successfully completed an emergency vehicle operator training course.

B. HOSPITAL
   1. 24-hour service, 7 days per week.
   2. Emergency department facilities with a physician (or emergency care nurse on duty within the emergency department with a physician on call) trained in emergency medical procedures on duty.
   3. Licensed or approved for definitive medical care by an appropriate State authority.
   4. Equipped for radio voice communications with ambulances and other hospitals.

C. Channel 9 Monitored
   1. Provided by either professional or volunteer monitors.
   2. Available 24 hours per day, 7 days per week.
   3. The service should be endorsed, sponsored, or controlled by an appropriate government authority to guarantee the level of monitoring.

Section ~~2E.51~~ 2F.03 General Service Signs for Freeways and Expressways

Support:

General Service (D9-18 or D9-18a) signs (see Figure 2F-3) are generally not appropriate at major interchanges (see Section 2E.28 for definition) and in urban areas.

Option:

If interchanges are not numbered, an action message such as NEXT EXIT or SECOND RIGHT may be ~~used~~ incorporated within the sign legend (D9-18e) or placed on a separate E2-2P plaque (see Figure 2F-4).

Standard:

General Service signs shall have white letters, symbols, and borders on a blue background. Letter and numeral sizes shall ~~conform to~~ comply with the minimum requirements of Tables 2E-2 through 2E-5. All approved symbols shall be permitted as alternatives to word messages, but symbols and word service messages shall not be intermixed. If the services are not visible from the ramp of a single-exit interchange, the service signing shall be repeated in smaller size at the intersection of the exit ramp and the crossroad. Such service signs shall use arrows to indicate the direction to the services.

Guidance:

Distance to services should be ~~shown~~ displayed edited to increase consistency on General Service signs where distances are more than 2 km or 1 mile.

General Service signing should only be provided at locations where the road user can return to the freeway or expressway and continue in the same direction of travel.

Only services that fulfill the needs of the road user should be ~~shown~~ displayed edited to increase consistency on General Service signs. If State or local agencies elect to provide General Service signing, there should be a statewide policy for such signing and criteria for the availability of the various types of services. The criteria should consider the following:

A. Gas, Diesel, LP Gas, EV Charging, and/or other alternative fuels if all of the following are available:
   1. Vehicle services such as gas, oil, and water;
   2. Modern sanitary facilities and drinking water;
   3. Continuous operations at least 16 hours per day, 7 days per week; and
   4. Public telephone.

B. Food if all of the following are available:
   1. Licensing or approval, where required;
   2. Continuous operation to serve at least two meals per day, at least 6 days per week;
   3. Public telephone; and
   4. Modern sanitary facilities.

C. Lodging if all of the following are available:
   1. Licensing or approval, where required;
   2. Adequate sleeping accommodations;
   3. Public telephone; and
   4. Modern sanitary facilities.

D. Public Telephone if continuous operation, 7 days per week is available.

E. Hospital if continuous emergency care capability, with a physician on duty 24 hours per day, 7 days per week is available. A physician on duty would include the following criteria and should be signed in accordance with the priority as follows:
   1. Physician on duty within the emergency department;
   2. Registered nurse on duty within the emergency department, with a physician in the hospital on call; or
   3. Registered nurse on duty within the emergency department, with a physician on call from office or home.

F. 24-Hour Pharmacy if a pharmacy is open, with a State-licensed pharmacist present and on duty, 24 hours per day, 7 days per week and is located within 4.8 km (3 mi) of an interchange on the Federal-aid system.

G. Camping if all of the following are available:
   1. Licensing or approval, where required;
   2. Adequate parking accommodations; and
   3. Modern sanitary facilities and drinking water.

Standard:

For any service that is operated on a seasonal basis only, the General Service signs shall be removed or covered during periods when the service is not available.

The General Service signs shall be mounted in an effective location, between the Advance Guide sign and the Exit Direction sign, in advance of the exit leading to the available services.

Guidance:

The General Service sign should contain the interchange number, if any, as illustrated in Figure 2F-3.

Option:

If the distance to the next point where services are available is greater than 16 km (10 miles), a NEXT SERVICES XX km (~~XX~~ MILES) (D9-17) sign (see Figure 2F-2), may be used as a separate sign ~~panel~~ deleted to increase accuracy installed below the Exit Direction sign.

Standard:

Signs for services shall ~~conform to~~ comply with the format for General Service signs (see Section 2F.02) and as specified herein. Letter and numeral sizes shall be as shown in Tables 2E-2 through 2E-5. No more than six general road user services shall be displayed on one sign, which includes any appended sign panels. General Service signs shall carry the legends for one or more of the following services: Food, Gas, Lodging, Camping, Phone, Hospital, 24-Hour Pharmacy, or Tourist Information.

The qualified services available shall be ~~shown~~ displayed edited to increase consistency at specific locations on the sign.

To provide flexibility for the future when the service might become available, the sign space normally reserved for a given service symbol or word shall be left blank when that service is not present.

Guidance:

The standard display of word messages should be FOOD and PHONE in that order on the top line, and GAS and LODGING on the second line. If used, HOSPITAL and CAMPING should be on separate lines (see Figures 2F-3 and 2F-4).

Option:

Signing for DIESEL, LP-Gas, or other alternative fuel services may be substituted for any of the general services or appended to such signs. The International Symbol of Accessibility for the Handicapped (D9-6) sign (see Figure 2F-1) may be used for facilities that qualify.

Guidance:

When symbols are used for the road user services, they should be displayed as follows:

A. Six services:
   1. Top row—GAS, FOOD, and LODGING
   2. Bottom row—PHONE, HOSPITAL, and CAMPING

B. Four services:
   1. Top row—GAS and FOOD
   2. Bottom row—LODGING and PHONE

C. Three services:
   1. Top row—GAS, FOOD, and LODGING

Option:

Substitutions of other services for any of the services shown above may be made by placing the substitution in the lower right (four or six services) or extreme right (three services) portion of the sign ~~panel~~. deleted to increase accuracy An action message or an interchange number may be used for symbol signs in the same manner as they are used for word message signs. The Diesel Fuel (D9-11) symbol or the LP-Gas (D9-15) symbol may be substituted for the symbol representing fuel or appended to such assemblies. The Tourist Information (D9-10) symbol or the 24-Hour Pharmacy (D9-20 and D9-20aP) symbol may be substituted on any of the above configurations.

At rural interchange areas where limited road user services are available and where it is unlikely that additional services will be provided within the near future, a sign panel having one to three services (words or symbols) may be appended to ~~ground~~ post-mounted edited to increase consistency interchange guide signs.

Standard:

If more than three services become available at rural interchange areas where limited road user services were anticipated, any appended sign panel shall be removed and replaced with an independently mounted General Service sign as described in this Section.

Option:

A separate Telephone Service (D9-1) sign (see Figure 2F-1) may be installed if telephone facilities are located adjacent to the route at places where public telephones would not normally be expected.

The Recreational Vehicle Sanitary Station (D9-12) sign (see Figure 2F-1) may be used as needed to indicate the availability of facilities designed for dumping wastes from recreational vehicle holding tanks.

In some locations, signs may be used to indicate that services are not available.

A separate TRUCK PARKING (D9-16) sign (see Figure 2F-1) may be ~~used on a separate sign panel~~ mounted below the other general road user services to direct truck drivers to designated parking areas. this sentence was edited to increase accuracy

Section 2F.04 Interstate Oasis Signing

Support:

An Interstate Oasis is a facility near an Interstate highway that provides products and services to the public, 24-hour access to public restrooms, and parking for automobiles and heavy trucks. Interstate Oasis guide signs inform road users on Interstate highways as to the presence of an Interstate Oasis at an interchange and which businesses have been designated by the State within which they are traveling as having met the eligibility criteria of the Federal Highway Administration's Interstate Oasis policy. The FHWA's policy, which is dated October 18, 2006, and which can be viewed on the MUTCD website at http://mutcd.fhwa.dot.gov/res-policy.htm, provides a more detailed definition of an Interstate Oasis and specifies the eligibility criteria for an Interstate Oasis designation in compliance with the requirements of laws enacted by Congress.

Guidance:

If a State elects to provide or allow Interstate Oasis signing, there should be a statewide policy, program, procedures, and criteria for the designation and signing of a facility as an Interstate Oasis that complies with FHWA's policy and with the provisions of this Section.

States electing to provide or allow Interstate Oasis signing should use the following signing practices on the freeway for any given exit to identify the availability of a designated Interstate Oasis:

A. If adequate sign spacing allows, a separate Interstate Oasis sign should be installed in an effective location with spacing of at least 245 m (800 ft) from other adjacent guide signs, including any Specific Service signs. This Interstate Oasis sign should be located upstream from the Advance Guide sign or between the Advance Guide sign and the Exit Direction sign for the exit leading to the Interstate Oasis. The Interstate Oasis sign should have a white legend with a letter height of at least 250 mm (10 in) and a white border on a blue background and should contain the words INTERSTATE OASIS and the exit number or, for an unnumbered interchange, an action message such as NEXT RIGHT. The names or logos of the businesses designated as Interstate Oases should not be included on this sign.

B. If the spacing of the other guide signs precludes the use of a separate sign as described in Item A, a supplemental panel with a white INTERSTATE OASIS legend with a letter height of at least 250 mm (10 in) and a white border on a blue background should be appended above or below an existing D9-18 series General Service sign for the interchange.

If a separate Interstate Oasis sign as described in Item A of the previous paragraph is installed, an Interstate Oasis (D5-12) sign panel (see Figure 2F-1) should be incorporated into the design of the sign.

Standard:

The Interstate Oasis (D5-12) sign panel shall only be used on the separate Interstate Oasis sign where it is accompanied by the words INTERSTATE OASIS and shall not be used independently without the words.

Option:

If Specific Service signing is provided at the interchange, a business designated as an Interstate Oasis and having a business logo sign panel on the Food and/or Gas Specific Service signs may use the bottom portion of the business logo sign panel to display the word OASIS.

Standard:

If Specific Services signs containing the OASIS legend as a part of the business logo(s) are not used on the ramp and if the Interstate Oasis is not clearly visible and identifiable from the exit ramp, a sign with a white INTERSTATE OASIS legend with a letter height of at least 150 mm (6 in) and a white border on a blue background shall be provided on the exit ramp to indicate the direction and distance to the Interstate Oasis.

If needed, additional trailblazer guide signs shall be used along the crossroad to guide road users to an Interstate Oasis.

Section ~~2D.42~~ 2F.05 Rest Area and Other Roadside Area Signs ~~(D5 Series)~~ this Section contains edited text that was formerly in Sections 2D.42, 2D.43, and 2E.52

~~Section 2D.43 Scenic Area Signs (D6 Series)~~

~~Section 2E.52 Rest and Scenic Area Signs~~

Standard:

Rest Area **signs ~~for this purpose~~ (see Figure 2F-5) shall have a retroreflective white ~~letters, symbols,~~ legend and border on a blue background.**

~~Rest Area~~ Signs ~~(see Figure 2D-9)~~ that include the legend REST AREA shall be used only where parking and restroom facilities are available.

~~Option:~~

~~Messages such as REST AREA X km (X MILE) (D5-1), REST AREA (D5-2), PARKING AREA X km (X MILE) (D5-3), PARKING AREA (D5-4), ROADSIDE TABLE X km (X MILE), ROADSIDE PARK X km (X MILE), and PICNIC AREA X km (X MILE) may be used, as well as other appropriate messages.~~

Guidance:

A roadside area that does not contain restroom facilities should be signed to indicate the major road user service that is provided. For example, the sign legends for an area with only parking should ~~be signed with a~~ use the words PARKING AREA ~~(D5-4) sign (see Figure 2E-44)~~ instead of REST AREA. The sign legends for an area with picnic tables and parking should ~~be signed with a~~ use words such as PICNIC AREA, ~~(D5-5e) sign or a Picnic Table Area (D5-5a) symbol sign~~ ROADSIDE TABLE, or ROADSIDE PARK instead of REST AREA.

Rest areas that have tourist information and welcome centers should be signed as discussed in Section 2F.06.

Scenic area signing should be consistent with that specified for rest areas, ~~Standard messages~~ except that the legends should ~~read~~ use words such as SCENIC AREA ~~(D6-1)~~, SCENIC VIEW ~~(D6-2)~~, or SCENIC OVERLOOK ~~(D6-3), or the equivalent~~ instead of REST AREA.

~~Option:~~

~~Scenic areas may be marked by signs (see Figure 2F-5) carrying the message SCENIC AREA, SCENIC VIEW, SCENIC OVERLOOK, or the equivalent, together with appropriate directional information.~~

~~Guidance:~~

~~The design of the signs should be consistent with that specified for rest areas in Section 2D.42 and should be white letters, symbols, and border on a blue background. An advance sign and an additional sign at the turnoff point should be used for this kind of attraction.~~

If ~~used~~ a rest area or other roadside area is provided on a conventional road, a D5-1 and/or D5-1b ~~Rest Area~~ sign~~s~~ should be installed in advance of ~~roadside parks or~~ the rest area~~s~~ or other roadside area to permit the driver to reduce speed ~~and leave~~ in preparation for leaving the highway ~~reasonably safely~~. A D5-5 sign (or a D5-2 sign if an exit ramp is provided) should be installed at the turnoff point where the driver needs to leave the highway to access the rest area or other roadside area.

Signing for rest areas and ~~scenic~~ other roadside areas should ~~conform to the provisions set forth in Sections 2D.42 and 2D.43. However, the signs should~~ be suitably enlarged for freeway or expressway application~~s~~.

Standard:

~~On the approach to rest areas~~ If a rest area or other roadside area is provided on a freeway or expressway, **a ~~REST AREA advance guide~~ D5-1 sign shall be placed 2 km or 1 mile and/or 4 km or 2 miles in advance of the rest area.** A D5-2 sign shall be placed **at the rest area or other roadside area exit gore~~, there shall be a sign with a message REST AREA together with an arrow indicating the appropriate turn as shown in Figure 2F-5~~.**

Option:

A D5-1b sign may be placed between the ~~REST AREA advance guide~~ D5-1 sign and the exit gore ~~of the rest area exit, there may be a REST AREA (D5-1b) sign (see Figure 2F-5)~~ on a freeway or expressway. ~~The words NEXT RIGHT (E2-2) or an arrow may be included as part of the message.~~

To provide the road user with information on the location of succeeding rest areas, a NEXT REST AREA XX km (~~XX~~ MILES) (D5-6) sign (see Figure 2F-5) may be installed independently or as a supplemental sign ~~panel~~ deleted to increase accuracy mounted below one of the REST AREA advance guide signs.

Guidance:

Signing for rest areas and ~~scenic~~ other roadside areas should ~~conform to the provisions set forth in Sections 2D.42 and 2D.43. However, the signs should~~ be suitably enlarged for freeway or expressway applications.

Standard:

All signs on freeways and expressways for rest and ~~scenic~~ other roadside areas shall have ~~white letters, symbols, and borders on a blue background.~~ letter and numeral sizes ~~shall~~ that ~~conform to~~ comply with the minimum requirements of Tables 2E-2 through 2E-5.

Option:

If the rest area has facilities for the physically impaired (see Section 2F.02), the International Symbol of Accessibility for the Handicapped (D9-6) sign (see Figure 2F-1) may be placed with or beneath the REST AREA advance guide sign.

If telecommunication devices for the deaf (TDD) are available at the rest area, the TDD Symbol (D9-21) sign (see Figure 2F-1) may be used to supplement the advance guide signs for the rest area.

If wireless Internet services are available at the rest area, the Wi-Fi Symbol (D9-22) sign (see Figure 2F-1) may be used to supplement the advance guide signs for the rest area.

Section ~~2F.53~~ 2F.06 Tourist Information and Welcome Center Signs

Support:

Tourist information and welcome centers have been constructed within rest areas on freeways and expressways and are operated by either a State or a private organization. Others have been located within close proximity to these facilities and operated by civic clubs, chambers of commerce, or private enterprise.

Guidance:

An excessive number of supplemental sign added to increase consistency panels should not be installed with Tourist Information or Welcome Center signs so as not to overload the road user.

Standard:

Tourist Information or Welcome Center signs (see Figure 2F-6) shall have a white legend and border on a blue background. Continuously staffed or unstaffed operation at least 8 hours per day, 7 days per week, shall be required.

If operated only on a seasonal basis, the Tourist Information or Welcome Center signs shall be removed or covered during the off seasons.

Guidance:

For freeway or expressway rest area locations that also serve as tourist information or welcome centers, the following signing criteria should be used:

A. The locations for tourist information and welcome center Advance Guide, Exit Direction, and Exit Gore signs should meet the General Service signing requirements described in Section 2F.03.
B. If the signing for the tourist information or welcome center is to be accomplished in conjunction with the initial signing for the rest areas, the message on the Advance Guide (D5-7) sign should be REST AREA, TOURIST INFO CENTER, XX km (~~XX~~ MILES) or REST AREA, STATE NAME (optional), WELCOME CENTER XX km (~~XX~~ MILES). On the Exit Direction (D5-8 or D5-11) sign the message should be REST AREA, TOURIST INFO CENTER with an upward sloping arrow (or

NEXT RIGHT), or REST AREA, STATE NAME (optional), WELCOME CENTER with an upward sloping arrow (or NEXT RIGHT).

C. If the initial rest area Advance Guide and Exit Direction signing is in place, these signs should include, on supplemental signs ~~panels~~, edited to increase accuracy the legend TOURIST INFO CENTER or STATE NAME (optional), WELCOME CENTER.

D. The Gore sign should contain only the legend REST AREA with the arrow and should not be supplemented with any legend pertaining to the tourist information center or welcome center.

Option:

An alternative to the supplemental TOURIST INFO CENTER legend is the Tourist Information ~~Symbol~~ (D9-10) sign (see Figure 2F-1), which may be appended beneath the REST AREA advance guide sign.

The name of the State or local jurisdiction may appear on the Advance Guide and Exit Direction tourist information/welcome center signs if the jurisdiction controls the operation of the tourist information or welcome center and the center meets the operating criteria set forth herein and is consistent with State policies. ~~The State name may be used on the Advance Guide and the Exit Direction signs.~~

Guidance:

For tourist information centers that are located off the freeway or expressway facility, additional signing criteria should be as follows:

A. Each State should adopt a policy establishing the maximum distance that a tourist information center can be located from the interchange in order to be included on official signs.

B. The location of signing should be in accordance with requirements pertaining to General Service signing (see Section 2F.03).

C. Signing along the crossroad should be installed to guide the road user from the interchange to the tourist information center and back to the interchange.

Option:

As an alternative, the Tourist Information ~~Symbol~~ (D9-10) sign (see Figure 2F-1) may be appended to the guide signs for the exit ~~providing~~ that provides access to the tourist information center. As a second alternative, the Tourist Information ~~Symbol~~ sign may be combined with General Service signing.

Section ~~2F.56~~ 2F.07 Radio Information Signing

Option:

Radio-Weather Information (D12-1) signs (see Figure 2F-7) may be used in areas where difficult driving conditions commonly result from weather systems. Radio-Traffic Information signs may be used in conjunction with traffic management systems.

Standard:

Radio-Weather and Radio-Traffic Information signs shall have a white legend and border on a blue background. Only the numerical indication of the radio frequency shall be used to identify a station broadcasting travel-related weather or traffic information. No more than three frequencies shall be ~~shown~~ displayed edited to increase consistency on each sign. Only radio stations whose signal will be of value to the road user and who agree to broadcast either of the two items below shall be identified on Radio-Weather and Radio-Traffic Information signs:

A. Periodic weather warnings at ~~no more than 15-minute intervals~~ a rate of at least once every 15 minutes during periods of adverse weather; or

B. Driving condition information (affecting the roadway being traveled) at a rate of at least once every 15 minutes, or when required, during periods of adverse traffic conditions, and when supplied by an official agency having jurisdiction.

If a station to be considered operates only on a seasonal basis, its signs shall be removed or covered during the off season.

Guidance:

The radio station should have a signal strength to adequately broadcast 110 km (70 mi) along the route. Signs should be spaced as needed for each direction of travel at distances determined by an engineering study. The stations to be included on the signs should be selected in cooperation with the association(s) representing major broadcasting stations in the area to provide: (1) maximum coverage to all road users on both AM and FM frequencies; and (2) consideration of 24 hours per day, 7 days per week broadcast capability.

Option:

In roadway rest area locations, a smaller sign using a greater number of radio frequencies, but of the same general design, may be used.

Standard:

Radio-Weather and Radio-Traffic Information signs installed in rest areas shall be positioned such that they are not visible from the main roadway.

Option:

A Channel 9 Monitored (D12-3) sign (see Figure 2F-7) may be installed as needed. Official public agencies or their designees may be ~~shown~~ displayed edited to increase consistency as the monitoring agency on the sign ~~(see Section 2E.56)~~.

~~A Channel 9 Monitored (D12-3) sign or cellular phone sign may be installed as needed.~~

Standard:

Only official public agencies or their designee shall be ~~shown~~ displayed edited to increase consistency as the monitoring agency on the Channel 9 Monitored sign.

Option:

An EMERGENCY ~~DIAL~~ CALL XX~~X~~ (D12-4) sign (see Figure 2F-7), along with the appropriate number to ~~dial~~ call, may be used for cellular phone communications. legend revised to be consistent with the D12-2 and the D12-5 signs

Section 2F.08 TRAVEL INFO CALL 511 Sign (D12-5) this Section contains edited text that was formerly in Sections 2D.45 and 2E.56

~~Support:~~

~~Section 2D.45 contains information about the use and application of TRAVEL INFO CALL 511 (D12-5) signs.~~

Option:

A TRAVEL INFO CALL 511 (D12-5) sign (see Figure 2F-7) may be installed if a 511 travel information services telephone number is available to road users for obtaining traffic, public transportation, weather, construction, or road condition information.

The ~~logo~~ pictograph of the transportation agency or the travel information service or program that is providing the travel information may be incorporated within the D12-5 sign either above or below the TRAVEL INFO CALL 511 legend.

Standard:

The ~~logo~~ pictograph of a commercial entity shall not be incorporated within the TRAVEL INFO CALL 511 sign.

The TRAVEL INFO CALL 511 sign shall have a white legend and border on a blue background.

Guidance:

If the ~~logo~~ pictograph of the transportation agency or the travel information service or program is used, the ~~logo's~~ pictograph's maximum height should not exceed two times the letter height used in the legend of the sign.

Section ~~2E.57~~ 2F.09 Carpool and Ridesharing Signing

Option:

In areas having carpool matching services, Carpool Information (D12-2) signs (see Figure 2F-7) may be provided adjacent to highways with preferential lanes or along any other highway.

Carpool Information signs may include Internet addresses or telephone numbers of more than four characters within the legend.

Guidance:

Because this is an information sign related to road user services, the Carpool Information sign should have a white legend and border on a blue background.

Standard:

If a local transit logo or carpool symbol is incorporated into the Carpool Information sign, the maximum vertical dimension of the logo or symbol shall not exceed 450 mm (18 in).

Section 2F.10 Brake Check Area Signs (D5-13 and D5-14)

Guidance:

If an area has been provided for drivers to check the brakes on their vehicle, a BRAKE CHECK AREA XX km (MILES) (D5-13) sign (see Figure 2F-8) should be installed in advance of the brake check area, and a D5-14 sign (see Figure 2F-8) should be placed at the entrance to the brake check area.

Section 2F.11 Chain Up Area Signs (D5-15 and D5-16)

Guidance:

If an area has been provided for drivers to pull off of the roadway to install chains on their tires, a CHAIN UP AREA XX km (MILES) (D5-15) sign (see Figure 2F-8) should be installed in advance of the chain up area, and a D5-16 sign (see Figure 2F-8) should be placed at the entrance to the chain up area.

Section 2F.12 Truck Escape Ramp Signs (D17-3, D17-4, and D17-5) relocated from Section 2C.13 and given new sign designations

Guidance:

Where applicable, truck escape (or runaway truck) ramp advance ~~warning~~ signs (see Figure 2F-8) should be located approximately 1.6 km (1 mi), and 800 m (0.5 mi) in advance of the grade, and of the ramp. A sign also should be placed at the gore. A RUNAWAY VEHICLES ONLY (R4-10) sign (see ~~Figure 2B-8~~ Section 2B.42) reference revised to a new section that has been added should be installed near the ramp entrance to discourage other road users from entering the ramp. added to increase clarity No Parking (R8-3) signs should be placed near the ramp entrance.

Standard:

When truck escape ramps are installed, at least one of the ~~W7-4 series~~ D17-3, D17-4, or D17-5 signs shall be used.

Option:

A SAND (~~W7-4d~~ D17-5dP), GRAVEL (~~W7-4e~~ D17-5eP), or PAVED (~~W7-4f~~ D17-5fP) supplemental plaque (see Figure 2D-21) may be used to describe the ramp surface. State and local highway agencies may develop appropriate word message signs for the specific situation.

CHAPTER ~~2F~~ 2G. SPECIFIC SERVICE SIGNS

Section ~~2F.01~~ 2G.01 Eligibility

Standard:

Specific Service signs shall be defined as guide signs that provide road users with business identification and directional information for services and for eligible attractions. Eligible service categories shall be limited to gas, food, lodging, camping, attractions, and 24-hour pharmacies.

Guidance:

The use of Specific Service signs should be limited to areas primarily rural in character or to areas where adequate sign spacing can be maintained.

Option:

Where an engineering study determines a need, Specific Service signs may be used on any class of highways.

Guidance:

Specific Service signs should not be installed at an interchange where the road user cannot conveniently reenter the freeway or expressway and continue in the same direction of travel.

Standard:

Eligible service facilities shall comply with laws concerning the provisions of public accommodations without regard to race, religion, color, age, sex, or national origin, and laws concerning the licensing and approval of service facilities.

The attraction services shall include only facilities which have the primary purpose of providing amusement, historical, cultural, or leisure activities to the public.

Distances to eligible 24-hour pharmacies shall not exceed 4.8 km (3 mi) in any direction of an interchange on the Federal-aid system.

Guidance:

Except as noted in the Option below, distances to eligible services other than pharmacies should not exceed 4.8 km (3 mi) in any direction.

Option:

If, within the 4.8 km (3 mi) limit, facilities for the services being considered other than pharmacies are not available or choose not to participate in the program, the limit of eligibility may be extended in 4.8 km (3 mi) increments until one or more facilities for the services being considered chooses to participate, or until 25 km (15 mi) is reached, whichever comes first.

Guidance:

If State or local agencies elect to provide Specific Service signing, there should be a statewide policy for such signing and criteria for the availability of the various types of services. The criteria should consider the following:

A. To qualify for a GAS logo sign added to increase consistency panel, a business should have:
   1. Vehicle services including gas and/or alternative fuels, oil, and water;
   2. Modern sanitary facilities and drinking water;
   3. Continuous operation at least 16 hours per day, 7 days per week for freeways and expressways, and continuous operation at least 12 hours per day, 7 days per week for conventional roads; and
   4. Public telephone.

B. To qualify for a FOOD logo sign added to increase consistency panel, a business should have:
   1. Licensing or approval, where required;
   2. Continuous operations to serve at least 2 meals per day, at least 6 days per week;
   3. Public telephone; and
   4. Modern sanitary facilities.

C. To qualify for a LODGING logo sign added to increase consistency panel, a business should have:
   1. Licensing or approval, where required;
   2. Adequate sleeping accommodations;
   3. Public telephone; and
   4. Modern sanitary facilities.

D. To qualify for a CAMPING logo sign added to increase consistency panel, a business should have:

1. Licensing or approval, where required;
2. Adequate parking accommodations; and
3. Modern sanitary facilities and drinking water.

E. To qualify for an ATTRACTION logo sign added to increase consistency panel, a facility should have:

1. Regional significance; and
2. Adequate parking accommodations.

Standard:

If State or local agencies elect to provide Specific Service signing for pharmacies, both of the following criteria shall be met for a pharmacy to qualify for signing:

A. The pharmacy shall be continuously operated 24 hours per day, 7 days per week, and shall have a State-licensed pharmacist present and on duty at all times; and

B. The pharmacy shall be located within 4.8 km (3 mi) of an interchange on the Federal-aid system.

Support:

Section 2F.04 contains information regarding the Interstate Oasis program.

Section ~~2F.02~~ 2G.02 Application

Standard:

The number of Specific Service signs along an approach to an interchange or intersection, regardless of the number of service types displayed, shall be limited to a maximum of four. In the direction of traffic, successive Specific Service signs shall be for 24-hour pharmacy, attraction, camping, lodging, food, and gas services, in that order.

A Specific Service sign shall display the word message GAS, FOOD, LODGING, CAMPING, ATTRACTION, or 24-HOUR PHARMACY, an appropriate directional legend such as the word message EXIT XX, NEXT RIGHT, SECOND RIGHT, or directional arrows, and the related logo sign panels.

No more than three types of services shall be represented on any sign or sign assembly. If three types of services are ~~shown~~ displayed edited to increase consistency on one sign, then the logo sign added to increase consistency panels shall be limited to two for each service type (for a total of six logo sign added to increase consistency panels). If two types of services are displayed on one sign, then the logo sign panels shall be limited to either three for each service type (for a total of six logo sign panels) or four for one service type and two for the other service type (for a total of six logo sign panels). The legend and logo sign added to increase consistency panels applicable to a service type shall be displayed such that the road user will not associate them with another service type on the same sign.

No service type shall appear on more than ~~one~~ two signs.

The signs shall have a blue background, a white border, and white legends of upper-case letters, numbers, and arrows.

Guidance:

Where a service type is displayed on two signs, the signs for that service should follow one another in succession.

The Specific Service signs should be located to take advantage of natural terrain, to have the least impact on the scenic environment, and to avoid visual conflict with other signs within the highway right-of-way.

Option:

General Service signs (see Sections 2F.02 and 2F.03) may be used in conjunction with Specific Service signs for eligible types of services that are not represented by a Specific Service sign.

Support:

Examples of Specific Service signs are shown in Figure 2G-1. Examples of sign locations are shown in Figure 2G-2.

Section ~~2F.03~~ 2G.03 Logos and Logo Sign added to increase consistency Panels

Standard:

A logo shall be either an identification symbol/trademark or a word message. Each logo shall be placed on a separate logo sign added to increase consistency panel that shall be attached to the Specific Service sign. Symbols or trademarks used alone for a logo shall be reproduced in the colors and general shape consistent with customary use, and any integral legend shall be in proportionate size. A logo that resembles an official traffic control device shall not be used.

Guidance:

A word message logo, not using a symbol or trademark, should have a blue background with white legend and border, and should have the minimum letter heights described in Section 2G.05.

Option:

Where business identification symbols or trademarks are used alone for a logo, the border may be omitted from the logo sign added to increase consistency panel.

A portion ~~at the bottom~~ of a ~~GAS~~ logo sign added to increase consistency panel may be used to display ~~the legends for alternative fuels (see Section 2E.51) available at the facility.~~ a supplemental message horizontally along the bottom of the logo sign panel (see Figure 2G-3). ~~A portion at the bottom of a FOOD logo panel may be used to display the word CLOSED and the day of the week when the facility is closed.~~

Standard:

All supplemental messages shall be displayed within the logo sign panel.

Guidance:

A logo sign panel should not display more than one supplemental message.

The supplemental message should be displayed in a color to contrast effectively with the background of the business sign or separated from the other legend or logo by a divider bar. Text for the supplemental message should have a minimum letter height of 100 mm (4 in) for logo sign panels on Specific Service signs on freeway and expressway mainlines and 50 mm (2 in) for logo sign panels on Specific Service signs for conventional roads, ramps, or trailblazers. State or local agencies that elect to allow supplemental messages on logo sign panels should develop a statewide policy for such messages.

Support:

Typical supplemental messages might include DIESEL, 24 HOURS, CLOSED and the day of the week when the facility is closed, ALTERNATIVE FUELS (see Section 2F.03), and RV ACCESS.

Option:

The RV ACCESS supplemental message may be circular.

Standard:

If the RV ACCESS supplemental message is circular, it shall be the abbreviation RV in black letters inside a yellow circle with a black border and it shall be displayed within the logo sign panel near the lower right-hand corner (see Figure 2G-4).

Guidance:

If the circular RV ACCESS supplemental message is used, the circle should have a diameter of 250 mm (10 in) and the letters should have a height of 150 mm (6 in).

Option:

If a business designated as an Interstate Oasis (see Section 2F.04) has a business logo sign panel on the Food and/or Gas Specific Service signs, the word OASIS may be displayed on the bottom portion of the business's logo sign panel.

Standard:

Except as noted in the Option below, dual logo sign panels shall not be used on Specific Service signs.

Option:

Dual logo sign panels that have two food logos or a gas and a food logo on the same logo sign panel may be used on Specific Service signs.

Guidance:

Dual logo sign panels should be used on Specific Service signs only when the two businesses are under the same roof and a separate display of the two logos is not possible because the two necessary sign panel positions are not available.

A Specific Service sign should not display more than two dual logo sign panels.

Section ~~2F.04~~ 2G.04 Number and Size of Signs and Logo~~s and~~ Sign~~s~~ Panels

Guidance:

Sign sizes should be determined by the amount and height of legend and the number and size of logo sign added to increase consistency panels attached to the sign. All logo sign added to increase consistency panels on a sign should be the same size.

Standard:

Each Specific Service sign or sign assembly shall be limited to no more than six logo sign added to increase consistency panels. ~~**There shall be no more than four logo panels for one of the two service types on the same sign or sign assembly.**~~

Option:

Where more than six businesses of a specific service type are eligible for logo sign panels at the same interchange, additional logo sign panels of that same specific service type may also be displayed provided that the Standards noted in the next paragraph are followed. The additional logo sign panels may be displayed either by placing more than one specific service type on the same sign (see Section 2G.02) or by using a second Specific Service sign of that specific service type if the additional sign can be added without exceeding the limit of four Specific Service signs at an interchange or intersection approach.

Standard:

Where logo sign panels for more than six businesses of a specific service type are displayed at the same interchange or intersection approach, the following provisions shall apply:

A. **No more than twelve logo sign panels of a specific service type shall be displayed on no more than two Specific Service signs or sign assemblies;**
B. **No more than six logo sign panels shall be displayed on a single Specific Service sign; and**
C. **No more than four Specific Service signs shall be displayed on the approach.**

Support:

Section 2G.08 contains information regarding Specific Service signs for double-exit interchanges.

Standard:

Each logo sign added to increase consistency panel attached to a Specific Service sign shall have a rectangular shape with a width longer than the height. A logo sign added to increase consistency panel on signs for freeways and expressways shall not exceed 1500 mm (60 in) in width and 900 mm (36 in) in height. A logo sign added to increase consistency panel on signs for conventional roads and ramps shall not exceed 750 mm (30 in) in width and 450 mm (18 in) in height. The vertical and horizontal spacing between logo sign added to increase consistency panels shall not exceed 200 mm (8 in) and 300 mm (12 in), respectively.

Support:

Sections 2A.14, 2E.15, and 2E.16 contain information regarding borders, interline spacing, and edge spacing.

Section ~~2F.05~~ 2G.05 Size of Lettering

Standard:

All letters and numerals on Specific Service signs, except on the logo sign added to increase consistency panels, shall be a minimum height of 250 mm (10 in) for signs on freeways and expressways, and 150 mm (6 in) for signs on conventional roads and ramps.

Guidance:

Any legend on a symbol/trademark should be proportional to the size of the symbol/trademark.

Standard:

If a logo sign panel displays only a word legend, the minimum letter height for logo sign panels displayed on the mainlines of freeways and expressways shall be 200 mm (8 in) for upper-case and 150 mm (6 in) for lower-case letters, and the minimum letter height for logo sign panels displayed on conventional roads and ramps shall be 150 mm (6 in) for upper-case and 100 mm (4 in) for lower-case letters.

Section ~~2F.06~~ 2G.06 Signs at Interchanges

Standard:

The Specific Service signs shall be installed between the previous interchange and at least 245 m (800 ft) in advance of the Exit Direction sign at the interchange from which the services are available (see Figure 2G-2).

Guidance:

There should be at least a 245 m (800 ft) spacing between the Specific Service signs, except for Specific Service ramp signs. However, excessive spacing is not desirable. Specific Service ramp signs should be spaced at least 30 m (100 ft) from the exit gore sign, from each other, and from the ramp terminal.

Section ~~2F.07~~ 2G.07 Single-Exit Interchanges

Standard:

At single-exit interchanges, the name of the service type followed by the exit number shall be displayed on one line above the logo sign added to increase consistency panels. At unnumbered interchanges, the directional legend NEXT RIGHT (LEFT) shall be used.

At single-exit interchanges, Specific Service ramp signs shall be installed along the ramp or at the ramp terminal for facilities that have logo sign added to increase consistency panels displayed along the main roadway if the facilities are not readily visible from the ramp terminal. Directions to the service facilities shall be indicated by arrows on the ramp signs. Logo sign added to increase consistency panels on Specific Service ramp signs shall be duplicates of those displayed on the Specific Service signs located in advance of the interchange, but shall be reduced in size.

Guidance:

Specific Service ramp signs should include distances to the service facilities.

Option:

An exit number plaque (see Section 2E.27) may be used instead of the exit number on the signs located in advance of an interchange.

~~The reduced-size logo panels and signs also may be installed along the crossroad.~~

Section ~~2F.08~~ 2G.08 Double-Exit Interchanges

Guidance:

At double-exit interchanges, the Specific Service signs should consist of two sections, one for each exit (see Figure 2G-1).

Standard:

At a double-exit interchange, the top section shall display the logo sign added to increase consistency panels for the first exit and the bottom section shall display the logo sign added to increase consistency panels for the second exit. The name of the service type and the exit number shall be displayed above the logo sign added to increase consistency panels in each section. At unnumbered interchanges, the word message NEXT RIGHT (LEFT) and SECOND RIGHT (LEFT) shall be used in place of the exit number. The number of logo sign added to increase consistency panels on the sign (total of both sections) or the sign assembly shall be limited to six.

Guidance:

At a double-exit interchange, where a service type is displayed on two Specific Service signs in accordance with the provisions of Section 2G.04, one of the signs should display the logo sign panels for that service type for the businesses that are accessible from one of the two exits and the other sign should display the logo sign panels for that service type for the businesses that are accessible from the other exit.

Option:

At a double-exit interchange where there are four logo sign added to increase consistency panels to be displayed for one of the exits and one or two logo sign added to increase consistency panels to be displayed for the other exit, the logo sign added to increase consistency panels may be arranged in three rows with two logo sign added to increase consistency panels per row.

At a double-exit interchange, where a service is to be signed for only one exit, one section of the Specific Service sign may be omitted, or a single exit interchange sign may be used. Signs on ramps and crossroads as described in Section 2G.07 may be used at a double-exit interchange.

Section 2G.09 Specific Service Trailblazer Signs

Support:

Specific Service trailblazer signs are guide signs with one to four logo sign panels that display business identification and directional information for services and for eligible attractions. Specific Service trailblazer signs are installed along crossroads for facilities that have logo sign panels displayed along the main roadway and ramp, and that require additional vehicle maneuvers.

Standard:

Specific Service trailblazer signs shall be installed along crossroads where the route to the facility requires a direction change, where it is questionable as to which roadway to follow, or where additional guidance is needed. Where it is not feasible or practical to install Specific Service trailblazer signs to such facilities, those facilities shall not be considered eligible for signing from the ramp and main roadway. A Specific Service trailblazer sign shall not be required at the point where the facility is visible from the roadway and its access is readily apparent.

Guidance:

If used, a Specific Service trailblazer sign should be located no more than 150 m (500 ft) in advance any required turn.

Standard:

The location of other traffic control devices shall take precedence over the location of a Specific Service trailblazer sign.

When used, each Specific Service trailblazer sign or sign assembly shall be limited to no more than four logo sign panels. The logo sign panels on Specific Service trailblazer signs shall be duplicates of those displayed on the Specific Service ramp signs.

Appropriate legends, such as directional arrows or the word message NEXT RIGHT or SECOND RIGHT, shall be displayed with the logo sign panel to provide proper guidance. The directional legend and border shall be white and shall be displayed on a blue background (see Figure 2G-5).

Option:

Specific Service trailblazer signs may contain various types of services on a single sign or sign assembly, as shown in Figure 2G-5. Advance Turn Arrow (M5 series) or Directional Arrow (M6 series) auxiliary signs (see Figure 2D-6) with white arrows on blue backgrounds may be used with logo sign panels to create a Specific Service trailblazer sign or assembly.

Specific Service trailblazer signs may be placed farther from the edge of the road than other traffic control signs.

Section ~~2F.09~~ 2G.10 Signs at Intersections

Standard:

Where both tourist-oriented information (see Chapter 2H) and specific service information would be needed at the same intersection, the design of the tourist-oriented directional signs shall be used, and the needed specific service information shall be incorporated.

Guidance:

If Specific Service signs are used on conventional roads or at intersections on expressways, they should be installed between the previous interchange or intersection and at least 90 m (300 ft) in advance of the intersection from which the services are available.

The spacing between signs should be determined on the basis of an engineering study.

Logo sign added to increase consistency panels should not be displayed for a type of service for which a qualified facility is readily visible.

Standard:

If Specific Service signs are used on conventional roads or at intersections on expressways, the name of each type of service shall be displayed above its logo sign added to increase consistency panel(s), together with an appropriate legend, such as NEXT RIGHT (LEFT) or a directional arrow, either displayed on the same line as the name of the type of service or displayed below the logo sign panel(s).

Option:

~~If Specific Service signs are used on conventional roads or at intersections on expressways, the NEXT RIGHT (LEFT) or other applicable directional legend or action message may be displayed below instead of above the logo panels.~~ this paragraph was incorporated into the Standard in the previous paragraph

Signs similar to Specific Service ramp signs as described in Section 2G.07 may be provided on the crossroad.

Section ~~2F.10~~ 2G.11 Signing Policy

Guidance:

Each highway agency that elects to use Specific Service signs should establish a signing policy that includes, as a minimum, the guidelines of Section 2G.01 and at least the following criteria:

A. Selection of eligible businesses;
B. Distances to eligible services;
C. The use of logo sign added to increase consistency panels, legends, and signs conforming with this Manual and State design requirements;
D. Removal or covering of logo sign added to increase consistency panels during off seasons for business that operate on a seasonal basis;
E. The circumstances, if any, under which Specific Service signs ~~may~~ are permitted to be used in nonrural areas; and
F. Determination of the costs to businesses for initial permits, installations, annual maintenance, and removal of logo sign added to increase consistency panels.

CHAPTER ~~2G~~ 2H. TOURIST-ORIENTED DIRECTIONAL SIGNS

Section ~~2G.01~~ 2H.01 Purpose and Application

Support:

Tourist-oriented directional signs are guide signs with one or more sign added to increase consistency panels that display the business identification of and directional information for business, service, and activity facilities.

Standard:

A facility shall be eligible for tourist-oriented directional signs only if it derives its major portion of income or visitors during the normal business season from road users not residing in the area of the facility.

Option:

Tourist-oriented directional signs may include businesses involved with seasonal agricultural products.

Standard:

When used, tourist-oriented directional signs shall be used only on rural conventional roads and shall not be used on conventional roads in urban areas or at interchanges on freeways or expressways.

Where both tourist-oriented directional signs and Specific Service signs (see Chapter 2G) would be needed at the same intersection, the tourist-oriented directional signs shall incorporate the needed information from, and be used in place of, the Specific Service signs.

Guidance:

Each State that elects to use tourist-oriented directional signs should have a State policy for use as indicated in Section 2H.07.

Option:

Tourist-oriented directional signs may be used in conjunction with General Service signs (see Section 2F.02).

Section ~~2G.02~~ 2H.02 Design

Standard:

Tourist-oriented directional signs shall have one or more sign added to increase consistency panels for the purpose of displaying the business identification of and directional information for eligible facilities. Each sign added to increase consistency panel shall be rectangular in shape and shall have a white legend and border on a blue background.

The content of the legend on each sign added to increase consistency panel shall be limited to the business identification and directional information for not more than one eligible business, service, or activity facility. The legends shall not include promotional advertising.

Guidance:

Each sign added to increase consistency panel should have a maximum of two lines of legend including not more than one symbol, a separate directional arrow, and the distance to the facility ~~shown~~ displayed edited to increase consistency beneath the arrow. Arrows pointing to the left or up should be at the extreme left of the sign panel. added to increase accuracy Arrows pointing to the right should be at the extreme right of the sign panel. added to increase accuracy Symbols, when used, should be to the left of the word legend or logo.

Option:

The tourist-oriented directional sign may have the word message TOURIST ACTIVITIES at the top of the sign.

Standard:

The TOURIST ACTIVITIES word message shall be a white legend and border on a blue background. If used, it shall be placed above and in addition to the sign added to increase consistency panels.

Option:

The General Service sign symbols (see Section 2F.02) and the symbols for recreational and cultural interest area signs (see Chapter 2J) may be used.

Logos for specific businesses, services, and activities may also be used. Based on engineering judgment, the hours of operation may be added on the sign added to increase consistency panels.

Standard:

When used, symbols and logos shall be an appropriate size (see Section 2H.04). Logos resembling official traffic control devices shall not be permitted.

Support:

Examples of tourist-oriented directional signs are shown in Figures 2H-1 and 2H-2.

Section ~~2G.03~~ 2H.03 Style and Size of Lettering

Guidance:

All letters and numbers on tourist-oriented directional signs, except on the logos, should be upper-case and at least 150 mm (6 in) in height. Any legend on a logo should be proportional to the size of the logo.

Standard:

Design standards for upper-case letters, lower-case letters, numerals, and spacing shall be as provided in the "Standard Highway Signs and Markings" book (see Section 1A.11).

Section ~~2G.04~~ 2H.04 Arrangement and Size of Signs

Standard:

The size of a tourist-oriented directional sign shall be limited to a maximum height of 1.8 m (6 ft). However, additional height shall be allowed to accommodate the addition of the optional TOURIST ACTIVITIES message discussed in Section 2H.02 and the directional word messages discussed in Section 2H.05.

Guidance:

The number of intersection approach signs (one sign for tourist-oriented destinations to the left, one for destinations to the right, and one for destinations straight ahead) installed in advance of an intersection should not exceed three. The number of sign added to increase consistency panels installed on each sign should not exceed four. The sign added to increase consistency panels for right-turn, left-turn, and straight-ahead destinations should be on separate signs. The left-turn destination sign should be located farthest from the intersection, then the right-turn destination sign, with the straight-ahead destination sign located closest to the intersection (see Figure 2H-2). Signs for facilities in the straight-ahead direction should be considered only when there are signs for facilities in either the left or right direction.

When it is appropriate to combine the left-turn and right-turn destination sign added to increase consistency panels on a single sign, the left-turn destination sign added to increase consistency panels should be above the right-turn destination sign added to increase consistency panels (see Figure 2H-1). When there are multiple destinations in the same direction, they should be in order based on their distance from the intersection. Except as noted in the Option, a straight-ahead sign added to increase consistency panel should not be combined with a sign displaying left- and/or right-turn facilities.

The sign added to increase consistency panels should not exceed the size necessary to accommodate two lines of legend without crowding. Symbols and logos on a sign added to increase consistency panel should not exceed the height of two lines of word legends. All sign added to increase consistency panels and other parts of the sign should be the same width, which should not exceed 1.8 m (6 ft).

Option:

At intersection approaches where three or fewer facilities are ~~shown~~ displayed, edited to increase consistency the left-turn, right-turn, and straight-ahead destination sign added to increase consistency panels may be combined on the same sign.

Section ~~2G.05~~ 2H.05 Advance Signs

Guidance:

Advance signs should be limited to those situations where sight distance, intersection vehicle maneuvers, or other vehicle operating characteristics require advance notification of the services.

The design of the advance sign should be identical to the design of the intersection approach sign. However, the directional arrows and distances to the facilities should be omitted. The directional word messages NEXT RIGHT, NEXT LEFT, or AHEAD should be placed on the sign above the business identification sign added to increase consistency panels. The directional word messages should have the same

letter height as the other word messages on the sign added to increase consistency panels (see Figures 2H-1 and 2H-2).

Standard:

The directional word messages shall be a white legend and border on a blue background.

Option:

The legend RIGHT 1 km or RIGHT 1/2 MILE or LEFT 1 km or LEFT 1/2 MILE may be used on advance signs when there are intervening minor roads.

The height required to add the directional word messages recommended for the advance sign may be added to the maximum sign height of 1.8 m (6 ft).

Section ~~2G.06~~ 2H.06 Sign Locations

Guidance:

If used, the intersection approach signs should be located at least 60 m (200 ft) in advance of the intersection. Signs should be spaced at least 60 m (200 ft) apart and at least 60 m (200 ft) from other traffic control devices.

If used, advance signs should be located approximately 1 km or 0.5 miles from the intersection with 150 m (500 ft) between these signs. In the direction of travel, the order of advance sign placement should be to show the facilities to the left first, then facilities to the right, and last, the facilities straight ahead.

Position, height, and lateral ~~clearance~~ offset edited to increase consistency of signs should be governed by Chapter 2A except as permitted in this Section.

Option:

Tourist-oriented directional signs may be placed farther from the edge of the road than other traffic control signs.

Standard:

The location of other traffic control devices shall take precedence over the location of tourist-oriented directional signs.

Section ~~2G.07~~ 2H.07 State Policy

Standard:

To be eligible for tourist-oriented directional signing, facilities shall comply with applicable State and Federal laws concerning the provisions of public accommodations without regard to race, religion, color, age, sex, or national origin, and with laws concerning the licensing and approval of service facilities. Each State that elects to use tourist-oriented directional signs shall adopt a policy that complies with these provisions.

Guidance:

The State policy should include:

A. A definition of tourist-oriented business, service, and activity facilities.
B. Eligibility criteria for signs for facilities.
C. Provision for incorporating Specific Service signs into the tourist-oriented directional signs as required.
D. Provision for covering signs during off seasons for facilities operated on a seasonal basis.
E. Provisions for signs to facilities that are not located on the crossroad when such facilities are eligible for signs.
F. A definition of the immediate area. The major portion of income or visitors to the facility should come from road users not residing in the immediate area of the facility.
G. Maximum distances to eligible facilities. The maximum distance should be 8 km (5 mi).
H. Provision for information centers (plazas) when the number of eligible sign applicants exceeds the maximum permissible number of sign panel installations.
I. Provision for limiting the number of signs when there are more applicants than the maximum number of signs permitted.
J. Criteria for use at intersections on expressways.
K. Provisions for controlling or excluding those businesses which have illegal signs as defined by the Highway Beautification Act of 1965 (23 U.S.C. 131).
L. Provisions for States to charge fees to cover the cost of signs through a permit system.

M. A definition of the conditions under which the time of operation is ~~shown~~ displayed. edited to increase consistency

N. Provisions for determining if advance signs will be permitted, and the circumstances under which they will be installed.

CHAPTER 2I. GENERAL INFORMATION SIGNS new chapter with relocated text from Chapters 2D and 2E

Section 2I.01 Sizes of General Information Signs

Standard:

Except as noted in Section 2A.11, the sizes of General Information signs that have a standardized design shall be as shown in Table 2I-1.

Support:

Section 2A.11 contains information regarding the applicability of the various columns in Table 2I-1.

Option:

Signs larger than those shown in Table 2I-1 may be used (see Section 2A.11).

Section ~~2D.46~~ 2I.02 Reference Location Signs (D10-1 through D10-3) and Intermediate Reference Location Signs (D10-1a through D10-3a)

Support:

There are two types of reference location signs:

A. Reference Location (D10-1, 2, and 3) signs show an integer distance point along a highway, and
B. Intermediate Reference Location (D10-1a, 2a, and 3a) signs also show a decimal between integer distance points along a highway.

Standard:

Except ~~as provided in the Option below~~ when Enhanced Reference Location signs (see Section 2I.03) are used instead, Reference Location (D10-1 through D10-3) signs ~~(see Section 2D.46)~~ shall be placed on all expressway facilities that are located on a route where there is reference location sign continuity and on all freeway facilities to assist road users in estimating their progress, to provide a means for identifying the location of emergency incidents and traffic crashes, and to aid in highway maintenance and servicing. relocated from Section 2E.54

Option:

Reference Location (D10-1 to D10-3) signs (see Figure 2I-1) may be installed along any section of a highway route or ramp to assist road users in estimating their progress, to provide a means for identifying the location of emergency incidents and traffic crashes, and to aid in highway maintenance and servicing.

To augment the reference location sign system, Intermediate Reference Location (D10-1a to D10-3a) signs (see Figure 2I-2), which show the tenth of a kilometer (mile) with a decimal point, may be installed at one tenth of a kilometer (mile) intervals, or at some other regular spacing.

Standard:

When Intermediate Reference Location (D10-1a to D10-3a) signs are used to augment the reference location sign system, the reference location sign at the integer kilometer (mile) point shall display a decimal point and a zero numeral.

When placed on freeways or expressways, ~~Reference Location (D10-1 to D10-3)~~ reference location revised to also include the D10-1a to D10-3a signs signs shall contain 250 mm (10 in) white numerals on a 300 mm (12 in) wide green background with a white border. The signs shall be 600, 900, or 1200 mm (24, 36, or 48 in) in height for one, two, or three digits, respectively, and shall contain the abbreviation km (MILE) in 100 mm (4 in) white letters.

When placed on conventional roads, ~~Reference Location (D10-1 to D10-3)~~ reference location revised to also include the D10-1a to D10-3a signs signs shall contain 150 mm (6 in) white numerals on a green background that is at least 250 mm (10 in) wide with a white border. The signs shall contain the abbreviation km (MILE) in 100 mm (4 in) white letters.

~~The design details for reference location signs shall be as shown in the "Standard Highway Signs" book (see Section 1A.11).~~

Reference location signs shall have a minimum mounting height of 1.2 m (4 ft), ~~to~~ measured vertically from the bottom of the sign ~~in accordance with the mounting height requirements of delineators (see Section 3D.04)~~ to the elevation of the near edge of the roadway, and shall not be governed by the mounting height requirements prescribed in Section 2A.18.

The distance numbering shall be continuous for each route within a State, except where overlaps occur (see Section 2E.27). Where routes overlap, reference location sign continuity shall be established for only one of the routes. If one of the overlapping routes is an Interstate route, that route shall be selected for continuity of distance numbering.

Guidance:

The route selected for continuity of distance numbering should also have continuity in interchange exit numbering (see Section 2E.27). relocated from Section 2E.54

On a route without reference location sign continuity, the first reference location sign beyond the overlap should indicate the total distance traveled on the route so that road users will have a means of correlating their travel distance between reference location signs with that shown on their odometer.

Standard:

For divided highways, the distance measurement shall be made on the northbound and eastbound roadways. The reference location signs for southbound or westbound roadways shall be set at locations directly opposite the reference location signs for the northbound or eastbound roadways.

Guidance:

Zero distance should begin at the south and west State lines, or at the south and west terminus points where routes begin within a State.

Standard:

Except as ~~provided~~ noted edited to increase consistency in the option below, reference location signs shall be installed on the right-hand edited to increase clarity side of the roadway.

Option:

Where conditions limit or restrict the use of reference location signs on the right-hand edited to increase clarity side of the roadway, they may be installed in the median. On two-lane conventional roadways, reference location signs may be installed on one side of the roadway only and may be installed back-to-back. Reference location signs may be placed up to 9 m (30 ft) from the edge of the pavement.

If a reference location sign cannot be installed in the correct location, it may be moved in either direction as much as 15 m (50 ft).

Guidance:

If a reference location sign cannot be placed within 15 m (50 ft) of the correct location, it should be omitted.

~~Option:~~

~~Enhanced reference location signs (see Section 2I.02) may also be used on conventional roads.~~

Section ~~2E.54~~ 2I.03 ~~Reference Location Signs and~~ Enhanced Reference Location Signs (D10-4, D10-5)

Support:

~~Reference Location (D10-1 through D10-3) signs and Intermediate Reference Location (D10-1a through D10-3a) signs and their applications are described in Section 2D.46.~~

There are two types of enhanced reference location signs:

A. Enhanced Reference Location signs (D10-4), and
B. Intermediate Enhanced Reference Location signs (D10-5).

Option:

Enhanced Reference Location (D10-4) signs (see Figure 2I-3), which enhance the reference location sign system by identifying the route, may be placed on freeways or expressways (instead of Reference Location signs) or on conventional roads.

To augment an enhanced reference location sign system, Intermediate Enhanced Reference Location (D10-5) signs (see Figure 2I-3), which show the tenth of a kilometer (mile) with a decimal point, may be installed along any section of a highway route or ramp at one tenth of a kilometer (mile) intervals, or at some other regular spacing.

Standard:

If enhanced reference location signs are used, they shall be vertical ~~panels~~ signs edited to increase accuracy having blue or green backgrounds with white numerals, letters, and borders, except for the

route shield, which shall be the standard color and shape. The top line shall consist of the cardinal direction for the roadway. The second line shall consist of the applicable route shield for the roadway. The third line shall identify the kilometer (mile) reference for the location and the bottom line of the Intermediate Enhanced Reference Location sign shall give the tenth of a kilometer (mile) reference for the location. The bottom line of the Intermediate Enhanced Reference Location sign shall contain a decimal point. The height of the legend on enhanced reference location signs shall be a minimum of 150 mm (6 in). The height of the route shield on enhanced reference location signs shall be a minimum of 300 mm (12 in).

The background color shall be the same for all enhanced reference location signs within a jurisdiction.

~~**The design details for enhanced reference location signs shall be as shown in the "Standard Highway Signs" book (see Section 1A.11).**~~

~~**Enhanced reference location signs shall have a minimum mounting height of 1.2 m (4 ft) to the bottom of the sign in accordance with the mounting height requirements of delineators (see Section 3D.04), and shall not be governed by the mounting height requirements prescribed in Section 2A.18.**~~

~~**The distance numbering shall be continuous for each route within any State, except where overlaps occur (see Section 2E.28). Where routes overlap, enhanced reference location sign continuity shall be established for only one of the routes. If one of the overlapping routes is an Interstate route, that route shall be selected for continuity of distance numbering.**~~

~~**The distance measurement shall be made on the northbound and eastbound roadways. The enhanced reference location signs for southbound or westbound roadways shall be set at locations directly opposite the enhanced reference location signs for the northbound or eastbound roadways.**~~

~~Guidance:~~

~~The route selected for continuity of distance numbering should also have continuity in interchange exit numbering (see Section 2E.28).~~ relocated to Section 2I.02 ~~On a route without enhanced reference location sign continuity, the first enhanced reference location sign beyond the overlap should indicate the total distance traveled on the route so that road users will have a means of correlating their travel distance between enhanced reference location signs with that shown on their odometer.~~

~~**Standard:**~~

~~**Except as provided in the Option below, enhanced reference location signs shall be installed on the right side of the roadway.**~~

~~Option:~~

~~Where conditions limit or restrict the use of enhanced reference location signs on the right side of the roadway, they may be installed in the median. In urban areas, Intermediate Enhanced Reference Location signs may be installed on the right side of the roadway, in the median, or on ramps to replace or to supplement the reference location signs. Enhanced Reference Location signs may be installed back-to-back in median locations.~~

Support:

The provisions in Section 2I.02 regarding mounting height, distance numbering and measurements, sign continuity, and placement with respect to the right-hand shoulder and/or median for reference location signs also apply to enhanced reference location signs. added to replace the previous six paragraphs in order to eliminate repetition

Section ~~2D.47~~ 2I.04 Traffic Signal Speed Sign (I1-1)

Option:

The Traffic Signal Speed (I1-1) sign (see Figure 2I-4), reading SIGNALS SET FOR XX km/h (~~XX~~ MPH), may be used to indicate a section of street or highway on which the traffic control signals are coordinated into a progressive system timed for a specified speed at all hours during which they are operated in a coordinated mode.

If different system progression speeds are set for different times of the day, a changeable message element may be used for the numerals of the Traffic Signal Speed (I1-1) sign. If the system is operated in coordinated mode only during certain times, a blank-out version of the Traffic Signal Speed (I1-1) sign may be used to display the message only during those times.

Guidance:

If used, the sign should be mounted as near as practical to each intersection where the timed speed changes, and at intervals of several blocks throughout any section where the timed speed remains constant.

Standard:

The Traffic Signal Speed sign shall be a minimum of ~~300 x 450~~ 600 x 900 mm (~~12 x 18~~ 24 x 36 in) with the longer dimension vertical. It shall have a white message and border on a green background.

Section ~~2D.48~~ 2I.05 General Information Signs (I Series)

Support:

Of interest to the traveler, though not directly necessary for guidance, are numerous kinds of information that can properly be conveyed by general information signs (see Figure 2I-4) or miscellaneous information signs (see Section 2I.06). They include such items as State lines, city limits, other political boundaries, time zones, stream names, elevations, landmarks, and similar items of geographical interest, and safety and transportation-related messages. Chapter 2J contains recreational and cultural interest area symbol signs that are sometimes used in combination with general information signs.

Guidance:

General information signs should not be installed within a series of guide signs or at other equally critical locations, unless there are specific reasons for orienting the road user or identifying control points for activities that are clearly in the public interest. On all such signs, the designs should be simple and dignified, devoid of any advertising, and in general conformance with other guide signing.

Option:

An information symbol sign (I-5 through ~~I-8~~ I-9~~, I-11~~) may be used to identify a route leading to a transportation or general information facility, or to provide additional guidance to the facility. The symbol sign may be supplemented by an educational plaque where necessary; also, the name of the facility may be used if needed to distinguish between similar facilities.

Guide signs for commercial service airports and noncarrier airports may be provided from the nearest Interstate, other freeway, or conventional highway intersection directly to the airport, normally not to exceed 25 km (15 mi). The Airport (I-5) symbol sign along with a supplemental plaque may be used to indicate the specific name of the airport. An Airport symbol sign, with or without a supplemental name plaque or the word AIRPORT, and an arrow may be used as a trailblazer.

Standard:

Adequate trailblazer signs shall be in place prior to installing the airport guide signs.

Support:

Location and placement of all airport guide signs depends upon the availability of longitudinal spacing on highways.

Standard:

When a sign is used to display a safety or transportation-related message, the display format shall not be of a type that would be considered similar to advertising displays. Messages and symbols that resemble any official traffic control device shall not be used on safety or transportation-related message signs.

Option:

Political jurisdiction ~~logos~~ pictographs may be placed on the political boundary general information signs. The ~~logo~~ pictograph may have different colors and shapes ~~but should be~~ provided that it is simple, dignified, and devoid of any advertising.

Standard:

Except for political boundary ~~and scenic-by-way logos and~~ signs, general information signs shall have white legends and borders on green rectangular-shaped backgrounds.

Option:

The Recycling Collection Center (I-11) symbol sign may be used to direct road users to recycling collection centers.

Guidance:

The Recycling Collection Center symbol sign should not be used on freeways and expressways.

Standard:

If used on freeways or expressways, the Recycling Collection Center symbol sign shall be considered one of the supplemental sign destinations.

Section ~~2E.55~~ 2I.06 Miscellaneous ~~Guide~~ Information Signs

Support:

Miscellaneous ~~Guide~~ information signs (see Figure 2I-4) are used to point out geographical features, such as rivers and summits, and other jurisdictional boundaries (see Section 2I.05).

Option:

Miscellaneous ~~Guide~~ information signs may be used if they do not interfere with signing for interchanges or other critical points.

Guidance:

Miscellaneous ~~Guide~~ information signs should not be installed unless there are specific reasons for orienting the road users or identifying control points for activities that are clearly in the public interest. If Miscellaneous ~~Guide~~ information signs are to be of value to the road user, they should be consistent with other ~~freeway or expressway~~ guide signs in design and legibility. On all such signs, the design should be simple and dignified, devoid of any tendency toward flamboyant advertising, and in general conformance with other ~~freeway and expressway~~ signing.

Section 2I.07 Memorial Signing this text was relocated from the first four paragraphs of Section 2D.49 of the 2003 MUTCD

Support:

Legislative bodies will occasionally adopt an act or resolution memorializing a highway, bridge, or other component of the highway.

Guidance:

Such memorial names should not appear on or along a highway, or be placed on bridges or other highway components. ~~The requirement for signing should be carried out by placing~~ If a route, bridge, or highway component is officially designated as a memorial, and if notification of the memorial is to be made on the highway right-of-way, such notification should consist of installing this text was relocated from Section 2E.08 of the 2003 MUTCD a memorial plaque in a rest area, scenic overlook, recreational area, or other appropriate location where parking is provided with the signing inconspicuously located relative to vehicle operations along the highway.

Option:

If the installation of a memorial plaque off the main roadway is not practical, memorial signs may be installed on the mainline.

Standard:

Where such memorial signs are installed on the mainline, (1) memorial names shall not appear on directional guide signs, (2) memorial signs shall not interfere with the placement of any other necessary ~~highway~~ deleted to increase consistency signing, and (3) memorial signs shall not compromise the safety or efficiency of traffic flow. The memorial signing shall be limited to one sign at an appropriate location in each route direction.

Memorial names shall not appear on supplemental signs or on any other information sign on or along the highway or its intersecting routes.

Guidance:

Freeways and expressways should not be signed as memorial highways. this sentence was relocated from Section 2E.08 of the 2003 MUTCD

Section ~~2D.50~~ 2I.08 Trail Signs

Support:

Trail signs are informational signs, plaques, or shields designed to provide road users with route guidance in following a trail of particular cultural, historical, or educational significance. Examples of such trails include the Great River Road and the Lewis and Clark Trail.

Guidance:

Primary guidance should be in the form of printed literature and strip maps rather than trail signing.

If shields or other similar signs are used to provide route guidance in following a trail, they should be designed in accordance with the sizes and other design principles for route signs, such as those described in Sections 2D.10 through 2D.12.

Option:

Trail signs may be installed on a highway if they have been approved by the appropriate transportation agency.

Standard:

Trail signs shall not be installed on freeways or expressways.

Section 2I.09 Acknowledgement Signs

Support:

Acknowledgment signs are a way of recognizing a company, business, or volunteer group that provides a highway-related service. Acknowledgment signs include sponsorship signs for adopt-a-highway litter removal programs, maintenance of a parkway or interchange, and other highway maintenance or beautification sponsorship programs.

Guidance:

A State or local highway agency that elects to have an acknowledgment sign program should develop an acknowledgement sign policy. The policy should require that eligible sponsoring organizations comply with State laws prohibiting discrimination based on race, religion, color, age, sex, national origin, and other applicable laws. The acknowledgment sign policy should include all of the provisions regarding sign placement and sign design that are described in this Section.

Standard:

Because regulatory, warning, and guide signs have a higher priority, acknowledgment signs shall only be installed where adequate spacing is available between the acknowledgment sign and other higher priority signs. Acknowledgment signs shall not be installed in a position where they would obscure the road users' view of other traffic control devices.

Acknowledgment signs shall not be installed at any of the following locations:

A. On the front or back of, adjacent to, or around any other traffic control device, including traffic signs, highway traffic signals, and changeable message signs;

B. On the front or back of, adjacent to, or around the supports or structures of other traffic control devices, or bridge piers; or

C. At key decision points where a road user's attention is more appropriately focused on other traffic control devices, roadway geometry, or traffic conditions, including exit and entrance ramps, intersections, highway-rail grade crossings, toll plazas, temporary traffic control zones, and areas of limited sight distance.

Guidance:

The minimum spacing between acknowledgment signs and any other traffic control signs, except parking regulation signs, should be:

A. 45 m (150 ft) on roadways with speed limits of less than 50 km/h (30 mph),
B. 60 m (200 ft) on roadways with speed limits of 50 to 70 km/h (30 to 45 mph), and
C. 150 m (500 ft) on roadways with speed limits greater than 70 km/h (45 mph).

If the placement of a newly-installed higher-priority traffic control device, such as a higher-priority sign, a highway traffic signal, or a temporary traffic control device, conflicts with an existing acknowledgment sign, the acknowledgment sign should be relocated, covered, or removed.

Option:

State or local highway agencies may develop their own acknowledgment sign designs and may also use their own pictograph and/or a brief jurisdiction-wide program slogan as part of any portion of the acknowledgement sign.

Guidance:

Acknowledgment signs should clearly indicate the type of highway services provided by the sponsor.

Standard:

In addition to the general provisions for signs described in Chapter 2A and the sign design principles covered in the "Standard Highway Signs and Markings" book (see Section 1A.11), acknowledgment sign designs developed by State or local highway agencies shall comply with the following provisions:

A. Neither the sign design nor the sponsor acknowledgment logo shall contain any contact information, directions, slogans (other than a brief jurisdiction-wide program slogan, if used), telephone numbers, or internet addresses;

B. Except for the lettering, if any, on the sponsor acknowledgment logo, all of the lettering shall be in upper-case letters as provided in the "Standard Highway Signs and Markings" book (see Section 1A.11);

C. In order to keep the main focus on the highway-related service and not on the sponsor acknowledgment logo, the area reserved for the sponsor acknowledgment logo shall not be more than 1/3 of the total area of the sign and not more than 0.8 square meters (8 square feet);

D. The sign shall not contain any messages, lights, symbols, or trademarks that resemble any official traffic control devices;

E. The sign shall not contain any light-emitting diodes, luminous tubing, fiber optics, luminescent panels, or other flashing, moving, or animated features; and

F. The sign shall not distract from official traffic control messages such as regulatory, warning, or guidance messages.

Support:

Examples of acknowledgment sign designs are shown in Figure 2I-5.

CHAPTER ~~2H~~ 2J. RECREATIONAL AND CULTURAL INTEREST AREA SIGNS

Section ~~2H.01~~ 2J.01 Scope

Support:

Recreational or cultural interest areas are attractions or traffic generators that are open to the general public for the purpose of play, amusement, or relaxation. Recreational attractions include such facilities as parks, campgrounds, gaming facilities, and ski areas, while examples of cultural attractions include museums, art galleries, and historical buildings or sites.

The purpose of recreation and cultural interest area signs is to guide road users to a general area and then to specific facilities or activities within the area.

Option:

Recreational and cultural interest area signs that depict significant traffic generators may be used on freeways and expressways where there is direct access to these areas as discussed in Section 2J.09.

Recreational and cultural interest area signs may be used off the road network, as appropriate.

Section ~~2H.02~~ 2J.02 Application of Recreational and Cultural Interest Area Signs

Support:

Standards for signing recreational or cultural interest areas are subdivided into two different types of signs: (1) symbol signs and (2) destination guide signs.

Guidance:

When highway agencies decide to provide recreational and cultural interest area signing, these agencies should have a policy for such signing. The policy should establish signing criteria for the eligibility of the various types of services, accommodations, and facilities. These signs should not be used where they might be confused with other traffic control signs.

Option:

Recreational and cultural interest area guide signs may be used on any road to direct persons to facilities, structures, and places, and to identify various services available to the general public. These guide signs may also be used in recreational or cultural interest areas for signing nonvehicular events and amenities such as trails, structures, and facilities.

Support:

Section 2A.12 contains information regarding the use of recreational and cultural interest area symbols on other types of signs.

Section ~~2H.03~~ 2J.03 Regulatory and Warning Signs

Standard:

All regulatory and warning signs installed on public roads and streets within recreational and cultural interest areas shall ~~conform to~~ comply with the requirements of Chapters 2A, 2B, ~~and~~ 2C, 7B, 8B, 9B, and 10C.

Section ~~2H.04~~ 2J.04 General Design Requirements for Recreational and Cultural Interest Area Symbol Guide Signs

Standard:

Recreational and cultural interest area symbol guide signs shall be square or rectangular in shape and shall have a white symbol or message and white border on a brown background. The symbols shall be grouped into the following usage and series categories ~~(see the "Standard Highway Signs" book for design details)~~ this was added to the Support sentence in the next paragraph for clarity:

- **A. General ~~Information (RG Series)~~ Applications,**
- **B. Accommodations ~~Services (RA Series)~~,**
- **C. ~~Motorist~~ Services ~~(RM Series)~~,**
- **D. Land Recreation ~~(RL series)~~,**
- **E. Water Recreation ~~(RW Series)~~,**
- **F. Winter Recreation ~~(RS Series)~~, and**
- **G. Prohibited Activities and Items.**

Support:

Table 2J-1 contains a listing of the symbols within each series category. Drawings showing the design details for these symbols are found in the "Standard Highway Signs and Markings" book (see Section 1A.11).

Option:

Mirror images of symbols may be used where the reverse image will better convey the message.

Section ~~2H.05~~ 2J.05 Symbol Sign Sizes

Guidance:

Recreational and cultural interest area symbol signs should be 600 x 600 mm (24 x 24 in). Where greater visibility or emphasis is needed, larger sizes should be used. Symbol sign enlargements should be in 150 mm (6 in) increments.

Recreational and cultural interest area symbol signs should be 750 x 750 mm (30 x 30 in) when used on guide signs on freeways or expressways.

Option:

A smaller size of 450 x 450 mm (18 x 18 in) may be used on low-speed, low-volume roadways and on nonroad applications.

Section ~~2H.06~~ 2J.06 Use of Educational Plaques

Guidance:

Educational plaques should accompany all initial installations of recreational and cultural interest area symbol signs. The educational plaque should remain in place for at least 3 years after the initial installation. If used, the educational plaque should be the same width as the symbol sign.

Option:

Symbol signs that are readily recognizable by the public may be installed without educational plaques.

Support:

Figure 2J-1 illustrates some examples of the use of educational plaques.

Section ~~2H.07~~ 2J.07 Use of Prohibitive Slash

Standard:

Where it is necessary to indicate a ~~restriction~~ prohibition of an activity or an item within a recreational or cultural interest area for non-road use and a standard regulatory sign for such a prohibition is not provided in Chapter 2B, ~~a red diagonal slash may be used to indicate that the activity is prohibited~~ the appropriate recreational and cultural interest area symbol sign for prohibited activities and items (see Figure 2J-11) shall be used.

The red diagonal slash, if used on a recreational and cultural interest area sign, shall be placed behind the symbol from the upper left corner to the lower right corner of the sign face (see Figures 2J-1 and 2J-11). Requirements for retroreflection of the red slash shall be the same as those requirements for legends, symbols, and borders.

~~Support:~~

~~Figure 2H-1 illustrates some examples of the use of prohibitive slashes.~~

Section ~~2H.08~~ 2J.08 Placement of Recreational and Cultural Interest Area Symbol Signs

Standard:

If used, recreational and cultural interest area symbol signs shall be placed in accordance with the general requirements contained in Chapter 2A. The symbol(s) shall be placed in the uppermost part of the sign assembly and the directional information shall be placed below the symbol(s).

Except as noted in the Option below, ~~where~~ if the name of the recreational or cultural interest area facility or activity is ~~shown~~ displayed edited to increase consistency on a general directional guide sign and a symbol is used, the symbol shall be placed below the name (see Figure 2J-2).

Option:

When the legend Wildlife Viewing Area is displayed with the RS-076 symbol, the symbol may be placed to the left or right of the legend and the arrow may be placed below the symbol (see Figure 2J-2).

Standard:

Recreational and cultural interest area symbols installed for nonroad use shall be placed in accordance with the general sign position requirements of the authority having jurisdiction.

Support:

Figure 2J-3 illustrates typical height and lateral mounting positions. Figure 2J-4 illustrates some examples of the placement of symbol signs within a recreational or cultural interest area. Figures 2J-5 through 2J-11 illustrate some of the symbols that can be used.

Guidance:

The number of symbols used in a single sign assembly should not exceed four.

Option:

Symbols for recreational or cultural interest areas may be used as legend components for a directional sign assembly. The symbols may be used singularly, or in groups of two, three, or four on a single sign assembly (see Figures 2J-1, 2J-3, and 2J-4). Smaller-size secondary symbols (see Figure 2J-1) may be placed beneath the primary symbols, where needed.

Section ~~2H.09~~ 2J.09 Destination Guide Signs

Guidance:

When recreational or cultural interest area destinations are ~~shown~~ displayed edited to increase consistency on supplemental guide signs, the sign should be rectangular or trapezoidal in shape. The order of preference for use of shapes and colors should be as follows: (1) rectangular with a white legend and border on a green background; (2) rectangular with a white legend and border on a brown background; or (3) trapezoidal with a white legend and border on a brown background.

Standard:

Whenever the trapezoidal shape is used, the color combination shall be a white legend and border on a brown background.

Option:

White-on-brown destination guide signs may be posted at the first point where an access or crossroad intersects a highway where recreational or cultural interest areas are a significant destination along conventional roads, expressways, or freeways. White-on-brown supplemental guide signs may be used along conventional roads, expressways, or freeways to direct road users to recreational or cultural interest areas. Where access or crossroads lead exclusively to the recreational or cultural interest area, the advance guide sign and the exit direction sign may be white-on-brown.

Standard:

~~**Linear parkway-type highways that primarily function as arterial connectors, even if they also provide access to recreational or cultural interest areas, shall not qualify for the use of white-on-brown destination guide signs. Directional guide signs used on these highways shall conform to Chapter 2D.**~~

All gore signs shall have a white legend and border on a green background. The background color of the interchange exit number ~~panel~~ plaque edited to increase accuracy shall match the background color of the guide sign. Design characteristics of conventional road, expressway, or freeway guide signs shall ~~conform to~~ comply with Chapter 2D or 2E except as ~~specified~~ noted edited to increase consistency in this Section for color combination.

The advance guide sign and the Exit Direction sign shall retain the white-on-green color combination where the crossroad leads to a destination other than a recreational or cultural interest area.

Support:

Figure 2J-2 illustrates destination guide signs commonly used for identifying recreational or cultural interest areas or facilities.

CHAPTER ~~2I~~ 2K. EMERGENCY MANAGEMENT SIGNING

Section ~~2I.01~~ 2K.01 Emergency Management

Guidance:

Contingency planning for an emergency evacuation should be considered by all State and local jurisdictions and should consider the use of all applicable roadways.

In the event of a disaster where highways that cannot be used will be closed, a successful contingency plan should account for the following elements: a controlled operation of certain designated highways, the establishment of traffic operations for the expediting of essential traffic, and the provision of emergency centers for civilian aid.

Section ~~2I.02~~ 2K.02 Design of Emergency Management Signs

Standard:

Emergency Management signs shall be used to guide and control highway traffic during an emergency.

Emergency Management signs shall not permanently displace any of the standard signs that are normally applicable.

Advance planning for transportation operations' emergencies shall be the responsibility of State and local authorities. The Federal Government shall provide guidance to the States as necessitated by changing circumstances.

Except as noted in Section 2A.11, the sizes for Emergency Management signs shall be as shown in Table 2K-1.

Support:

Section 2A.11 contains information regarding the applicability of the various columns in Table 2K-1.

Option:

Signs larger than those shown in Table 2K-1 may be used (see Section 2A.11).

Guidance:

As conditions permit, the Emergency Management signs should be replaced or augmented by standard signs.

The background of Emergency Management signs should be retroreflective.

Because Emergency Management signs might be needed in large numbers for temporary use during an emergency, consideration should be given to their fabrication from any light and economical material that can serve through the emergency period.

Option:

Any Emergency Management sign that is used to mark an area that is contaminated by biological or chemical warfare agents or radioactive fallout may be accompanied by ~~a~~ the standard ~~triangular plaque, as~~ symbol that is illustrated ~~for~~ in the upper left corner of the EM-7c and EM-7d signs in Figure 2K-1~~, for marking areas contaminated by biological and chemical warfare agents and radioactive fallout~~.

Section ~~2I.03~~ 2K.03 Evacuation Route Signs (EM-1 and EM-1a) paragraphs were relocated within this Section

Standard:

The Evacuation Route (EM-1 and EM-1a) signs ~~(see Figure 2I-1)~~ shall ~~be~~ display a ~~rectangular sign with a~~ blue circular symbol ~~with~~ on a white square sign without a border as shown in Figure 2K-1. The EM-1 sign shall include a white directional arrow (except as noted in the Option below) and ~~the~~ a white legend EVACUATION ROUTE within the blue circular symbol. The EM-1a sign shall include the words TSUNAMI EVACUATION ROUTE within the blue circular symbol. The diameter of the blue circular symbol on the EM-1 and EM-1a signs shall be 25 mm (1 in) smaller than the height and width of the sign, and the entire sign shall be retroreflective.

An Advance Turn Arrow (M5 series) or Directional Arrow (M6 series) auxiliary sign (see Figure 2D-6) with a white arrow on a blue background below which shall be installed below the EM-1a sign.

Option:

~~The arrow may be a separate panel attached to the face of the sign.~~

Instead of including a directional arrow within the blue circular symbol on the EM-1 sign, an Advance Turn Arrow (M5 series) or Directional Arrow (M6 series) auxiliary sign (see Figure 2D-6) with a white arrow on a blue background may be installed below the EM-1 sign.

~~The legend on the EVACUATION ROUTE sign may be modified to describe the type of evacuation route, such as HURRICANE.~~

If desired, the word HURRICANE, or a word that describes some other type of evacuation route, may be added as a third line of text above the white EVACUATION ROUTE legend within the blue circular symbol on the EM-1 sign.

An approved Emergency Management symbol with a diameter of 87 mm (3.5 in) may appear near the bottom of ~~the~~ an Evacuation Route sign ~~with a diameter of 87 mm (3.5 in)~~. edited to increase clarity

Standard:

~~**The legend and arrow of the EVACUATION ROUTE sign shall be white on a blue circular background. The corners of the sign outside of the blue circle shall be white. The entire sign shall be retroreflective.**~~ **The arrow designs, if used, on the EM-1 sign shall include a straight, vertical arrow pointing upward, a straight horizontal arrow pointing to the left or right, or a bent arrow pointing to the left or right for advance warning of a turn.** this paragraph edited to increase clarity

If used, the Evacuation Route sign, with the appropriate arrow, shall be installed 45 to 90 m (150 to 300 ft) in advance of, and at, any turn in an approved evacuation route. The sign shall also be installed elsewhere for straight-ahead confirmation where needed.

If used in urban areas, the Evacuation Route sign shall be mounted at the right-hand side of the roadway, not less than 2.1 m (7 ft) above the top of the curb, and at least 0.3 m (1 ft) back from the face of the curb. If used in rural areas, ~~it~~ the Evacuation Route sign shall be mounted at the right-hand side of the roadway, not less than 2.1 m (7 ft) above the pavement and not less than 1.8 m (6 ft) or more than ~~to~~ 3 m (~~6 to~~ 10 ft) to the right ~~side~~ of the right-hand roadway edge. this paragraph edited to increase clarity

Evacuation Route signs shall not be placed where they will conflict with other signs. Where conflict in placement would occur between the Evacuation Route sign and a standard regulatory sign, the regulatory sign shall take precedence.

Option:

In case of conflict with guide or warning signs, the ~~Emergency Management~~ Evacuation Route sign may take precedence.

Guidance:

Placement of Evacuation Route signs should be made under the supervision of the officials having jurisdiction over the placement of other traffic signs. Coordination with Emergency Management authorities and agreement between contiguous political entities should occur to assure continuity of routes.

Section ~~2I.04~~ 2K.04 AREA CLOSED Sign (EM-2)

Standard:

The AREA CLOSED (EM-2) sign (see Figure 2K-1) shall be used to close a roadway in order to prohibit traffic from entering the area. It shall be installed on the shoulder as near as practical to the right-hand edited to increase clarity **edge of the roadway, or preferably, on a portable mounting or barricade partly or entirely in the roadway.**

Guidance:

For best visibility, particularly at night, the sign height should not exceed 1.2 m (4 ft) measured vertically from the pavement to the bottom of the sign. Unless adequate advance warning signs are used, it should not be placed to create a complete and unavoidable blocked route. Where feasible, the sign should be located at an intersection that provides a detour route.

Section ~~2I.05~~ 2K.05 TRAFFIC CONTROL POINT Sign (EM-3)

Standard:

The TRAFFIC CONTROL POINT (EM-3) sign (see Figure 2K-1) shall be used to designate a location where an official traffic control point has been set up to impose such controls as are necessary to limit congestion, expedite emergency traffic, exclude unauthorized vehicles, or protect the public.

The sign shall be installed in the same manner as the AREA CLOSED sign (see Section 2K.04), and at the point where traffic must stop to be checked.

The standard STOP (R1-1) sign shall be used in conjunction with the TRAFFIC CONTROL POINT sign. The TRAFFIC CONTROL POINT sign shall consist of a black legend and border on a retroreflectorized white background.

Guidance:

The TRAFFIC CONTROL POINT sign should be mounted directly below the STOP sign.

Section ~~2I.06~~ 2K.06 MAINTAIN TOP SAFE SPEED Sign (EM-4)

Option:

The MAINTAIN TOP SAFE SPEED (EM-4) sign (see Figure 2K-1) may be used on highways where conditions are such that it is prudent to evacuate or traverse an area as quickly as possible.

Where an existing Speed Limit (R2-1) sign is in a suitable location, the MAINTAIN TOP SAFE SPEED sign may conveniently be mounted directly over the face of the speed limit sign that it supersedes.

Support:

Since any speed zoning would be impractical under such emergency conditions, no minimum speed limit can be prescribed by the MAINTAIN TOP SAFE SPEED sign in numerical terms. Where traffic is supervised by a traffic control point, official instructions will usually be given verbally, and the sign will serve as an occasional reminder of the urgent need for maintaining the proper ~~reasonably safe~~ speed.

Guidance:

The sign should be installed as needed, in the same manner as other standard speed signs.

Standard:

If used in rural areas, the MAINTAIN TOP SAFE SPEED sign shall be mounted on the right-hand edited to increase clarity side of the road at a horizontal distance of 1.8 to 3 m (6 to 10 ft) from the roadway edge, and ~~with its lower edge not less than~~ at a minimum height, measured vertically from the bottom of the sign to the elevation of the near edge of the pavement, of 1.5 m (5 ft) ~~above the pavement, 1.8 to 3 m (6 to 10 ft) from the roadway edge~~. If used in urban areas, 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, shall be ~~not less than~~ 2.1 m (7 ft), and the nearest edge of the sign shall be not less than 0.3 m (1 ft) back from the face of the curb.

Section ~~2I.07~~ 2K.07 ROAD (AREA) USE PERMIT REQUIRED FOR THRU TRAFFIC Sign (EM-5)

Support:

The intent of the ROAD (AREA) USE PERMIT REQUIRED FOR THRU TRAFFIC (EM-5) sign (see Figure 2K-1) is to notify road users of the presence of the traffic control point so that those who do not have priority permits issued by designated authorities can take another route, or turn back, without making a needless trip and without adding to the screening load at the post. Local traffic, without permits, can proceed as far as the traffic control post.

Standard:

If used, the ROAD (AREA) USE PERMIT REQUIRED FOR THRU TRAFFIC (EM-5) sign shall be used at an intersection that is an entrance to a route on which a traffic control point is located.

If used, the sign shall be installed in a manner similar to that of the MAINTAIN TOP SAFE SPEED sign (see Section 2K.06).

Section ~~2I.08~~ 2K.08 Emergency Aid Center Signs (EM-6 Series)

Standard:

In the event of emergency, State and local authorities shall establish various centers for civilian relief, communication, medical service, and similar purposes. To guide the public to such centers a series of directional signs shall be used.

Emergency Aid Center (EM-6 series) signs (see Figure 2K-1) shall carry the designation of the center and an arrow indicating the direction to the center. They shall be installed as needed, at intersections and elsewhere, on the right-hand edited to increase clarity side of the roadway, in urban areas at a 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, ~~in urban areas~~ of ~~at least~~ 2.1 m (7 ft), and not less than 0.3 m (1 ft) back from the face of the curb, and in rural areas at a minimum height, measured vertically from the bottom of the sign to the elevation of the near edge of the pavement, of 1.5 m (5 ft), and at a horizontal distance of 1.8 to 3 m (6 to 10 ft) from the roadway edge.

Emergency Aid Center signs shall carry one of the following legends, as appropriate, or others designating similar emergency facilities:

A. MEDICAL CENTER (EM-6a),
B. WELFARE CENTER (EM-6b),
C. REGISTRATION CENTER (EM-6c), or
D. DECONTAMINATION CENTER (EM-6d).

The Emergency Aid Center sign shall be a horizontal rectangle. Except as noted in the Option below, the identifying word and the word CENTER, the directional arrow, and the border shall be black on a white background.

Option:

When Emergency Aid Center signs are used in an incident situation, such as during the aftermath of a nuclear or biological attack, the background color may be fluorescent pink (see Chapter 6H).

Section ~~2I.09~~ 2K.09 Shelter Directional Signs (EM-7 Series)

Standard:

Shelter Directional (EM-7 Series) signs (see Figure 2K-1) shall be used to direct the public to selected shelters that have been licensed and marked for emergency use.

The installation of Shelter Directional signs shall ~~conform to~~ comply with established ~~highway~~ deleted to increase consistency signing standards. Where used, the signs shall not be installed in competition with other necessary highway guide, warning, and regulatory signs.

The Shelter Directional sign shall be a horizontal rectangle. Except as noted in the Option below, the identifying word and the word SHELTER, the directional arrow, the distance to the shelter, and the border shall be black on a white background.

Option:

When Shelter Directional signs are used in an incident situation, such as during the aftermath of a nuclear or biological attack, the background color may be fluorescent pink (see Chapter 6H).

The distance to the shelter may be omitted from the sign when appropriate.

Shelter Directional signs may carry one of the following legends, or others designating similar emergency facilities:

A. EMERGENCY (EM-7a),
B. HURRICANE (EM-7b),
C. FALLOUT (EM-7c), or
D. CHEMICAL (EM-7d).

If appropriate, the name of the facility may be used.

The Shelter Directional signs may be installed on the Interstate Highway System or any other major highway system when it has been determined that a need exists for such signs as part of a State or local shelter plan.

The Shelter Directional signs may be used to identify different routes to a shelter to provide for rapid movement of large numbers of persons.

Guidance:

The Shelter Directional sign should be used sparingly and only in conjunction with approved plans of State and local authorities.

As a general rule, the Shelter Directional sign should not be posted more than 8 km (5 mi) from a shelter.

CHAPTER ~~3C.~~ 2L. OBJECT MARKERS, BARRICADES, AND GATES Chapter 3C and barricades both relocated, and gates added

Section ~~3C.01~~ 2L.01 Object Marker Design and Placement Height

Support:

Type 1, 2, and 3 added to increase accuracy object markers are used to mark obstructions within or adjacent to the roadway.

Standard:

When used, Type 1, 2, and 3 added to increase accuracy object markers (see Figure 2L-1) shall consist of an arrangement of one or more of the following types:

Type 1—either a marker consisting of nine yellow retroreflectors, each with a minimum diameter of 75 mm (3 in), mounted symmetrically on a yellow (OM1-1) or black (OM1-2) diamond ~~panel~~ sign edited to increase accuracy 450 mm (18 in) or more on a side; or ~~on~~ an all-yellow retroreflective diamond ~~panel~~ sign edited to increase accuracy (OM1-3) of the same size.

Type 2—either a marker (OM2-1V or OM2-1H) consisting of three yellow retroreflectors, each with a minimum diameter of 75 mm (3 in), arranged either horizontally or vertically on a white ~~panel~~ sign edited to increase accuracy measuring at least 150 x 300 mm (6 x 12 in); or ~~on~~ an all-yellow horizontal or vertical retroreflective ~~panel~~ sign edited to increase accuracy (OM2-2V or OM2-2H), measuring at least 150 x 300 mm (6 x 12 in).

Type 3—a striped marker, 300 x 900 mm (12 x 36 in), 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 75 mm (3 in).

Support:

A better appearance can be achieved if the black stripes are wider than the yellow stripes.

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 (~~OM-3R~~ 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 (~~OM-3L~~ OM3-L).

Guidance:

When used for marking ~~objects in~~ obstructions within edited to increase consistency the roadway or ~~objects~~ obstructions edited to increase consistency that are 2.4 m (8 ft) or less from the shoulder or curb, the minimum mounting height, measured ~~to~~ from the bottom of the object marker to the elevation of the near edge of the traveled way, should be ~~at least~~ 1.2 m (4 ft) ~~above the surface of the nearest traffic lane~~.

When used to mark ~~objects~~ obstructions edited to increase consistency more than 2.4 m (8 ft) from the shoulder or curb, the ~~mounting height~~ clearance from the ground to the bottom of the object marker should be at least 1.2 m (4 ft) ~~above the ground~~.

Object markers should not present a vertical or horizontal clearance obstacle for pedestrians. relocated from last paragraph of Section 3A.03

Option:

When object markers or markings are applied to an ~~object~~ obstruction edited to increase consistency that by its nature requires a lower or higher mounting, the vertical mounting height may vary according to need.

Section ~~3C.02~~ 2L.02 ~~Markings~~ Object Markers for ~~Objects in~~ Obstructions Within the Roadway edited to increase consistency

Standard:

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.10).

Option:

To provide additional emphasis, a Type 1 or Type 3 object marker may be installed on the nose of a median island at an intersection.

To provide additional emphasis, large surfaces such as bridge piers may be painted with diagonal stripes, 300 mm (12 in) or greater in width, similar in design to the Type 3 object marker.

Standard:

The alternating black and retroreflective yellow stripes (~~OM-3L~~ OM3-L, ~~OM-3R~~ 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 (~~OM-3C~~ OM3-C) shall form chevrons that point upwards.

Option:

Appropriate signs (see Sections 2B.40 and 2C.24) directing traffic to one or both sides of the obstruction may be used instead of the object marker.

Section ~~3C.03~~ 2L.03 ~~Markings~~ Object Markers edited to increase clarity for ~~Objects~~ Obstructions Adjacent to the Roadway changes to this section made to increase clarity

Support:

~~Objects~~ Obstructions edited to increase consistency not actually ~~in~~ within edited to increase consistency 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.

~~Option:~~

~~Type 2 or Type 3 object markers may be used at locations such as those described in the preceding Support paragraph.~~

Standard:

If Type 2 or Type 3 object markers are used at locations such as those described in the preceding Support paragraph, the inside edge of the marker shall be in line with the inner edge of the obstruction.

Type 1 and Type 4 object markers shall not be used at locations such as those described in the preceding Support paragraph.

Guidance:

Standard warning signs (see Chapter 2C) should also be used where applicable.

Section ~~3C.04~~ 2L.04 ~~End-of-Roadway~~ Object Markers for Ends of Roadways edited to increase consistency

Support:

The ~~end-of-roadway~~ Type 4 object edited to increase consistency marker is used to warn and alert road users of the end of a roadway in other than construction or maintenance areas.

Standard:

If an object marker is used to mark the end of a roadway, a Type 4 object marker shall be used.

If used, the ~~end-of-roadway~~ Type 4 object edited to increase consistency marker (see Figure 2L-1) shall be one of the following: a marker consisting of nine red retroreflectors, each with a minimum diameter of 75 mm (3 in), mounted symmetrically on a red (OM4-1) or black (OM4-2) diamond ~~panel~~ sign edited to increase accuracy 450 mm (18 in) or more on a side; or a retroreflective red diamond ~~panel~~ sign edited to increase accuracy (OM4-3) 450 mm (18 in) or more on a side.

Option:

The ~~end-of-roadway~~ Type 4 object edited to increase consistency marker may be used in instances where there are no alternate vehicular paths.

Where conditions warrant, more than one marker, or a larger marker with or without a Type ~~III~~ 3 Barricade (see Section 2L.05), may be used at the end of the roadway.

Standard:

The minimum mounting height, measured vertically from ~~to~~ the bottom of ~~an end-of-roadway~~ a Type 4 object edited to increase consistency marker to the elevation of the near edge of the pavement, shall be 1.2 m (4 ft) ~~above the edge of the pavement~~.

Guidance:

Appropriate advance warning signs (see Chapter 2C) should be used.

Section ~~3F.01~~ 2L.05 Barricades relocated from Chapter 3F

Standard:

When used to warn and alert road users of the terminus of a roadway in other than temporary traffic control zones, barricades shall meet the design criteria of Section 6F.65 for a Type ~~III~~ 3 Barricade, except that the colors of the stripes shall be retroreflective white and retroreflective red.

Option:

An end-of-roadway marker or markers may be used as described in Section 2L.04. Barricades may be used to mark any of the following conditions:

A. A roadway ends,
B. A ramp or lane closed for operational purposes, or
C. The permanent or semipermanent closure or termination of a roadway.

Guidance:

Appropriate advance warning signs (see Chapter 2C) should be used.

Section 2L.06 Gates

Support:

A gate is an automatically-operated or manually-operated traffic control device that is used to physically obstruct road users such that they cannot proceed past a particular point on a roadway or pathway, or such that they cannot enter a particular ramp, lane, roadway, or facility.

Gates described in this section used for weather or other emergency conditions are typically permanently installed to enable the gate to be immediately deployed as needed to prohibit the entry of traffic to the highway segment(s).

A gate typically features a gate arm that is moved from a vertical to a horizontal position or is rotated in a horizontal plane from parallel to traffic to perpendicular to traffic. Traffic is obstructed and required to stop when the gate arm is placed in a horizontal position perpendicular to traffic. Another type of gate consists of a segment of fence (usually on rollers) that swings open and closed, or that is retracted to open and then extended to close.

Gates are sometimes used to enforce a required stop. Some examples of such uses are the following:

A. Parking facility entrances and exits,
B. Private community entrances and exits,
C. Military base entrances and exits,
D. Toll plaza lanes,
E. Movable bridges (see Chapter 4J),
F. Automated Flagger Assistance Devices (see Chapter 6E),
G. Highway-rail grade crossings (see Part 8), and
H. Highway-light rail transit grade crossings (see Part 10).

Gates are sometimes used to periodically close a roadway or a ramp. Some examples of such uses are the following:

A. Closing ramps to implement counter-flow operations for evacuations,
B. Closing ramps that lead to reversible lanes, and
C. Closing roadways for weather events such as snow, ice, or flooding, or for other emergencies.

Standard:

Gate arms, if used, shall be fully retroreflectorized on both sides, have vertical stripes alternately red and white at 400 mm (16 in) intervals measured horizontally as shown in Figure 8C-1. When in the horizontal position, the bottom of the gate arm shall be 1.1 to 1.4 m (3.5 to 4.5 ft) above the roadway or pathway surface. The gate arm shall extend across the approaching lane or lanes of traffic to effectively block motor vehicle and/or pedestrian travel as appropriate.

Rolling sections of fence, if used, shall include either a horizontal strip of retroreflectorized sheeting with vertical stripes alternately red and white at 400 mm (16 in) intervals measured horizontally to simulate the appearance of a gate arm in the horizontal position, or one or more Type 4 end-of-roadway

object markers (see Section 2L.04), or both. If a horizontal strip of retroreflectorized sheeting is used, the bottom of the sheeting shall be located 1.1 to 1.4 m (3.5 to 4.5 ft) above the roadway surface.

When gate arms are in the vertical position or rotated to an open position, the closest part of the gate arm and support shall have a lateral offset of at least 0.6 m (2 ft) from the face of the curb or the edge of the pavement.

When gate arms that are located in the median or on an island are in the horizontal position or rotated to a closed position, the closest part of the counterweight or its supports shall have a lateral offset of at least 0.6 m (2 ft) from the face of the curb or the edge of the pavement of the open roadway on the opposite side of the median or island.

Gates shall meet the crashworthy performance criteria contained in the National Cooperative Highway Research Program (NCHRP) Report 350, "Recommended Procedures for the Safety Performance Evaluation of Highway Features" (see Section 6F.01).

Guidance:

When a gate that is rotated in a horizontal plane is in the position where it is parallel to traffic (indicating that the roadway is open), the outer end of the gate arm should be rotated to the downstream direction (from the perspective of traffic in the lane adjacent to the gate support) to prevent spearing if the gate is struck by an errant vehicle.

If a pedestrian route is present and if it is not intended that pedestrian traffic be controlled by the gate, sufficient lateral offset from supports, posts, counterweights, and gate mechanisms should be provided when the gate arm is in the open position and when the gate arm is in the closed position such that pedestrian travel is not impeded.

Option:

Red lights may be attached to traffic gates. If used, the red lights shall be steadily illuminated or flashed only during the period when the gate is in the horizontal or closed position and when the gate is in the process of being opened or closed.

CHAPTER 2M. CHANGEABLE MESSAGE SIGNS text was relocated from Sections 2A.07 and 2E.21 to form this new Section

Section 2M.01 Description of Changeable Message Signs

Support:

~~Changeable message signs, with more sophisticated technologies, are gaining widespread use to inform road users of variable situations, particularly along congested traffic corridors. Highway and transportation organizations are encouraged to develop and experiment (see Section 1A.10) with changeable message signs and to carefully evaluate such installations so that experience is gained toward adoption of future standards.~~

~~Because technology for changeable message signs continues to advance, a specific standard for changeable message signs is not practical. Considerations that influence the selection of the best sign for a particular application include conspicuity, legibility, operation, and maintenance of the changeable message sign. This Section applies to signs for use on freeway and expressway mainlines. It is recognized that similar signs might be used on ramps and at ramp terminals where smaller letter heights and the number of messages might differ from the provisions of this Section.~~

A changeable message sign (CMS) is a traffic control device that is capable of displaying one or more alternative messages. Some changeable message signs have a blank mode when no message is displayed, while others display multiple messages with only one of the messages displayed at a time (such as OPEN/CLOSED signs at weigh stations). Changeable message signs are referred to as "dynamic message signs" in the National Intelligent Transportation Systems (ITS) Architecture. The information in this Chapter applies to both changeable message and dynamic message signs and the terms are used interchangeably.

The provisions in this Chapter apply to both permanent and portable changeable message signs with electronic displays. Additional provisions that only apply to portable changeable message signs can be found in Section 6F.57. The provisions in this Chapter do not apply to changeable message signs with non-electronic displays that are changed either manually or electromechanically, such as a flip-panel or a rotating drum CMS.

~~Guidance~~ **Standard:**

Except ~~for safety or transportation related messages~~ as noted in the Option in Section 2M.02, changeable message signs ~~should not be used to~~ shall display ~~information other than~~ only traffic operational, regulatory, warning, and guidance information ~~related to traffic control~~. ~~Changeable message signs shall display pertinent traffic operational and guidance information only, not advertising.~~ Advertising messages shall not be displayed on changeable message signs.

The design of non-electronic display changeable message signs shall comply with the provisions of Chapters 2A through 2K of this Manual. ~~To the extent practical, the design and application of changeable message signs should conform to the general principles of this Manual. To the extent practical, changeable message signs, which are traffic control devices designed to display variable messages, shall conform to the principles established in this Manual, and with the design and applications prescribed in Sections 2E.21, 6F.02, and 6F.55.~~ All other changeable message signs shall comply with the design and application principles established in this Chapter and in Chapter 2A.

Section 2M.02 Applications of Changeable Message Signs

Support:

Changeable message signs have a large number of applications including, but not limited to, the following:

A. Travel times (see Section 2M.07)
B. Incident management and route diversion
C. Warning of adverse weather conditions
D. Control at crossing situations
E. Lane, ramp, and roadway control
F. Special event applications
G. Traffic regulations
H. Speed control
I. Warning situations
J. Destination guidance
K. Toll and managed lanes

Option:

Changeable message signs~~, both permanent and portable,~~ may be used by State and local highway agencies to display safety or transportation-related messages, homeland security, and America's Missing: Broadcast Emergency Response (AMBER) alert messages.

Guidance:

State and local highway agencies ~~may~~ should develop and establish a policy regarding the display of safety and transportation-related messages ~~on permanent and changeable message signs that specifies the allowable messages and applications, consistent with the provisions of this Manual~~.

Support:

Examples of safety messages include "SEAT BELT BUCKLED?" and "DON'T DRINK AND DRIVE." Examples of transportation-related messages include "STADIUM EVENT SUNDAY, EXPECT DELAYS NOON TO 4 PM" and "OZONE ALERT CODE RED—USE TRANSIT."

Guidance:

When a CMS is used to display a safety or transportation related message, the ~~requirements of Section 6F.55 should be followed. The~~ message should be simple, brief, legible, and clear. A CMS should not be used to display a safety or transportation-related message if doing so would adversely affect ~~the~~ respect for the sign. "CONGESTION AHEAD" or other overly simplistic or vague messages should not be displayed alone. These messages should be supplemented with a message on the location or distance to the congestion or incident, ~~how much~~ delay ~~is expected~~ and travel time, alternative route, or other similar messages.

Standard:

When a CMS is used to display a safety, ~~or~~ transportation-related, or AMBER alert message, the display format shall not be of a type that could be considered similar to advertising displays.

Support:

Section 2B.13 contains information regarding the design of changeable message signs that are used to display variable speed limits that change based on ambient or operational conditions, or that display the speed at which approaching drivers are traveling.

Section 2M.03 Legibility and Visibility of Changeable Message Signs

Support:

The maximum distance at which a driver can first correctly identify letters and words on a sign is called the legibility distance of the sign. Legibility distance is affected by the characteristics of the sign design and the visual capabilities of drivers. Visual capabilities, and thus legibility distances, vary among drivers.

For the more common types of changeable message signs, the longest measured legibility distances on sunny days occur during mid-day when the sun is overhead or during a washout condition when the sun is on the horizon and shining on the sign face. Legibility distances are much shorter when the sun is behind the sign face or at night.

Visibility is the characteristic that enables a CMS to be seen. Visibility is associated with the point where the CMS is first detected, whereas legibility is the point where the message on the CMS can be read. Environmental conditions such as rain, fog, and snow impact the visibility of changeable message signs and can reduce the available legibility distances. During these conditions, there might not be enough viewing time for drivers to read the message.

Guidance:

Changeable message signs used on roadways with speed limits of 90 km/h (55 mph) or higher should be visible from 800 m (0.5 mi) under both day and night conditions. The message should be designed to be legible from a minimum distance of 180 m (600 ft) for nighttime conditions and 245 m (800 ft) for normal daylight conditions. When environmental conditions that reduce visibility and legibility are present, messages composed of fewer units of information should be used (see Section 2M.05 for information regarding the lengths of messages displayed on changeable message signs).

If protective material is used on the front face of a CMS, the material should be regularly cleaned to improve visibility and legibility. It should be replaced when the surfaces become excessively scratched. When legibility distances are reduced because of deterioration of the protective material or the active pixels, the number of units of information in a message displayed should be lower than the maximum allowable units of information that are discussed in Section 2M.05.

Section 2M.04 Design Characteristics of Changeable Message Signs

Standard:

~~The display format~~ Changeable message signs **shall not include** advertising, **animation, rapid flashing,** dissolving, exploding, scrolling, **or other dynamic elements** ~~that are characteristic of sports scoreboards or advertising displays~~**.**

Guidance:

Except in the case of a CMS (such as a blank-out or variable message regulatory sign) that is used in place of a static regulatory sign, changeable message signs should be used as a supplement to and not as a substitute for conventional signs and markings.

CMS should be limited to not more than 3 lines, with no more than 20 characters per line.

The spacing between characters in a word should be between 25 to 40 percent of the letter height. The spacing between words in a message should be between 75 and 100 percent of the letter height. Spacing between the message lines should be between 50 and 75 percent of the letter height.

Word messages on changeable message signs should be created using all ~~capital~~ upper-case letters ~~and have a desirable letter size of 450 mm (18 in) or a minimum letter size of 265 mm (10.6 in)~~. The minimum letter height should be 450 mm (18 in) for changeable message signs on roadways with speed limits of 70 km/h (45 mph) or higher. The minimum letter height should be 300 mm (12 in) for changeable message signs on roadways with speed limits of less than 70 km/h (45 mph).

Support:

Using letter heights of more than 450 mm (18 in) will not result in proportional increases in legibility distance.

Guidance:

The width-to-height ratio of the sign characters should be between 0.7 and 1.0. The stroke width-to-height ratio should be 0.2.

Support:

The width-to-height ratio is commonly accomplished using a minimum font matrix density of 5 pixels wide by 7 pixels high.

Standard:

Changeable message signs shall automatically adjust their brightness under varying light conditions to maintain legibility.

Guidance:

The luminance of changeable message signs should be greater than 1,000 cd/m^2 for daytime conditions and approximately 30 cd/m^2 for nighttime conditions. Luminance contrast should be between 8 and 12 for all conditions.

Contrast orientation of changeable message signs should always be positive, that is, with luminous characters on a dark or less luminous background.

Support:

Legibility distances for negative-contrast changeable message signs are likely to be at least 25 percent shorter than those of positive-contrast messages. In addition, the increased light emitted by negative-contrast changeable message signs has not been shown to improve detection distances.

Guidance:

The front face of a CMS should be covered with protective material.

Standard:

The colors used for the legends and backgrounds on changeable message signs shall be as indicated in Table 2A-4.

~~Option:~~

~~Changeable message signs (including portable changeable message signs) that display a regulatory or warning message may use a black background with a white, yellow, orange, red, or fluorescent yellow-green legend as appropriate, except where specifically restricted in this Manual for a particular sign.~~

Guidance:

If a black background is used, the color used for the legend on a changeable message sign should match the background color that would be used on a standard sign for that type of legend, such as white for regulatory, yellow for warning, orange for temporary traffic control, red for stop or yield, fluorescent pink for incident management, and fluorescent yellow-green for bicycle, pedestrian, and school warning.

Standard:

If a green background is used for a guide message on a CMS or if a blue background is used for a motorist services message on a CMS, the background color shall be provided by green or blue lighted pixels such that the entire CMS would be lighted, not just the white legend.

Section 2M.05 Message Length and Units of Information

Guidance:

The maximum length of a message should be dictated by the number of units of information contained in the message, in addition to the size of the CMS. A unit of information, which is a single answer to a single question that a driver can use to make a decision, should not be more than four words.

Support:

In order to illustrate the concept of units of information, Table 2M-1 shows an example message that is comprised of four units of information.

The maximum allowable number of units of information in a CMS message is based on the principles described in this Section, the current highway operating speed, the legibility characteristics of the CMS, and the lighting conditions.

Standard:

~~**No more than two displays should be used within any message cycle.**~~ **Each message shall consist of no more than two phases. A phase shall consist of no more than 3 lines of text.** ~~**A three-line changeable message sign shall be limited to not more than two messages. Each display should convey a single thought.**~~ **Each phase shall be understood by itself regardless of the sequence in which it is read.**

Messages shall be centered within each line of legend. Except at toll plazas, if more than one CMS is visible to road users, then only one sign shall display a sequential message at any given time.

Techniques of message display such as fading, exploding, dissolving, or moving messages shall not be used. The text of the message shall not scroll or travel horizontally or vertically across the face of the sign.

~~**Changeable message signs shall be capable of displaying several messages in a sequence. Such messages shall be changed manually, by remote control, or by automatic controls.**~~

Guidance:

~~Within the context of Section 2A.07, these practices should be followed for mainline freeway and expressway applications~~ When designing and displaying messages on changeable message signs, the following principles relative to message design should be used:

A. The minimum time that an individual phase is displayed should be based on 1 second per word or 2 seconds per unit of information, whichever produces a lesser value. The display time for a phase should never be less than 2 seconds.
B. The maximum cycle time of a two-phase message should be 8 seconds.
C. No more than 3 units of information should be displayed on a phase of a message.
D. No more than 4 units of information should be in a message when the traffic operating speeds are 60 km/h (35 mph) or more.
E. No more than 5 units of information should be in a message when the traffic operating speeds are less than 60 km/h (35 mph).
F. Only 1 unit of information should appear on each line of the CMS.
G. Compatible units of information should be displayed on the same message phase.

Option:

A unit of information may be displayed on more than one line. ~~The entire message cycle should be readable at least twice by drivers traveling at the posted speed, the off-peak 85th-percentile speed, or the operating speed.~~ Two changeable message signs may be used for the purpose of allowing the entire message to be read twice.

Guidance:

If more than two phases are needed to display a message, additional changeable message signs should be used.

~~Section 1A.15 contains information regarding the use of abbreviations on traffic control devices, including changeable message signs.~~ When the message on a CMS includes an abbreviation, the provisions specified in Section 1A.15 should be used.

Section 2M.06 Installation of Permanent Changeable Message Signs

Guidance:

A CMS that is used in place of a static sign (such as a blank-out or variable legend regulatory sign) should be located in accordance with Chapter 2A. The following factors should be considered when installing other permanent changeable message signs:

A. Changeable message signs should be located upstream of known bottlenecks and high crash locations.
B. Changeable message signs should be located upstream of major diversion decision points, such as interchanges.
C. Changeable message signs should not be located within an interchange except for toll plazas or managed lanes.
D. Changeable message signs should not be positioned at locations where the information load on drivers is already high because of guide signs and other types of information.
E. Changeable message signs should not be located in areas where drivers frequently perform lane-changing maneuvers in response to static guide sign information, or because of merging or weaving conditions.

Support:

Information regarding the design and application of portable changeable message signs in temporary traffic control zones is contained in Section 6F.57.

Section 2M.07 Display of Travel Times on Changeable Message Signs

Support:

Most agencies in major metropolitan areas that are operating traffic management systems that include changeable message signs for real-time communication with drivers have the ability to provide dynamic travel time information instead of providing generic messages such as "CONGESTION AHEAD" or "STAY ALERT." While travel time messages are not appropriate for every location, they have proven successful in regions or corridors that experience periods of daily recurring congestion resulting from the traffic demand exceeding the available capacity.

Guidance:

Because drivers consider a blank message on a permanent CMS as a transportation investment that is not being fully used, no new permanent changeable message signs should be installed on freeways in a major metropolitan area or along a heavily traveled route unless the operating agency has the capability to display travel time messages as the default information available to motorists throughout the day.

Support:

Although travel time messages are sometimes overridden by more critical traffic incident or road construction messages, travel time messages can provide valuable motorist information in conjunction with the event messages, as well as after the incident or construction has been cleared if there is residual congestion. Because they typically generate traffic demand that exceeds capacity, special events (such as fairs, concerts, and sporting events) provide additional opportunities for providing travel time information to motorists.

Guidance:

To achieve solid public support for the display of travel time messages, the following items should be considered:

A. The operating agency should seek feedback from and educate the public before starting to post travel time messages. A campaign of public awareness is critical in order for the travel time messages to have to have an initial positive effect. New types of CMS messages often cause motorists to slow down, so any efforts to reduce those surprise effects will help motorists more easily adapt to the new messages. Also engaging the public and the media in helping determine destinations and message forms will improve the quality of service and help achieve a positive response to the messages.

B. Travel times must be generated automatically and not require a human operator to manually enter travel time data. Effective travel time messages do not require the data to be 100% accurate. Research has indicated that data with error rates of 20% produce useful traveler information. When presenting a range of travel times on changeable message signs, the acceptable error rate might be even higher.

C. Travel time messages are not appropriate for every CMS or for every hour of the day. The travel times displayed on the signs must reflect reality and must change. In other words, the traffic conditions must be dynamic enough (such as in major metropolitan areas and along heavily traveled corridors) so that travel time messages are not viewed as merely static messages, which might result in credibility problems.

D. Where there is a mixture of types of travelers, travel time messages can be constructed to benefit more than the local commuter. By including the distance to the destination in addition to the travel time, even those travelers unfamiliar with the area can determine the approximate level of congestion ahead.

E. Travel time messages are different than emergency messages or AMBER Alert messages where the information is unique for each occurrence. Drivers require time to comprehend the message and determine what actions, if any, are needed. Once established in an area, drivers can become accustomed to reading travel time messages, being able to understand their format, and picking out the pertinent information quickly. Therefore, the guidance in Section 2M.05 for constructing dynamic messages that recommends allowing 1 second per word can be relaxed somewhat when dealing with a knowledgeable motorist base.

CHAPTER 3A. GENERAL

Section 3A.01 Functions and Limitations

Support:

Markings on highways, public facilities, and private property open to public travel have important functions in providing guidance and information for the road user. Major marking types include pavement and curb markings, ~~object markers,~~ delineators, colored pavements, barricades, channelizing devices and islands. In some cases, markings are used to supplement other traffic control devices such as signs, signals, and other markings. In other instances, markings are used alone to effectively convey regulations, guidance, or warnings in ways not obtainable by the use of other devices.

Markings have limitations. Visibility of the markings can be limited by snow, debris, and water on or adjacent to the markings. Marking durability is affected by material characteristics, traffic volumes, weather, and location. However, under most highway conditions, markings provide important information while allowing minimal diversion of attention from the roadway.

~~Pavement markings can enhance roadway delineation with the addition of audible and tactile features such as bars, differential surface profiles, raised pavement markers, or other devices intended to alert the road user that a delineation on the roadway is being traversed.~~

~~The general functions of longitudinal lines are:~~ **relocated to Section 3A.05 and upgraded to Standard**

~~A. A double line indicates maximum or special restrictions,~~
~~B. A solid line discourages or prohibits crossing (depending on the specific application),~~
~~C. A broken line indicates a permissive condition, and~~
~~D. A dotted line provides guidance.~~

Section 3A.02 Standardization of Application

Standard:

Each standard marking shall be used only to convey the meaning prescribed for that marking in this Manual. When used for applications not described herein, markings shall conform in all respects to the principles and standards set forth herein.

Guidance:

Before any new highway, public facility, private property open to public travel, paved detour, or temporary route is opened to ~~traffic~~ public travel, all necessary markings should be in place.

Standard:

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

Markings that are no longer applicable for roadway conditions or restrictions and that might cause confusion for the road user shall be removed or obliterated to be unidentifiable as a marking as soon as practical. **this sentence was relocated from the previous paragraph**

Option:

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

Section 3A.03 Materials

Support:

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

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

Guidance:

The materials used for markings should provide the specified color throughout their useful life.

Consideration should be given to selecting pavement marking materials that will minimize tripping or loss of traction for pedestrians, ~~and~~ bicyclists, and motorcyclists.

~~Object markers and~~ relocated to Section 2L.01 Delineators should not present a vertical or horizontal clearance obstacle for pedestrians.

Section 3A.04 Colors

Standard:

Markings shall be yellow, white, red, ~~or~~ blue, or purple. The colors for markings shall conform to the standard highway colors. Black in conjunction with one of the above colors shall be a usable color.

When used, white markings for longitudinal lines shall delineate:

A. The separation of traffic flows in the same direction, or
B. The right-hand edited to increase clarity edge of the roadway.

When used, yellow markings for longitudinal lines shall delineate:

A. The separation of traffic traveling in opposite directions,
B. The left-hand edited to increase clarity edge of the roadways of divided ~~and one-way~~ highways and one-way streets or edited to increase consistency ramps, or
C. The separation of two-way left-turn lanes and reversible lanes from other lanes.

When used, red raised pavement markers or delineators shall delineate truck escape ramps and one-way roadways or ramps that shall not be entered or used in the direction from which the markers are visible.

When used, blue markings shall supplement white markings for parking spaces for persons with disabilities. ~~When used, blue raised pavement markers shall indicate locations of fire hydrants along a roadway.~~

When used, purple markings shall supplement lane line or edge line markings for toll plaza approach lanes that are used only by vehicles that are equipped with electronic toll collection (ETC) transponders (see Section 3B.29).

Option:

Appropriate colors may be used in a route shield pavement marking symbol, such as red, white, and blue for an Interstate highway route shield pavement marking (see Figure 3B-25).

Black may be used in combination with the above colors where a light-colored pavement does not provide sufficient contrast with the markings.

Support:

When used in combination with other colors, black is not considered a marking color, but only a contrast-enhancing system for the markings.

Section 3A.05 Functions, Widths, and Patterns of Longitudinal Pavement Markings

Standard:

The general functions of longitudinal lines shall be: relocated from Section 3A.01 and upgraded to Standard

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

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

A. A normal line ~~is~~ shall be 100 to 150 mm (4 to 6 in) wide.
B. A wide line ~~is~~ shall be at least twice the width of a normal line. The width of the line shall indicate~~s~~ the degree of emphasis.
C. A double line shall consist~~s~~ of two parallel lines separated by a discernible space.
D. A broken line shall consist~~s~~ of normal line segments separated by gaps.
E. A dotted line shall consist of noticeably shorter line segments separated by shorter gaps than used for a broken line. The width of a dotted line shall be at least the same as the width of the line it extends.

Guidance:

Broken lines should consist of 3 m (10 ft) line segments and 9 m (30 ft) gaps, or dimensions in a similar ratio of line segments to gaps as appropriate for traffic speeds and need for delineation.

Support:

Dotted lines are used to extend lines through intersections or interchanges. Dotted lines are also used instead of broken lane lines to separate a continuing lane from a non-continuing lane, such as acceleration or deceleration lanes, auxiliary lanes, lane drops, and lane reductions.

~~Option~~ Guidance:

A dotted line for line extensions within an intersection or taper area ~~may~~ should consist of 0.6 m (2 ft) line segments and 0.6 m (2 ft) to 1.8 m (6 ft) gaps. A dotted line ~~for lane drop/add markings~~ used as a lane line to separate a continuing lane from a non-continuing lane ~~may~~ should consist of 0.9 m (3 ft) line segments and 2.7 m (9 ft) gaps.

Section 3A.06 Definitions Relating to Pavement Markings

Standard:

The following technical terms, when used in Part 3, shall be defined as follows:

1. **Neutral area—the paved area between the channelizing lines that separate an entrance or exit ramp and the adjacent through lane(s).**
2. **Physical gore—a longitudinal point where a physical barrier or the lack of a paved surface inhibits road users from crossing from a ramp to the adjacent through lane(s) or vice versa.**
3. **Theoretical gore—a longitudinal point at the upstream end of an exit ramp neutral area where the channelizing lines that separate the ramp from the adjacent through lane(s) begin to diverge or a longitudinal point at the downstream end of an entrance ramp neutral area where the channelizing lines that separate the ramp from the adjacent through lane(s) intersect each other.**

CHAPTER 3B. PAVEMENT AND CURB MARKINGS

Section 3B.01 Yellow ~~Centerline~~ Center Line Pavement Markings and Warrants

Standard:

~~Centerline~~ 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:

~~Centerline~~ Center line pavement markings may be placed at a location that is not the geometric center of the roadway.

On roadways without continuous ~~centerline~~ center line pavement markings, short sections may be marked with ~~centerline~~ center line pavement markings to control the position of traffic at specific locations, such as around curves, over hills, on approaches to highway-rail~~road~~ grade crossings, at highway-rail~~road~~ grade crossings, and at bridges.

Standard:

The ~~centerline~~ center line markings on two-lane, two-way roadways shall be one of the following as shown in Figure 3B-1:

A. **Two-direction passing zone markings consisting of a normal broken yellow line where crossing the ~~centerline~~ 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 normal broken yellow line and a normal solid yellow line where crossing the ~~centerline~~ 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; ~~and~~ or edited to increase accuracy**
C. **Two-direction no-passing zone markings consisting of two normal solid yellow lines where crossing the ~~centerline~~ center line markings for passing is prohibited for traffic traveling in either direction.**

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

The ~~centerline~~ 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 two normal solid yellow lines as shown in Figure 3B-2.

Guidance:

On two-way roadways with three through lanes for moving motor vehicle traffic, two lanes should be designated for traffic in one direction by using one- or two-direction no-passing zone markings as shown in Figure 3B-3.

Support:

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

Standard:

~~Centerline~~ Center line markings shall be placed on all paved urban arterials and collectors that have a traveled way of 6.1 m (20 ft) or more in width and an ADT of 6,000 vehicles per day or greater. ~~Centerline~~ Center line markings shall also be placed on all paved two-way streets or highways that have three or more lanes for moving motor vehicle traffic.

Guidance:

~~Centerline~~ Center line markings should be placed on paved urban arterials and collectors that have a traveled way of 6.1 m (20 ft) or more in width and an ADT of 4,000 vehicles per day or greater. ~~Centerline~~ Center line markings should also be placed on all rural arterials and collectors that have a traveled way of 5.5 m (18 ft) or more in width and an ADT of 3,000 vehicles per day or greater. ~~Centerline~~ Center line markings should also be placed on other traveled ways where an engineering study indicates such a need.

Engineering judgment should be used in determining whether to place ~~centerline~~ center line markings on traveled ways that are less than 4.9 m (16 ft) wide because of the potential for traffic encroaching on the

pavement edges, traffic being affected by parked vehicles, and traffic encroaching into the opposing traffic lane.

Option:

~~Centerline~~ Center line markings may be placed on other paved two-way traveled ways that are 4.9 m (16 ft) or more in width.

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

Section 3B.02 No-Passing Zone Pavement Markings and Warrants paragraphs have been relocated within this Section

Standard:

No-passing zones shall be marked by either the one direction no-passing zone pavement markings or the two-direction no-passing zone pavement markings described ~~previously~~ in Section 3B.01 and shown in Figures 3B-1 and 3B-3.

When ~~centerline~~ center line markings are used, no-passing zone markings shall be used on two-way roadways at lane-reduction transitions (see Section 3B.09) and on approaches to obstructions that must be passed on the right (see Section 3B.10).

On two-way, two- or three-lane roadways where ~~centerline~~ center line markings are installed, no-passing zones shall be established at vertical and horizontal curves and other locations where an engineering study indicates that passing must be prohibited because of inadequate sight distances or other special conditions.

On roadways with ~~centerline~~ 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 ~~necessary~~ for ~~reasonably safe passing at~~ the 85th-percentile speed or the posted or statutory speed limit ~~as shown in Table 3B-1~~. The passing sight distance on a vertical curve is the distance at which an object 1.07 m (3.5 ft) above the pavement surface can be seen from a point 1.07 m (3.5 ft) above the pavement (see Figure 3B-4). Similarly, the passing sight distance on a horizontal curve is the distance measured along the ~~centerline~~ center line (or right-hand lane line of a three-lane roadway) between two points 1.07 m (3.5 ft) 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).

Support:

The ~~beginning~~ 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.

The values of the minimum passing sight distances that are shown in Table 3B-1 are for operational use in marking no-passing zones and are less than the values that are used for the geometric designs of highways.

Guidance:

Where the distance between successive no-passing zones is less than 120 m (400 ft), no-passing markings should connect the zones.

Standard:

Where ~~centerline~~ center line markings are used, no-passing zone markings shall be used on approaches to highway-rail grade crossings in conformance with Section 8B.20.

Option:

In addition to pavement markings, no-passing zone signs (see Sections 2B.34, 2B.37, and 2C.47) may be used to emphasize the existence and extent of a no-passing zone.

Support:

Section 11-307 of the "Uniform Vehicle Code (UVC) Revised" contains further information regarding required road user behavior in no-passing zones. The "UVC" can be obtained from the National Committee on Uniform Traffic Laws and Ordinances at the address shown on Page i.

Standard:

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 shall be provided in the center lane as shown in Figure 3B-5. A lane transition shall be provided at each end of the buffer zone.

The buffer zone shall be a flush median island formed by two sets of double yellow center line markings that is at least 15 m (50 ft) in length.

Option:

Yellow diagonal markings may be placed in the neutral area between the two sets of no-passing zone markings as shown in Figure 3B-5.

Guidance:

For three-lane roadways having a posted or statutory speed limit of 70 km/h (45 mph) or greater, the lane transition taper length should be computed by the formula L = 0.62 WS for speeds in km/h (L = WS for speeds in mph). For roadways where the posted or statutory speed limit is less than 70 km/h (45 mph), the formula $L = WS^2/155$ for speeds in km/h ($L = WS^2/60$ for speeds in mph) should be used to compute taper length. Under both formulas, L equals the taper length in meters (feet), W equals the width of the center lane or offset distance in meters (feet), and S equals the 85th-percentile speed or the posted or statutory speed limit, whichever is higher.

Standard:

The minimum lane transition taper length shall be 30 m (100 ft) in urban areas and 60 m (200 ft) in rural areas.

Section 3B.03 Other Yellow Longitudinal Pavement Markings

Standard:

If reversible lanes are used, the lane line pavement markings on each side of reversible lanes shall consist of a normal double broken yellow line to delineate the edge of a lane in which the direction of travel is reversed from time to time, such that each of these markings serve as the ~~centerline~~ center line markings of the roadway during some period (see Figure 3B-6).

Signs (see Section 2B.25), lane-use control signals (see Chapter 4M), or both shall be used to supplement reversible lane pavement markings.

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

~~Option~~ Guidance:

A two-way left-turn arrow pavement marking, with opposing arrows spaced as shown in Figure 3B-7, ~~may~~ should be used in conjunction with the longitudinal two-way left-turn markings ~~as shown in Figure 3B-7~~ at or just downstream from the upstream end of the two-way left-turn lane and at other locations along the two-way left-turn lane where engineering judgment determines that such additional markings are needed to emphasize the proper use of the lane.

~~Guidance:~~

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

Standard:

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

Section 3B.04 White Lane Line Pavement Markings and Warrants paragraphs have been relocated within this Section and revisions and additions have been made – paragraphs previously in Section 3B.05 have been relocated to this Section

Standard:

When used, lane line pavement markings delineating the separation of traffic lanes that have the same direction of travel shall be white.

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

Guidance:

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

Support:

Examples of lane line markings are shown in Figures 3B-2, 3B-3, and 3B-7 through 3B-13~~, 3B-22, 3B-24, and 3B-26~~.

Standard:

Except as noted in the next paragraph, where crossing the lane line markings with care is permitted, the lane line markings shall consist of a normal broken white line.

On an approach to or a departure from an interchange or intersection, a broken white lane line marking shall not be used to separate a through lane that continues beyond the interchange or intersection from an adjacent lane of any of the following types:

A. A through lane that becomes a mandatory exit or turn lane,
B. An auxiliary lane 3.2 km (2 mi) or less in length between an entrance ramp and an exit ramp,
C. An auxiliary lane 1.6 km (1 mi) or less in length between two or more adjacent intersections, or
D. An acceleration or deceleration lane.

For the conditions listed in the previous paragraph, a dotted white line shall be used as the lane line.

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

~~**With a parallel deceleration lane, a lane line shall be extended from the beginning of the channelizing line upstream for a distance of one-half the length of the full-width deceleration lane as shown in Figure 3B-8.**~~

Option:

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

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

Standard:

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

Option:

For entrance ramps with a parallel acceleration lane, a 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.

For entrance ramps with a tapered acceleration lane, ~~lane line markings may be placed to extend the channelizing line, but not beyond a point where the tapered lane meets the near side of the through traffic lane~~ a dotted white line extension may be installed from the theoretical gore to the downstream end of the acceleration taper, as shown in Drawing B of Figure 3B-9.

Standard:

A wide dotted white line (see Drawings A and B of Figure 3B-10) shall be used as a lane drop marking~~s as shown in Figure 3B-10 may be used~~ in advance of lane drops at exit ramps to distinguish a lane drop from a normal exit ramp ~~or from an auxiliary lane~~.

A wide dotted white line (see Drawing C of Figure 3B-8) shall be used to separate a through lane that continues beyond an interchange from an adjacent auxiliary lane between an entrance ramp and an exit ramp.

A normal or wide dotted white line (see Drawing C of Figure 3B-10) shall be used as a lane drop marking in advance of lane drops at intersections to distinguish a lane drop from an intersection through lane.

A normal or wide dotted white line (see Drawing D of Figure 3B-10) shall be used to separate a through lane that continues beyond an intersection from an adjacent auxiliary lane between two or more intersections.

Guidance:

A normal dotted white line should be used as a lane drop marking for lane reduction transitions (see Section 3B.09 and Figure 3B-13).

~~If used,~~ Lane drop markings used in advance of lane drops at freeway and expressway exit ramps should begin at least added to be consistent with Figure 3B-10, which shows a solid line of variable length after 0.5 miles of lane drop markings 800 m (0.5 mi) in advance of the theoretical gore point.

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

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 dotted white lines that are used for lane drop markings ~~may~~ and that are used as a lane line separating through lanes from auxiliary lanes should consist of ~~a wide dotted white line with~~ line segments that are 0.9 m (3 ft) in length separated by 2.7 m (9 ft) gaps.

Support:

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

Option:

Where lane changes might cause conflicts, a wide solid white ~~channelizing~~ lane line may extend upstream from the theoretical gore point of an exit ramp or, for multi-lane exits, as shown in Drawing B of Figure 3B-10.

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

Support:

Section 3B.09 contains information about the lane line markings that are to be used for transition areas where the number of through lanes is reduced.

Standard:

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

Guidance:

On approaches to intersections, a solid white lane line marking should be used to separate a through lane from an added mandatory turn lane. For a lane drop at an intersection, a solid white lane line marking should be used to separate the dropped lane from the adjacent through lane for a distance upstream of the intersection as determined by engineering judgment (see Drawing C of Figure 3B-10).

Option:

~~They~~ On approaches to intersections, solid white lane line markings may ~~also~~ be used to separate ~~traffic~~ adjacent through lanes or adjacent mandatory turn lanes from each other ~~approaching an intersection~~.

Where the median width allows the left-turn lanes to be separated from the through lanes to give drivers on opposing approaches a less obstructed view of opposing through traffic, white pavement markings may be used to form channelizing islands as shown in Figure 2B-20.

Solid white lane line markings may be used to separate through traffic lanes from auxiliary lanes, such as an added uphill truck lane~~s, left- or right-turn lanes, and~~ or a preferential lane~~s~~ (see Section 3B.25).

Wide solid lane line markings may be used for greater emphasis.

Standard:

Where crossing the lane line markings is prohibited, the lane line markings shall consist of two normal solid white lines (see Figure 3B-11).

Section 3B.05 Other White Longitudinal Pavement Markings paragraphs have been relocated within this Section and revisions and additions have been made – paragraphs previously in this Section have been relocated to Section 3B.04

Standard:

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

Option:

Channelizing lines may be used to form channelizing islands where traffic traveling in the same direction is permitted on both sides of the island.

Standard:

Other pavement markings in the channelizing island area shall be white.

Support:

Examples of channelizing line applications are shown in Figures 3B-8, 3B-9, 3B-10, and 3B-11.

Channelizing lines at exit ramps as shown in Figure 3B-8 define the neutral area, direct exiting traffic at the proper angle for smooth divergence from the main lanes into the ramp, and reduce the probability of colliding with objects adjacent to the roadway.

Channelizing lines at entrance ramps as shown in Figure 3B-9 promote ~~reasonably safe~~ orderly and efficient merging with the through traffic.

Standard:

For exit and entrance ramps, channelizing lines shall be placed ~~along the~~ on both sides of the neutral area ~~adjacent to the through traffic lane and the ramp lane~~.

For exit ramps, the channelizing lines for the ramp and through lanes shall begin at the theoretical gore and extend downstream on each side of the neutral area to the physical gore.

For entrance ramps, the channelizing lines for the ramp and through lanes shall begin at the physical gore and extend downstream on each side of the neutral area to the theoretical gore.

Option:

White chevron markings may be placed in the neutral area of exit ramp and entrance ramp gores for special emphasis as shown in Figure 3B-8. The channelizing lines and the optional chevron markings at exit ramp and entrance ramp gores may be supplemented with white retroreflective or internally illuminated raised pavement markers (see Sections 3B.11 and 3B.13) for enhanced nighttime visibility.

~~**Guidance:**~~

~~**For entrance ramps, a channelizing line should be placed along the side of the neutral area adjacent to the ramp lane.**~~

Section 3B.06 Edge Line Pavement Markings

Standard:

If used, edge line pavement markings shall delineate the right or left edges of a roadway.

Except for dotted edge line extensions (see Section 3B.08), edge line markings shall not be continued through intersections or major driveways.

If used on the roadways of divided highways or one-way streets, or on any ramp in the direction of travel, left edge line pavement markings shall consist of a normal solid yellow line to delineate the left-hand edited to increase clarity edge of a roadway or to indicate driving or passing restrictions left of these markings.

If used, ~~the~~ right edge line pavement markings shall consist of a normal solid white line to delineate the right-hand edited to increase clarity edge of the roadway.

Guidance:

Edge line markings should not be broken for minor driveways.

Support:

Edge line markings have unique value as visual references to guide road users during adverse weather and visibility conditions.

Option:

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

Section 3B.07 Warrants for Use of Edge Lines

Standard:

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

A. Freeways,
B. Expressways, and
C. Rural arterials with a traveled way of 6.1 m (20 ft) or more in width and an ADT of 6,000 vehicles per day or greater.

Guidance:

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

A. Rural arterials and collectors with a traveled way of 6.1 m (20 ft) or more in width and an ADT of 3,000 vehicles per day or greater.
B. At other paved streets and highways where an engineering study indicates a need for edge line markings.

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

Option:

Edge line markings may be placed on streets and highways with or without ~~centerline~~ center line markings.

Edge line markings may be excluded, based on engineering judgment, for reasons such as if the traveled way edges are delineated by curbs, parking, ~~bicycle lanes,~~ or other markings.

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

Edge line markings may be used where edge delineation is desirable to minimize unnecessary driving on paved shoulders or on refuge areas that have lesser structural pavement strength than the adjacent roadway.

Section 3B.08 Extensions Through Intersections or Interchanges

Standard:

Except as noted in the Option below, edited to increase clarity pavement markings extended into or continued through an intersection or interchange area shall be the same color and at least the same width as the line markings they extend (see Figure 3B-12).

Option:

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

Guidance:

Where highway design or reduced visibility conditions make it desirable to provide control or to guide vehicles through an intersection or interchange, such as at offset, skewed, complex, or multilegged intersections, on curved roadways, ~~or~~ where multiple turn lanes are used, or where offset left turn lanes might cause driver confusion, dotted line markings consisting of 0.6 m (2 ft) line segments and 0.6 m (2 ft) to 1.8 m (6 ft) gaps should be used to extend longitudinal line markings through an intersection or interchange area.

Option:

Dotted edge line extensions may be placed through intersections or major driveways.

Guidance:

Where greater restriction is required, solid lane lines or channelizing lines should be extended into or continued through intersections or major driveways. However, edge lines should not be extended into or continued through intersections or major driveways as solid lines.

~~A single line of equal width to one of the lines of the double line should be used to extend~~ 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. edited to increase clarity

To the extent possible, pavement marking extensions through intersections should be designed in a manner that minimizes potential confusion for drivers in adjacent or opposing lanes.

Section 3B.09 Lane-Reduction Transition Markings

Standard:

Except as noted in the Option below, where pavement markings are used, lane-reduction transition markings shall be used to guide traffic through transition areas where the number of through lanes is reduced, as shown in Figure 3B-13. On two-way roadways, no-passing zone markings shall be used to prohibit passing in the direction of the convergence, and shall continue through the transition area.

Option:

On low-speed urban roadways where curbs clearly define the roadway edge in the lane-reduction transition, the edge line and/or delineators shown in Figure 3B-13 may be deleted as determined by engineering judgment.

Guidance:

For roadways having a posted or statutory speed limit of 70 km/h (45 mph) or greater, the transition taper length for a lane-reduction transition added to increase consistency should be computed by the formula L = 0.62 WS for speeds in km/h (L = WS for speeds in mph). For roadways where the posted or statutory speed limit is less than 70 km/h (45 mph), the formula $L = WS^2/155$ for speeds in km/h ($L = WS^2/60$ for speeds in mph) should be used to compute taper length. Under both formulas, L equals the taper length in meters (feet), W equals the width of the offset distance in meters (feet), and S equals the 85th-percentile speed or the posted or statutory speed limit, whichever is higher.

Where observed speeds exceed posted or statutory speed limits, longer tapers should be used.

Option:

On new construction, where no posted or statutory speed limit ~~is~~ has been established, the design speed may be used in the transition taper length formula.

Guidance:

Broken lane line markings should be discontinued ~~one-quarter of the distance between~~ at the Lane Ends sign (see Section 2C.41) and a dotted lane drop marking (see Section 3A.05) should be used to extend the lane line to the ~~point where~~ upstream end of the transition taper ~~begins~~.

Except as noted in the Option above for low-speed urban roadways, the edge line markings shown in Figure 3B-13 should be installed from the location of the Lane Ends warning sign to beyond the beginning of the narrower roadway.

Support:

Pavement markings at lane-reduction transitions supplement the standard signs.

Section 3B.10 Approach Markings for Obstructions

Standard:

Pavement markings shall be used to guide traffic away from fixed obstructions within a paved roadway, including toll booths at toll plazas. Approach markings for bridge supports, refuge islands, median islands, and raised channelization islands shall consist of a tapered line or lines extending from the ~~centerline~~ center line or the lane line to a point 0.3 to 0.6 m (1 to 2 ft) to the right-hand edited to increase clarity side, or to both sides, of the approach end of the obstruction (see Figure 3B-14).

Guidance:

For roadways having a posted or statutory speed limit of 70 km/h (45 mph) or greater, the taper length of the tapered line markings should be computed by the formula L = 0.62 WS for speeds in km/h (L = WS for speeds in mph). For roadways where the posted or statutory speed limit is less than 70 km/h (45 mph), the formula $L = WS^2/155$ for speeds in km/h ($L = WS^2/60$ for speeds in mph) should be used to compute taper

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

Standard:

The minimum taper length shall be 30 m (100 ft) in urban areas and 60 m (200 ft) in rural areas.

Support:

Examples of approach markings for obstructions in the roadway are shown in Figure 3B-14.

~~Option~~ Guidance:

Where observed speeds exceed posted or statutory speed limits, longer tapers ~~may~~ should be used.

Standard:

If traffic is required to pass only to the right of the obstruction, the markings shall consist of a two-direction no-passing zone marking at least twice the length of the diagonal portion as determined by the appropriate taper formula (see Figure 3B-14).

Option:

If traffic is required to pass only to the right of the obstruction, yellow diagonal approach markings may be placed in the neutral area between the no-passing zone markings as shown in Figure 3B-14. Other markings, such as yellow delineators, yellow channelizing devices, yellow raised pavement markers, and white crosswalk pavement markings, may also be placed in the neutral area.

Standard:

If traffic can pass either to the right or left of the obstruction, the markings shall consist of two channelizing lines diverging from the lane line, one to each side of the obstruction. In advance of the point of divergence, a solid wide white line or solid double normal white line shall be extended in place of the broken lane line for a distance equal to the length of the diverging lines (see Figure 3B-14).

Option:

If traffic can pass either to the right or left of the obstruction, additional white markings may be placed in the neutral area between the channelizing lines as shown in Figure 3B-14. Other markings, such as white delineators, white channelizing devices, white raised pavement markers, and white crosswalk markings may also be placed in the neutral area.

Section 3B.11 Raised Pavement Markers

Standard:

A raised pavement marker shall be a device ~~with a height of at least 10 mm (0.4 in)~~ mounted on or in a road surface that has a height generally not exceeding approximately 25 mm (1 in) above the road surface and that is intended to be used as a positioning guide or to supplement or substitute for pavement markings ~~or to mark the position of a fire hydrant~~.

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:

~~Blue raised pavement markers may be used to mark the positions of fire hydrants.~~

The side of a raised pavement marker that is visible to traffic proceeding in the wrong direction of a one-way roadway or ramp may be red. relocated from Section 3B.14 and modified by adding "of a one-way roadway or ramp"

Retroreflective or internally illuminated raised pavement markers may be used in the roadway immediately adjacent to curbed noses of raised medians and curbs of islands, or on top of such curbs (see Section 3B.23).

Support:

Retroreflective and internally illuminated raised pavement markers are available in monodirectional and bidirectional configurations. The bidirectional marker is capable of displaying the applicable color for each direction of travel.

Standard:

When used, internally illuminated raised pavement markers shall be steadily illuminated and shall not be flashed.

Support:

Flashing raised pavement markers are considered to be In-Roadway Lights (see Chapter 4N).

Guidance:

Nonretroreflective raised pavement markers should not be used alone, without supplemental retroreflective or internally illuminated markers, as a substitute for other types of pavement markings.

Directional configurations should be used to maximize correct information and to minimize confusing information provided to the road user. Directional configurations also should be used to avoid confusion resulting from visibility of markers that do not apply to the road user.

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.

Standard:

The value of N cited in Sections 3B.12 through 3B.14 for the spacing of raised pavement markers ~~for a broken or dotted line~~ shall equal the length of one line segment plus one gap of the broken lines used on the highway. ~~The value of N referenced for solid lines shall equal the N for the broken or dotted lines that might be adjacent to or might extend the solid lines (see Sections 3B.13 and 3B.14).~~

Guidance:

Where additional emphasis is needed, as determined by engineering judgment or engineering study, consideration should be given to spacing retroreflective raised pavement markers more closely together than the maximum spacings recommended or required in Sections 3B.12 through 3B.14.

Support:

Figures 9-20 through 9-22 in the "Traffic Control Devices Handbook" (see Section 1A.11) contain additional information regarding the spacing of raised pavement markers on longitudinal markings.

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

Option:

Retroreflective or internally illuminated raised pavement markers may be used as positioning guides with longitudinal line markings without necessarily conveying information to the road user about passing or lane-use restrictions. In such applications, markers may be positioned between the two lines of a ~~one-way~~ one-direction or ~~two-way~~ two-direction no-passing zone marking or positioned in line with or immediately adjacent to a single ~~solid or~~ broken yellow ~~centerline~~ center line or a single broken or solid lane line marking~~s~~.

~~Support~~ Guidance:

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

Option:

Where it is desired to alert the road user to changes in the travel path, such as on sharp curves or on transitions that reduce the number of lanes or that shift traffic laterally, the spacing may be reduced to N or less.

On freeways and expressways, ~~a~~ the spacing ~~of 3N~~ may be ~~used~~ 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.13 Raised Pavement Markers Supplementing Other Markings

Guidance:

The use of retroreflective or internally illuminated raised pavement markers for supplementing longitudinal line markings should ~~conform to~~ comply with the following:

A. Lateral Positioning

1. When supplementing double line markings, pairs of raised pavement markers placed laterally in line with or immediately outside of the two lines should be used.

2. When supplementing wide line markings, pairs of raised pavement markers placed laterally adjacent to each other should be used.

B. Longitudinal Spacing

1. When supplementing solid line markings, raised pavement markers at a spacing no greater than N (see Section 3B.11) should be used, except that when supplementing channelizing lines or left edge line markings, a spacing of no greater than N/2 should be used. Raised markers should not supplement right edge line markings.
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 line markings for applications such as lane drops or auxiliary lanes, 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 edge line extensions through freeway interchanges, a spacing of no greater than N should be used.

Option:

Raised pavement markers also may be used to supplement other markings ~~for~~ such as channelizing islands, gore areas, ~~or~~ approaches to obstructions, or wrong-way arrows.

To improve the visibility of horizontal curves, centerlines 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.14 Raised Pavement Markers Substituting for Pavement Markings

Option:

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

Standard:

If used, the color of the raised pavement markers shall simulate the color of the markings for which they substitute. **changed from Guidance (see next paragraph) to Standard**

Guidance:

If used, the pattern ~~and color~~ of the raised pavement markers should simulate the pattern ~~and color~~ of the markings for which they substitute. moved to previous paragraph

~~The normal spacing of raised pavement markers, when substituting for other markings, should be determined in terms of the standard length of the broken line segment.~~

~~Option:~~

~~The side of a raised pavement marker that is visible to traffic proceeding in the wrong direction may be red.~~ relocated to Section 3B.11

Standard:

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.11) shall be used. If N is other than 12 m (40 ft), the markers shall be equally spaced over the line segment length (at 1/2 points for 3 markers, at 1/3 points for 4 markers, and at 1/4 points for 5 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 nonretroreflective markers.

When raised pavement markers substitute for solid ~~lane~~ 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:

Raised pavement markers should not substitute for right edge line markings.

Standard:

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:

When substituting for wide lines, raised pavement markers may be placed laterally adjacent to each other to simulate the width of the line.

Section 3B.15 Transverse Markings

Standard:

Transverse markings, which include shoulder markings, word and symbol markings, arrows, stop lines, yield lines, crosswalk lines, speed measurement markings, speed reduction markings, speed hump markings, parking space markings, and others, shall be white unless otherwise specified herein.

Guidance:

Because of the low approach angle at which pavement markings are viewed, transverse lines should be proportioned to provide visibility at least equal to that of longitudinal lines.

Standard:

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

Section 3B.16 Stop and Yield Lines some of the paragraphs in this Section have been relocated to improve continuity

Guidance:

Stop lines should be used to indicate the point behind which vehicles are required to stop in compliance with a ~~STOP (R1-1) sign,~~ traffic control signal~~, or some other traffic control device, except YIELD signs~~. relocated to next paragraph

Option:

Stop lines may be used to indicate the point behind which vehicles are required to stop in compliance with a STOP (R1-1) sign, a Stop Here For Pedestrians (R1-5b or R1-5c) sign, or some other traffic control device that requires vehicles to stop, except YIELD signs. phrase at end of sentence relocated from previous paragraph

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

Standard:

Stop lines shall not be used at locations where drivers are required to yield in compliance with a YIELD (R1-2) sign or a Yield Here To Pedestrians (R1-5 or R1-5a) sign or at locations on uncontrolled approaches where drivers are required by State law to yield to pedestrians.

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

~~If used,~~ 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.

~~If used,~~ Yield lines (see Figure 3B-15) shall consist of a row of solid white isosceles triangles pointing toward approaching vehicles extending across approach lanes to indicate the point at which the yield is intended or required to be made.

Guidance:

Stop lines should be 300 to 600 mm (12 to 24 in) wide.

The individual triangles comprising the yield line should have a base of 300 to 600 mm (12 to 24 in) wide and a height equal to 1.5 times the base. The space between the triangles should be 75 to 300 mm (3 to 12 in).

If used, stop and yield lines should be placed a minimum of 1.2 m (4 ft) in advance of the nearest crosswalk line at controlled intersections, except for yield lines at roundabouts ~~intersections~~ as provided for in Section 3C.04 and at midblock crosswalks. In the absence of a marked crosswalk, the stop line or yield line should be placed at the desired stopping or yielding point, but should not be placed ~~no~~ edited to improve

grammar more than 9 m (30 ft) or less than 1.2 m (4 ft) from the nearest edge of the intersecting traveled way. ~~Stop lines should be placed to allow sufficient sight distance to all other approaches to an intersection.~~

Stop lines at midblock signalized locations should be placed at least 12 m (40 ft) in advance of the nearest signal indication (see Section 4D.14).

If yield or stop lines are used at ~~an unsignalized midblock~~ a crosswalk that crosses an uncontrolled multi-lane approach, the yield lines should be placed ~~adjacent to the Yield Here to Pedestrians sign located~~ 6.1 to 15 m (20 to 50 ft) in advance of the nearest crosswalk line, and parking should be prohibited in the area between the yield or stop line and the crosswalk (see Figure 3B-16).

Standard:

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

Guidance:

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

Support:

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

Option:

Stop and Yield lines may be staggered longitudinally on a lane-by-lane basis.

Support:

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 8B.21 contains information regarding the use of stop lines and yield lines at highway-rail grade crossings.

Section 3B.17 Do Not Block Intersection Markings

Option:

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

Standard:

If used, Do Not Block Intersection markings (see Figure 3B-17) 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.

Do Not Block Intersection markings shall be accompanied by one or more DO NOT BLOCK INTERSECTION (R10-7) signs (see Section 2B.59), one or more DO NOT STOP ON TRACKS (R8-8) signs (see Section 8B.09), or one or more similar signs.

Section ~~3B.17~~ 3B.18 Crosswalk Markings

Support:

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

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

At nonintersection locations, crosswalk markings legally establish the crosswalk.

Standard:

When crosswalk lines are used, they shall consist of solid white lines that mark the crosswalk. They shall not be less than 150 mm (6 in) or greater than 600 mm (24 in) in width.

Guidance:

If transverse lines are used to mark a crosswalk, the gap between the lines should not be less than 1.8 m (6 ft). If diagonal or longitudinal lines are used without transverse lines to mark a crosswalk, the crosswalk should be not less than 1.8 m (6 ft) wide.

Crosswalk lines, if used on both sides of the crosswalk, should extend across the full width of pavement or to the edge of the intersecting crosswalk to discourage diagonal walking between crosswalks (see Figures 3B-16 and 3B-18).

~~Crosswalks should be marked at all intersections where there is substantial conflict between vehicular and pedestrian movements.~~

~~Marked crosswalks also should be provided at other appropriate points of pedestrian concentration, such as at loading islands, midblock pedestrian crossings, or where pedestrians could not otherwise recognize the proper place to cross.~~

At locations controlled by traffic control signals or on approaches controlled by STOP signs, crosswalk lines should be installed where engineering judgment indicates they are needed to direct pedestrians to the proper crossing path(s).

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

Marked crosswalks alone, without other substantial measures designed to reduce traffic speeds, shorten crossing distances, enhance driver awareness of the crossing, and/or provide active warning of pedestrian presence, should not be installed across uncontrolled roadways where:

A. The speed limit exceeds 60 km/h (40 mph);

B. 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

C. 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.

Support:

Section 4L.03 contains information regarding Warning Beacons. Section 4N.02 contains information regarding In-Roadway Warning Lights at crosswalks. Chapter 7D contains information regarding school crossing supervision.

Guidance:

Because nonintersection pedestrian crossings are generally unexpected by the road user, warning signs (see Section 2C.52) should be installed for all marked crosswalks at nonintersection locations and adequate visibility should be provided by parking prohibitions.

Support:

Section 3B.16 contains information regarding placement of stop line markings near crosswalk markings.

Option:

For added visibility, the area of the crosswalk may be marked with white diagonal lines at a 45-degree angle to the line of the crosswalk or with white longitudinal lines parallel to traffic flow as shown in Figure 3B-18.

When diagonal or longitudinal lines are used to mark a crosswalk, the transverse crosswalk lines may be omitted. This type of marking may be used at locations where substantial numbers of pedestrians cross

without any other traffic control device, at locations where physical conditions are such that added visibility of the crosswalk is desired, or at places where a pedestrian crosswalk might not be expected.

Guidance:

If used, the diagonal or longitudinal lines should be 300 to 600 mm (12 to 24 in) wide and spaced 300 to 1500 mm (12 to 60 in) apart. The marking design should avoid the wheel paths, and the spacing should not exceed 2.5 times the line width.

Option:

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 3B-19 may be used for the crosswalk.

Guidance:

Crosswalk markings should be located so that the curb ramps are within the extension of the crosswalk markings (see Figure 3B-20).

Support:

Detectable warning surfaces mark boundaries between pedestrian and vehicular ways where there is no raised curb. Detectable warning surfaces are required by 49 CFR, Part 37 and by the Americans with Disabilities Act (ADA) where curb ramps are constructed at the junction of sidewalks and the roadway, for marked and unmarked crosswalks. The surfaces extend from the back of the curb line for a distance of at least 600 mm (24 in) in the pedestrian direction of travel and for the full width of the curb ramp, landing, or blended transition (see Figure 3B-20). The surfaces enable pedestrians who have visual disabilities to detect the warning under foot, by use of a long white cane, or by low vision, and to come to a stop before stepping into the roadway. The surfaces also alert pedestrians who have visual disabilities to the presence of hazards in their line of travel, thus indicating to them that they need to stop and determine the nature of the hazard before proceeding farther.

The "Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG)" (see Section 1A.11) specifies that detectable warning surfaces consist of truncated domes having a base diameter of 23 to 36 mm (0.9 to 1.4 in), a top diameter of 12 to 23 mm (0.5 to 0.9 in), and a height of 5 mm (0.2 in). The center-to-center spacing of the domes is specified as 41 to 61 mm (1.6 to 2.4 in). The base-to-base spacing of the domes is specified as 16 mm (0.6 in) minimum, measured between the adjacent domes on a square grid.

Detectable warning surfaces contrast visually with adjacent walking surfaces, either light-on-dark, or dark-on-light.

Section ~~3B.18~~ 3B.19 Parking Space Markings

Support:

Marking of parking space boundaries encourages more orderly and efficient use of parking spaces where parking turnover is substantial. Parking space markings tend to prevent encroachment into fire hydrant zones, bus stops, loading zones, approaches to intersections, curb ramps, and clearance spaces for islands and other zones where parking is restricted. Examples of parking space markings are shown in Figure 3B-21.

Standard:

Parking space markings shall be white.

Option:

Blue lines may supplement white parking space markings of each parking space designated for use only by persons with disabilities.

Support:

Additional parking space markings for the purpose of designating spaces for use only by persons with disabilities are discussed in Section 3B.20 and illustrated in Figure 3B-22. The design and layout of accessible parking spaces for persons with disabilities is specified in the "Americans with Disabilities Act Accessibility Guidelines (ADAAG)" (see Section 1A.11).

Section ~~3B.19~~ 3B.20 Pavement Word, ~~and~~ Symbol, and Arrow Markings paragraphs were relocated within this Section

Support:

Word, ~~and~~ symbol, and arrow markings on the pavement are used for the purpose of guiding, warning, or regulating traffic. These pavement markings can be helpful to road users in some locations by supplementing signs and providing additional emphasis for important regulatory, warning, or guidance messages, because the markings do not require diversion of the road user's attention from the roadway surface. Symbol messages are preferable to word messages. Examples of standard word and arrow pavement markings are shown in Figures 3B-23 and 3B-24.

Option:

Word, symbol, and arrow markings, including those contained in the "Standard Highway Signs and Markings" book (see Section 1A.11), may be used as determined by engineering judgment to supplement signs and/or to provide additional emphasis for regulatory, warning, or guidance messages. Among the word, ~~and~~ symbol, and arrow markings that may ~~include, but~~ be used are ~~not limited to,~~ the following: ~~Other words or symbols may also be used under certain conditions.~~

A. Regulatory:
   1. STOP
   2. RIGHT (LEFT) TURN ONLY
   3. 40 km/h (25 MPH)
   4. Lane-use and wrong-way arrows ~~symbols~~
   5. Diamond symbol for HOV lanes
   6. Other preferential lane word markings

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

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

Standard:

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

Pavement marking letters, numerals, arrows, and symbols shall be installed in accordance with the design details in the Pavement Markings chapter of the "Standard Highway Signs and Markings" book (see Section 1A.11). repeated from last paragraph of Section 3B.15

Guidance:

Letters and numerals should be 1.8 m (6 ft) or more in height.

Word and symbol markings should not exceed three lines of information.

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

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

The number of different word and symbol markings used should be minimized to provide effective guidance and avoid misunderstanding.

Except ~~as noted in the Option~~ for the SCHOOL word marking, pavement word and symbol markings should be no more than one lane in width.

Option:

If used, the SCHOOL word marking may extend to the width of two approach lanes (see Section 7C.06).

Guidance:

When the SCHOOL word marking is extended to the width of two approach lanes, the ~~characters~~ letters edited for consistency with Section 7C.06 should be 3 m (10 ft) or more in height (see Section 7C.06).

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

Option:

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

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

Standard:

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

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

Option:

A yield-ahead triangle symbol 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 (see Figure 3B-26). relocated from earlier in this Section

Standard:

The yield-ahead triangle symbol or YIELD AHEAD word pavement marking shall not be used unless a YIELD sign (see Section 2B.08) is in place at the intersection. The yield-ahead symbol marking shall be as shown in Figure 3B-26.

Guidance:

The International Symbol of Accessibility parking space marking~~s~~ (see Figure 3B-22) ~~may~~ should be placed in each parking space designated for use by persons with disabilities.

Option:

A blue background with white border may supplement the wheelchair symbol as shown in Figure 3B-21.

Support:

Lane-use arrow markings (see Figure 3B-23) are ~~often~~ used to ~~provide guidance in turn bays~~ indicate the mandatory or permissible movements in certain lanes (see Figure 3B-25)~~, where turns may or may not be mandatory,~~ and in two-way left-turn lanes (see Figure 3B-7). relocated from later in this Section

Guidance:

Lane-use arrows (see Figure 3B-24) should be used in lanes designated for the exclusive use of a turning movement, including turn bays, except where engineering judgment determines that physical conditions or other markings (such as a dotted extension of the lane line through the taper into the turn bay) clearly discourage unintentional use of a turn bay by through vehicles. Lane-use arrows should also be used in lanes from which movements are allowed that are contrary to the normal rules of the road (see Drawing B of Figure 3B-12). When used in turn lanes, at least two arrows should be used, one at or just downstream from the upstream end of the full-width turn lane and one 6.1 to 15 m (20 to 50 ft) upstream from the stop line or intersection (see Drawing C of Figure 3B-10). Where opposing offset channelized left-turn lanes exist, lane-use arrows should be placed near the downstream terminus of the offset left-turn lanes to reduce wrong-way movements (see Figure 2B-20).

Standard:

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

Guidance:

Where through lanes approaching an intersection become mandatory turn lanes, ONLY word markings (see Figure 3B-23) should be used in addition to the required lane-use arrow markings and signs. ~~Where through lanes become mandatory turn lanes, signs or~~ These markings and signs should be placed well in advance of the turn and should be repeated as necessary to prevent entrapment and to help the road user select the appropriate lane in advance of reaching a queue of waiting vehicles (see Drawing C of Figure 3B-10).

Option:

On freeways or expressways where a through lane becomes a mandatory exit lane, lane-use arrow markings may be used in the dropped lane on the approach to the exit.

Standard:

Lane-use, lane-reduction, and wrong-way arrow markings shall be designed as shown in Figure 3B-24 and in Chapter 10 of the "Standard Highway Signs and Markings" book (see Section 1A.11).

Option:

~~Lane-use arrow markings (see Figure 3B-21) may be used to convey either guidance or mandatory messages.~~

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

Standard:

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

Guidance:

~~In situations~~ Where a lane-reduction transition occurs on a roadway with a speed limit of 70 km/h (45 mph) or more, the lane-reduction arrow markings shown in Drawing F in Figure 3B-24 ~~may~~ should be used (see Figure 3B-13). Where a lane-reduction transition occurs on a roadway with a speed limit of less than 70 km/h (45 mph), the lane-reduction arrow markings shown in Drawing F in Figure 3B-24 should be used if determined to be appropriate based on engineering judgment.

~~Guidance:~~

Where crossroad channelization or ramp geometrics do not make wrong-way movements difficult, ~~a~~ 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 3B-28).

Option:

The wrong-way arrow markings shown in Figure 3B-24 may be placed near the downstream terminus of a ramp as shown in Figures 3B-28 and 3B-29, 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.20~~ 3B.21 Speed Measurement Markings

Support:

A speed measurement marking is a transverse marking placed on the roadway to assist the enforcement of speed regulations.

Standard:

Speed measurement markings, if used, shall be white, and shall not be greater than 600 mm (24 in) in width.

Option:

Speed measurement markings may extend 600 mm (24 in) on either side of the ~~centerline~~ center line or 600 mm (24 in) on either side of edge line markings at 400 m (0.25 mi) intervals over a 1.6 km (1 mi) length of roadway. When paved shoulders of sufficient width are available, the speed measurement~~s~~ markings may be placed entirely on these shoulders (see Drawing A of Figure 3B-10 and Figure 3B-29). Advisory signs may be used in conjunction with these markings ~~(see Figure 3B-10)~~.

Section 3B.22 Speed Reduction Markings

Support:

Speed reduction markings (see Figure 3B-30) are transverse markings that are placed on the roadway within a lane (along both edges of the lane) in a pattern of progressively reduced spacing to give drivers the impression that their speed is increasing. These markings might be placed in advance of an unexpectedly severe 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.

Standard:

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

Guidance:

Speed reduction markings should not be greater than 300 mm (12 in) in width, and should not extend more than 450 mm (18 in) into the lane.

Standard:

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

Guidance:

Speed reduction markings should be used to supplement the appropriate warning signs and other traffic control devices rather than as a substitute for these devices.

Section ~~3B.21~~ 3B.23 Curb Markings paragraphs have been relocated within this Section

Support:

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

Standard:

~~Signs shall be used with curb markings~~ Where curbs are marked to convey parking regulations in ~~those~~ areas where curb markings are frequently obliterated by snow and ice accumulation, signs shall be used with the curb markings except as noted in the Option below ~~unless the no-parking zone is controlled by statute or local ordinance~~.

Guidance:

Except as noted in the Option below, when curb markings are used without signs to convey parking regulations, a legible word marking regarding the regulation (such as "No Parking" or "No Standing") should be placed on the curb.

Option:

Curb markings without word markings or signs may be used to convey a general prohibition by statute of parking within a specified distance of a STOP sign, driveway, fire hydrant, or crosswalk.

Local highway agencies may prescribe special colors for curb markings to supplement standard signs for parking regulation.

Support:

Since yellow and white curb markings are frequently used for curb delineation and visibility, it is advisable to establish parking regulations through the installation of standard signs (see Sections 2B.53 through 2B.55).

Standard:

Where curbs are marked for delineation or visibility purposes, the colors shall ~~conform to~~ comply with the general principles of markings (see Section 3A.04).

Guidance:

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

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

Support:

Where the curbs of the islands become parallel to the direction of traffic flow, it is not necessary to mark the curbs unless an engineering study indicates the need for this type of delineation.

Curbs at openings in a continuous median island need not be marked unless an engineering study indicates the need for this type of marking.

Option:

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

Section ~~3B.22~~ 3B.24 Preferential Lane Word and Symbol Markings

Support:

Preferential lanes ~~identify~~ are established for one or more of a wide variety of special uses, including, but not limited to, high-occupancy vehicle (HOV) lanes, lanes for use only by vehicles equipped with electronic toll collection (ETC) transponders, bicycle lanes, bus only lanes, taxi only lanes, and light rail transit only lanes. A managed lane includes as an operational strategy, in real time in response to changing conditions, the designation of the lane as a preferential lane for use only by certain types of vehicles or occupancies during certain variable time periods. **relocated from later in this Section**

Standard:

When a lane is assigned full or part time to a particular class or classes of vehicles, the preferential lane word and symbol markings described in this Section and the preferential lane longitudinal markings described in Section 3B.25 shall be used.

All longitudinal pavement markings, as well as word and symbol pavement markings, associated with a preferential lane shall end where the Preferential Lane Ends (R3-12a or R3-12c) sign (see Section 2B.30) designating the downstream end of the preferential only lane restriction is installed.

Static or changeable message regulatory signs (see Sections 2B.26 to 2B.30) ~~or signals~~ shall be used with preferential lane word or symbol markings.

All preferential lane word and symbol markings shall be white and ~~all preferential lane word and symbol markings~~ shall be positioned laterally in the center of the ~~preferred use~~ preferential lane. two paragraphs combined into one

Where a preferential lane use is established, the preferential lane shall be marked with one or more of the following symbol or word markings for the preferential lane use specified:

A. **HOV lane—the preferential lane-use marking for high-occupancy vehicle lanes shall consist of white lines formed in a diamond shape symbol or the word message HOV. The diamond shall be at least 0.75 m (2.5 ft) wide and 3.7 m (12 ft) in length. The lines shall be at least 150 mm (6 in) in width.**

B. **ETC Only lane—the preferential lane use marking for an ETC only lane shall consist of a word marking using the name of the ETC payment system required for use of the lane, such as E Z PASS ONLY.**

C. **Bicycle lane—the preferential lane-use marking for a bicycle lane shall consist of a bicycle symbol or the word marking BIKE LANE (see Chapter 9C and Figures 9C-1 and 9C-3 through 9C-6).**

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

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

F. **Light rail transit lane—the preferential lane-use marking for a light rail transit lane shall consist of the letter T or the word marking TRANSIT ONLY.**

G. **Other type of preferential lane—the preferential lane-use markings shall ~~be identified in accordance with Section 3B.23~~ consist of a word marking appropriate to the restriction.**

If two or more preferential lane uses are permitted in a single lane, the symbol or word marking for each preferential lane use shall be installed.

~~Support~~ Guidance:

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

Support:

Markings spaced as close as 24 m (80 ft) apart might be appropriate on city streets, while markings spaced as far as 300 m (1,000 ft) apart might be appropriate for freeways.

Guidance:

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

Option:

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.

Guidance:

Engineering judgment should determine the need for supplemental devices such as tubular markers~~,~~ or traffic cones~~, or flashing lights~~. relocated from earlier in this Section

Section ~~3B.23~~ 3B.25 Preferential Lane Longitudinal Markings for Motor Vehicles this Section was reorganized

Support:

Preferential lanes can take many forms depending on the level of usage and the design of the facility. They might be barrier-separated (on a separate alignment or physically separated from the other travel lanes by a barrier~~,~~ or median~~, or painted neutral area~~), or they might be concurrent with other travel lanes and be buffer-separated (separated from general purpose lanes only by a narrow buffer area created with longitudinal pavement markings) or contiguous with general purpose lanes (separated only by a lane line). ~~Further,~~ Physically separated preferential lanes might be operated in ~~the same~~ 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.

A managed lane might include the designation of the lane as a preferential lane for use only by certain types of vehicles or occupancies during certain variable time periods as an operational strategy in real time in response to changing conditions. Additional information regarding signs for managed lanes is contained in Sections 2B.32 and 2E.61.

Option:

Preferential lanes may be operated ~~either~~ grammar – more than two choices full-time (24 hours per day on all days), for extended periods of the day, ~~or~~ part-time (restricted usage during specific hours on specified days), or on a variable basis (such as a strategy for a managed lane).

Standard:

~~The following four items~~ Longitudinal pavement markings for preferential lanes shall be as follows (these same requirements are presented in tabular form in Table 3B-2):

A. ~~Physically~~ Barrier-separated, nonreversible preferential lane—the longitudinal pavement markings for preferential lanes that are physically separated from the other travel lanes by a barrier~~,~~ or median~~, or painted neutral area~~ shall consist of a single normal solid yellow line at the left-hand edited to increase clarity edge of the travel lane(s), and a single normal solid white line at the right-hand edited to increase clarity edge of the travel lane(s)~~, and if there are two or more preferential lanes, the preferential travel lanes shall be separated with a normal broken white line~~ (see Drawing A in Figure 3B-31).

B. ~~Physically~~ Barrier-separated, reversible preferential lane—the longitudinal pavement markings for reversible preferential lanes that are physically separated from the other travel lanes by a barrier~~,~~ or median~~, or painted neutral area~~ shall consist of a single normal solid white line at

both edges of the travel lane(s)~~, and if there are two or more preferential lanes, the preferential travel lanes shall be separated with a normal broken white line~~ (see Drawing B in Figure 3B-31).

C. Buffer-separated (left-hand side) preferential lane—the longitudinal pavement markings for a full-time or part-time preferential lane on the left-hand side of and separated from the other travel lanes by a neutral buffer space shall consist of a single normal solid yellow line at the left-hand edge of the preferential travel lane(s) and one of the following at the right-hand edge of the preferential travel lane(s):

1. A double solid wide white line along both edges of the buffer space where crossing the buffer space is prohibited (see Drawing A in Figure 3B-32).
2. A single solid wide white line along both edges of the buffer space where crossing the buffer space is discouraged (see Drawing B in Figure 3B-32).
3. A single broken wide white line along both edges of the buffer space, or a single broken wide white line within the allocated buffer space (resulting in wider lanes), where crossing the buffer space is permitted (see Drawing C in Figure 3B-32).

D. Buffer-separated (right-hand side) preferential lane—the longitudinal pavement markings for a full-time or part-time preferential lane on the right-hand side of and separated from the other travel lanes by a neutral buffer space shall consist of a single normal solid white line at the right-hand edge of the preferential travel lane(s) if warranted (see Section 3B.07) and one of the following at the left-hand edge of the preferential travel lane(s) (see Drawing D in Figure 3B-32):

1. A double solid wide white line along both edges of the buffer space where crossing the buffer space is prohibited.
2. A single solid wide white line along both edges of the buffer space where crossing of the buffer space is discouraged.
3. A single broken wide white line along both edges of the buffer space, or a single broken wide white line within the allocated buffer space (resulting in wider lanes), where crossing the buffer space is permitted.
4. A single dotted normal white line within the allocated buffer space (resulting in wider lanes) where crossing the buffer space is permitted for any vehicle to perform a right-turn maneuver.

E. ~~Concurrent flow~~ Contiguous (left-hand edited to increase clarity side) preferential lane—the longitudinal pavement markings for a full-time or part-time preferential lane on the left-hand edited to increase clarity side of and contiguous to the other travel lanes shall consist of a single normal solid yellow line at the left-hand edited to increase clarity edge of the preferential travel lane(s) and one of the following at the right-hand edited to increase clarity edge of the preferential travel lane(s):

1. A double solid wide white line where crossing is prohibited (see Drawing A in Figure 3B-33).
2. A single solid wide white line where crossing is discouraged (see Drawing B in Figure 3B-33).
3. A single broken wide white line where crossing is permitted (see Drawing C in Figure 3B-33).

~~If there are two or more preferential lanes, the preferential travel lanes shall be separated with a normal broken white line.~~

F. ~~Concurrent flow~~ Contiguous (right-hand edited to increase clarity side) preferential lane—the longitudinal pavement markings for a full-time or part-time preferential lane on the right-hand side edited to increase clarity of and contiguous to the other travel lanes shall consist of a single normal solid white line at the right-hand edited to increase clarity edge of the preferential travel lane(s) if warranted (see Section 3B.07) and one of the following at the left-hand edited to increase clarity edge of the preferential travel lane(s) (see Drawing D in Figure 3B-33):

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

~~If there are two or more preferential lanes, the preferential travel lanes shall be separated with a normal broken white line.~~

Guidance:

When ~~concurrent flow~~ preferential lanes and other travel lanes are separated by ~~more~~ a buffer space wider than 1.2 m (4 ft) and crossing the buffer space is prohibited, chevron markings (see Section 3B.26) should be placed in the ~~neutral~~ buffer area (see Drawing A in Figure 3B-32). The chevron spacing should be 30 m (100 ft) or greater.

Option:

~~For~~ If a full-time or part-time ~~concurrent flow~~ contiguous preferential lane~~s, the spacing or skip pattern of the~~ is separated from the other travel lanes by a single broken wide white line (see Drawing C in Figure 3B-33), the spacing or skip pattern of the line may be reduced~~.~~ and the width of the ~~single broken wide white~~ line may be increased.

Standard:

If there are two or more preferential lanes, the lane lines between the preferential lanes shall be normal broken white lines.

Preferential lanes ~~longitudinal markings~~ for motor vehicles shall also be marked with the appropriate word or symbol pavement markings in accordance with Section 3B.24 and shall have appropriate regulatory signs in accordance with Sections 2B.26 through 2B.30.

Guidance:

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

Standard:

On a divided highway, a part-time counter-flow preferential lane that is contiguous to the travel lanes in the opposing direction shall be separated from the opposing direction lanes by the standard reversible lane longitudinal marking, a normal width double yellow broken line (see Section 3B.03 and Drawing A of Figure 3B-34). If a buffer space is provided between the part-time counter-flow preferential lane and the opposing direction lanes, a normal width double yellow broken line shall be placed along both edges of the buffer space (see Drawing B of Figure 3B-34). Signs (see Section 2B.25), lane-use control signals (see Chapter 4M), or both shall be used to supplement the reversible lane markings.

On a divided highway, a full-time counter-flow preferential lane that is contiguous to the travel lanes in the opposing direction shall be separated from the opposing direction lanes by a double solid yellow center line marking (see Drawing C of Figure 3B-34). If a buffer space is provided between the full-time counter-flow preferential lane and the opposing direction lanes, a normal width double solid yellow line shall be placed along both edges of the buffer space (see Drawing D of Figure 3B-34).

Option:

Cones, tubular markers, or other channelizing devices may also be used to separate the opposing lanes when a counter-flow preferential lane operation is in effect.

Section 3B.26 Chevron and Diagonal Crosshatching Markings

Option:

Chevron and diagonal crosshatching markings may be used to discourage travel on certain paved areas, such as shoulders, gore areas, neutral areas between double solid yellow center line markings approaching obstructions in the roadway (see Section 3B.10 and Figure 3B-14), neutral areas between double solid yellow center line markings forming flush medians or channelized travel paths at intersections (see Figures 3B-2 and 3B-5), and buffer spaces between preferential lanes and general purpose lanes (see Figures 3B-32 and 3B-34).

Standard:

When crosshatching markings are used in paved areas that separate traffic flows in the same general direction, they shall be white and they shall be shaped as chevron markings, with the point of each chevron facing towards approaching traffic and with the diagonal lines that form the chevron slanting such that the downstream ends of the lines intersect the longitudinal lines at the edges of the adjacent travel lanes (see Figures 3B-8, 3B-11, and 3B-14, Sheet 2 of 2).

When crosshatching markings are used in paved areas that separate opposing directions of traffic, they shall be yellow diagonal markings that slant such that the downstream ends of the lines intersect the longitudinal lines at the edges of the adjacent travel lanes (see Figures 3B-5 and 3B-14, Sheet 1 of 2).

When crosshatching markings used on paved shoulders, they shall be diagonal markings that slant such that the downstream ends of the lines intersect the edge line of the adjacent travel lane. The diagonal markings shall be yellow when used on the left-hand shoulders of the roadways of divided highways and on the left-hand shoulders of one-way streets or ramps. The diagonal markings shall be white when used on right-hand shoulders.

Guidance:

The chevron and diagonal lines used for crosshatching markings should be at least 300 mm (12 in) wide. The longitudinal spacing of the chevron or diagonal lines should be determined by engineering judgment considering factors such as speeds and desired visual impacts. The chevron and diagonal lines should form an angle of approximately 45 degrees with the longitudinal lines that they intersect.

~~Section 3B.24 Markings for Roundabout Intersections~~ **text relocated to new Chapter 3C**

~~Section 3B.25 Markings for Other Circular Intersections~~ **text relocated to new Chapter 3C**

Section ~~3B.26~~ 3B.27 Speed Hump Markings **sequence of paragraphs has been revised**

Option:

Speed humps, except those ~~used for~~ where the speed hump also functions as a crosswalk~~s~~ or speed table, may be marked in accordance with Figure 3B-35. ~~The markings shown in Figure 3B-30 may be used where the~~ Speed humps that also function~~s~~ as a crosswalk or speed table may be marked in accordance with Figure 3B-36.

Standard:

If ~~used,~~ 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-35. 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-36.

Section ~~3B.27~~ 3B.28 Advance Speed Hump Markings **sequence of paragraphs has been revised**

Option:

Advance speed hump markings (see Figure 3B-37) may be used in advance of ~~an~~ speed humps or other engineered vertical roadway deflections such as dips where added visibility is desired or where such deflection is not expected.

Advance pavement wording such as BUMP or HUMP (see Section 3B.20) may be used on the approach to a speed hump either alone or in conjunction with advance speed hump markings. Appropriate advance warning signs may be used in conformance with Section 2C.28.

Standard:

If ~~used,~~ advance speed hump markings are used, they shall be a ~~special~~ series of eight white ~~marking~~ 300 mm (12 in) transverse lines that become longer and are spaced closer together as the vehicle approaches the ~~placed in advance of~~ speed hump~~s~~ or other ~~engineered vertical roadway~~ deflection~~s such as dips~~. If advance markings are used, they shall comply with the detailed design shown in Figure 3B-37.

Guidance:

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

Section 3B.29 Markings for Toll Plazas

Support:

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

Standard:

Longitudinal pavement markings for Electronic Toll Collection (ETC) Only lanes approaching a toll plaza shall comply with Section 3B.25, except as noted in the Option below.

Guidance:

If drivers using an ETC Only lane that is within or immediately adjacent to a toll plaza are not required to stop at the plaza, the ETC Only lane should be separated from adjacent cash payment toll plaza lanes by a curb or barrier, channelizing devices (see Section 3F.01), and/or single or double solid wide white longitudinal pavement markings that discourage or prohibit lane changing. This form of separation should begin on the approach to the toll plaza at approximately the point where the vehicle speeds in the adjacent cash lanes drop below 50 km/h (30 mph) during off-peak periods. This form of separation 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 50 km/h (30 mph).

Option:

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

Standard:

If used, the purple solid longitudinal marking described in the previous paragraph shall be a minimum of 25 mm (1 in) and a maximum of 75 mm (3 in) in width, and ETC-Only preferential lane word markings (see Section 3B.24) shall be installed within the lane.

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

CHAPTER 3C. ROUNDABOUT MARKINGS edited from Sections 3B.24 and 3B.25

Section ~~3B.24~~ 3C.01 ~~Markings for Roundabout Intersections~~ General

~~Support:~~

~~Roundabout intersections are distinctive circular roadways that have the following three critical characteristics:~~

~~A. A requirement to yield at entry which gives a vehicle on the circular roadway the right-of-way;~~
~~B. A deflection of the approaching vehicle around the central island; and~~
~~C. A flare or widening of the approach to allow for proper operation as needed.~~

Standard:

Roundabouts shall be defined as circular intersections that meet the following characteristics:

A. Yield at entry to vehicles that are traveling on the circulatory roadway; and
B. Deflection of the approaching vehicle in a counter-clockwise direction around the central island.

Pavement markings and signing at roundabouts shall present a consistent message to the road user.

Guidance:

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

Markings at roundabouts should facilitate the movement through the roundabout without requiring vehicles to change lanes within the circulatory roadway to exit the roundabout in a given direction.

Markings on roundabout approaches should be compatible with circulatory roadway markings to provide a consistent message to road users at roundabouts.

Option:

Traffic control signals (see Part 4) may be used at roundabouts to facilitate the crossing of pedestrians in crosswalks or to allow metering of traffic.

Section 3C.02 White Lane Line Pavement Markings for Roundabouts

Standard:

Multi-lane approaches to roundabouts shall have lane lines.

Bicycle lane markings shall not be provided on the circular roadway of a roundabout ~~intersection~~.

Guidance:

Bicycle lane markings should stop at least 30 m (100 ft) before the crosswalk, or if no crosswalk is provided, at least 30 m (100 ft) before the yield line, or if no yield line is provided, then at least 30 m (100 ft) before the edge of the circulatory roadway (see Chapter 9C for details.)

~~Lane lines may be used on the circular roadway if there is more than one lane.~~ Multi-lane roundabouts should have lane line markings within the circulatory roadway to channelize traffic to the appropriate exit lane.

Standard:

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

Section 3C.03 Edge Line Pavement Markings for Roundabouts

Guidance:

A white edge line should be used on the outer (right-hand edited to increase clarity) side of the ~~circular~~ circulatory roadway.

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

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

Standard:

Edge line extensions ~~should~~ shall not be placed across the exits from the ~~circular~~ circulatory roadway at roundabouts.

Option:

A yellow edge line may be placed around the inner (left-hand edited to increase clarity) edge of the ~~circular~~ circulatory roadway (see Figure 3C-1) and may be used to channelize traffic (see Figure 3C-7).

Section 3C.04 Yield Lines for Roundabouts

Option:

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

Section 3C.05 Crosswalk Markings at Roundabouts

Standard:

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

Guidance:

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

~~Where crosswalk markings are used, these markings should be located a minimum of 7.6 m (25 ft) upstream from the yield line, or, if none, from the dotted white line.~~ Crosswalks should be a minimum of 6.1 m (20 ft) from the edge of the circulatory roadway.

Support:

Figure 3C-2 illustrates examples of layouts for crosswalk markings at roundabouts.

Section 3C.06 Pavement Word and Symbol Markings for Roundabouts

Option:

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

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

Word and/or route shield pavement markings may be used on an approach to or within the circulatory roadway of a roundabout to provide route and/or destination guidance information to road users (see Figure 3C-18).

Guidance:

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

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

Option:

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

Section 3C.07 Example Markings for Roundabouts

Support:

Figures 3C-4 through 3C-18 illustrate examples of markings for roundabouts ~~intersections are shown in Figures 3B-27 and 3B-28~~ of various geometric and lane-use configurations.

Section ~~3B.25~~ 3C.08 Markings for Other Circular Intersections

Support:

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

Option:

The markings shown in ~~Figures 3B-27 and 3B-28~~ this Chapter may be used at other circular intersections ~~when~~ if engineering judgment indicates that their presence will benefit drivers or pedestrians.

CHAPTER 3D. DELINEATORS

Section 3D.01 Delineators

Support:

Delineators are particularly beneficial at locations where the alignment might be confusing or unexpected, such as at lane-reduction transitions and curves. Delineators are effective guidance devices at night and during adverse weather. An important advantage of delineators in certain locations is that they remain visible when the roadway is wet or snow covered.

Delineators are considered guidance devices rather than warning devices.

Option:

Delineators may be used on long continuous sections of highway or through short stretches where there are changes in horizontal alignment.

Section 3D.02 Delineator Design

Standard:

Delineators shall be retroreflective devices mounted above the roadway surface and along the side of the roadway in a series to indicate the alignment of the roadway. Delineators shall consist of retroreflector units that are capable of clearly retroreflecting light under normal atmospheric conditions from a distance of 300 m (1,000 ft) when illuminated by the high beams of standard automobile lights.

Retroreflective elements for delineators shall have a minimum dimension of 75 mm (3 in).

Option:

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

Section 3D.03 Delineator Application

Standard:

The color of delineators shall conform to the color of edge lines stipulated in Section 3B.06.

Single delineators shall be provided on the right-hand edited to increase clarity side of freeways and expressways and on at least one side of interchange ramps, except in the following cases:

A. On tangent sections of freeways and expressways when ~~all~~ 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.

2. ~~Where whole routes or substantial portions of routes have large sections of tangent alignment.~~

~~3.~~ Roadside delineators are used to lead into all curves.

B. On sections of roadways where continuous lighting is in operation between interchanges.

Option:

Delineators may be provided on other classes of roads. Single delineators may be provided on the left-hand edited to increase clarity side of roadways.

Standard:

Delineators on the left-hand side of a two-way roadway shall be white.

Guidance:

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

Where median crossovers are provided for official or emergency use on divided highways and where these crossovers are to be marked, a double yellow delineator should be placed on the left-hand edited to increase clarity side of the through roadway on the far side of the crossover for each roadway.

Double or vertically elongated delineators should be installed at 30 m (100 ft) intervals along acceleration and deceleration lanes.

Delineators should be used wherever guardrail or other longitudinal barriers are present.

Option:

Red delineators may be used on the reverse side of any delineator where it would be viewed by a road user traveling in the wrong direction on ~~that particular~~ a one-way ramp or roadway.

Delineators of the appropriate color may be used to indicate a lane-reduction transition where either an outside or inside lane merges into an adjacent lane.

Guidance:

When used for lane-reduction transitions, the delineators should be ~~used~~ 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 Figure 3B-13).

Support:

Delineators are not necessary for traffic moving in the direction of a wider pavement or on the side of the roadway where the alignment is not affected by the lane-reduction transition.

Guidance:

On a highway with continuous delineation on either or both sides, delineators should be carried through transitions.

Option:

On a highway with continuous delineation on either or both sides, the spacing between a series of delineators may be closer.

Standard:

When used on a truck escape ramp, delineators shall be red.

Guidance:

Red delineators should be placed on both sides of truck escape ramps. The delineators should be spaced at 15 m (50 ft) intervals for a distance sufficient to identify the ramp entrance. Delineator spacing beyond the ramp entrance should be adequate for guidance according to the length and design of the escape ramp.

Section 3D.04 Delineator Placement and Spacing

Guidance:

Delineators should be mounted on suitable supports ~~so that~~ at a mounting height, measured vertically from the ~~top~~ bottom of the ~~highest~~ lowest retroreflector to the elevation of the near edge of the roadway, ~~is~~ of 1.2 m (4 ft) ~~above the near roadway edge~~.

Option:

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 stated above.

Guidance:

~~They~~ Delineators should be placed 0.6 to 2.4 m (2 to 8 ft) outside the outer edge of the shoulder, or if appropriate, in line with the roadside barrier that is 2.4 m (8 ft) or less outside the outer edge of the shoulder.

Delineators should be placed at a constant distance from the edge of the roadway, except that where an obstruction intrudes into the space between the pavement edge and the extension of the line of the delineators, the delineators should be transitioned to be in line with or inside the innermost edge of the obstruction. If the obstruction is a guardrail, the delineators should be transitioned to be ~~either~~ grammar – more than two choices just behind, directly above (in line with), or on the innermost edge of the guardrail.

Delineators should be spaced 60 to 160 m (200 to 530 ft) apart on mainline tangent sections. Delineators should be spaced 30 m (100 ft) apart on ramp tangent sections.

Support:

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

Option:

When uniform spacing is interrupted by such features as driveways and intersections, delineators which would ordinarily be located within the features may be relocated in either direction for a distance not exceeding one quarter of the uniform spacing. Delineators still falling within such features may be eliminated.

Delineators may be transitioned in advance of a lane transition or obstruction as a guide for oncoming traffic.

Guidance:

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 3D-1 should be used.

Option:

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.

CHAPTER 3E. COLORED PAVEMENTS

Section 3E.01 General paragraphs have been relocated within this Section

Support:

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

~~When used for guidance or regulation of traffic, colored pavements are traffic control devices.~~ If nonretroreflective colored pavement~~s~~, including bricks and other types of patterned surfaces, ~~also are sometimes~~ is used ~~to supplement other traffic control devices~~ as a purely aesthetic treatment and is not intended to communicate a regulatory, warning, or guidance message to road users, the colored pavement is not considered to be a traffic control device, even if it is located between the lines of a crosswalk.

~~Colored pavement located between crosswalk lines to emphasize the presence of the crosswalk is not considered to be a traffic control device.~~

Standard:

If colored pavement~~s~~ is used ~~as~~ within the traveled way, on flush or raised islands, or on shoulders to regulate, warn, or guide traffic or if retroreflective colored pavement is used, the colored pavement is considered to be a traffic control device~~s~~ and shall be limited to the following colors and applications:

A. Yellow pavement color shall be used only for flush or raised median islands separating traffic flows in opposite directions or for left-hand shoulders of roadways of divided highways or one-way streets or ramps.

B. White pavement color shall be used for ~~delineation on shoulders, and for~~ flush~~ed~~ or raised channelizing islands where traffic passes on both sides in the same general direction or for right-hand shoulders.

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

Guidance:

Colored pavements used as traffic control devices should be used only where they contrast significantly with adjoining paved areas.

Colored pavement located between crosswalk lines should not use colors or patterns that degrade the contrast of white crosswalk lines, or that might be mistaken by road users as a traffic control application~~, should not be used for colored pavement located between crosswalk lines~~.

CHAPTER 3F. ~~BARRICADES AND~~ barricades relocated to Section 2L.05 CHANNELIZING DEVICES

Section 3F.01 Channelizing Devices

Option:

Channelizing devices, such as traffic cones and tubular markers, may be used for general traffic control purposes such as adding emphasis to reversible lane delineation, channelizing lines, or islands. Channelizing devices may also be used along the center line of an undivided highway to preclude turns or along lane lines to preclude lane changing, as determined by engineering judgment.

Standard:

Except for color, the design of added to increase accuracy channelizing devices, including retroreflectivity, shall ~~conform to~~ comply with the provisions of Sections 6F.67, 6F.68, and 6F.69. added to increase accuracy ~~and~~ Channelizing devices shall be a minimum of 450 mm (18 in) in height.

The minimum height of ~~cones~~ channelizing devices added to increase accuracy shall be 700 mm (28 in) for use on freeways and other high-speed roadways, and on all facilities when used during hours of darkness or whenever more conspicuous guidance is needed.

The color of channelizing devices used outside of temporary traffic control zones shall be either orange or the same color as the pavement marking that they supplement, or for which they are substituted.

For nighttime use, channelizing devices shall be retroreflective. Except for the bands on channelizing devices that are used to separate traffic flows in opposing directions, the color of the retroreflective bands on channelizing devices shall be white. The bands on channelizing devices that are used to separate traffic flows in opposing directions shall be yellow.

~~**Retroreflective material shall have a smooth, sealed outer surface that will display a similar color during both day and night.**~~ **replaced by reference to Chapter 6F in Paragraph 2**

~~**Retroreflection of cones shall be provided by a minimum 150 mm (6 in) white band placed a minimum of 75 mm (3 in) but no more than 100 mm (4 in) from the top.**~~ **replaced by reference to Chapter 6F in Paragraph 2**

~~**When 700 mm (28 in) or larger size cones are used, the standard 150 mm (6 in) band shall be supplemented with an additional 100 mm (4 in) white band spaced a minimum of 50 mm (2 in) below the 150 mm (6 in) band.**~~ **replaced by reference to Chapter 6F in Paragraph 2**

~~**Retroreflection of tubular markers shall be a minimum of two 75 mm (3 in) white bands placed a maximum of 50 mm (2 in) from the top with a maximum of 150 mm (6 in) between the bands.**~~ **replaced by reference to Chapter 6F in Paragraph 2**

Guidance:

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

CHAPTER 3G. ISLANDS

Section 3G.01 General

Support:

Chapter 3G addresses the characteristics of islands as traffic-control devices. Criteria for the design of islands are set forth in "A Policy on Geometric Design of Highways and Streets" (see Section 1A.11).

Standard:

An island for traffic control purposes shall be the defined area between traffic lanes for control of vehicular movements, for toll collection, or for pedestrian refuge. Within an intersection area, a median or an outer separation shall be an island.

Option:

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

Section 3G.02 Approach-End Treatment

Guidance:

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

~~Option~~ Support:

The neutral area between approach-end markings that can be readily crossed even at considerable speed ~~may~~ sometimes contains slightly raised (usually less than 25 mm (1 in) high) sections of coarse aggregate or other suitable materials to create rumble sections that provide increased visibility of the marked areas and that produce an audible warning to road users traveling across them. For additional discouragement to driving in the neutral area, bars or buttons projecting 25 to 75 mm (1 to 3 in) above the pavement surface are sometimes placed in the neutral area. These bars or buttons are designed so that any wheel encroachment within the area will be obvious to the vehicle operator, but will result in only minimal effects on control of the vehicle. Such bars or buttons are sometimes preceded by rumble sections or their height is gradually increased as approached by traffic.

Guidance:

When raised bars or buttons are used in these neutral areas, they should be marked with white or yellow retroreflective materials, as determined by the direction or directions of travel they separate. relocated from Section 3G.03

Standard:

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

~~Guidance:~~

~~Bars or buttons should not project more than 25 to 75 mm (1 to 3 in) above the pavement surface and should be designed so that any wheel encroachment within the area will be obvious to the vehicle operator, but will not result in loss of control of the vehicle.~~ incorporated into the above Support paragraph

Option:

~~Bars or buttons may be preceded by rumble sections, or their height may be gradually increased as approached by traffic.~~ incorporated into the above Support paragraph

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

Section 3G.03 Island Marking Application

Standard:

Markings, as related to islands, shall consist only of pavement and curb markings, object markers, channelizing devices, and delineators.

Guidance:

Unless engineering judgment determines that there is not a need on the approach to a particular island~~s~~, the triangular neutral area in advance of the upstream end of the island ~~shall~~ should include pavement markings as described in Section 3B.10.

~~Option:~~

~~As indicated in Section 3G.02, rumble sections, or other similar traffic control designs which contrast with the pavement surface, may also be applied in the triangular neutral area in advance of the end of an island.~~

Section 3G.04 Island Marking Colors

Guidance:

Islands outlined by curbs or pavement markings should be marked with retroreflective white or yellow material as determined by the direction or directions of travel they separate (see Section 3A.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 nose, when viewed from the approach to the island.

Option:

On long islands, curb retroreflection may be discontinued such that it does not extend for the entire length of the curb, especially if the island is illuminated or marked with delineators or edge lines.

Section 3G.05 Island Object Markers

Option:

Object markers (see Chapter 2L) may be installed alone or in combination with other signs (such as ~~KEEP RIGHT~~ Keep Right, ~~KEEP LEFT~~ Keep Left, double arrows, or guide signs) located within the island.

Section 3G.06 Island Delineators

Standard:

Delineators installed on islands shall be the same colors as the related edge lines except that, when facing wrong-way traffic, they shall be red (see Section 3D.03).

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

Section 3G.07 Pedestrian Islands and Medians

Support:

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

Placement of detectable warnings (see Section 3B.18) at the back of the curb line on curb ramps allows placement of the detectable warning behind depressed curbing.

At cut-through islands or medians (see Figure 3G-1), detectable warnings can readily be placed such that they are even with or just behind the face of curb to increase the separation between the detectable warnings at the opposite sides of the island or median to better define the area of refuge. Increased separation also provides clearer information to pedestrians who have visual disabilities.

CHAPTER 3H. RUMBLE STRIP MARKINGS

Section 3H.01 Longitudinal Rumble Strip Markings

Support:

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

The provisions in this Manual address the use of markings in combination with a longitudinal rumble strip.

Option:

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

Standard:

If used, the edge line or center line associated with a longitudinal rumble stripe shall be white for the right-hand edge of the roadway, yellow for the left-hand edge of the roadways of divided and one-way highways and ramps, and yellow for the separation of traffic traveling in opposite directions.

Section 3H.02 Transverse Rumble Strip Markings

Support:

Transverse rumble strips consist of intermittent narrow, transverse areas of rough-textured or slightly raised or depressed road surface that extend across the travel lanes to alert drivers to unusual vehicular traffic conditions. Through noise and vibration, they attract the attention of road users to features such as unexpected changes in alignment and conditions requiring a reduction in speed or a stop.

The provisions in this Manual address the use of markings in combination with a transverse rumble strip.

Standard:

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 white.

Guidance:

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

CHAPTER 4A. GENERAL

Section 4A.01 Types

Support:

The following types and uses of highway traffic signals are discussed in Part 4: traffic control signals; pedestrian signals; emergency-vehicle ~~traffic control~~ signals; traffic control signals for one-lane, two-way facilities; traffic control signals for freeway entrance ramps; traffic control signals for movable bridges; traffic control signals for toll plazas; flashing beacons; lane-use control signals; ~~flashing beacons;~~ and in-roadway lights.

Section 4A.02 Definitions Relating to Highway Traffic Signals

Standard:

The following technical terms, when used in Part 4, shall be defined as follows: existing definitions were renumbered as necessary

1. **Accessible Pedestrian Signal—a device that communicates information about pedestrian timing in nonvisual format such as audible tones, ~~verbal~~ speech messages, and/or vibrating surfaces.**
2. **Active Grade Crossing Warning System—the flashing-light signals, with or without warning gates, together with the necessary control equipment used to inform road users of the approach or presence of trains at highway-rail grade crossings or highway-light rail transit grade crossings.**
3. **Actuated Operation—a type of traffic control signal operation in which some or all signal phases are operated on the basis of actuation.**
4. **Actuation—initiation of a change in or extension of a traffic signal phase through the operation of any type of detector.**
5. **Approach—all lanes of traffic moving towards an intersection or a midblock location from one direction, including any adjacent parking lane(s).**
6. **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.**
7. **Backplate—see Signal Backplate.**
8. **Beacon—a highway traffic signal with one or more signal sections that operates in a flashing mode.**
9. **Conflict Monitor—a device used to detect and respond to improper or conflicting signal indications and improper operating voltages in a traffic controller assembly.**
10. **Controller Assembly—a complete electrical device mounted in a cabinet for controlling the operation of a highway traffic signal.**
11. **Controller Unit—that part of a controller assembly that is devoted to the selection and timing of the display of signal indications.**
12. **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 centerline; (b) any portion of a roadway at an intersection or elsewhere distinctly indicated as a pedestrian crossing by pavement marking added to increase clarity lines on the surface, which ~~may~~ might be supplemented by a contrasting pavement texture, style, or color.**
13. **Cycle Length—the time required for one complete sequence of signal indications.**
14. **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 signals, beacons, and some movable bridge signals.)**
15. **Detector—a device used for determining the presence or passage of vehicles or pedestrians.**
16. **Dual-Arrow Signal Section—a type of signal section designed to include both a yellow arrow and a green arrow.**
17. **Emergency Vehicle Traffic Control Signal—a special traffic control signal that assigns the right-of-way to an authorized emergency vehicle.**
18. **Flasher—a device used to turn highway traffic signal indications on and off at a repetitive rate of approximately once per second.**

19. **Flashing—an operation in which a highway traffic signal indication is turned on and off repetitively.**
20. **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.**
21. **Full-Actuated Operation—a type of traffic control signal operation in which all signal phases function on the basis of actuation.**
22. **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 ~~signals at toll plazas,~~ power-operated signs, illuminated pavement markers, warning lights (see Section 6F.79), or steady-burning electric lamps.**
23. **Hybrid Signal—a special type of highway traffic signal 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.**
24. **In-Roadway 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 slow down and/or come to a stop.**
25. **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 or driveway with a roadway or highway shall not constitute an intersection.**
    - **(c) If a highway includes two roadways that are 9 m (30 ft) or more apart, then every crossing of each roadway of such divided highway by an intersecting highway shall be a separate intersection; in the event such intersecting highway also includes two roadways that are 9 m (30 ft) or more apart, then every crossing of two roadways of such highways shall be a separate intersection (see definition of Median). However, regardless of the distance between the separate intersections as defined herein, where a stopping point 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 deemed to be one intersection.**
    - **(d) Where a stopping point is designated on a roadway approaching an intersection as defined in Items (a) and (c) above, a vehicle of which any part is legally beyond said designated stopping point shall be deemed to be legally in the intersection.**
    - **(e) A vehicle, which is deemed to have or which has legally entered the intersection as defined in Items (a) and (c) above, upon departing said intersection shall be deemed to still be legally in the intersection until:**
      - **(1) The rear of the vehicle and any attached trailer(s) clears the intersection; or**
      - **(2) Where a marked or unmarked associated crosswalk is present, the rear of the vehicle and any attached trailer(s) clears said crosswalk.**
26. **Intersection Control Beacon—a beacon used only at an intersection to control two or more directions of travel.**
27. **Interval—the part of a signal cycle during which signal indications do not change.**
28. **Interval Sequence—the order of appearance of signal indications during successive intervals of a signal cycle.**
29. **Lane-Use Control Signal—a signal face displaying signal indications to permit or prohibit the use of specific lanes of a roadway or to indicate the impending prohibition of such use.**
30. **Lens—see Signal Lens.**
31. **Louver—see Signal Louver.**
32. **Major Street—the street normally carrying the higher volume of vehicular traffic.**
33. **Malfunction Management Unit—same as Conflict Monitor.**
34. **Minor Street—the street normally carrying the lower volume of vehicular traffic.**
35. **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.**

36. Movable Bridge Signal—a highway traffic signal installed at a movable bridge to notify traffic to stop during periods when the roadway is closed to allow the bridge to open.
37. 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.
38. Pedestrian Change Interval—an interval during which the flashing UPRAISED HAND (symbolizing DONT WALK) signal indication is displayed. ~~When a verbal message is provided at an accessible pedestrian signal, the verbal message is "wait."~~
39. Pedestrian Clearance Time—the time provided for a pedestrian crossing in a crosswalk, after leaving the curb or shoulder, to travel to the far side of the traveled way or to a median.
40. Pedestrian Hybrid Signal— a special type of hybrid signal used to warn and control traffic at an unsignalized location to assist pedestrians in crossing a street or highway at a marked crosswalk.
41. 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 pedestrian traffic at a traffic control signal.
42. Permissive Mode—a mode of traffic control signal operation in which~~, when a CIRCULAR GREEN signal indication is displayed,~~ left or right turns are permitted to be made after yielding to pedestrians, if any, and/or ~~oncoming~~ opposing traffic, if any. added to allow left turns from one-way streets and from stems of T-intersections to be classified as permissive left turns 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.
43. 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.
44. Preemption Control—the transfer of normal operation of a traffic control signal to a special control mode of operation.
45. Pretimed Operation—a type of traffic control signal operation in which none of the signal phases function on the basis of actuation.
46. Priority Control—a means by which the assignment of right-of-way is obtained or modified.
47. Protected Mode—a mode of traffic control signal operation in which left or right turns are permitted to be made when a left or right GREEN ARROW signal indication is displayed.
48. Pushbutton—a button to activate pedestrian timing.
49. Pushbutton Locator Tone—a repeating sound that informs approaching pedestrians that ~~they are required to push a button~~ a pushbutton to actuate pedestrian timing or receive additional information exists and that enables pedestrians who have visual disabilities to locate the pushbutton.
50. Ramp Control Signal—a highway traffic signal installed to control the flow of traffic onto a freeway at an entrance ramp or at a freeway-to-freeway ramp connection.
51. Ramp Meter—see Ramp Control Signal.
52. Red Clearance Interval—an optional interval that follows a yellow change interval and precedes the next conflicting green interval.
53. Right-of-Way (Assignment)—the permitting of vehicles and/or pedestrians to proceed in a lawful manner in preference to other vehicles or pedestrians by the display of signal indications.
54. Roadway Network—a geographical arrangement of intersecting roadways.
55. Semiactuated Operation—a type of traffic control signal operation in which at least one, but not all, signal phases function on the basis of actuation.
56. Separate ~~Left~~ Turn Signal Face—a signal face for controlling a ~~left~~ turn movement that sometimes displays a different color of circular signal indication than the adjacent through signal faces display.
57. Shared ~~Left~~ Turn Signal Face—a signal face, for controlling both a ~~left~~ 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.
58. 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.
59. Signal Coordination—the establishment of timed relationships between adjacent traffic control signals.

60. Signal Face—~~that part of a traffic control signal~~ an assembly of one or more signal sections that is provided for controlling one or more traffic movements on a single approach.
61. Signal Head—an assembly of one or more signal ~~sections~~ faces that is provided for controlling traffic movements on one or more approaches.
62. Signal Housing—that part of a signal section that protects the light source and other required components.
63. Signal Indication—the illumination of a signal lens or equivalent device.
64. Signal Lens—that part of the signal section that redirects the light coming directly from the light source and its reflector, if any.
65. 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.
66. 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.
67. Signal Section—the assembly of a signal housing, signal lens, if any, and light source with necessary components to be used for ~~providing~~ displaying one signal indication.
68. Signal System—two or more traffic control signals operating in signal coordination.
69. Signal Timing—the amount of time allocated for the display of a signal indication.
70. 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.
71. Signal Warrant—a threshold condition 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 signal or other improvement is justified.
72. Speed Limit Sign Beacon—a beacon used to supplement a SPEED LIMIT sign.
73. Steady (Steady Mode)—the continuous ~~illumination~~ display of a signal indication for the duration of an interval, signal phase, or consecutive signal phases.
74. Stop Beacon—a beacon used to supplement a STOP sign, a DO NOT ENTER sign, or a WRONG WAY sign.
75. Traffic Control Signal (Traffic Signal)—any highway traffic signal by which traffic is alternately directed to stop and permitted to proceed.
76. Vibrotactile Pedestrian Device—~~a device~~ an accessible pedestrian signal feature that communicates, by touch, information about pedestrian timing using a vibrating surface.
77. Visibility-Limited Signal Face or 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.
78. Walk Interval—an interval during which the WALKING PERSON (symbolizing WALK) signal indication is displayed. When a ~~verbal~~ speech message is provided at an accessible pedestrian signal, the ~~verbal~~ speech message is "walk sign."
79. Warning Beacon—a beacon used only to supplement an appropriate warning or regulatory sign or marker.
80. Yellow Change Interval—the first interval following the green interval during which the steady added to increase accuracy yellow signal indication is displayed.

CHAPTER 4B. TRAFFIC CONTROL SIGNALS—GENERAL

Section 4B.01 General

Standard:

A traffic control signal (traffic signal) shall be defined as any highway traffic signal by which traffic (see Section 1A.13 for definition) is alternately directed to stop and permitted to proceed.

~~**Traffic shall be defined as pedestrians, bicyclists, ridden or herded animals, vehicles, streetcars, and other conveyances either singularly or together while using any highway for purposes of travel.**~~

Support:

Words such as pedestrians and bicyclists are used redundantly in selected sections of Part 4 to encourage sensitivity to these elements of "traffic."

Standards for traffic control signals are important because traffic control signals need to attract the attention of a variety of road users, including those who are older, those with impaired vision, as well as those who are fatigued or distracted, or who are not expecting to encounter a signal at a particular location.

Section 4B.02 Basis of Installation or Removal of Traffic Control Signals

Guidance:

The selection and use of traffic control signals should be based on an engineering study of roadway, traffic, and other conditions.

Support:

A careful analysis of traffic operations, pedestrian and bicyclist needs, and other factors at a large number of signalized and unsignalized locations, coupled with engineering judgment, has provided a series of signal warrants, described in Chapter 4C, that define the minimum conditions under which installing traffic control signals might be justified.

Guidance:

Engineering judgment should be applied in the review of operating traffic control signals to determine whether the type of installation and the timing program meet the current requirements of all forms of traffic.

If changes in traffic patterns eliminate the need for a traffic control signal, consideration should be given to removing it and replacing it with appropriate alternative traffic control devices, if any are needed.

~~Option:~~

If the engineering study indicates that the traffic control signal is no longer justified, and a decision is made to remove the signal, removal ~~may~~ should be accomplished using the following steps:

A. Determine the appropriate traffic control to be used after removal of the signal.
B. Remove any sight-distance restrictions as necessary.
C. Inform the public of the removal study, for example by installing an informational sign (or signs) ~~with the legend TRAFFIC SIGNAL UNDER STUDY FOR REMOVAL~~ at the signalized location in a position where it is visible to all road users.
D. Flash or cover the signal heads for a minimum of 90 days, and install the appropriate stop control or other traffic control devices.
E. Remove the signal if the engineering data collected during the removal study period confirms that the signal is no longer needed.

Option:

Because Items C, D, and E in the previous Guidance paragraph are not relevant when a temporary traffic control signal (see Section 4D.32) is removed, a temporary traffic control signal may be removed immediately after Items A and B are completed.

Instead of total removal of a traffic control signal, the poles, controller cabinet, and cables may remain in place after removal of the signal heads for continued analysis. relocated from Item E in the previous Guidance paragraph

Section 4B.03 Advantages and Disadvantages of Traffic Control Signals

Support:

When properly used, traffic control signals are valuable devices for the control of vehicular and pedestrian traffic. They assign the right-of-way to the various traffic movements and thereby profoundly influence traffic flow.

Traffic control signals that are properly designed, located, operated, and maintained will have one or more of the following advantages:

A. They provide for the orderly movement of traffic.
B. They increase the traffic-handling capacity of the intersection if:
    1. Proper physical layouts and control measures are used, and
    2. The signal operational parameters are reviewed and updated (if needed) on a regular basis (as engineering judgment determines that significant traffic flow and/or land use changes have occurred) to maximize the ability of the traffic control signal to satisfy current traffic demands.
C. They reduce the frequency and severity of certain types of crashes, especially right-angle collisions.
D. They are coordinated to provide for continuous or nearly continuous movement of traffic at a definite speed along a given route under favorable conditions.
E. They are used to interrupt heavy traffic at intervals to permit other traffic, vehicular or pedestrian, to cross.

Traffic control signals are often considered a panacea for all traffic problems at intersections. This belief has led to traffic control signals being installed at many locations where they are not needed, adversely affecting the safety and efficiency of vehicular, bicycle, and pedestrian traffic.

Traffic control signals, even when justified by traffic and roadway conditions, can be ill-designed, ineffectively placed, improperly operated, or poorly maintained. Improper or unjustified traffic control signals can result in one or more of the following disadvantages:

A. Excessive delay,
B. Excessive disobedience of the signal indications,
C. Increased use of less adequate routes as road users attempt to avoid the traffic control signals, and
D. Significant increases in the frequency of collisions (especially rear-end collisions).

Section 4B.04 Alternatives to Traffic Control Signals

Guidance:

Since vehicular delay and the frequency of some types of crashes are sometimes greater under traffic signal control than under STOP sign control, consideration should be given to providing alternatives to traffic control signals even if one or more of the signal warrants has been satisfied.

Option:

These alternatives may include, but are not limited to, the following:

A. Installing signs along the major street to warn road users approaching the intersection;
B. Relocating the stop line(s) and making other changes to improve the sight distance at the intersection;
C. Installing measures designed to reduce speeds on the approaches;
D. Installing a flashing beacon at the intersection to supplement STOP sign control;
E. Installing flashing beacons on warning signs in advance of a STOP sign controlled intersection on major- and/or minor-street approaches;
F. Adding one or more lanes on a minor-street approach to reduce the number of vehicles per lane on the approach;
G. Revising the geometrics at the intersection to channelize vehicular movements and reduce the time required for a vehicle to complete a movement, which could also assist pedestrians;
H. Revising the geometrics at the intersection to add pedestrian median refuge islands and/or curb extensions;
I. Installing roadway lighting if a disproportionate number of crashes occur at night;
J. Restricting one or more turning movements, perhaps on a time-of-day basis, if alternate routes are available;
K. If the warrant is satisfied, installing multiway STOP sign control;
L. Installing a pedestrian hybrid signal (see Chapter 4F) or In-Roadway Warning Lights (see Chapter 4N) if pedestrian safety is the major concern; added to inform the reader about alternatives to midblock pedestrian signals
M. Installing a roundabout ~~intersection~~; and
N. Employing other alternatives, depending on conditions at the intersection.

Section 4B.05 Adequate Roadway Capacity

Support:

The delays inherent in the alternating assignment of right-of-way at intersections controlled by traffic control signals can frequently be reduced by widening the major roadway, the minor roadway, or both roadways. Widening the minor roadway often benefits the operations on the major roadway, because it reduces the green time that must be assigned to minor-roadway traffic. In urban areas, the effect of widening can be achieved by eliminating parking on intersection approaches. It is desirable to have at least two lanes for moving traffic on each approach to a signalized location. Additional width on the departure side of the intersection, as well as on the approach side, will sometimes be needed to clear traffic through the intersection effectively.

Guidance:

Adequate roadway capacity should be provided at a signalized location. Before an intersection is widened, the additional green time pedestrians need to cross the widened roadways should be considered to determine if it will exceed the green time saved through improved vehicular flow.

Other methods of increasing the roadway capacity at signalized locations that do not involve roadway widening, such as revisions to the pavement markings and the careful evaluation of proper lane-use assignments (including varying the lane use by time of day), should be considered where appropriate.

CHAPTER 4C. TRAFFIC CONTROL SIGNAL NEEDS STUDIES

Section 4C.01 Studies and Factors for Justifying Traffic Control Signals

Standard:

An engineering study of traffic conditions, pedestrian characteristics, and physical characteristics of the location shall be performed to determine whether installation of a traffic control signal is justified at a particular location.

The investigation of the need for a traffic control signal shall include an analysis of factors related to the existing operation and safety at the study location and the potential to improve these conditions, and the applicable factors contained in the following traffic signal warrants ~~and other factors related to existing operation and safety at the study location~~:

Warrant 1, Eight-Hour Vehicular Volume
Warrant 2, Four-Hour Vehicular Volume
Warrant 3, Peak Hour
Warrant 4, Pedestrian Volume
Warrant 5, School Crossing
Warrant 6, Coordinated Signal System
Warrant 7, Crash Experience
Warrant 8, Roadway Network
Warrant 9, Intersection Near a Highway-Rail Grade Crossing

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

Support:

Sections 8C.08 and 10D.06 contain information regarding the use of traffic control signals instead of gates and/or flashing-light signals at highway-rail~~road~~ grade crossings and highway-light rail transit grade crossings, respectively.

Guidance:

A traffic control signal should not be installed unless one or more of the factors described in this Chapter are met.

A traffic control signal should not be installed unless an engineering study indicates that installing a traffic control signal will improve the overall safety and/or operation of the intersection.

A traffic control signal should not be installed if it will seriously disrupt progressive traffic flow.

The study should consider the effects of the right-turn vehicles from the minor-street approaches. Engineering judgment should be used to determine what, if any, portion of the right-turn traffic is subtracted from the minor-street traffic count when evaluating the count against the above signal warrants.

Engineering judgment should also be used in applying various traffic signal warrants to cases where approaches consist of one lane plus one left-turn or right-turn lane. The site-specific traffic characteristics should dictate whether an approach ~~should be~~ is considered as one lane or two lanes. For example, for an approach with one lane for through and right-turning traffic plus a left-turn lane, if engineering judgment ~~could~~ indicates that it should be considered a one-lane approach ~~if~~ because the traffic using the left-turn lane is minor, ~~In such a case,~~ the total traffic volume approaching the intersection should be applied against the signal warrants as a one-lane approach. The approach should be considered two lanes if approximately half of the traffic on the approach turns left and the left-turn lane is of sufficient length to accommodate all left-turn vehicles.

Similar engineering judgment and rationale should be applied to a street approach with one lane plus a right-turn lane. In this case, the degree of conflict of minor-street right-turn traffic with traffic on the major street should be considered. Thus, right-turn traffic should not be included in the minor-street volume if the movement enters the major street with minimal conflict. The approach should be evaluated as a one-lane approach with only the traffic volume in the through/left-turn lane considered.

At a location that is under development or construction and where it is not possible to obtain a traffic count that would represent future traffic conditions, hourly volumes should be estimated as part of an engineering study for comparison with traffic signal warrants. Except for locations where the engineering study uses the satisfaction of Warrant 8 to justify a signal, a traffic control signal installed under projected conditions should have an engineering study done within 1 year of putting the signal into stop-and-go

operation to determine if the signal is justified. If not justified, the signal should be taken out of stop-and-go operation or removed.

For signal warrant analysis, a location with a wide median, even if the median width is greater than 9 m (30 ft), should be considered as one intersection.

Option:

At an intersection with a high volume of left-turn traffic from the major street, the signal warrant analysis may be performed in a manner that considers the higher of the major-street left-turn volumes as the "minor-street" volume and the corresponding single direction of opposing traffic on the major street as the "major-street" volume.

For signal warrants requiring conditions to be present for a certain number of hours in order to be satisfied, any four sequential 15-minute periods may be considered as one hour if the separate one-hour periods used in the warrant analysis do not overlap each other and both the major-street volume and the minor-street volume are for the same specific one-hour periods.

For signal warrant analysis, bicyclists may be counted as either vehicles or pedestrians.

Support:

When performing a signal warrant analysis, bicyclists riding in the street with other vehicular traffic are usually counted as vehicles and bicyclists who are clearly using pedestrian facilities are usually counted as pedestrians.

Option:

Engineering study data may include the following:

A. The number of vehicles entering the intersection in each hour from each approach during 12 hours of an average day. It is desirable that the hours selected contain the greatest percentage of the 24-hour traffic volume.
B. Vehicular volumes for each traffic movement from each approach, classified by vehicle type (heavy trucks, passenger cars and light trucks, public-transit vehicles, and, in some locations, bicycles), during each 15-minute period of the 2 hours in the morning and 2 hours in the afternoon during which total traffic entering the intersection is greatest.
C. Pedestrian volume counts on each crosswalk during the same periods as the vehicular counts in Item B above and during hours of highest pedestrian volume. Where young, elderly, and/or persons with physical or visual disabilities need special consideration, the pedestrians and their crossing times may be classified by general observation.
D. Information about nearby facilities and activity centers that serve the young, elderly, and/or persons with disabilities, including requests from persons with disabilities for accessible crossing improvements at the location under study. These persons might not be adequately reflected in the pedestrian volume count if the absence of a signal restrains their mobility.
E. The posted or statutory speed limit or the 85th-percentile speed on the uncontrolled approaches to the location.
F. A condition diagram showing details of the physical layout, including such features as intersection geometrics, channelization, grades, sight-distance restrictions, transit stops and routes, parking conditions, pavement markings, roadway lighting, driveways, nearby railroad crossings, distance to nearest traffic control signals, utility poles and fixtures, and adjacent land use.
G. A collision diagram showing crash experience by type, location, direction of movement, severity, weather, time of day, date, and day of week for at least 1 year.

The following data, which are desirable for a more precise understanding of the operation of the intersection, may be obtained during the periods specified in Item B of the preceding paragraph:

A. Vehicle-hours of stopped time delay determined separately for each approach.
B. The number and distribution of acceptable gaps in vehicular traffic on the major street for entrance from the minor street.
C. The posted or statutory speed limit or the 85th-percentile speed on controlled approaches at a point near to the intersection but unaffected by the control.
D. Pedestrian delay time for at least two 30-minute peak pedestrian delay periods of an average weekday or like periods of a Saturday or Sunday.
E. Queue length on stop-controlled approaches.

Section 4C.02 Warrant 1, Eight-Hour Vehicular Volume

Support:

The Minimum Vehicular Volume, Condition A, is intended for application at locations where a large volume of intersecting traffic is the principal reason to consider installing a traffic control signal.

The Interruption of Continuous Traffic, Condition B, is intended for application at locations where Condition A is not satisfied and where the traffic volume on a major street is so heavy that traffic on a minor intersecting street suffers excessive delay or conflict in entering or crossing the major street.

It is intended that Warrant 1 be treated as a single warrant. If Condition A is satisfied, then ~~the criteria for~~ Warrant 1 is satisfied and analyses of Condition B and the combination of Conditions A and B are not needed. Similarly, if Condition B is satisfied, then ~~the criteria for~~ Warrant 1 is satisfied and an analysis of the combination of Conditions A and B is not needed. edited to increase clarity

Standard:

The need for a traffic control signal shall be considered if an engineering study finds that one of the following conditions exist for each of any 8 hours of an average day:

- **A. The vehicles per hour given in both of the 100 percent columns of Condition A in Table 4C-1 exist on the major-street and the higher-volume minor-street approaches, respectively, to the intersection; or**
- **B. The vehicles per hour given in both of the 100 percent columns of Condition B in Table 4C-1 exist on the major-street and the higher-volume minor-street approaches, respectively, to the intersection.**

In applying each condition the major-street and minor-street volumes shall be for the same 8 hours. On the minor street, the higher volume shall not be required to be on the same approach during each of these 8 hours.

Option:

If the posted or statutory speed limit or the 85th-percentile speed on the major street exceeds 70 km/h or exceeds 40 mph, or if the intersection lies within the built-up area of an isolated community having a population of less than 10,000, the traffic volumes in the 70 percent columns in Table 4C-1 may be used in place of the 100 percent columns.

Guidance:

The combination of Conditions A and B is intended for application at locations where Condition A is not satisfied and Condition B is not satisfied and should be applied only after an adequate trial of other alternatives that could cause less delay and inconvenience to traffic has failed to solve the traffic problems.

Standard:

The need for a traffic control signal shall be considered if an engineering study finds that both of the following conditions exist for each of any 8 hours of an average day:

- **A. The vehicles per hour given in both of the 80 percent columns of Condition A in Table 4C-1 exist on the major-street and the higher-volume minor-street approaches, respectively, to the intersection; and**
- **B. The vehicles per hour given in both of the 80 percent columns of Condition B in Table 4C-1 exist on the major-street and the higher-volume minor-street approaches, respectively, to the intersection.**

These major-street and minor-street volumes shall be for the same 8 hours for each condition; however, the 8 hours satisfied in Condition A shall not be required to be the same 8 hours satisfied in Condition B. On the minor street, the higher volume shall not be required to be on the same approach during each of the 8 hours.

Option:

If the posted or statutory speed limit or the 85th-percentile speed on the major street exceeds 70 km/h or exceeds 40 mph, or if the intersection lies within the built-up area of an isolated community having a population of less than 10,000, the traffic volumes in the 56 percent columns in Table 4C-1 may be used in place of the 80 percent columns.

Section 4C.03 Warrant 2, Four-Hour Vehicular Volume

Support:

The Four-Hour Vehicular Volume signal warrant conditions are intended to be applied where the volume of intersecting traffic is the principal reason to consider installing a traffic control signal.

Standard:

The need for a traffic control signal shall be considered if an engineering study finds that, for each of any 4 hours of an average day, the plotted points representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the higher-volume minor-street approach (one direction only) all fall above the applicable curve in Figure 4C-1 for the existing combination of approach lanes. On the minor street, the higher volume shall not be required to be on the same approach during each of these 4 hours.

Option:

If the posted or statutory speed limit or the 85th-percentile speed on the major street exceeds 70 km/h or exceeds 40 mph, or if the intersection lies within the built-up area of an isolated community having a population of less than 10,000, Figure 4C-2 may be used in place of Figure 4C-1.

Section 4C.04 Warrant 3, Peak Hour

Support:

The Peak Hour signal warrant is intended for use at a location where traffic conditions are such that for a minimum of 1 hour of an average day, the minor-street traffic suffers undue delay when entering or crossing the major street.

Standard:

This signal warrant shall be applied only in unusual cases, such as office complexes, manufacturing plants, industrial complexes, or high-occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time.

The need for a traffic control signal shall be considered if an engineering study finds that the criteria in either of the following two categories are met:

A. If all three of the following conditions exist for the same 1 hour (any four consecutive 15-minute periods) of an average day:

1. The total stopped time delay experienced by the traffic on one minor-street approach (one direction only) controlled by a STOP sign equals or exceeds: 4 vehicle-hours for a one-lane approach or 5 vehicle-hours for a two-lane approach; and

2. The volume on the same minor-street approach (one direction only) equals or exceeds 100 vehicles per hour for one moving lane of traffic or 150 vehicles per hour for two moving lanes; and

3. The total entering volume serviced during the hour equals or exceeds 650 vehicles per hour for intersections with three approaches or 800 vehicles per hour for intersections with four or more approaches.

B. The plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the higher-volume minor-street approach (one direction only) for 1 hour (any four consecutive 15-minute periods) of an average day falls above the applicable curve in Figure 4C-3 for the existing combination of approach lanes.

Option:

If the posted or statutory speed limit or the 85th-percentile speed on the major street exceeds 70 km/h or exceeds 40 mph, or if the intersection lies within the built-up area of an isolated community having a population of less than 10,000, Figure 4C-4 may be used in place of Figure 4C-3 to satisfy the criteria in the second category of the Standard.

If this warrant is the only warrant met and a traffic control signal is justified by an engineering study, the traffic control signal may be operated in the flashing mode during the hours that the volume criteria of this warrant are not met.

Guidance:

If this warrant is the only warrant met and a traffic control signal is justified by an engineering study, the traffic control signal should be traffic-actuated.

Section 4C.05 Warrant 4, Pedestrian Volume

Support:

The Pedestrian Volume signal warrant is intended for application where the traffic volume on a major street is so heavy that pedestrians experience excessive delay in crossing the major street.

Standard:

The need for a traffic control signal at an intersection or midblock crossing shall be considered if an engineering study finds that ~~both~~ one of the following criteria ~~are~~ is met:

~~**A. The pedestrian volume crossing the major street at an intersection or midblock location during an average day is 100 or more for each of any 4 hours or 190 or more during any 1 hour; and**~~

~~**B. There are fewer than 60 gaps per hour in the traffic stream of adequate length to allow pedestrians to cross during the same period when the pedestrian volume criterion is satisfied. Where there is a divided street having a median of sufficient width for pedestrians to wait, the requirement applies separately to each direction of vehicular traffic.**~~

A. For each of any 4 hours of an average day, the plotted points representing the vehicles per hour on the major street (total of both approaches) and the corresponding pedestrians per hour crossing the major street (total of all crossings) all fall above the curve in Figure 4C-5; or

B. For 1 hour (any four consecutive 15-minute periods) of an average day, the plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding pedestrians per hour crossing the major street (total of all crossings) falls above the curve in Figure 4C-6.

Option:

If the posted or statutory speed limit or the 85th-percentile speed on the major street exceeds 60 km/h or exceeds 35 mph, or if the intersection lies within the built-up area of an isolated community having a population of less than 10,000, Figure 4C-7 may be used in place of Figure 4C-5 to satisfy Criterion A in the Standard above, and Figure 4C-8 may be used in place of Figure 4C-6 to satisfy Criterion B in the Standard above.

Standard:

The Pedestrian Volume signal warrant shall not be applied at locations where the distance to the nearest traffic control signal ~~along~~ or STOP sign controlling the ~~major~~ street that pedestrians desire to cross is less than 90 m (300 ft), unless the proposed traffic control signal will not restrict the progressive movement of traffic.

If this warrant is met and a traffic control signal is justified by an engineering study, the traffic control signal shall be equipped with pedestrian signal heads conforming to requirements set forth in Chapter 4E.

Guidance:

If this warrant is met and a traffic control signal is justified by an engineering study, then:

A. If it is installed at an intersection or major driveway location, the traffic control signal should also control the minor-street or driveway traffic, should be traffic-actuated, and should include pedestrian ~~detectors~~ activation.

B. If it is installed at a nonintersection crossing, the traffic control signal should be installed at least 30 m (100 ft) from side streets or driveways that are controlled by STOP or YIELD signs, and should be pedestrian-actuated. If the traffic control signal is installed at a nonintersection crossing, at least one of the signal faces should be over the traveled way for each approach, parking and other sight obstructions should be prohibited for at least 30 m (100 ft) in advance of and at least 6.1 m (20 ft) beyond the crosswalk, and the installation should include suitable standard signs and pavement markings.

C. Furthermore, if it is installed within a signal system, the traffic control signal should be coordinated.

Option:

The criterion for the pedestrian volume crossing the major ~~roadway~~ street may be reduced as much as 50 percent if the ~~average~~ 15th-percentile crossing speed of pedestrians is less than ~~1.2~~ 1.1 m/sec (~~4~~ 3.5 ft/sec).

A traffic control signal may not be needed at the study location if adjacent coordinated traffic control signals consistently provide gaps of adequate length for pedestrians to cross the street~~, even if the rate of gap occurrence is less than one per minute~~.

Section 4C.06 Warrant 5, School Crossing

Support:

The School Crossing signal warrant is intended for application where the fact that schoolchildren cross the major street is the principal reason to consider installing a traffic control signal. For the purposes of this warrant, the word "schoolchildren" is defined as elementary to high school students.

Standard:

The need for a traffic control signal shall be considered when an engineering study of the frequency and adequacy of gaps in the vehicular traffic stream as related to the number and size of groups of schoolchildren at an established school crossing across the major street shows that the number of adequate gaps in the traffic stream during the period when the children are using the crossing is less than the number of minutes in the same period (see Section 7A.03) and there are a minimum of 20 students during the highest crossing hour.

Before a decision is made to install a traffic control signal, consideration shall be given to the implementation of other remedial measures, such as warning signs and flashers, school speed zones, school crossing guards, or a grade-separated crossing.

The School Crossing signal warrant shall not be applied at locations where the distance to the nearest traffic control signal along the major street is less than 90 m (300 ft), unless the proposed traffic control signal will not restrict the progressive movement of traffic.

Guidance:

If this warrant is met and a traffic control signal is justified by an engineering study, then:

A. If it is installed at an intersection or major driveway location, the traffic control signal should also control the minor-street or driveway traffic, should be traffic-actuated, and should include pedestrian detectors.
B. If it is installed at a nonintersection crossing, the traffic control signal should be installed at least 30 m (100 ft) from side streets or driveways that are controlled by STOP or YIELD signs, and should be pedestrian-actuated. If the traffic control signal is installed at a nonintersection crossing, at least one of the signal faces should be over the traveled way for each approach, parking and other sight obstructions should be prohibited for at least 30 m (100 ft) in advance of and at least 6.1 m (20 ft) beyond the crosswalk, and the installation should include suitable standard signs and pavement markings.
C. Furthermore, if it is installed within a signal system, the traffic control signal should be coordinated.

Section 4C.07 Warrant 6, Coordinated Signal System

Support:

Progressive movement in a coordinated signal system sometimes necessitates installing traffic control signals at intersections where they would not otherwise be needed in order to maintain proper platooning of vehicles.

Standard:

The need for a traffic control signal shall be considered if an engineering study finds that one of the following criteria is met:

A. On a one-way street or a street that has traffic predominantly in one direction, the adjacent traffic control signals are so far apart that they do not provide the necessary degree of vehicular platooning.
B. On a two-way street, adjacent traffic control signals do not provide the necessary degree of platooning and the proposed and adjacent traffic control signals will collectively provide a progressive operation.

Guidance:

The Coordinated Signal System signal warrant should not be applied where the resultant spacing of traffic control signals would be less than 300 m (1,000 ft).

Section 4C.08 Warrant 7, Crash Experience

Support:

The Crash Experience signal warrant conditions are intended for application where the severity and frequency of crashes are the principal reasons to consider installing a traffic control signal.

Standard:

The need for a traffic control signal shall be considered if an engineering study finds that all of the following criteria are met:

A. **Adequate trial of alternatives with satisfactory observance and enforcement has failed to reduce the crash frequency; and**
B. **Five or more reported crashes, of types susceptible to correction by a traffic control signal, have occurred within a 12-month period, each crash involving personal injury or property damage apparently exceeding the applicable requirements for a reportable crash; and**
C. **For each of any 8 hours of an average day, the vehicles per hour (vph) given in both of the 80 percent columns of Condition A in Table 4C-1 (see Section 4C.02), or the vph in both of the 80 percent columns of Condition B in Table 4C-1 exists on the major-street and the higher-volume minor-street approach, respectively, to the intersection, or the volume of pedestrian traffic is not less than 80 percent of the requirements specified in the Pedestrian Volume warrant. These major-street and minor-street volumes shall be for the same 8 hours. On the minor street, the higher volume shall not be required to be on the same approach during each of the 8 hours.**

Option:

If the posted or statutory speed limit or the 85th-percentile speed on the major street exceeds 70 km/h or exceeds 40 mph, or if the intersection lies within the built-up area of an isolated community having a population of less than 10,000, the traffic volumes in the 56 percent columns in Table 4C-1 may be used in place of the 80 percent columns.

Section 4C.09 Warrant 8, Roadway Network

Support:

Installing a traffic control signal at some intersections might be justified to encourage concentration and organization of traffic flow on a roadway network.

Standard:

The need for a traffic control signal shall be considered if an engineering study finds that the common intersection of two or more major routes meets one or both of the following criteria:

A. **The intersection has a total existing, or immediately projected, entering volume of at least 1,000 vehicles per hour during the peak hour of a typical weekday and has 5-year projected traffic volumes, based on an engineering study, that meet one or more of Warrants 1, 2, and 3 during an average weekday; or**
B. **The intersection has a total existing or immediately projected entering volume of at least 1,000 vehicles per hour for each of any 5 hours of a nonnormal business day (Saturday or Sunday).**

A major route as used in this signal warrant shall have at least one ~~or more~~ edited to increase consistency of the following characteristics:

A. **It is part of the street or highway system that serves as the principal roadway network for through traffic flow.**
B. **It includes rural or suburban highways outside, entering, or traversing a city.**
C. **It appears as a major route on an official plan, such as a major street plan in an urban area traffic and transportation study.**

Section 4C.10 Warrant 9, Intersection Near a Highway-Rail Grade Crossing

Support:

The Intersection Near a Highway-Rail Grade Crossing signal warrant is intended for use at a location where none of the conditions described in the other eight traffic signal warrants are met, but the proximity to the intersection of a highway-rail grade crossing on an intersection approach controlled by a STOP or YIELD sign is the principal reason to consider installing a traffic control signal.

Guidance:

This signal warrant should be applied only after adequate consideration has been given to other alternatives or after a trial of an alternative has failed to alleviate the safety concerns associated with the highway-rail grade crossing. Among the alternatives that should be considered or tried are:

A. Providing additional pavement that would enable vehicles to clear the track or that would provide space for an evasive maneuver, or

B. Reassigning the stop controls at the intersection to make the approach across the track a non-stopping approach.

Standard:

The need for a traffic control signal shall be considered if an engineering study finds that both of the following criteria are met:

A. A highway-rail grade crossing exists on an approach controlled by a STOP or YIELD sign and the center of the track nearest to the intersection is within 43 m (140 ft) of the stop line on the approach; and

B. During the highest traffic volume hour during which trains use the crossing, the plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the minor-street approach that crosses the track (one direction only, approaching the intersection) falls above the applicable curve in Figure 4C-9 or 4C-10 for the existing combination of approach lanes over the track and the distance D, which is the clear storage distance as defined in Section 8A.01.

Guidance:

The following considerations apply when plotting the traffic volume data on Figure 4C-9 or 4C-10:

A. Figure 4C-9 should be used if there is only one lane approaching the intersection at the track crossing location and Figure 4C-10 should be used if there are two or more lanes approaching the intersection at the track crossing location.

B. After determining the actual distance D, the curve for the distance D that is nearest to the actual distance D should be used. For example, if the actual distance D is 29 m (95 ft), the plotted point should be compared to the curve for D = 27 m (90 ft).

C. If the train arrival times are unknown, the highest traffic volume hour of the day should be used.

Option:

The minor-street approach volume may be multiplied by up to three adjustment factors as noted below.

Because the curves are based on an average of 4 trains per day, the vehicles per hour on the minor-street approach may be multiplied by the adjustment factor shown in Table 4C-2 for the appropriate number of trains per day.

Because the curves are based on typical vehicle occupancy, if at least 2% of the vehicles crossing the track are buses carrying at least 20 people, the vehicles per hour on the minor-street approach may be multiplied by the adjustment factor shown in Table 4C-3 for the appropriate percentage of high-occupancy buses.

Because the curves are based on tractor-trailer trucks comprising 10% of the vehicles crossing the track, the vehicles per hour on the minor-street approach may be multiplied by the adjustment factor shown in Table 4C-4 for the appropriate distance and percentage of tractor-trailer trucks.

Standard:

If this warrant is met and a traffic control signal at the intersection is justified by an engineering study, then:

A. The traffic control signal shall have actuation on the minor street,

B. Preemption control shall be provided in accordance with Sections 4D.27 and 8C.08, and

C. The highway-rail grade crossing shall have flashing-light signals and gates (see Chapter 8C).

CHAPTER 4D. TRAFFIC CONTROL SIGNAL FEATURES the Sections in this Chapter and the text within the Sections have been substantially reorganized

Section 4D.01 General three paragraphs were relocated to Sections 4D.34 and 4D.35

Support:

The features of traffic control signals of interest to road users are the location, design, and meaning of the signal indications. Uniformity in the design features that affect the traffic to be controlled, as set forth in this Manual, is especially important for ~~reasonably safe and efficient traffic~~ the safety and efficiency of operations.

Traffic control signals can be operated in pretimed, semiactuated, or full-actuated modes.

For isolated (non-interconnected) signalized locations on rural high-speed highways, full-actuated mode with extensive advance vehicle detection on the high-speed approaches is typically used. These features are designed to reduce the frequency with which the onset of the yellow change interval is displayed when high-speed approaching vehicles are in the "dilemma zone" such that the drivers of these high-speed vehicles find it difficult to decide whether to stop or proceed.

Standard:

When a traffic control signal is not in operation, such as before it is placed in service, during seasonal shutdowns, or when it is not desirable to operate the traffic control signal, the signal faces shall be covered, turned, or taken down to clearly indicate that the traffic control signal is not in operation.

Support:

Seasonal shutdown is a condition in which a permanent traffic signal is turned off or otherwise made non-operational during a particular season when its operation is not justified. This might be applied in a community where tourist traffic during most of the year justifies the permanent signalization, but a seasonal shutdown of the signal during an annual period of lower tourist traffic would reduce delays; or where a major traffic generator, such as a large factory, justifies the permanent signalization, but the large factory is shut down for an annual factory vacation for a few weeks in the summer.

Standard:

A traffic control signal shall control traffic only at the intersection or midblock location where the signal faces are placed.

Midblock crosswalks shall not be signalized if they are located within 90 m (300 ft) from the nearest traffic control signal, unless the proposed traffic control signal or pedestrian hybrid signal added to be consistent with new Chapter 4F will not restrict the progressive movement of traffic.

Guidance:

A midblock crosswalk~~s~~ location should not be ~~signalized~~ controlled by a traffic control signal if ~~they are~~ the crosswalk is located within 30 m (100 ft) from side streets or driveways that are controlled by STOP signs or YIELD signs. edited to be consistent with new Chapter 4F

Engineering judgment should be used to determine the proper phasing and timing for a traffic control signal. Since traffic flows and patterns change, phasing and timing should be reevaluated regularly and updated if needed.

Traffic control signals within 800 m (0.5 mi) of one another along a major route or in a network of intersecting major routes should be coordinated, preferably with interconnected controller units. Where traffic control signals that are within 800 m (0.5 mi) of one another along a major route have a jurisdictional boundary or a boundary between different signal systems between them, coordination across the boundary should be considered. paragraph relocated from Section 4D.14

Support:

~~However,~~ Signal coordination need not be maintained ~~across boundaries between signal systems~~ between control sections that operate on different cycle lengths. paragraph relocated from Section 4D.14

For coordination with railroad-highway grade crossing signals and movable bridge signals, see Sections 4D.27, 4J.03, and 8C.08. paragraph relocated from Section 4D.14

Section 4D.02 Responsibility for Operation and Maintenance

Guidance:

Prior to installing any traffic control signal, the responsibility for the maintenance of the signal and all of the appurtenances, hardware, software, and the timing plan(s) should be clearly established. The responsible

agency should provide for the maintenance of the traffic control signal and all of its appurtenances in a competent manner.

To this end the agency should:

A. Keep every controller assembly in effective operation in accordance with its predetermined timing schedule; check the operation of the controller assembly frequently enough to verify that it is operating in accordance with the predetermined timing schedule; and establish a policy to maintain a record of all timing changes and that only authorized persons are permitted to make timing changes;
B. Clean the optical system of the signal sections and replace the light sources as frequently as experience proves necessary;
C. Clean and service equipment and other appurtenances as frequently as experience proves necessary;
D. Provide for alternate operation of the traffic control signal during a period of failure, using flashing mode or manual control, or manual traffic direction by proper authorities as might be required by traffic volumes or congestion, or by erecting other traffic control devices;
E. Have properly skilled maintenance personnel available without undue delay for all ~~emergency and lamp failure calls~~ signal malfunctions and signal indication failures;
F. Provide spare equipment to minimize the interruption of traffic control signal operation as a result of equipment failure;
G. Provide for the availability of properly skilled maintenance personnel for the repair of all components; and
H. Maintain the appearance of the signal displays and equipment.

Section 4D.03 Provisions for Pedestrians

Support:

Chapter 4E contains additional information regarding pedestrian signals and Chapter 4F contains additional information regarding pedestrian hybrid signals.

Standard:

The design and operation of traffic control signals shall take into consideration the needs of pedestrian as well as vehicular traffic.

If engineering judgment indicates the need for provisions for a given pedestrian movement, signal faces conveniently visible to pedestrians shall be provided by pedestrian signal heads (see Chapter 4E) or a vehicular signal face(s) for ~~an adjacent~~ a concurrent vehicular movement.

Guidance:

~~Safety considerations should include the installation, where appropriate, of~~ Accessible pedestrian signals (see Sections 4E.06 and 4E.09) that provide information in nonvisual formats (such as audible tones, ~~verbal~~ speech messages, and/or vibrating surfaces) should be provided where determined appropriate by engineering judgment.

Where pedestrian movements regularly occur, pedestrians should be provided with sufficient time to cross the roadway by adjusting the traffic control signal operation and timing to provide sufficient crossing time every cycle or by providing pedestrian detectors.

~~Option:~~

If it is necessary or desirable to prohibit certain pedestrian movements at a traffic control signal location, ~~a PEDESTRIANS PROHIBITED (R9-3) or~~ No Pedestrian Crossing (R9-3~~a~~) signs ~~may be used~~ (see Section 2B.58) should be used if the pedestrian movements are not physically prevented by barriers or other physical features.

Section ~~4D.18~~ 4D.04 Signal Indications – Design, Illumination, ~~and~~ Color, ~~of Signal Sections~~ and Shape one paragraph relocated to Section 4D.12

Standard:

Each signal indication, except those used for pedestrian signal heads and lane-use control signals, shall be circular or arrow.

Except for toll plaza signals (see Chapter 4K), letters or numbers (including those associated with countdown displays) shall not be displayed as part of a vehicular signal indication.

Strobes or other flashing displays within or adjacent to red signal indications shall not be used.

~~Each signal indication shall be independently illuminated.~~ deleted because it is no longer needed and could be misinterpreted

Each circular signal indication shall emit a single color: red, yellow, or green.

Each arrow signal indication shall emit a single color: red, yellow, or green except that the alternate display (dual-arrow signal section) of a GREEN ARROW and a YELLOW ARROW signal indication, both pointing in the same direction, shall be permitted, provided that they are not displayed simultaneously.

The arrow, which shall show only one direction, shall be the only illuminated part of an arrow signal indication.

Arrows shall be pointed: relocated from Section 4D.16

A. Vertically upward to indicate a straight-through movement,
B. Horizontally in the direction of the turn to indicate a turn at approximately or greater than a right angle, and
C. Upward with a slope at an angle approximately equal to that of the turn if the angle of the turn is substantially less than a right angle.
D. In a manner that directs the driver through the turn if a U-turn arrow is used (see Figure 4D-1).

Except ~~for the requirements of this section~~ as noted in the Guidance below, the requirements of the "Standards for Vehicle Traffic Control Signal Heads" (see Section 1A.11) that pertain to the aspects of the signal head design that affect the display of the signal indications shall be met.

Guidance:

The intensity and distribution of light from each illuminated signal lens should ~~conform to~~ comply with the current "Standards for Vehicle Traffic Control Signal Heads" and "Traffic Signal Lamps" (see Section 1A.11).

Standard:

References to signal lenses in this section shall not be used to limit signal optical units to incandescent lamps within optical assemblies that include lenses.

Support:

Research has resulted in signal optical units that are not lenses, such as, but not limited to, light emitting diode (LED) traffic signal modules. Some units are practical for all signal indications, and some are practical for specific types such as visibility-limited signal indications.

Guidance:

If a signal indication is ~~operated in the flashing mode for nighttime operation and the signal indication is~~ so bright ~~as to~~ that it causes excessive glare during nighttime conditions, some form of automatic dimming should be used to reduce the brilliance of the signal indication.

Section 4D.05 Size of Vehicular Signal Indications paragraphs relocated from Section 4D.15

Standard:

There shall be two nominal diameter sizes for vehicular signal ~~lenses~~ indications: 200 mm (8 in) and 300 mm (12 in).

Except as noted in the Option paragraph below, 300 mm (12 in) signal ~~lenses~~ indications shall be used for all signal sections in all new signal faces, except that existing 200 mm (8 in) signal indications shall be permitted to be retained for the remainder of their useful service life.~~:~~

~~A. For signal indications for approaches (see definition in Section 4A.02) where road users view both traffic control and lane-use control signal heads simultaneously;~~
~~B. If the nearest signal face is between 35 m (120 ft) and 45 m (150 ft) beyond the stop line, unless a supplemental near-side signal face is provided;~~
~~C. For signal faces located more than 45 m (150 ft) from the stop line;~~
~~D. For approaches to all signalized locations for which the minimum sight distance in Table 4D-1 cannot be met; and~~
~~E. For arrow signal indications.~~

~~A 200 mm (8 in) signal lens for a CIRCULAR RED signal indication shall not be used in combination with a 300 mm (12 in) signal lens for a CIRCULAR GREEN signal indication or a 300 mm (12 in) signal lens for a CIRCULAR YELLOW signal indication.~~

Option:

~~Different sizes of signal lenses may be used in the same signal face or signal head, except for the prohibitions listed in the Standards in this Section.~~

Two-hundred millimeter (8 in) circular signal indications may be used in new signal faces only for:

A. The flashing yellow or steady green signal indications in an emergency-vehicle traffic control signal (see Section 4G.02);
B. The signal faces controlling the approach to the downstream location where two adjacent signalized locations are close to each other and it is not practical because of factors such as high approach speeds, horizontal or vertical curves, or other geometric factors to install visibility-limited signal faces for the downstream approach; and
C. Supplemental signal faces installed for the sole purpose of controlling pedestrian movements (see Section 4D.03) rather than vehicular movements.

~~Guidance:~~

~~Three-hundred millimeter (12 in) signal lenses should be used for all signal indications for the following:~~

~~A. Approaches with 85th percentile approach speeds exceeding 60 km/h (40 mph),~~
~~B. Approaches where a traffic control signal might be unexpected,~~
~~C. All approaches without curbs and gutters where only post-mounted signal heads are used, and~~
~~D. Locations where there is a significant percentage of elderly drivers.~~

Section 4D.06 Positions of Signal Indications Within a Signal Face – General paragraphs relocated from Section 4D.16

Support:

Standardization of the number and arrangements of signal sections in vehicular traffic control signal faces enables road users who are color vision deficient to identify the illuminated color by its position relative to other signal sections.

Standard:

Unless otherwise stated in this Manual for a particular application, each signal face at a signalized location shall have three, four, or five signal sections. Unless otherwise stated in this Manual for a particular application, if a vertical signal face includes a cluster(s), the signal face shall have at least three vertical positions. added to make sure that color-blind road users are adequately served

A single-section signal face shall be permitted at a traffic control signal if it consists of a continuously-~~illuminated~~ displayed GREEN ARROW signal ~~lens~~ indication that is being used to indicate a continuous movement.

The signal ~~lenses~~ sections in a signal face shall be arranged in a vertical or horizontal straight line, except ~~that in a vertical array, signal lenses of the same color may be arranged horizontally adjacent to each other at right angles to the basic straight line arrangement~~ as otherwise noted in Section 4D.07.

~~C.~~ If adjacent signal ~~indications~~ sections in a signal face are not identical, their arrangement shall follow ~~Items A or B above~~ the relative positions listed in Sections 4D.07 or 4D.08, as applicable.

If a signal section that displays a CIRCULAR YELLOW signal ~~lens~~ indication is used, it shall be located between the signal section that displays the red signal ~~lens or lenses~~ indication and all other signal ~~lenses~~ sections.

If a U-turn arrow signal section is used in a signal face for a U-turn to the left, its position in the signal face shall be the same as stated in the previous paragraph for a left-turn arrow signal section of the same color. If a U-turn arrow signal section is used in a signal face for a U-turn to the right, its position in the signal face shall be the same as stated in the previous paragraph for a right-turn arrow signal section of the same color.

Option:

Horizontally-arranged and vertically-arranged signal faces may be used on the same approach provided they are separated to meet the lateral separation spacing required in Section 4D.13.

Support:

Figure 4D-2 illustrates some of the ~~possible~~ typical edited to agree with title of figure arrangements of signal ~~lenses~~ sections in signal faces that do not control turning movements. Figures 4D-6 to 4D-12 illustrate the typical arrangements of signal sections in left-turn signal faces. Figures 4D-13 to 4D-19 illustrate the

typical arrangements of signal sections in right-turn signal faces. added because of new figures being added to Chapter 4D

Section 4D.07 Positions of Signal Indications Within a Vertical Signal Face paragraphs relocated from Section 4D.16

Standard:

In each vertically-arranged signal face, all signal sections that display red signal ~~lenses~~ indications ~~in vertically-arranged signal faces~~ shall be located above~~, and in horizontally-arranged signal faces shall be located to the left of,~~ all signal sections that display yellow and green signal ~~lenses~~ indications.

In vertically-arranged signal faces, each signal section that displays a YELLOW ARROW signal ~~lens~~ indication shall be located immediately above the signal section that displays the GREEN ARROW signal ~~lens~~ indication to which it applies.

If a dual-arrow signal section (capable of alternating between the display of a GREEN ARROW and a YELLOW ARROW signal indication) is used in a vertically-arranged signal face, the ~~lenses~~ dual-arrow signal section shall ~~be in~~ occupy the same position relative to the other ~~lenses~~ sections as ~~are~~ the signal section that displays the GREEN ARROW signal ~~lenses~~ indication in a vertically-arranged signal face would occupy.

The relative positions of signal ~~lenses~~ sections ~~within the signal face~~ in a vertically-arranged signal face, from top to bottom, shall be as follows:

~~**A. In a vertically-arranged signal face from top to bottom:**~~

CIRCULAR RED
Left-turn RED ARROW
Right-turn RED ARROW
CIRCULAR YELLOW
CIRCULAR GREEN
Straight-through GREEN ARROW
Left-turn YELLOW ARROW
Left-turn GREEN ARROW
Right-turn YELLOW ARROW
Right-turn GREEN ARROW

Option:

In a vertically-arranged signal face, ~~identical~~ signal sections that display signal indications of the same color may be ~~repeated in adjacent horizontal locations within the same signal face~~ arranged horizontally adjacent to each other at right angles to the basic straight line arrangement.

Standard:

Such clusters shall be limited to two identical signal ~~lenses~~ sections or to two or three different signal ~~lenses~~ sections that display signal indications of the same color.

Section 4D.08 Positions of Signal Indications Within a Horizontal Signal Face paragraphs relocated from Section 4D.16

Standard:

In each horizontally-arranged signal face, all signal sections that display red signal indications shall be located to the left of all signal sections that display yellow and green signal indications.

In horizontally-arranged signal faces, ~~the~~ each signal section that displays a YELLOW ARROW signal ~~lens~~ indication shall be located immediately to the left of the signal section that displays the GREEN ARROW signal ~~lens~~ indication to which it applies.

If a dual-arrow signal section (capable of alternating between the display of a GREEN ARROW and a YELLOW ARROW signal indication) is used in a horizontally-arranged signal face, the signal section that displays the dual left-turn arrow signal ~~lens~~ indication shall be located immediately to the right of the signal section that displays the CIRCULAR YELLOW signal ~~lens~~ indication, the signal section that displays the straight-through GREEN ARROW signal ~~lens~~ indication shall be located immediately to the right of the signal section that displays the CIRCULAR GREEN signal ~~lens~~ indication, and the signal section that displays the dual right-turn arrow signal ~~lens~~ indication shall be located to the right of all other signal ~~lenses~~ sections.

~~B.~~ The relative positions of signal sections in a horizontally-arranged signal face, from left to right, shall be as follows:

CIRCULAR RED
Left-turn RED ARROW
Right-turn RED ARROW
CIRCULAR YELLOW
Left-turn YELLOW ARROW
Left-turn GREEN ARROW
CIRCULAR GREEN
Straight-through GREEN ARROW
Right-turn YELLOW ARROW
Right-turn GREEN ARROW

Section ~~4D.04~~ 4D.09 Meaning of Vehicular Signal Indications

Support:

The "Uniform Vehicle Code" (see Section 1A.11) is the primary source for the standards for the meaning of vehicular signal indications to both vehicle operators and pedestrians as set forth below, and the standards for the meaning of separate pedestrian signal indications as set forth in Section 4E.02.

As described in the definition of intersection in Section 4A.02, in some cases vehicles are considered to be legally in the intersection although they are not physically located within the intersection.

Standard:

The following meanings shall be given to highway traffic signal indications for vehicles and pedestrians:

A. Steady green signal indications shall have the following meanings:

1. Vehicular traffic~~, except pedestrians,~~ facing a CIRCULAR GREEN signal indication is permitted to proceed straight through or turn right or left except as such movement is modified by lane-use signs, turn prohibition signs, lane markings, ~~or~~ roadway design, separate turn signal indications, or other traffic control devices.

~~But~~ Such vehicular traffic, including vehicles turning right or left, shall yield the right-of-way to: ~~other vehicles, and to~~

(a) Pedestrians lawfully within ~~the intersection or~~ an ~~adjacent~~ associated crosswalk, ~~at the time such signal indication is exhibited~~ and
(b) Other vehicles lawfully within the intersection.

In addition, vehicular traffic turning left shall yield the right-of-way to other vehicles approaching from the opposite direction so closely as to constitute an immediate hazard during the time when such turning vehicle is moving across or within the intersection.

2. Vehicular traffic~~, except pedestrians,~~ facing a GREEN ARROW signal indication, ~~shown~~ displayed alone or in combination with another signal indication, is permitted to cautiously enter the intersection only to make the movement indicated by such arrow, or such other movement as is permitted by other signal indications ~~shown~~ displayed at the same time.

Such vehicular traffic, including vehicles turning right or left, shall yield the right-of-way to:

(a) Pedestrians lawfully within an ~~adjacent~~ associated crosswalk, and ~~to~~
(b) Other ~~traffic~~ vehicles lawfully ~~using~~ within the intersection.

3. ~~Unless otherwise directed by a pedestrian signal head,~~ Pedestrians facing ~~any~~ a CIRCULAR GREEN signal indication, unless otherwise directed by a pedestrian signal indication or other traffic control device, ~~except when the sole green signal indication is a turn arrow,~~ are permitted to proceed across the roadway within any marked or unmarked associated crosswalk. The pedestrian shall yield the right-of-way to vehicles lawfully within the intersection or so close as to create an immediate hazard at the time that the green signal indication is first ~~shown~~ displayed.

4. Pedestrians facing a GREEN ARROW signal indication, unless otherwise directed by a pedestrian signal indication or other traffic control device, shall not cross the roadway.

B. Steady yellow signal indications shall have the following meanings:

1. Vehicular traffic~~, except pedestrians,~~ facing a steady CIRCULAR YELLOW ~~or YELLOW ARROW~~ signal indication is thereby warned that the related green movement or the related flashing arrow movement is being terminated or that a steady red signal indication will be ~~exhibited~~ displayed immediately thereafter when vehicular traffic shall not enter the intersection. The rules set forth concerning vehicular operation under the movement(s) being terminated shall continue to apply while the steady CIRCULAR YELLOW signal indication is displayed.
2. Vehicular traffic facing a steady YELLOW ARROW signal indication is thereby warned that the related GREEN ARROW movement or the related flashing arrow movement is being terminated. The rules set forth concerning vehicular operation under the movement(s) being terminated shall continue to apply while the steady YELLOW ARROW signal indication is displayed.
3. Pedestrians facing a steady CIRCULAR YELLOW or YELLOW ARROW signal indication, unless otherwise directed by a pedestrian signal ~~head, are thereby advised that there is insufficient time to cross the roadway before a red signal indication is shown, and no pedestrian~~ indication or other traffic control device shall ~~then~~ not start to cross the roadway.

C. Steady red signal indications shall have the following meanings:

1. Vehicular traffic facing a steady CIRCULAR RED signal indication ~~alone~~, unless entering the intersection to make another movement permitted by another signal indication, shall stop at a clearly marked stop line; but if there is no stop line, traffic shall stop before entering the crosswalk on the near side of the intersection; or if there is no crosswalk, then before entering the intersection; and shall remain stopped until a signal indication to proceed is ~~shown~~ displayed, or as provided below.

   Except when a ~~sign~~ traffic control device is in place prohibiting a turn on red or a steady RED ARROW signal indication is displayed, vehicular traffic facing a steady CIRCULAR RED signal indication is permitted to enter the intersection to turn right, or to turn left from a one-way street into a one-way street, after stopping. ~~Such vehicular traffic shall yield the right-of-way to pedestrians lawfully within an adjacent crosswalk and to other traffic lawfully using the intersection.~~ The right to proceed with the turn shall be subject to the rules applicable after making a stop at a STOP sign.
2. Vehicular traffic facing a steady RED ARROW signal indication shall not enter the intersection to make the movement indicated by the arrow and, unless entering the intersection to make another movement permitted by another signal indication, shall stop at a clearly marked stop line; but if there is no stop line, before entering the crosswalk on the near side of the intersection; or if there is no crosswalk, then before entering the intersection; and shall remain stopped until a signal indication or other traffic control device permitting the movement indicated by such RED ARROW is ~~shown~~ displayed.

   When ~~an R10-17a sign (see Section 2B.45)~~ a traffic control device is in place permitting a turn on a steady RED ARROW signal indication, vehicular traffic facing a steady RED ARROW signal indication is permitted to enter the intersection to ~~turn right, or to turn left from a one-way street into a one-way street~~ make the movement indicated by the arrow signal indication, after stopping. ~~Such vehicular traffic shall yield the right-of-way to pedestrians lawfully within an adjacent crosswalk and to other traffic lawfully using the intersection.~~ The right to proceed with the turn shall be limited to the direction indicated by the arrow and shall be subject to the rules applicable after making a stop at a STOP sign.
3. Unless otherwise directed by a pedestrian signal ~~head~~ indication or other traffic control device, pedestrians facing a steady CIRCULAR RED or steady RED ARROW signal indication ~~alone~~ shall not enter the roadway.

~~D. Flashing signal indications shall have the following meanings:~~

~~1. Flashing yellow—When a yellow lens is illuminated with rapid intermittent flashes, vehicular traffic is permitted to proceed through the intersection or past such signal indication only with caution.~~

~~2. Flashing red—When a red lens is illuminated with rapid intermittent flashes, vehicular traffic shall stop at a clearly marked stop line; but if there is no stop line, traffic shall stop before entering the crosswalk on the near side of the intersection; or if there is no crosswalk, at the point nearest the intersecting roadway where the driver has a view of approaching~~

~~traffic on the intersecting roadway before entering the intersection. The right to proceed shall be subject to the rules applicable after making a stop at a STOP sign.~~

~~3. Flashing RED ARROW and flashing YELLOW ARROW signal indications have the same meaning as the corresponding flashing circular signal indication, except that they apply only to vehicular traffic intending to make the movement indicated by the arrow.~~

D. A flashing green signal indication has no meaning and shall not be used.

E. Flashing yellow signal indications shall have the following meanings:

1. Vehicular traffic, on an approach to an intersection, facing a flashing CIRCULAR YELLOW signal indication is permitted to cautiously enter the intersection to proceed straight through or turn right or left except as such movement is modified by lane-use signs, turn prohibition signs, lane markings, roadway design, separate turn signal indications, or other traffic control devices.

   Such vehicular traffic, including vehicles turning right or left, shall yield the right-of-way to:

   (a) Pedestrians lawfully within an associated crosswalk, and
   (b) Other vehicles lawfully within the intersection.

   In addition, vehicular traffic turning left shall yield the right-of-way to other vehicles approaching from the opposite direction so closely as to constitute an immediate hazard during the time when such turning vehicle is moving across or within the intersection.

2. Vehicular traffic, on an approach to an intersection, facing a flashing YELLOW ARROW signal indication, displayed alone or in combination with another signal indication, is permitted to cautiously enter the intersection only to make the movement indicated by such arrow, or other such movement as is permitted by other signal indications displayed at the same time.

   Such vehicular traffic, including vehicles turning right or left, shall yield the right-of-way to:

   (a) Pedestrians lawfully within an associated crosswalk, and
   (b) Other vehicles lawfully within the intersection.

   In addition, vehicular traffic turning left shall yield the right-of-way to other vehicles approaching from the opposite direction so closely as to constitute an immediate hazard during the time when such turning vehicle is moving across or within the intersection.

3. Pedestrians facing any flashing yellow signal indication at an intersection, unless otherwise directed by a pedestrian signal indication or other traffic control device, are permitted to proceed across the roadway within any marked or unmarked associated crosswalk. Pedestrians shall yield the right-of-way to vehicles lawfully within the intersection at the time that the flashing yellow signal indication is first displayed.

4. When a flashing CIRCULAR YELLOW signal indication(s) is displayed as a beacon (see Chapter 4L) to supplement another traffic control device, road users are notified that there is a need to pay extra attention to the message contained thereon or that the regulatory or warning requirements of the other traffic control device, which might not be applicable at all times, are currently applicable.

5. Vehicular traffic facing a flashing yellow signal indication that is displayed as a beacon at the approach to or along a curve or other geometric feature is thereby notified that extra caution is required during passage by or through said curve or geometric feature.

F. Flashing red signal indications shall have the following meanings:

1. Vehicular traffic, on an approach to an intersection, facing a flashing CIRCULAR RED signal indication shall stop at a clearly marked stop line; but if there is no stop line, before entering the crosswalk on the near side of the intersection; or if there is no crosswalk, at the point nearest the intersecting roadway where the driver has a view of approaching traffic on the intersecting roadway before entering the intersection. The right to proceed shall be subject to the rules applicable after making a stop at a STOP sign.

2. Vehicular traffic, on an approach to an intersection, facing a flashing RED ARROW signal indication if intending to turn in the direction indicated by the arrow shall stop at a clearly marked stop line; but if there is no stop line, before entering the crosswalk on the near side of the intersection; or if there is no crosswalk, at the point nearest the intersecting roadway where the driver has a view of approaching traffic on the intersecting roadway before

entering the intersection. The right to proceed with the turn shall be limited to the direction indicated by the arrow and shall be subject to the rules applicable after making a stop at a STOP sign.

3. Pedestrians facing any flashing red signal indication at an intersection, unless otherwise directed by a pedestrian signal indication or other traffic control device, are permitted to proceed across the roadway within any marked or unmarked associated crosswalk. Pedestrians shall yield the right-of-way to vehicles lawfully within the intersection at the time that the flashing red signal indication is first displayed.
4. When a flashing CIRCULAR RED signal indication(s) is displayed as a beacon (see Chapter 4L) to supplement another traffic control device, road users are notified that there is a need to pay extra attention to the message contained thereon or that the regulatory requirements of the other traffic control device, which might not be applicable at all times, are currently applicable.

Use of this signal indication shall be limited to supplementing STOP (R1-1), DO NOT ENTER (R5-1), or WRONG WAY (R5-1a) signs, and to applications where compliance with the supplemented traffic control device requires a stop at a designated point.

Section ~~4D.05~~ 4D.10 Application of Steady Signal Indications

Standard:

When a traffic control signal is being operated in a steady (stop-and-go) mode, at least one ~~lens~~ indication in each signal face shall be ~~illuminated~~ displayed at any given time.

A signal face(s) that controls a particular vehicular movement during any interval of a cycle shall control that same movement during all intervals of the cycle.

Steady signal indications shall be applied as follows:

A. A steady CIRCULAR RED signal indication:

1. **Shall be displayed when it is intended to prohibit traffic, except pedestrians directed by a pedestrian signal head, from entering the intersection or other controlled area. Turning after stopping is permitted as stated in Item C.1 of Section 4D.09.**
2. **Shall be displayed with the appropriate GREEN ARROW signal indications when it is intended to permit traffic to make a specified turn or turns, and to prohibit traffic from proceeding straight ahead through the intersection or other controlled area, except in protected only mode ~~turn signal faces~~ operation (see Sections 4D.19 and 4D.23), or in protected/permissive mode ~~left-turn~~ operation with separate ~~left-turn~~ signal faces, flashing yellow arrow signal faces, or flashing red arrow signal faces (see Sections 4D.20 and 4D.24), or where it is physically impossible for traffic to go straight through the intersection such as on the stem of a T-intersection.**

B. A steady CIRCULAR YELLOW signal indication:

1. **Shall be displayed following a CIRCULAR GREEN or straight-through GREEN ARROW signal indication in the same signal face.**
2. **Shall not be displayed in conjunction with the change from the CIRCULAR RED signal indication to the CIRCULAR GREEN signal indication.**
3. **Shall be followed by a CIRCULAR RED signal indication except that, when entering preemption operation, the return to the previous CIRCULAR GREEN signal indication shall be permitted following a steady added to increase accuracy CIRCULAR YELLOW signal indication (see Section 4D.27).**
4. **Shall not be displayed to an approach from which drivers are turning left permissively unless one of the following conditions exists:**

   (a) A steady CIRCULAR YELLOW signal indication is also simultaneously being ~~shown~~ displayed ~~simultaneously~~ to the opposing approach;

   (b) A separate left-turn signal face is provided and operated as described in Sections 4D.18 and 4D.20;

   (c) An engineering study has determined that, because of unique intersection conditions, the conditions described in items (a) and (b) above cannot reasonably be implemented without causing significant operational or safety problems and that the volume of impacted left-turning traffic is relatively low, and those left-turning drivers are advised that a steady added to increase accuracy CIRCULAR YELLOW signal indication ~~the~~

~~opposing traffic~~ is not simultaneously being ~~shown~~ displayed ~~a CIRCULAR YELLOW signal indication~~ to the opposing traffic if this operation occurs continuously by the installation near the left-most signal head of a W25-1 sign (see Section 2C.50) with the legend ONCOMING TRAFFIC HAS EXTENDED GREEN; or

(d) Drivers are advised of the operation if it occurs only occasionally, such as during a preemption sequence ~~or because of the skipping of actuated phases~~, by the installation near the left-most signal head of a W25-2 sign (see Section 2C.50) with the legend ONCOMING TRAFFIC MAY HAVE EXTENDED GREEN.

C. A steady CIRCULAR GREEN signal indication shall be displayed only when it is intended to permit traffic to proceed in any direction that is lawful and practical.

D. A steady RED ARROW signal indication shall be displayed when it is intended to prohibit traffic, except pedestrians directed by a pedestrian signal head, from entering the intersection or other controlled area to make the indicated turn. Except as described in Item C.2 of Section 4D.09, turning on a steady RED ARROW signal indication shall not be permitted.

E. A steady YELLOW ARROW signal indication:

1. Shall be displayed in the same direction as a GREEN ARROW signal indication following a GREEN ARROW signal indication in the same signal face, unless:
   (a) The GREEN ARROW signal indication and a CIRCULAR GREEN (or straight-through GREEN ARROW) signal indication terminate simultaneously in the same signal face, or
   (b) The green arrow is a straight-through GREEN ARROW.
2. Shall not be displayed in conjunction with the change from a RED ARROW signal indication to a GREEN ARROW signal indication.
3. Shall not be displayed when any conflicting vehicular movement has a green or yellow signal indication (except for the situation regarding U-turns described in the Option below) or any conflicting pedestrian movement has a WALKING PERSON (symbolizing WALK) or flashing UPRAISED HAND (symbolizing DONT WALK) signal indication ~~(see Section 4D.09)~~, deleted because this reference is to text that is now found later in this Section except that a steady left-turn YELLOW ARROW signal indication used to terminate a flashing left-turn YELLOW ARROW or a flashing left-turn RED ARROW signal indication in a signal face controlling a permissive left-turn movement as described in Sections 4D.18 and 4D.20 shall be permitted to be displayed when a CIRCULAR YELLOW signal indication is displayed for the opposing through movement. Vehicles departing in the same direction shall not be considered in conflict if, for each turn lane with moving traffic, there is a separate departing lane, and pavement markings or raised channelization clearly indicate which departure lane to use.
4. Shall be terminated by a RED ARROW signal indication for the same direction or a CIRCULAR RED signal indication except:
   (a) When entering preemption operation, the return to the previous GREEN ARROW signal indication shall be permitted following a YELLOW ARROW signal indication.
   (b) When the movement controlled by the arrow is to continue on a permissive mode basis during an immediately following CIRCULAR GREEN or flashing YELLOW ARROW signal indication.

F. A steady GREEN ARROW signal indication:

1. Shall be displayed only to allow vehicular movements, in the direction indicated, that are not in conflict with other vehicles moving on a green or yellow signal indication or with pedestrians crossing in conformance with a WALKING PERSON (symbolizing WALK) or flashing UPRAISED HAND (symbolizing DONT WALK) signal indication ~~(see Section 4D.09)~~. deleted because this reference is to text that is now found later in this Section Vehicles departing in the same direction shall not be considered in conflict if, for each turn lane with moving traffic, there is a separate departing lane, and pavement markings or raised channelization clearly indicate which departure lane to use.
2. Shall be displayed on a signal face that controls a left-turn movement when said movement is not in conflict with other vehicles moving on a green or yellow signal indication (except for the situation regarding U-turns described in the Option below) or with pedestrians crossing in conformance with a WALKING PERSON (symbolizing WALK) or flashing

UPRAISED HAND (symbolizing DONT WALK) signal indication ~~(see Section 4D.09)~~.
deleted because this reference is to text that is now found later in this Section Vehicles departing in the same direction shall not be considered in conflict if, for each turn lane with moving traffic, there is a separate departing lane, and pavement markings or raised channelization clearly indicate which departure lane to use.

3. **Shall not be required on the stem of a T-intersection or for turns from a one-way street.**

Option:

If U-turns are permitted from the approach and a right-turn GREEN ARROW signal indication is ~~if drivers making a right turn from the conflicting approach to the left are~~ simultaneously being ~~shown~~ displayed to road users making a right turn from the conflicting approach to the left ~~a right-turn GREEN ARROW signal indication~~, ~~drivers~~ road users making a U-turn may be advised of the operation by the installation near the left-turn signal face of a U-TURN YIELD TO RIGHT TURN (R10-16) sign (see Section 2B.59).

~~Steady RED ARROW, YELLOW ARROW, and GREEN ARROW signal indications, if not otherwise prohibited, may be used instead of the corresponding circular signal indications at the following locations:~~

~~A. On an approach intersecting a one-way street,~~
~~B. Where certain movements are prohibited, and~~
~~C. Where certain movements are physically impossible.~~

If not otherwise prohibited, a steady straight-through GREEN ARROW signal indication may be used instead of a CIRCULAR GREEN signal indication in a signal face on an approach intersecting a one-way street to discourage wrong-way turns.

If not otherwise prohibited, steady red, yellow, and green turn arrow signal indications may be used instead of steady circular red, yellow, and green signal indications in a signal face on an approach where all traffic is required to turn or where the straight-through movement is not physically possible.

Standard:

~~H.~~ If supplemental signal faces are used, the following limitations shall apply: relocated from Section 4D.15

A. Left-turn arrows shall not be used in near-right signal faces.
B. Right-turn arrows shall not be used in far-left signal faces. A far-side median-mounted signal face shall be considered a far-left signal for this application.

A straight-through RED ARROW signal indication or a straight-through YELLOW ARROW signal indication shall not be displayed on any signal face, either alone or in combination with any other signal indication. relocated from Section 4D.08

The following combinations of signal indications shall not be simultaneously displayed on any one signal face: relocated from Section 4D.08

A. CIRCULAR GREEN with CIRCULAR YELLOW.
B. CIRCULAR RED with CIRCULAR YELLOW.
C. CIRCULAR GREEN with CIRCULAR RED.
D. Straight-through GREEN ARROW with CIRCULAR RED.
E. Straight-through GREEN ARROW with CIRCULAR YELLOW.

Additionally, the above combinations shall not be simultaneously displayed ~~in different signal faces~~ on ~~any one~~ an approach as a result of the combination of displays from multiple signal faces unless ~~one of the following conditions exists~~ the display is created by a signal face(s) devoted exclusively to the control of a turning movement and: relocated from Section 4D.08

A. The signal ~~faces~~ face(s) controlling the turning movement ~~are shielded, hooded, louvered, positioned, or designed~~ is visibility-limited from the adjacent through movement or positioned ~~so that the combination is not confusing~~ to minimize potential confusion to approaching road users, or
B. ~~One of the signal faces is a turn signal controlling a protected only mode turn, and~~ A LEFT (RIGHT) (U) TURN SIGNAL (R10-10) sign (see Sections 4D.17 through 4D.24) is mounted adjacent to ~~each such~~ the signal face(s) controlling the turning movement. sequence of Items A and B switched

The following combinations of signal indications shall not be simultaneously displayed on any one signal face or as a result of the combination of displays from multiple signal faces on an approach:

A. GREEN ARROW with YELLOW ARROW pointing in the same direction.

B. RED ARROW with YELLOW ARROW pointing in the same direction.
C. GREEN ARROW with RED ARROW pointing in the same direction.

Except as otherwise provided in Sections 4F.03 and 4G.04, the same signal section shall not be used to display both a flashing and a steady indication during steady mode operation.

~~A steady GREEN ARROW or YELLOW ARROW signal indication shall not be displayed to vehicular movements that are in conflict with the following:~~ relocated from Section 4D.09 and deleted because it is now covered in Items E and F in Paragraph 3 above

~~A. Other vehicles moving on a green or yellow signal indication, except for the situation regarding U-turns described earlier in this Section. Vehicles departing in the same direction shall not be considered in conflict if, for each turn lane with moving traffic, there is a separate departing lane, and pavement markings or raised channelization clearly indicate which departure lane to use.~~

~~B. Pedestrians crossing in conformance with a WALKING PERSON (symbolizing WALK) or flashing UPRAISED HAND (symbolizing DON'T WALK) signal indication.~~

Guidance:

No movement that creates an unexpected crossing of pathways of moving vehicles or pedestrians should be allowed during any green or yellow interval, except when all three of the following conditions are met: relocated from Section 4D.09

A. The movement involves only slight conflict, and
B. Serious traffic delays are substantially reduced by permitting the conflicting movement, and
C. Drivers and pedestrians subjected to the unexpected conflict are effectively warned thereof by a sign.

Section 4D.11 Number of Signal Faces on an Approach paragraphs relocated from Section 4D.15

Standard:

The signal faces for each approach to an intersection or a midblock location shall be provided as follows:

A. If a signalized through movement exists on an approach, a minimum of two signal faces shall be provided for the ~~major~~ through movement ~~on the approach, even if the major movement is a turning movement~~. If a signalized through movement does not exist on an approach, a minimum of two signal faces shall be provided for the signalized turning movement that is considered to be the major movement from the approach.

B. See Sections 4D.17 through 4D.20 for left-turn signal faces.

C. See Sections 4D.21 through 4D.24 for right-turn signal faces.

Option:

Where a movement (or a certain lane or lanes) at the intersection never conflicts with any other signalized vehicular or pedestrian movement, a continuously-displayed single-section GREEN ARROW signal indication may be used to inform road users that the movement is free-flow and does not need to stop.

Support:

In some circumstances where the through movement never conflicts with any other signalized vehicular or pedestrian movement at the intersection, such as at T-intersections with appropriate geometrics and/or pavement markings and signing, an engineering study might determine that the through movement (or certain lanes of the through movement) can be free-flow and not signalized.

Guidance:

If two or more left-turn lanes are provided for a separately controlled protected only mode left-turn movement, or if a left-turn movement represents the major movement from an approach, two or more left-turn signal faces should be provided.

If two or more right-turn lanes are provided for a separately controlled right-turn movement, or if a right-turn movement represents the major movement from an approach, two or more right-turn signal faces should be provided.

Support:

Locating primary signal faces overhead on the far side of the intersection has been shown to provide safer operation by reducing intersection entries late in the yellow interval and by reducing red signal violations, as

compared to post-mounting signal faces at the roadside or locating signal faces overhead within the intersection on a diagonally-oriented mast arm or span wire. On approaches with two or more lanes for the through movement, one signal face per through lane, centered over each through lane, has also been shown to provide safer operation.

Guidance:

If the posted or statutory speed limit or the 85th-percentile speed on an approach to a signalized location exceeds 60 km/h or exceeds 40 mph, signal faces should be provided (see Figure 4D-3) as follows:

A. All primary (non-supplemental) signal faces for through traffic and any primary signal faces for exclusive turn lanes that are required by Sections 4D.17 through 4D.24 should be located overhead on the far side of the intersection.
B. If there are two or more lanes for through traffic, a separate signal face should be provided for each through lane and they should be located approximately over the center of each through lane.
C. Except for shared left-turn and right-turn signal faces, any primary signal face required by Sections 4D.17 through 4D.24 for an exclusive turn lane should be located approximately over the center of each exclusive lane.
D. One or more supplemental pole-mounted or overhead signal faces on or near the near-right, far-right, near-left, and/or far-left corners of the intersection should be strongly considered to provide added visibility for approaching traffic that is traveling behind large vehicles.
E. All signal faces on the approach should have backplates.

This layout of signal faces should also be considered for any major urban or suburban arterial street with four or more lanes.

Section 4D.12 Visibility, Aiming, and Shielding of Signal Faces

Standard:

The primary consideration in signal face placement, aiming, and adjustment shall be to optimize the visibility of signal indications to approaching traffic. relocated from Section 4D.17

Road users approaching a signalized intersection or other signalized area, such as a midblock crosswalk, shall be given a clear and unmistakable indication of their right-of-way assignment. relocated from Section 4D.17

The geometry of each intersection to be signalized, including vertical grades, horizontal curves, and obstructions as well as the lateral and vertical angles of sight toward a signal face, as determined by typical driver-eye position, shall be considered in determining the vertical, longitudinal, and lateral position of the signal face. relocated from Section 4D.17

In cases where irregular street design necessitates placing signal faces for different street approaches with a comparatively small angle between their respective signal ~~lenses~~ indications, each signal ~~lens~~ indication shall, to the extent practical, be ~~shielded or directed~~ visibility-limited by signal visors, signal louvers, or other means so that an approaching road user's ~~can see only~~ view of the signal ~~lens(es)~~ indication(s) controlling ~~the~~ movements on ~~the road user's~~ other approaches is minimized. relocated from Section 4D.17

Signal visors exceeding 300 mm (12 in) in length shall not be used on free-swinging signal ~~heads~~ faces. relocated from Section 4D.17

Guidance:

There should be legal authority to prohibit the display of any unauthorized sign, signal, marking, or device that interferes with the effectiveness of any official traffic control device (see Section 11-205 of the "Uniform Vehicle Code"). relocated from Section 4D.17

Signal visors should be used on signal faces to aid in directing the signal indication specifically to approaching traffic, as well as to reduce "sun phantom," which can result when external light enters the lens. relocated from Section 4D.17

The use of signal visors, or the use of signal faces or devices that direct the light without a reduction in intensity, should be considered as an alternative to signal louvers because of the reduction in light output caused by signal louvers. relocated from Section 4D.17

If the posted or statutory speed limit or the 85th-percentile speed on an approach to a signalized location exceeds 60 km/h or exceeds 40 mph, signal backplates should be used on all of the signal faces that face the approach. ~~The use of a~~ Signal backplates ~~for target value enhancement~~ should also be considered for use on

signal faces ~~viewed against a~~ on approaches with posted or statutory speed limits or 85th-percentile speeds of 60 km/h or less or 40 mph or less where sun glare, bright sky, ~~or bright~~ and/or complex or confusing backgrounds indicate a need for enhanced signal face target value. relocated from Section 4D.17

Support:

The use of backplates enhances the contrast between the traffic signal indications and their surroundings for both day and night conditions, which is also helpful to elderly drivers. relocated from Section 4D.17

Option:

Special signal faces, such as visibility-limited signal faces, may be used such that the road user does not see signal indications intended for other approaches before seeing the signal indications for their own approach, if simultaneous viewing of both signal indications could cause the road user to be misdirected. relocated from Section 4D.17

If the sight distance to the signal ~~heads facing the~~ faces for an approach is limited by horizontal or vertical alignment, supplemental signal faces aimed at a point on the approach at which the signal indications first become visible may be used. relocated from Section 4D.17

Standard:

The inside of signal visors (hoods), the entire surface of louvers and fins, and the front surface of backplates shall have a dull black finish to minimize light reflection and to increase contrast between the signal indication and its background. relocated from Section 4D.18

Option:

A yellow retroreflective strip with a width of at least 25 mm (1 in) but not more than 75 mm (3 in) may be placed along the perimeter of the face of a signal backplate to project a rectangular appearance at night.

Guidance:

The two signal faces required as a minimum for each approach should be continuously visible to traffic approaching the traffic control signal, from a point at least the minimum sight distance indicated in Table 4D-1 in advance of and measured to the stop line. This range of continuous visibility should be provided unless precluded by a physical obstruction or unless another signalized location is within this range. relocated from Section 4D.15

Supplemental signal faces should be used if engineering judgment has shown that they are needed to achieve intersection visibility both in advance and immediately before the signalized location. relocated from Section 4D.15

If supplemental signal faces are used, they should be located to provide optimum visibility for the movement to be controlled. relocated from Section 4D.15

At signalized midblock crosswalks, at least one of the signal faces should be over the traveled way for each approach. relocated from Section 4D.15

Standard:

~~E.~~ If approaching traffic does not have a continuous view of at least two signal faces for at least the minimum sight distance shown in Table 4D-1 ~~cannot be met~~, a sign (see Section 2C.35) shall be installed to warn approaching traffic of the traffic control signal. relocated from Section 4D.15

Option:

If a sign is installed to warn approaching road users of the traffic control signal, the sign may be supplemented by a Warning Beacon (see Section 4L.03). relocated from Section 4D.15

A Warning Beacon used in this manner may be interconnected with the traffic signal controller assembly in such a manner as to flash yellow during the period when road users passing this beacon at the legal speed for the roadway might encounter a red signal indication (or a queue resulting from the display of the red signal indication) upon arrival at the signalized location. relocated from Section 4D.15

Section 4D.13 Lateral Positioning of Signal Faces

Standard:

~~4.~~ At least one and preferably both of the minimum of two signal faces required ~~by Item A in this Standard~~ for the through movement (or the major turning movement if there is no through movement) on the approach shall be located between two lines intersecting with the center of the approach at a point 3 m (10 ft) behind the stop line, one making an angle of approximately 20 degrees to the right of the center of the approach extended, and the other making an angle of approximately 20 degrees to the

left of the center of the approach extended ~~(see Figure 4D-2)~~. The signal face that satisfies this requirement shall simultaneously satisfy the longitudinal placement requirement described in Section 4D.14 (see Figure 4D-4). sentence added to preserve the relationship between these two requirements that used to be in the same paragraph paragraph relocated from Section 4D.15

~~5.~~ If both of the minimum of two signal faces required ~~by Item A in this Standard~~ for the through movement (or the major turning movement if there is no through movement) on the approach are post-mounted, they shall both be on the far side of the intersection, one on the right and one on the left of the approach lane(s). relocated from Section 4D.15

~~F.~~ The required signal faces for through traffic on ~~any one~~ an approach shall be located not less than 2.4 m (8 ft) apart measured horizontally perpendicular to the approach between the centers of the signal faces. relocated from Section 4D.15

~~G.~~ If more than one turn signal face is provided for a protected-mode turn and if one or both of the signal faces are located over the roadway, the signal faces shall be located not less than 2.4 m (8 ft) apart measured horizontally perpendicular to the approach between the centers of the signal faces. relocated from Section 4D.15

Guidance:

If a signal face controls a specific lane or lanes of an approach, its position should make it readily visible to road users making that movement. relocated from Section 4D.15

Support:

Section 4D.11 contains additional provisions regarding lateral positioning of signal faces for approaches having a posted or 85th-percentile speed exceeding 60 km/h or exceeding 40 mph.

Standard:

If an exclusive left-turn lane is present on an approach and if a separate left-turn signal face, a flashing yellow arrow signal face, or a flashing red arrow signal face is mounted over the roadway, it shall not be positioned any farther to the right than the lane line (or the extension of the lane line) between the left-turn lane and the adjacent through lane nor any farther to the left than the left edge of the left-turn lane. Supplemental left-turn signal faces mounted over the roadway shall not be subject to these positioning requirements.

If an exclusive right-turn lane is present on an approach and if a separate right-turn signal face, a flashing yellow arrow signal face, or a flashing red arrow signal face is mounted over the roadway, it shall not be positioned any farther to the left than the lane line (or the extension of the lane line) between the right-turn lane and the adjacent through lane nor any farther to the right than the right edge of the right-turn lane. Supplemental right-turn signal faces mounted over the roadway shall not be subject to these positioning requirements.

Guidance:

For new or reconstructed signal installations, on an approach with an exclusive left-turn lane(s) and opposing vehicular traffic where a CIRCULAR GREEN signal indication is used for permissive left turns, signal faces containing a CIRCULAR GREEN signal indication should not be post-mounted on the far side median or overhead above the left-turn lane(s) or the extension of the lane(s).

Standard:

If supplemental post-mounted signal faces are used, the following limitations shall apply: repeated from new Section 4D.10

A. Left-turn arrows shall not be used in near-right signal faces.

B. Right-turn arrows shall not be used in far-left signal faces. A far-side median-mounted signal face shall be considered a far-left signal for this application.

Section 4D.14 Longitudinal Positioning of Signal Faces text relocated from Section 4D.15

Standard:

Except where the width of an intersecting roadway or other conditions make it physically impractical, the signal faces for each approach to an intersection or a midblock location shall be provided as follows:

~~D. Except where the width of an intersecting roadway or other conditions make it physically impractical:~~

A. A signal face installed to satisfy the requirements for left-turn signal faces (see Sections 4D.17 through 4D.20) and right-turn signal faces (see Sections 4D.21 through 4D.24), and at least one and preferably both of the minimum of two signal faces required for the ~~major~~ through movement (or the major turning movement if there is no through movement) on the approach shall be located:

1. Not less than 12 m (40 ft) beyond the stop line,
2. Not more than 55 m (180 ft) beyond the stop line unless a supplemental near-side signal face is provided, and
3. As near as practical to the line of the driver's normal view, if mounted over the roadway.

The signal face that satisfies this requirement shall simultaneously satisfy the lateral placement requirement described in Section 4D.13 (see Figure 4D-4). added to preserve the relationship between these two requirements that used to be in the same paragraph

B. Where the nearest signal face is located between 45 and 55 m (150 and 180 ft) beyond the stop line, engineering judgment of the conditions, including the worst-case visibility conditions, shall be used to determine if the provision of a supplemental near-side signal face would be beneficial.

Support:

Section 4D.11 contains additional provisions regarding longitudinal positioning of signal faces for approaches having a posted or 85th-percentile speed exceeding 60 km/h or exceeding 40 mph.

Guidance:

Supplemental near-side signal faces should be located as near as practical to the stop line.

Section 4D.15 Mounting Height of Signal Faces

Standard:

~~3.~~ A signal face installed to satisfy the requirements for left-turn signal faces (see Sections 4D.17 through 4D.20) and right-turn signal faces (see Sections 4D.21 through 4D.24), and at least one and preferably both of the minimum of two signal faces required for the ~~major~~ through movement (or the major turning movement if there is no through movement) on the approach shall be located no higher than at a maximum height to the top of the signal housing mounted over a roadway of 7.8 m (25.6 ft) above the pavement ~~(see Section 4D.17)~~. For viewing distances between 12 m (40 ft) and 16 m (53 ft) from the stop line, the maximum mounting height to the top of the signal housing shall be as shown in Figure 4D-5. ~~(See Section 4D.17 for additional information regarding mounting heights.)~~ relocated from Section 4D.15

The bottom of the signal housing and any related attachments to a vehicular signal face located over ~~a roadway~~ any portion of a highway that can be used by motor vehicles shall be at least 4.6 m (15 ft) above the pavement. relocated from Section 4D.17

The top of the signal housing of a vehicular signal face located over ~~a roadway~~ any portion of a highway that can be used by motor vehicles shall not be more than 7.8 m (25.6 ft) above the pavement. relocated from Section 4D.17

The bottom of the signal housing (including brackets) of a vehicular signal face that is vertically arranged and not located over a roadway: relocated from Section 4D.17

A. Shall be at least 2.4 m (8 ft) but not more than 5.8 m (19 ft) above the sidewalk or, if there is no sidewalk, above the pavement grade at the center of the roadway.
B. Shall be at least 1.4 m (4.5 ft) but not more than 5.8 m (19 ft) above the median island grade of a center median island if located on the near side of the intersection.

The bottom of the signal housing (including brackets) of a vehicular signal face that is horizontally arranged and not located over a roadway: relocated from Section 4D.17

A. Shall be at least 2.4 m (8 ft) but not more than 6.7 m (22 ft) above the sidewalk or, if there is no sidewalk, above the pavement grade at the center of the roadway.
B. Shall be at least 1.4 m (4.5 ft) but not more than 6.7 m (22 ft) above the median island grade of a center median island if located on the near side of the intersection.

Section 4D.16 Lateral Offset (Clearance) of Signal Faces text relocated from Section 4D.17

Standard:

Signal ~~heads~~ faces mounted at less than 4.6 m (15 ft) from the bottom of the housing and any related attachments at the side of a roadway with curbs shall have a horizontal clearance of not less than 0.6 m (2 ft) from the face of a vertical curb. If there is no curb, signal ~~heads~~ faces mounted at less than 4.6 m (15 ft) from the bottom of the housing and any related attachments shall have a horizontal clearance of not less than 0.6 m (2 ft) from the edge of a shoulder.

Section ~~4D.06~~ 4D.17 ~~Application of Steady~~ Signal Indications for Left-Turn~~s~~ Movements – General

Support:

Sections 4D.17 through 4D.20 describe the use of the following four types of signal faces for controlling left-turn movements:

A. Shared signal face – This type of signal face controls both the left-turn movement and the adjacent through movement and can serve as one of the two required signal faces for the through movement. A shared signal face always displays the same color of circular indication that the adjacent through signal face or faces display. If a shared signal face that provides protected/permissive mode left turns is mounted overhead at the intersection, it is usually positioned over the lane line separating the left-turn lane from the adjacent through lane, or over the extension of this lane line.

B. Separate left-turn signal face – This type of signal face controls only the left-turn movement and cannot serve as one of the two required signal faces for the adjacent through movement because it sometimes displays a different color of circular signal indication than the adjacent through signal faces display or it is comprised only of steady left-turn arrow indications. If a separate left-turn signal face is mounted overhead at the intersection, it is usually positioned over the left-turn lane, or over the extension of this lane.

C. Flashing yellow arrow signal face – This type of signal face controls only the left-turn movement and cannot serve as one of the two required signal faces for the adjacent through movement because it consists entirely of left-turn arrows and cannot display any circular signal indications. If a flashing yellow arrow signal face is mounted overhead at the intersection, it is usually positioned over the left-turn lane, or over the extension of this lane. A flashing yellow arrow signal face displays a flashing left-turn YELLOW ARROW signal indication (instead of a steady CIRCULAR GREEN signal indication) during steady mode (stop-and-go) operation to control permissive left-turning movements from an intersection approach.

D Flashing red arrow signal face – This type of signal face is used only for unusual geometric conditions, such as wide medians with offset left-turn lanes, and only when an engineering study determines that each and every vehicle must successively come to a full stop before making a permissive left turn. This type of signal face controls only the left-turn movement and cannot serve as one of the two required signal faces for the adjacent through movement because it consists entirely of left-turn arrows and cannot display any circular signal indications. If a flashing red arrow signal face is mounted overhead at the intersection, it is usually positioned over the left-turn lane, or over the extension of this lane. A flashing red arrow signal face displays a flashing left-turn RED ARROW signal indication (instead of a steady CIRCULAR GREEN signal indication) during steady mode (stop-and-go) operation to control permissive left-turning movements from an intersection approach.

Section 4D.13 contains provisions regarding the lateral positioning of left-turn signal faces.

Although Sections 4D.17 through 4D.20 describe the use of flashing yellow arrow signal faces and flashing red arrow signal faces for certain modes of left-turn operation, there are no provisions in this Section or any other Section that requires the use of these types of signal faces. The use of these types of signal faces is optional and is a matter of engineering judgment.

It is not necessary that the same mode of left-turn operation or same type of left-turn signal face be used on every approach to a signalized location. Selecting different modes and types of left-turn signal faces for the various approaches to the same signalized location is acceptable.

Sections 4D.17 through 4D.20 set forth provisions for the display of four types of messages to drivers intending to turn left from a signalized approach (see specific paragraphs in this Section for the appropriate display to use in each circumstance):

A. A message to stop, which is accomplished by displaying either:

1. A steady left-turn RED ARROW signal indication that requires a driver to stop and await authorization to proceed; or

2. A steady CIRCULAR RED signal indication that requires a driver to stop and await authorization to proceed under the rules as set forth in the applicable Motor Vehicle Code.

B. A message to turn left in a protected manner, which is accomplished by displaying a left-turn GREEN ARROW signal indication.

C. A message to turn left in a permissive manner, which is accomplished by displaying either a CIRCULAR GREEN signal indication or a flashing left-turn YELLOW ARROW signal indication. (For unusual geometric conditions, such as wide medians with offset left-turn lanes, and only when an engineering study determines that each and every vehicle must successively come to a full stop before making a permissive left turn, the message to turn left in a permissive manner can be accomplished by displaying a flashing left-turn RED ARROW signal indication.)

D. A message that the status of the left-turn operation is changing, which is accomplished by displaying a steady left-turn YELLOW ARROW signal indication when the left-turn status is changing from protected to permissive, or by displaying a steady left-turn YELLOW ARROW signal indication or a steady CIRCULAR YELLOW signal indication (as applicable) when the left-turn status is changing from permissive to stopped or from protected to stopped.

It is not necessary to display a change interval when the status of the left-turn operation is changing from permissive to protected.

Left-turning traffic is controlled by one of four modes as follows:

A. Permissive Only Mode—turns made on ~~the~~ a CIRCULAR GREEN signal indication, a flashing left-turn YELLOW ARROW signal indication, or a flashing left-turn RED ARROW signal indication after yielding to pedestrians, if any, and/or ~~oncoming~~ opposing traffic, if any ~~and pedestrians~~. added to allow left turns from one-way streets and from stems of T-intersections to be classified as permissive left turns

B. Protected Only Mode—turns made only when ~~the~~ a left-turn GREEN ARROW signal indication is displayed.

C. Protected/Permissive Mode—both modes occur on an approach during the same cycle.

D. Variable Left-Turn Mode—the operating mode changes among the protected only mode and/or the protected/permissive mode and/or the permissive only mode during different periods of the day.

Option:

In areas having a high percentage of elderly drivers, special consideration may be given to the use of protected only mode left-turn phasing, when appropriate.

Standard:

During a permissive left-turn movement, the signal faces for through traffic on the opposing approach shall simultaneously display green or steady yellow signal indications. If pedestrians crossing the lane or lanes used by the permissive left-turn movement to depart the intersection are controlled by pedestrian signal heads, the signal indications displayed by those pedestrian signal heads shall not be limited to any particular display during the permissive left-turn movement.

During a protected left-turn movement, the signal faces for through traffic on the opposing approach shall simultaneously display steady CIRCULAR RED signal indications. If pedestrians crossing the lane or lanes used by the protected left-turn movement to depart the intersection are controlled by pedestrian signal heads, the pedestrian signal heads shall display a steady UPRAISED HAND (symbolizing DONT WALK) signal indication during the protected left-turn movement.

A protected only mode left-turn movement that does not begin and terminate at the same time as the adjacent through movement shall not be provided on an approach unless an exclusive left-turn lane exists. added to prohibit an inefficient and unsafe practice

~~**D. Variable Left-Turn Mode—If the protected only**~~ **operating mode** ~~**occurs during one or more periods of the day, and the permissive only mode or the combined protected/permissive mode occurs**~~ **changes among the protected only mode and/or the protected/permissive mode and/or the permissive only mode during** ~~**other**~~ **different periods of the day, the requirements** ~~**of Items A, B, and C**~~ **in** ~~**this Standard**~~ **Sections 4D.18 through 4D.20 that are appropriate to that mode of operation shall be met, subject to the following:**

A. The CIRCULAR GREEN and CIRCULAR YELLOW signal indications shall not be displayed when operating in the protected only mode.

B. The left-turn GREEN ARROW and left-turn YELLOW ARROW signal indications shall not be displayed when operating in the permissive only mode.

Option:

Additional ~~appropriate signal indications~~ static signs or changeable message signs may be used to meet the requirements for the variable left-turn mode or to inform drivers that left-turn green arrows will not be available during certain times of the day.

A signal face that is shared by left-turning and right-turning traffic may be provided for a shared left-turn/right-turn lane on an approach that has no through traffic (see Section 4D. 25).

Section 4D.18 Signal Indications for Permissive Only Mode Left-Turn Movements

Standard:

~~**The required left-turn signal faces and operation for an approach shall be determined by the selected mode of left-turn operation, as follows:**~~

~~**A. Permissive Only Mode —**~~**If a shared signal face is provided for permissive only mode left turns, it shall meet the following requirements (see Figure 4D-6):**

A. ~~**The signal indications for permissive only mode left turns shall be provided by the signal faces controlling the through movement, or by a permissive only left-turn signal face that is either a shared signal face or a separate signal face.**~~ **It shall be capable of displaying, from top to bottom or from left to right, the following signal indications: steady CIRCULAR RED, steady CIRCULAR YELLOW, and CIRCULAR GREEN. Only one of the three indications shall be displayed at any given time.**

B. During the permissive left-turn movement, a CIRCULAR GREEN signal indication shall be displayed.

C. A permissive only shared signal face, regardless of where ~~the permissive only left-turn signal face~~ it is positioned and regardless of how many adjacent through signal faces are provided, shall always simultaneously display the same color of circular indication that the adjacent through signal face or faces display. ~~**A separate permissive only left-turn signal face sometimes displays a different color of circular signal indication than the adjacent through signal faces display.**~~

D. If the permissive only mode is not the only left-turn mode used for the approach, the signal face shall be the same shared signal face that is used for the protected/permissive mode (see Section 4D.20) except that the left-turn GREEN ARROW and left-turn YELLOW ARROW signal indications shall not be displayed when operating in the permissive only mode.

If a separate left-turn signal face is ~~provided for~~ being operated in a permissive only left-turn~~s~~ mode, it shall meet the following requirements:

A. It shall be capable of displaying, from top to bottom or from left to right, the following signal indications: steady CIRCULAR RED, steady CIRCULAR YELLOW, and CIRCULAR GREEN. Only one of the three indications shall be displayed at any given time.

B. During the permissive left-turn movement, ~~the left-turn signal face shall display~~ a CIRCULAR GREEN signal indication shall be displayed.

C. If the CIRCULAR GREEN and CIRCULAR YELLOW signal indications in the separate left-turn signal face are visibility-limited from the adjacent through movement, the separate left-turn signal face shall not be required to simultaneously display the same color of circular signal indication as the signal faces for the adjacent through movement.

D. If the CIRCULAR GREEN and CIRCULAR YELLOW signal indications in the separate left-turn signal face are visibility-limited from the adjacent through movement, the display of a CIRCULAR GREEN signal indication for a permissive left-turn movement while the signal faces for the adjacent through movement display steady added to increase accuracy CIRCULAR RED signal indications and the opposing left-turn signal faces display left-turn GREEN ARROW signal indications for a protected left-turn movement shall be permitted.

E. If the separate left-turn signal face does not simultaneously display the same color of circular signal indication as the signal faces for the adjacent through movement, a LEFT TURN YIELD ON GREEN (symbolic circular green ~~ball~~) (R10-12) sign or a LEFT TURN SIGNAL—YIELD ON GREEN (symbolic circular green ~~ball~~) (R10-21) sign (see Figure 2B-30) shall be used.

F. If the permissive only mode is not the only left-turn mode used for the approach, the signal face shall be the same separate left-turn signal face that is used for the protected/permissive mode

(see Section 4D.20) except that the left-turn GREEN ARROW and left-turn YELLOW ARROW signal indications shall not be displayed when operating in the permissive only mode.

Guidance:

Because signal faces containing a CIRCULAR GREEN signal indication should not be post-mounted on the far side median or overhead above the left-turn lane(s) or the extension of the lane(s) (see Section 4D.13), a separate left-turn signal face should not be used for permissive only mode left turns for new or reconstructed signal installations.

Standard:

If a flashing yellow arrow signal face is provided for permissive only mode left turns, it shall meet the following requirements (see Figure 4D-7):

A. It shall be capable of displaying, from top to bottom or from left to right, the following signal indications: steady left-turn RED ARROW, steady left-turn YELLOW ARROW, and flashing left-turn YELLOW ARROW. Only one of the three indications shall be displayed at any given time.

B. During the permissive left-turn movement, a flashing left-turn YELLOW ARROW signal indication shall be displayed.

C. A steady left-turn YELLOW ARROW signal indication shall be displayed following the flashing left-turn YELLOW ARROW signal indication.

D. The display of a flashing left-turn YELLOW ARROW signal indication for a permissive left-turn movement while the signal faces for the adjacent through movement display steady CIRCULAR RED signal indications and the opposing left-turn signal faces display left-turn GREEN ARROW signal indications for a protected left-turn movement shall be permitted.

E. During steady mode (stop-and-go) operation, the signal section that displays the steady left-turn YELLOW ARROW signal indication during change intervals shall not be used to display the flashing left-turn YELLOW ARROW signal indication for permissive left turns.

F. During flashing mode operation (see Section 4D.30), the display of a flashing left-turn YELLOW ARROW signal indication shall be only from the signal section that displays a steady left-turn YELLOW ARROW signal indication during steady mode (stop-and-go) operation.

G. If the permissive only mode is not the only left-turn mode used for the approach, the signal face shall be the same flashing yellow arrow signal face that is used for the protected/permissive mode (see Section 4D.20) except that the left-turn GREEN ARROW signal indication shall not be displayed when operating in the permissive only mode.

Option:

For unusual geometric conditions, such as wide medians with offset left-turn lanes, and only when an engineering study determines that each and every vehicle must successively come to a full stop before making a permissive left turn, a flashing red arrow signal face that flashes a left-turn RED ARROW signal indication during the permissive left-turn movement may be used.

Standard:

If a flashing red arrow signal face is provided for permissive only mode left turns, it shall meet the following requirements (see Figure 4D-8):

A. It shall be capable of displaying, from top to bottom or from left to right, the following signal indications: steady or flashing left-turn RED ARROW, steady left-turn YELLOW ARROW, and left-turn GREEN ARROW. Only one of the three indications shall be displayed at any given time. The GREEN ARROW indication is required in order to provide a three-section signal face, but shall not be displayed during permissive only mode.

B. During the permissive left-turn movement, a flashing left-turn RED ARROW signal indication shall be displayed, thus indicating that each and every vehicle must successively come to a full stop before making a permissive left turn.

C. A steady left-turn YELLOW ARROW signal indication shall be displayed following the flashing left-turn RED ARROW signal indication.

D. The display of a flashing left-turn RED ARROW signal indication for a permissive left-turn movement while the signal faces for the adjacent through movement display steady CIRCULAR RED signal indications and the opposing left-turn signal faces display left-turn GREEN ARROW signal indications for a protected left-turn movement shall be permitted.

E. A supplementary sign shall not be required. If used, it shall be a LEFT TURN YIELD ON FLASHING RED ARROW AFTER STOP (R10-27) sign (see Figure 2B-30).

Section 4D.19 Signal Indications for Protected Only Mode Left-Turn Movements

Standard:

A shared signal face shall be used for protected only mode left turns only when the CIRCULAR GREEN and left-turn GREEN ARROW signal indications begin and terminate together. If a shared signal face is provided for protected only left turns, it shall meet the following requirements (see Figure 4D-9):

A. It shall be capable of displaying the following signal indications: steady CIRCULAR RED, steady CIRCULAR YELLOW, CIRCULAR GREEN, and left-turn GREEN ARROW. Only one of the three colors shall be displayed at any given time.

B. During the protected left-turn movement, the shared signal face shall simultaneously display both a CIRCULAR GREEN signal indication and a left-turn GREEN ARROW signal indication.

C. The shared signal face shall always simultaneously display the same color of circular indication that the adjacent through signal face or faces display.

D. If the protected only mode is not the only left-turn mode used for the approach, the signal face shall be the same shared signal face that is used for the protected/permissive mode (see Section 4D.20).

~~B. Protected Only Mode—The left-turn signal face~~ If a separate left-turn signal face is provided for protected only mode left turns, it shall meet the following requirements (see Figure 4D-10):

A. It **shall be capable of displaying,** ~~one of~~ from top to bottom or from left to right, **the following** ~~sets of~~ **signal indications:** ~~1.~~ steady **left-turn RED ARROW,** steady left-turn **YELLOW ARROW, and** left-turn **GREEN ARROW** ~~signal indications only~~**.** ~~At least one left-turn signal face shall be provided in addition to the two approach signal faces required in Section 4D.15 for the major movement.~~ **Only one of the three** ~~colors~~ indications **shall be** ~~illuminated~~ displayed **at any given time. A signal instruction sign shall not be required with this set of signal indications. If used, it shall be a LEFT ON GREEN ARROW ONLY (R10-5) sign.**

~~2. CIRCULAR RED, left-turn YELLOW ARROW, and left-turn GREEN ARROW signal indications. At least one left-turn signal face shall be provided in addition to the two approach signal faces required in Section 4D.15 for the major movement. Only one of the three colors shall be illuminated at any given time. Unless the CIRCULAR RED signal indication is shielded, hooded, louvered, positioned, or designed such that it is not readily visible to drivers in the through lane(s), a LEFT TURN SIGNAL (R10-10) sign shall be used.~~

~~3. CIRCULAR RED, CIRCULAR YELLOW, CIRCULAR GREEN, and left-turn GREEN ARROW signal indications. This four-section signal face shall be used only when the CIRCULAR GREEN and left-turn GREEN ARROW signal indications begin and terminate together. During each interval, the circular signal indication shall be the same color as the signal indication on the signal face(s) for the adjacent through traffic.~~

B. During the protected left-turn movement, a left-turn GREEN ARROW signal indication shall be displayed.

C. A steady left-turn YELLOW ARROW signal indication shall be displayed following the left-turn GREEN ARROW signal indication.

If a flashing yellow arrow signal face is being operated in a protected only left-turn mode, it shall meet the following requirements:

A. It shall be capable of displaying, from top to bottom or from left to right, the following signal indications: steady left-turn RED ARROW, steady left-turn YELLOW ARROW, and left-turn GREEN ARROW. Only one of the three indications shall be displayed at any given time.

B. During the protected left-turn movement, a left-turn GREEN ARROW signal indication shall be displayed.

C. A steady left-turn YELLOW ARROW signal indication shall be displayed following the left-turn GREEN ARROW signal indication.

D. Because the protected only mode is not the only left-turn mode used for the approach, the signal face shall be the same flashing yellow arrow signal face that is used for the protected/permissive

mode (see Section 4D.20 and Figure 4D-12) except that the flashing left-turn YELLOW ARROW signal indication shall not be displayed when operating in the protected only mode.

If a flashing red arrow signal face is being operated in a protected only left-turn mode, it shall meet the following requirements:

A. It shall be capable of displaying, from top to bottom or from left to right, the following signal indications: steady left-turn RED ARROW, steady left-turn YELLOW ARROW, and left-turn GREEN ARROW. Only one of the three indications shall be displayed at any given time. A signal instruction sign shall not be required with this set of signal indications. If used, it shall be a LEFT ON GREEN ARROW ONLY (R10-5) sign.

B. During the protected left-turn movement, a left-turn GREEN ARROW signal indication shall be displayed.

C. A steady left-turn YELLOW ARROW signal indication shall be displayed following the left-turn GREEN ARROW signal indication.

D. Because the protected only mode is not the only left-turn mode used for the approach, the signal face shall be the same flashing red arrow signal face that is used for the protected/permissive mode (see Section 4D.20 and Figure 4D-8), except that the left-turn RED ARROW signal indication shall not be flashed when operating in the protected only mode.

Section 4D.20 Signal Indications for Protected/Permissive Mode Left-Turn Movements

Standard:

~~C. Protected/Permissive Mode—The signal indications for protected/permissive mode left turns shall be provided in either a shared signal face or a separate signal face. Any protected/permissive left-turn signal face that always simultaneously displays the same color of circular signal indication that the adjacent through signal faces display shall be considered to be a shared signal face, regardless of where the left-turn signal face is positioned and regardless of how many adjacent through signal faces are provided. Any protected/permissive left-turn signal face that sometimes displays a different color of circular signal indication than the adjacent through signal faces display shall be considered to be a separate signal face. The requirements for each type of signal face are as follows:~~

~~1.~~ **If a shared signal face is provided** for protected/permissive mode left turns, it shall ~~be considered an approach signal face, and shall~~ meet the following requirements (see Figure 4D-11):

A. It shall be capable of displaying the following signal indications: steady CIRCULAR RED, steady CIRCULAR YELLOW, CIRCULAR GREEN, steady left-turn YELLOW ARROW, and left-turn GREEN ARROW. Only one of the three circular indications shall be displayed at any given time. Only one of the two arrow indications shall be displayed at any given time. If the left-turn GREEN ARROW signal indication and the CIRCULAR GREEN signal indication(s) for the adjacent through movement are always terminated together, the steady left-turn YELLOW ARROW signal indication shall not be required.

B. During the protected left-turn movement, the shared signal face shall simultaneously display a left-turn GREEN ARROW signal indication and a circular signal indication that is the same color as the signal indication for the adjacent through lane on the same approach as the protected left turn. ~~During the protected left-turn movement, the signal faces for through traffic on the opposing approach shall simultaneously display CIRCULAR RED signal indications.~~

C. A steady left-turn YELLOW ARROW signal indication shall be displayed following the left-turn GREEN ARROW signal indication, unless the left-turn GREEN ARROW signal indication and the CIRCULAR GREEN signal indication(s) for the adjacent through movement are being terminated together, in which case a steady CIRCULAR YELLOW signal indication shall be displayed following the left-turn GREEN ARROW signal indication.

D. During the permissive left-turn movement, ~~all signal faces on the approach~~ the shared signal face shall display only a CIRCULAR GREEN signal indication~~s~~.

E. ~~All signal faces on the approach~~ A protected/permissive shared signal face, regardless of where it is positioned and regardless of how many adjacent through signal faces are provided, shall always simultaneously display the same color of circular indication~~s to both through and left-turn road users~~ that the adjacent through signal face or faces display.

F. A supplementary sign shall not be required. If used, it shall be a LEFT TURN YIELD ON GREEN (symbolic circular green ~~ball~~) (R10-12) sign (see Figure 2B-30).

~~2.~~ If a separate left-turn signal face is ~~provided~~ being operated in a protected/permissive left-turn mode, it shall ~~be considered a left-turn signal face, and shall~~ meet the following requirements:

A. It shall be capable of displaying the following signal indications: steady CIRCULAR RED, steady CIRCULAR YELLOW, CIRCULAR green, steady left-turn YELLOW ARROW, and left-turn GREEN ARROW. Only one of the three circular indications shall be displayed at any given time.

B. During the protected left-turn movement, the separate left-turn signal face shall display a left-turn GREEN ARROW signal indication. ~~During the protected left-turn movement, the signal faces for through traffic on the opposing approach shall simultaneously display CIRCULAR RED signal indications.~~

C. A steady left-turn YELLOW ARROW signal indication shall be displayed following the left-turn GREEN ARROW signal indication, unless the left-turn GREEN ARROW signal indication and the CIRCULAR GREEN signal indication(s) for the adjacent through movement are being terminated together, in which case a steady CIRCULAR YELLOW signal indication shall be displayed following the left-turn GREEN ARROW signal indication.

D. During the permissive left-turn movement, the separate left-turn signal face shall display only a CIRCULAR GREEN signal indication.

E. If the CIRCULAR GREEN and CIRCULAR YELLOW signal indications in the separate left-turn signal face are visibility-limited from the adjacent through movement, the separate left-turn signal face shall not be required to simultaneously display the same color of circular signal indication as the signal faces for the adjacent through movement.

F. If the CIRCULAR GREEN and CIRCULAR YELLOW signal indications in the separate left-turn signal face are visibility-limited from the adjacent through movement, the display of a CIRCULAR GREEN signal indication for a permissive left-turn movement while the signal faces for the adjacent through movement display steady added to increase accuracy CIRCULAR RED signal indications and the opposing left-turn signal face displays a left-turn GREEN ARROW for a protected left-turn movement shall be permitted.

G. If the separate left-turn signal face does not simultaneously display the same color of circular signal indication as the signal faces for the adjacent through movement, a LEFT TURN SIGNAL—YIELD ON GREEN (symbolic circular green ~~ball~~) (R10-21) sign (see Figure 2B-30) shall be used.

Guidance:

Because signal faces containing a CIRCULAR GREEN signal indication should not be post-mounted on the far side median or overhead above the left-turn lane(s) or the extension of the lane(s) (see Section 4D.13), a separate left-turn signal face should not be used for protected/permissive mode left turns for new or reconstructed signal installations.

Standard:

If a flashing yellow arrow signal face is provided for protected/permissive mode left turns, it shall meet the following requirements (see Figure 4D-12):

A. It shall be capable of displaying, from top to bottom or from left to right, the following signal indications: steady left-turn RED ARROW, steady left-turn YELLOW ARROW, flashing left-turn YELLOW ARROW, and left-turn GREEN ARROW. Only one of the four indications shall be displayed at any given time.

B. During the protected left-turn movement, a left-turn GREEN ARROW signal indication shall be displayed.

C. A steady left-turn YELLOW ARROW signal indication shall be displayed following the left-turn GREEN ARROW signal indication.

D. During the permissive left-turn movement, a flashing left-turn YELLOW ARROW signal indication shall be displayed.

E. A steady left-turn YELLOW ARROW signal indication shall be displayed following the flashing left-turn YELLOW ARROW signal indication if the permissive left-turn movement is being terminated and the flashing yellow arrow signal face will subsequently display a steady left-turn RED ARROW indication.

F. The display of a flashing left-turn YELLOW ARROW signal indication for a permissive left-turn movement while the signal faces for the adjacent through movement display steady

CIRCULAR RED signal indications and the opposing left-turn signal faces display left-turn GREEN ARROW signal indications for a protected left-turn movement shall be permitted.

G. When a permissive left-turn movement is changing to a protected left-turn movement, a left-turn GREEN ARROW signal indication shall be displayed immediately upon the termination of the flashing left-turn YELLOW ARROW signal indication. A steady left-turn YELLOW ARROW signal indication shall not be displayed between the display of the flashing left-turn YELLOW ARROW signal indication and the display of the steady left-turn GREEN ARROW signal indication.

H. The display shall be a four-section signal face except that a three-section signal face containing a dual-arrow signal section shall be permitted where signal head height limitations will not permit the use of a four-section signal face. The dual-arrow signal section, where used, shall display a steady GREEN ARROW for the protected left-turn movement and a flashing YELLOW ARROW for the permissive left-turn movement.

I. During steady mode (stop-and-go) operation, the signal section that displays the steady left-turn YELLOW ARROW signal indication during change intervals shall not be used to display the flashing left-turn YELLOW ARROW signal indication for permissive left turns.

J. During flashing mode operation (see Section 4D.30), the display of a flashing left-turn YELLOW ARROW signal indication shall be only from the signal section that displays a steady left-turn YELLOW ARROW signal indication during steady mode (stop-and-go) operation.

Option:

For unusual geometric conditions, such as wide medians with offset left-turn lanes, and only when an engineering study determines that each and every vehicle must successively come to a full stop before making a permissive left turn, a flashing red arrow signal face that flashes a left-turn RED ARROW signal indication during the permissive left-turn movement may be used.

Standard:

If a flashing red arrow signal face is provided for protected/permissive mode left turns, it shall meet the following requirements (see Figure 4D-8):

A. It shall be capable of displaying, from top to bottom or from left to right, the following signal indications: steady or flashing left-turn RED ARROW, steady left-turn YELLOW ARROW, and left-turn GREEN ARROW. Only one of the three indications shall be displayed at any given time.

B. During the protected left-turn movement, a left-turn GREEN ARROW signal indication shall be displayed.

C. A steady left-turn YELLOW ARROW signal indication shall be displayed following the left-turn GREEN ARROW signal indication.

D. During the permissive left-turn movement, a flashing left-turn RED ARROW signal indication shall be displayed.

E. A steady left-turn YELLOW ARROW signal indication shall be displayed following the flashing left-turn RED ARROW signal indication if the permissive left-turn movement is being terminated and the flashing red arrow signal face will subsequently display a steady left-turn RED ARROW indication.

F. When a permissive left-turn movement is changing to a protected left-turn movement, a left-turn GREEN ARROW signal indication shall be displayed immediately upon the termination of the flashing left-turn RED ARROW signal indication. A steady left-turn YELLOW ARROW signal indication shall not be displayed between the display of the flashing left-turn RED ARROW signal indication and the display of the steady left-turn GREEN ARROW signal indication.

G. The display of a flashing left-turn RED ARROW signal indication for a permissive left-turn movement while the signal faces for the adjacent through movement display steady CIRCULAR RED signal indications and the opposing left-turn signal faces display left-turn GREEN ARROW signal indications for a protected left-turn movement shall be permitted.

H. A supplementary sign shall not be required. If used, it shall be a LEFT TURN YIELD ON FLASHING RED ARROW AFTER STOP (R10-27) sign (see Figure 2B-30).

Section ~~4D.07~~ 4D.21 ~~Application of Steady~~ Signal Indications for Right-Turn~~s~~ Movements – General

Support:

Sections 4D.21 through 4D.24 describe the use of the following four types of signal faces for controlling right-turn movements:

A. Shared signal face – This type of signal face controls both the right-turn movement and the adjacent through movement and can serve as one of the two required signal faces for the through movement. A shared signal face always displays the same color of circular indication that the adjacent through signal face or faces display.

B. Separate right-turn signal face – This type of signal face controls only the right-turn movement and cannot serve as one of the two required signal faces for the adjacent through movement because it sometimes displays a different color of circular signal indication than the adjacent through signal faces display. If a separate right-turn signal face is mounted overhead at the intersection, it is usually positioned over the right-turn lane, or over the extension of this lane.

C. Flashing yellow arrow signal face – This type of signal face controls only the right-turn movement and cannot serve as one of the two required signal faces for the adjacent through movement because it consists entirely of right-turn arrows and cannot display any circular signal indications. If a flashing yellow arrow signal face is mounted overhead at the intersection, it is usually positioned over the right-turn lane, or over the extension of this lane. A flashing yellow arrow signal face displays a flashing right-turn YELLOW ARROW signal indication (instead of a steady CIRCULAR GREEN signal indication) during steady mode (stop-and-go) operation to control permissive right-turning movements from an intersection approach.

D Flashing red arrow signal face – This type of signal face is used only when an engineering study determines that each and every vehicle must successively come to a full stop before making a permissive right turn. This type of signal face controls only the right-turn movement and cannot serve as one of the two required signal faces for the adjacent through movement. If a flashing red arrow signal face is mounted overhead at the intersection, it is usually positioned over the right-turn lane, or over the extension of this lane. A flashing red arrow signal face displays a flashing right-turn RED ARROW signal indication (instead of a steady CIRCULAR GREEN signal indication) during steady mode (stop-and-go) operation to control permissive right-turning movements from an intersection approach.

Section 4D.13 contains provisions regarding the lateral positioning of right-turn signal faces.

Although Sections 4D.21 through 4D.24 describe the use of flashing yellow arrow signal faces and flashing red arrow signal faces for certain modes of right-turn operation, there are no provisions in this Section or any other Section that requires the use of these types of signal faces. The use of these types of signal faces is optional and is a matter of engineering judgment.

It is not necessary that the same mode of right-turn operation or same type of right-turn signal face be used on every approach to a signalized location. Selecting different modes and different types of right-turn signal faces for the various approaches to the same signalized location is acceptable.

Sections 4D.21 through 4D.24 set forth provisions for the display of four types of messages to drivers intending to turn right from a signalized approach (see specific paragraphs in this Section for the appropriate display to use in each circumstance):

A. A message to stop, which is accomplished by displaying either:

1. A steady right-turn RED ARROW signal indication that requires a driver to stop and await authorization to proceed (right turn on red is not permitted); or
2. A steady CIRCULAR RED signal indication that requires a driver to stop and await authorization to proceed under the rules as set forth in the applicable Motor Vehicle Code (right turn on red is permitted).

B. A message to turn right in a protected manner, which is accomplished by displaying a right-turn GREEN ARROW signal indication.

C. A message to turn right in a permissive manner, which is accomplished by displaying either a CIRCULAR GREEN signal indication or a flashing right-turn YELLOW ARROW signal indication. (When an engineering study determines that each and every vehicle must successively come to a full stop before making a permissive right turn, the message to turn right in a permissive manner can be accomplished by displaying a flashing right-turn RED ARROW signal indication.)

D. A message that the status of the right-turn operation is changing, which is accomplished by displaying a steady right-turn YELLOW ARROW signal indication when the right-turn status is changing from

protected to permissive, or by displaying a steady right-turn YELLOW ARROW signal indication or a steady CIRCULAR YELLOW signal indication (as applicable) when the right-turn status is changing from permissive to stopped or from protected to stopped.

It is not necessary to display a change interval when the status of the right-turn operation is changing from permissive to protected.

Right-turning traffic is controlled by one of four modes as follows:

A. Permissive Only Mode—turns made on ~~the~~ a CIRCULAR GREEN signal indication, a flashing right-turn YELLOW ARROW signal indication, or a flashing right-turn RED ARROW signal indication after yielding to pedestrians, if any.
B. Protected Only Mode—turns made only when ~~the~~ a right-turn GREEN ARROW signal indication is displayed.
C. Protected/Permissive Mode—both modes occur on an approach during the same cycle.
D. Variable Right-Turn Mode—the operating mode changes among the protected only mode and/or the protected/permissive mode and/or the permissive only mode during different periods of the day.

Standard:

During a permissive right-turn movement, if pedestrians crossing the lane or lanes used by the permissive right-turn movement to depart the intersection are controlled by pedestrian signal heads, the signal indications displayed by those pedestrian signal heads shall not be limited to any particular display.

During a protected right-turn movement, the signal faces for left-turn traffic, if any, on the opposing approach shall simultaneously display steady left-turn RED ARROW signal indications. If pedestrians crossing the lane or lanes used by the protected right-turn movement to depart the intersection are controlled by pedestrian signal heads, the pedestrian signal heads shall display a steady UPRAISED HAND (symbolizing DONT WALK) signal indication during the protected right-turn movement.

A protected only mode right-turn movement that does not begin and terminate at the same time as the adjacent through movement shall not be provided on an approach unless an exclusive right-turn lane exists. **added to prohibit an inefficient and unsafe practice**

~~**D. Variable Right-Turn Mode—**~~**If the** ~~**protected only**~~ **operating mode** ~~**occurs during one or more periods of the day, and the permissive only mode or the combined protected/permissive mode occurs**~~ **changes among the protected only mode and/or the protected/permissive mode and/or the permissive only mode during** ~~**other**~~ **different periods of the day, the requirements** ~~**of Items A, B, and C**~~ **in** ~~**this Standard**~~ **Sections 4D.22 through 4D.24 that are appropriate to that mode of operation shall be met, subject to the following:**

A. The CIRCULAR GREEN and CIRCULAR YELLOW signal indications shall not be displayed when operating in the protected only mode.
B. The right-turn GREEN ARROW and right-turn YELLOW ARROW signal indications shall not be displayed when operating in the permissive only mode.

Option:

Additional ~~appropriate signal indications~~ static signs or changeable message signs may be used to meet the requirements for the variable right-turn mode or to inform drivers that right-turn green arrows will not be available during certain times of the day.

A signal face that is shared by left-turning and right-turning traffic may be provided for a shared left-turn/right-turn lane on an approach that has no through traffic (see Section 4D.25).

Section 4D.22 Signal Indications for Permissive Only Mode Right-Turn Movements

Standard:

~~**The required right-turn signal faces and operation for an approach shall be determined by the selected mode of right-turn operation, as follows:**~~

~~**A. Permissive Only Mode—A separate signal indication or signal face for right turns shall not be required. The signal indication for permissive only mode right turns shall be the same color as the signal indication for adjacent through traffic, except that if the right turn is held to provide an exclusive pedestrian movement, a separate right-turn RED ARROW signal indication shall be provided.**~~

If a shared signal face is provided for permissive only mode right turns, it shall meet the following requirements (see Figure 4D-13):

A. It shall be capable of displaying, from top to bottom or from right to right, the following signal indications: steady CIRCULAR RED, steady CIRCULAR YELLOW, and CIRCULAR GREEN. Only one of the three indications shall be displayed at any given time.
B. During the permissive right-turn movement, a CIRCULAR GREEN signal indication shall be displayed.
C. A permissive only shared signal face, regardless of where it is positioned and regardless of how many adjacent through signal faces are provided, shall always simultaneously display the same color of circular indication that the adjacent through signal face or faces display.
D. If the permissive only mode is not the only right-turn mode used for the approach, the signal face shall be the same shared signal face that is used for the protected/permissive mode (see Section 4D.24) except that the right-turn GREEN ARROW and right-turn YELLOW ARROW signal indications shall not be displayed when operating in the permissive only mode.

A separate right-turn signal face shall not be used for permissive only mode right turns.

If a flashing yellow arrow signal face is provided for permissive only mode right turns, it shall meet the following requirements (see Figure 4D-14):

A. It shall be capable of displaying, from top to bottom or from left to right, one of the following sets of displays:
    1. Steady right-turn RED ARROW, steady right-turn YELLOW ARROW, and flashing right-turn YELLOW ARROW. Only one of the three indications shall be displayed at any given time.
    2. Steady CIRCULAR RED, steady right-turn YELLOW ARROW, and flashing right-turn YELLOW ARROW. Only one of the three indications shall be displayed at any given time. If the CIRCULAR RED signal indication is sometimes displayed when the signal faces for the adjacent through lane(s) are not displaying a CIRCULAR RED signal indication, a RIGHT TURN SIGNAL (R10-10R) sign shall be used unless the CIRCULAR RED signal indication in the flashing yellow arrow signal face is shielded, hooded, louvered, positioned, or designed such that it is not readily visible to drivers in the through lane(s).
B. During the permissive right-turn movement, a flashing right-turn YELLOW ARROW signal indication shall be displayed.
C. A steady right-turn YELLOW ARROW signal indication shall be displayed following the flashing right-turn YELLOW ARROW signal indication.
D. When the flashing yellow arrow signal face is providing a message to stop, a steady right-turn RED ARROW signal indication shall be displayed if it is intended that right turns on red not be permitted (except when a traffic control device is in place permitting a turn on a steady RED ARROW signal indication) or a steady CIRCULAR RED signal indication shall be displayed if it is intended that right turns on red be permitted.
E. The display of a flashing right-turn YELLOW ARROW signal indication for a permissive right-turn movement while the signal faces for the adjacent through movement display steady CIRCULAR RED signal indications shall be permitted.
F. During steady mode (stop-and-go) operation, the signal section that displays the steady right-turn YELLOW ARROW signal indication during change intervals shall not be used to display the flashing right-turn YELLOW ARROW signal indication for permissive right turns.
G. During flashing mode operation (see Section 4D.30), the display of a flashing right-turn YELLOW ARROW signal indication shall be only from the signal section that displays a steady right-turn YELLOW ARROW signal indication during steady mode (stop-and-go) operation.
H. If the permissive only mode is not the only right-turn mode used for the approach, the signal face shall be the same flashing yellow arrow signal face that is used for the protected/permissive mode (see Section 4D.24) except that the right-turn GREEN ARROW signal indication shall not be displayed when operating in the permissive only mode.

Option:

When an engineering study determines that each and every vehicle must successively come to a full stop before making a permissive right turn, a flashing red arrow signal face that flashes a right-turn RED ARROW signal indication during the permissive right-turn movement may be used.

Standard:

If a flashing red arrow signal face is provided for permissive only mode right turns, it shall meet the following requirements (see Figure 4D-15):

A. It shall be capable of displaying one of the following sets of displays:

1. From top to bottom or from left to right, the following signal indications: steady or flashing right-turn RED ARROW, steady right-turn YELLOW ARROW, and right-turn GREEN ARROW. Only one of the three indications shall be displayed at any given time. The GREEN ARROW indication is required in order to provide a three-section signal face, but shall not be displayed during permissive only mode.
2. Steady CIRCULAR RED on the left and steady right-turn RED ARROW on the right of the top position, steady right-turn YELLOW ARROW in the middle position, and right-turn GREEN ARROW in the bottom position. Only one of the four indications shall be displayed at any given time. The GREEN ARROW indication is required in order to provide three vertical positions, but shall not be displayed during permissive only mode. If the CIRCULAR RED signal indication is sometimes displayed when the signal faces for the adjacent through lane(s) are not displaying a CIRCULAR RED signal indication, a RIGHT TURN SIGNAL (R10-10R) sign shall be used unless the CIRCULAR RED signal indication in the flashing yellow arrow signal face is shielded, hooded, louvered, positioned, or designed such that it is not readily visible to drivers in the through lane(s).

B. During the permissive right-turn movement, a flashing right-turn RED ARROW signal indication shall be displayed, thus indicating that each and every vehicle must successively come to a full stop before making a permissive right turn.

C. A steady right-turn YELLOW ARROW signal indication shall be displayed following the flashing right-turn RED ARROW signal indication.

D. When the flashing red arrow signal face is providing a message to stop, a steady right-turn RED ARROW signal indication shall be displayed if it is intended that right turns on red not be permitted (except when a traffic control device is in place permitting a turn on a steady RED ARROW signal indication) or a steady CIRCULAR RED signal indication shall be displayed if it is intended that right turns on red be permitted.

E. The display of a flashing right-turn RED ARROW signal indication for a permissive right-turn movement while the signal faces for the adjacent through movement display steady CIRCULAR RED signal indications and the opposing right-turn signal faces display right-turn GREEN ARROW signal indications for a protected right-turn movement shall be permitted.

F. A supplementary sign shall not be required. If used, it shall be a RIGHT TURN YIELD ON FLASHING RED ARROW AFTER STOP (R10-27) sign (see Figure 2B-30).

Section 4D.23 Signal Indications for Protected Only Mode Right-Turn Movements

Standard:

A shared signal face shall be used for protected only mode right turns only when the CIRCULAR GREEN and right-turn GREEN ARROW signal indications begin and terminate together. If a shared signal face is provided for protected only right turns, it shall meet the following requirements (see Figure 4D-16):

A. It shall be capable of displaying, from top to bottom or from left to right or in a cluster arrangement, the following signal indications: steady CIRCULAR RED, steady CIRCULAR YELLOW, CIRCULAR GREEN, and right-turn GREEN ARROW. Only one of the three colors shall be displayed at any given time.

B. During the protected right-turn movement, the shared signal face shall simultaneously display both a CIRCULAR GREEN signal indication and a right-turn GREEN ARROW signal indication.

C. The shared signal face shall always simultaneously display the same color of circular indication that the adjacent through signal face or faces display.

D. If the protected only mode is not the only right-turn mode used for the approach, the signal face shall be the same shared signal face that is used for the protected/permissive mode (see Section 4D.24).

~~B. Protected Only Mode The~~ If a separate **right-turn signal face** is provided for protected only mode right turns, it shall meet the following requirements (see Figure 4D-17):

A. It shall be capable of displaying, from top to bottom or from left to right, ~~one of~~ the following ~~sets of~~ signal indications:

1. Steady right-turn RED ARROW, steady right-turn YELLOW ARROW, and right-turn GREEN ARROW ~~signal indications only~~. ~~At least one right-turn signal face shall be provided in addition to the two approach signal faces required in Section 4D.15 for the major movement.~~ Only one of the three ~~colors~~ indications shall be ~~illuminated~~ displayed at any given time. A signal instruction sign shall not be required with this set of signal indications. If used, it shall be a RIGHT ON GREEN ARROW ONLY (R10-5a) sign.
2. Steady CIRCULAR RED, steady right-turn YELLOW ARROW, and right-turn GREEN ARROW ~~signal indications~~. ~~At least one right-turn signal face shall be provided in addition to the two approach signal faces required in Section 4D.15 for the major movement.~~ Only one of three colors shall be illuminated at any given time. If the CIRCULAR RED signal indication is sometimes displayed when the signal faces for the adjacent through lane(s) are not displaying a CIRCULAR RED signal indication, a RIGHT TURN SIGNAL (R10-10R) sign shall be used unless the CIRCULAR RED signal indication is shielded, hooded, louvered, positioned, or designed such that it is not readily visible to drivers in the through lane(s)~~, a RIGHT TURN SIGNAL (R10-10R) sign shall be used~~.
3. ~~CIRCULAR RED, CIRCULAR YELLOW, CIRCULAR GREEN, and right-turn GREEN ARROW signal indications. This four-section signal face shall be used only when the CIRCULAR GREEN and right-turn GREEN ARROW signal indications begin and terminate together. During each interval, the circular signal indication shall be the same color as the signal indication on the signal faces for the adjacent through traffic.~~

B. During the protected right-turn movement, a right-turn GREEN ARROW signal indication shall be displayed.

C. A steady right-turn YELLOW ARROW signal indication shall be displayed following the right-turn GREEN ARROW signal indication.

D. When the separate signal face is providing a message to stop, a steady right-turn RED ARROW signal indication shall be displayed if it is intended that right turns on red not be permitted (except when a traffic control device is in place permitting a turn on a steady RED ARROW signal indication) or a steady CIRCULAR RED signal indication shall be displayed if it is intended that right turns on red be permitted.

If a flashing yellow arrow signal face is being operated in a protected only right-turn mode, it shall meet the following requirements:

A. It shall be capable of displaying, from top to bottom or from left to right, one of the following sets of displays:

1. Steady right-turn RED ARROW, steady right-turn YELLOW ARROW, and right-turn GREEN ARROW. Only one of the three indications shall be displayed at any given time.
2. Steady CIRCULAR RED, steady right-turn YELLOW ARROW, and right-turn GREEN ARROW. Only one of the three indications shall be displayed at any given time. If the CIRCULAR RED signal indication is sometimes displayed when the signal faces for the adjacent through lane(s) are not displaying a CIRCULAR RED signal indication, a RIGHT TURN SIGNAL (R10-10R) sign shall be used unless the CIRCULAR RED signal indication in the flashing yellow arrow signal face is shielded, hooded, louvered, positioned, or designed such that it is not readily visible to drivers in the through lane(s).

B. During the protected right-turn movement, a right-turn GREEN ARROW signal indication shall be displayed.

C. A steady right-turn YELLOW ARROW signal indication shall be displayed following the right-turn GREEN ARROW signal indication.

D. When the flashing yellow arrow signal face is providing a message to stop, a steady right-turn RED ARROW signal indication shall be displayed if it is intended that right turns on red not be permitted (except when a traffic control device is in place permitting a turn on a steady RED ARROW signal indication) or a steady CIRCULAR RED signal indication shall be displayed if it is intended that right turns on red be permitted.

E. Because the protected only mode is not the only right-turn mode used for the approach, the signal face shall be the same flashing yellow arrow signal face that is used for the protected/permissive mode (see Section 4D.24 and Figure 4D-19) except that the flashing right-

turn YELLOW ARROW signal indication shall not be displayed when operating in the protected only mode.

If a flashing red arrow signal face is being operated in a protected only right-turn mode, it shall operate under the same set of requirements as the separate right-turn signal face that is described earlier in this Section.

Section 4D.24 Signal Indications for Protected/Permissive Mode Right-Turn Movements

Standard:

~~C.~~ If a shared ~~Protected/Permissive Mode—A separate~~ signal face is ~~not required for the right turn, but, if~~ provided for protected/permissive mode right turns, it shall ~~be considered an approach signal face, and shall~~ meet the following requirements (see Figure 4D-18):

A. It shall be capable of displaying the following signal indications: steady CIRCULAR RED, steady CIRCULAR YELLOW, CIRCULAR GREEN, steady right-turn YELLOW ARROW, and right-turn GREEN ARROW. Only one of the three circular indications shall be displayed at any given time. Only one of the two arrow indications shall be displayed at any given time. If the right-turn GREEN ARROW signal indication and the CIRCULAR GREEN signal indication(s) for the adjacent through movement are always terminated together, the steady right-turn YELLOW ARROW signal indication shall not be required.

B. During the protected right-turn movement, the shared signal face shall simultaneously display a right-turn GREEN ARROW signal indication and a circular signal indication that is the same color as the signal indication for the adjacent through lane on the same approach as the protected right turn.

C. A steady right-turn YELLOW ARROW signal indication shall be displayed following the right-turn GREEN ARROW signal indication, unless the right-turn GREEN ARROW signal indication and the CIRCULAR GREEN signal indication(s) for the adjacent through movement are being terminated together, in which case a steady CIRCULAR YELLOW signal indication shall be displayed following the right-turn GREEN ARROW signal indication.

D. During the permissive right-turn movement, ~~all signal faces on the approach~~ the shared signal face shall display only a CIRCULAR GREEN signal indication~~s~~.

E. ~~All signal faces on the approach~~ A protected/permissive shared signal face, regardless of where it is positioned and regardless of how many adjacent through signal faces are provided, shall always simultaneously display the same color of circular indication~~s to both through and right-turn road users~~ that the adjacent through signal face or faces display.

A separate right-turn signal face shall not be used for protected/permissive mode right turns.

If a flashing yellow arrow signal face is provided for protected/permissive mode right turns, it shall meet the following requirements (see Figure 4D-19):

A. It shall be capable of displaying, from top to bottom or from left to right, one of the following sets of displays:

1. Steady right-turn RED ARROW, steady right-turn YELLOW ARROW, flashing right-turn YELLOW ARROW, and right-turn GREEN ARROW. Only one of the four indications shall be displayed at any given time.
2. Steady CIRCULAR RED, steady right-turn YELLOW ARROW, flashing right-turn YELLOW ARROW, and right-turn GREEN ARROW. Only one of the four indications shall be displayed at any given time. If the CIRCULAR RED signal indication is sometimes displayed when the signal faces for the adjacent through lane(s) are not displaying a CIRCULAR RED signal indication, a RIGHT TURN SIGNAL (R10-10R) sign shall be used unless the CIRCULAR RED signal indication in the flashing yellow arrow signal face is shielded, hooded, louvered, positioned, or designed such that it is not readily visible to drivers in the through lane(s).

B. During the protected right-turn movement, a right-turn GREEN ARROW signal indication shall be displayed.

C. A steady right-turn YELLOW ARROW signal indication shall be displayed following the right-turn GREEN ARROW signal indication.

D. During the permissive right-turn movement, a flashing right-turn YELLOW ARROW signal indication shall be displayed.

E. A steady right-turn YELLOW ARROW signal indication shall be displayed following the flashing right-turn YELLOW ARROW signal indication if the permissive right-turn movement is being terminated and the flashing yellow arrow signal face will subsequently display a steady red indication.

F. When a permissive right-turn movement is changing to a protected right-turn movement, a right-turn GREEN ARROW signal indication shall be displayed immediately upon the termination of the flashing right-turn YELLOW ARROW signal indication. A steady right-turn YELLOW ARROW signal indication shall not be displayed between the display of the flashing right-turn YELLOW ARROW signal indication and the display of the steady right-turn GREEN ARROW signal indication.

G. When the flashing yellow arrow signal face is providing a message to stop, a steady right-turn RED ARROW signal indication shall be displayed if it is intended that right turns on red not be permitted (except when a traffic control device is in place permitting a turn on a steady RED ARROW signal indication) or a steady CIRCULAR RED signal indication shall be displayed if it is intended that right turns on red be permitted.

H. The display of a flashing right-turn YELLOW ARROW signal indication for a permissive right-turn movement while the signal faces for the adjacent through movement display steady CIRCULAR RED signal indications and the opposing right-turn signal faces display right-turn GREEN ARROW signal indications for a protected right-turn movement shall be permitted.

I. A signal face containing a dual-arrow signal section in place of separate flashing right-turn YELLOW ARROW and right-turn GREEN ARROW signal sections shall be permitted where signal head height limitations are a concern. The dual-arrow signal section, where used, shall display a steady GREEN ARROW for the protected right-turn movement and a flashing YELLOW ARROW for the permissive right-turn movement.

J. During steady mode (stop-and-go) operation, the signal section that displays the steady right-turn YELLOW ARROW signal indication during change intervals shall not be used to display the flashing right-turn YELLOW ARROW signal indication for permissive right turns.

K. During flashing mode operation (see Section 4D.30), the display of a flashing right-turn YELLOW ARROW signal indication shall be only from the signal section that displays a steady right-turn YELLOW ARROW signal indication during steady mode (stop-and-go) operation.

Option:

When an engineering study determines that each and every vehicle must successively come to a full stop before making a permissive right turn, a flashing red arrow signal face that flashes a right-turn RED ARROW signal indication during the permissive right-turn movement may be used.

Standard:

If a flashing red arrow signal face is provided for protected/permissive mode right turns, it shall meet the following requirements (see Figure 4D-15):

A. It shall be capable of displaying one of the following sets of displays:

1. From top to bottom or from left to right, the following signal indications: steady or flashing right-turn RED ARROW, steady right-turn YELLOW ARROW, and right-turn GREEN ARROW. Only one of the three indications shall be displayed at any given time.
2. Steady CIRCULAR RED on the left and steady or flashing right-turn RED ARROW on the right of the top position, steady right-turn YELLOW ARROW in the middle position, and right-turn GREEN ARROW in the bottom position. Only one of the four indications shall be displayed at any given time. If the CIRCULAR RED signal indication is sometimes displayed when the signal faces for the adjacent through lane(s) are not displaying a CIRCULAR RED signal indication, a RIGHT TURN SIGNAL (R10-10R) sign shall be used unless the CIRCULAR RED signal indication in the flashing yellow arrow signal face is shielded, hooded, louvered, positioned, or designed such that it is not readily visible to drivers in the through lane(s).

B. During the protected right-turn movement, a right-turn GREEN ARROW signal indication shall be displayed.

C. A steady right-turn YELLOW ARROW signal indication shall be displayed following the right-turn GREEN ARROW signal indication.

D. During the permissive right-turn movement, the flashing red arrow signal face shall display a flashing right-turn RED ARROW signal indication.

E. A steady right-turn YELLOW ARROW signal indication shall be displayed following the flashing right-turn RED ARROW signal indication if the permissive right-turn movement is being terminated and the flashing red arrow signal face will subsequently display a steady red indication.

F. When a permissive right-turn movement is changing to a protected right-turn movement, a right-turn GREEN ARROW signal indication shall be displayed immediately upon the termination of the flashing right-turn RED ARROW signal indication. A steady right-turn YELLOW ARROW signal indication shall not be displayed between the display of the flashing right-turn RED ARROW signal indication and the display of the steady right-turn GREEN ARROW signal indication.

G. When the flashing red arrow signal face is providing a message to stop, a steady right-turn RED ARROW signal indication shall be displayed if it is intended that right turns on red not be permitted (except when a traffic control device is in place permitting a turn on a steady RED ARROW signal indication) or a steady CIRCULAR RED signal indication shall be displayed if it is intended that right turns on red be permitted.

H. The display of a flashing right-turn RED ARROW signal indication for a permissive right-turn movement while the signal faces for the adjacent through movement display steady CIRCULAR RED signal indications and the opposing right-turn signal faces display right-turn GREEN ARROW signal indications for a protected right-turn movement shall be permitted.

I. A supplementary sign shall not be required. If used, it shall be a RIGHT TURN YIELD ON FLASHING RED ARROW AFTER STOP (R10-27) sign (see Figure 2B-30).

Section 4D.25 Signal Indications for Approaches With Shared Left-Turn/Right-Turn Lanes and No Through Movement

Support:

A lane that is shared by left-turn and right-turn movements is sometimes provided on an approach that has no through movement, such as the stem of a T-intersection or where the opposite approach is a one-way roadway in the opposing direction.

Standard:

When a shared left-turn/right-turn lane exists on a signalized approach, the left-turn and right-turn movements shall start and terminate simultaneously and the red signal indication used in each of the signal faces on the approach shall be a CIRCULAR RED.

When there are no pedestrian or vehicular movements that conflict with the left-turn or right-turn movements, the signal faces provided for the approach shall be one of the following:

A. For an approach with any number of lanes, one of which is a shared left-turn/right-turn lane, two or more signal faces, each capable of displaying CIRCULAR RED, CIRCULAR YELLOW, and CIRCULAR GREEN signal indications. A left-turn GREEN ARROW signal indication shall also be included in the shared signal face and shall be displayed in situations where the lack of a vehicular conflict is because a red signal indication is being displayed to traffic on the opposing approach.

B. For an approach with one or more exclusive left-turn and/or right-turn lanes in addition to a shared left-turn/right-turn lane, a signal face(s) capable of displaying CIRCULAR RED, YELLOW ARROW, and GREEN ARROW signal indications for the exclusive turn lane(s), with the arrows pointing in the direction of the turn, and a shared left-turn/right-turn signal face capable of displaying CIRCULAR RED, left-turn YELLOW ARROW, left-turn GREEN ARROW, right-turn YELLOW ARROW, and right-turn GREEN ARROW signal indications, in an arrangement of signal sections that complies with the provisions of Section 4D.07 or 4D.08.

If a vehicular movement and/or pedestrians crossing in conformance with a WALKING PERSON (symbolizing WALK) or flashing UPRAISED HAND (symbolizing DONT WALK) signal indication conflict with the left-turn or right-turn movement or both turning movements, the signal faces provided for the approach shall be one of the following:

A. For an approach with any number of lanes, one of which is a shared left-turn/right-turn lane, two or more signal faces, each capable of displaying CIRCULAR RED, CIRCULAR YELLOW, and CIRCULAR GREEN signal indications.

B. For an approach with one or more exclusive left-turn and/or right-turn lanes in addition to a shared left-turn/right-turn lane, the signal face or faces described in Item B of the previous paragraph, but with:

1. A flashing YELLOW ARROW signal indication in place of the GREEN ARROW signal indication for the turning movement(s) that conflicts with the signalized pedestrian or vehicular movement, or
2. If only one of the turning movements conflicts with a signalized pedestrian or vehicular movement, CIRCULAR GREEN and CIRCULAR YELLOW signal indications in place of the GREEN ARROW and YELLOW ARROW signal indications for the turning movement that conflicts with the signalized pedestrian or vehicular movement.

Option:

If the lane-use regulations on an approach are variable such that at certain times all of the lanes on the approach are designated as exclusive turn lanes and no lane is designated as a shared left-turn/right-turn lane:

A. During the times that no lane is designated as a shared left-turn/right-turn lane, the left-turn and right-turn movements may start and terminate independently, and the left-turn and right-turn movements may be operated in one or more of the modes of operation as described in Sections 4D.17 through 4D.24; and
B. If a protected-permissive mode is used, the shared left-turn/right-turn signal face described in the Standard above may be modified to include a dual-arrow signal section capable of displaying both a GREEN ARROW signal indication and a flashing YELLOW ARROW signal indication for a turn movement(s) in order to not exceed the maximum of five sections per signal head specified in Section 4D.06.

Section ~~4D.10~~ 4D.26 Yellow Change and Red Clearance Intervals paragraphs have been relocated in this Section

Standard:

A steady added to increase accuracy yellow signal indication shall be displayed following every CIRCULAR GREEN or GREEN ARROW signal indication and following every flashing YELLOW ARROW or flashing RED ARROW signal indication displayed as a part of a steady mode operation.

The exclusive function of the yellow change interval shall be to warn traffic of an impending change in the right-of-way assignment.

A steady CIRCULAR YELLOW signal indication shall not be displayed to an approach from which drivers are turning left permissively unless one of the following conditions exists: relocated from Section 4D.05

A. A steady CIRCULAR YELLOW signal indication is also simultaneously being displayed to the opposing approach;
B. A separate left-turn signal face is provided and operated as described in Sections 4D.17 through 4D.20;
C. An engineering study has determined that, because of unique intersection conditions, the conditions described in items (a) and (b) above cannot reasonably be implemented without causing significant operational or safety problems and that the volume of impacted left-turning traffic is relatively low, and those left-turning drivers are advised that a steady CIRCULAR YELLOW signal indication is not simultaneously being displayed to the opposing traffic if this operation occurs continuously by the installation near the left-most signal head of a W25-1 sign (see Section 2C.50) with the legend ONCOMING TRAFFIC HAS EXTENDED GREEN; or
D. Drivers are advised of the operation if it occurs only occasionally, such as during a preemption sequence, by the installation near the left-most signal head of a W25-2 sign (see Section 2C.50) with the legend ONCOMING TRAFFIC MAY HAVE EXTENDED GREEN.

~~Option~~ Guidance:

When indicated by the application of engineering practices, the yellow change interval ~~may~~ should be followed by a red clearance interval to provide additional time before conflicting traffic movements, including pedestrians, are released.

Standard:

The duration of ~~a~~ the yellow change interval shall be ~~pre~~determined using engineering practices.

When used, **the duration of ~~a~~ the red clearance interval shall be ~~pre~~determined using engineering practices.**

Support:

Engineering practices for determining the duration of yellow change and red clearance intervals can be found in ITE's "Traffic Control Devices Handbook" and in ITE's "Manual of Traffic Signal Design" (see Section 1A.11).

Standard:

The durations of yellow change intervals and red clearance intervals shall be consistent with the determined values within the technical capabilities of the controller unit.

The duration of a yellow change interval shall not vary on a cycle-by-cycle basis within the same signal timing plan.

Except as described in the Option below for lagging left turns, the duration of a red clearance interval shall not be decreased or omitted on a cycle-by-cycle basis within the same signal timing plan.

Option:

When an actuated signal sequence includes a signal phase for permissive/protected (lagging) left-turn movements in both directions, the red clearance interval may be shown during those cycles when the lagging left-turn signal phase is skipped and may be omitted during those cycles when the lagging left-turn signal phase is shown.

The duration of a yellow change interval may be different in different signal timing plans for the same controller unit.

The duration of a red clearance interval may be different in different signal timing plans for the same controller unit.

Guidance:

A yellow change interval should not have a duration of ~~approximately~~ less than 3 ~~to~~ seconds or more than 6 seconds. The longer intervals should be reserved for use on approaches with higher speeds.

Except when clearing a one-lane, two-way facility (see Section 4H.02), a red clearance interval should have a duration not exceeding 6 seconds.

Standard:

Except for warning beacons mounted on advance warning signs on the approach to a signalized location (see Section 2C.35), signal displays that are intended to provide a "pre-yellow warning" interval, such as flashing green signal indications, vehicular countdown displays, or other similar displays, shall not be used at a signalized location.

Support:

The use of signal displays (other than warning beacons mounted on advance warning signs) that convey a "pre-yellow warning" have been found by research to increase the frequency of crashes.

Section ~~4D.13~~ 4D.27 Preemption and Priority Control of Traffic Control Signals

Option:

Traffic control signals may be designed and operated to respond to certain classes of approaching vehicles by altering the normal signal timing and phasing plan(s) during the approach and passage of those vehicles. The alternative plan(s) may be as simple as extending a currently displayed green interval or as complex as replacing the entire set of signal phases and timing.

Support:

Preemption control (see definition in Section 4A.02) is typically given to trains, boats, emergency vehicles, and light rail transit.

Examples of preemption control include the following:

A. The prompt displaying of green signal indications at signalized locations ahead of fire vehicles, law enforcement vehicles, ambulances, and other official emergency vehicles;
B. A special sequence of signal phases and timing to expedite and/or provide additional clearance time for vehicles to clear the tracks prior to the arrival of a train or transit vehicle; and

C. A special sequence of signal phases to display a steady added to increase accuracy red indication to prohibit turning movements towards the tracks during the approach or passage of a train or transit vehicle.

Priority control (see definition in Section 4A.02) is typically given to certain nonemergency vehicles such as buses and light-rail vehicles.

Examples of priority control include the following:

A. The displaying of early or extended green signal indications at an intersection to assist public transit vehicles in remaining on schedule, and
B. Special phasing to assist public transit vehicles in entering the travel stream ahead of the platoon of traffic.

Some types or classes of vehicles supersede others when a traffic control signal responds to more than one type or class. In general, a vehicle that is more difficult to control supersedes a vehicle that is easier to control. ~~Typically, the order of priority is: train, boat, heavy vehicle (fire vehicle, emergency medical service), light vehicle (law enforcement), light rail transit, rubber-tired transit.~~

Option:

Preemption or priority control of traffic control signals may also be a means of assigning priority right-of-way to specified classes of vehicles at certain nonintersection locations such as on approaches to one-lane bridges and tunnels, movable bridges, highway maintenance and construction activities, metered freeway entrance ramps, and transit operations.

Standard:

During the transition into preemption control:

A. The yellow change interval, and any red clearance interval that follows, shall not be shortened or omitted.
B. The shortening or omission of any pedestrian walk interval and/or pedestrian change interval shall be permitted.
C. The return to the previous steady green signal indication shall be permitted following a steady yellow signal indication in the same signal face, omitting the red clearance interval, if any.

During preemption control and during the transition out of preemption control:

A. The shortening or omission of any yellow change interval, and of any red clearance interval that follows, shall not be permitted.
B. A signal indication sequence from a steady yellow signal indication to a steady green signal indication shall not be permitted.

During priority control and during the transition into or out of priority control:

A. The shortening or omission of any yellow change interval, and of any red clearance interval that follows, shall not be permitted.
B. The shortening of any pedestrian walk interval below that time described in Section 4E.10 shall not be permitted.
C. The omission of a pedestrian walk interval and its associated change interval shall not be permitted unless the associated vehicular phase is also omitted or the pedestrian phase is exclusive.
D. The shortening or omission of any pedestrian change interval shall not be permitted.
E. A signal indication sequence from a steady yellow signal indication to a steady green signal indication shall not be permitted.

Guidance:

Except for traffic control signals interconnected with light rail transit systems, traffic control signals with railroad preemption or coordinated with flashing-light signal systems should be provided with a back-up power supply.

When a traffic control signal that is returning to a steady mode from a dark mode (typically upon restoration from a power failure) receives a preemption or priority request, care should be exercised to minimize the possibility of vehicles or pedestrians being misdirected into a conflict with the vehicle making the request.

Option:

During the change from a dark mode to a steady mode under a preemption or priority request, the display of signal indications that could misdirect road users may be prevented by one or more of the following methods:

A. Having the traffic control signal remain in the dark mode,
B. Having the traffic control signal remain in the flashing mode,
C. Altering the flashing mode,
D. Executing the normal start-up routine before responding, or
E. Responding directly to initial or dwell period.

Guidance:

If a traffic control signal is installed near or within a highway-rail~~road~~ grade crossing or if a highway-rail~~road~~ grade crossing with active traffic control devices is within or near a signalized highway intersection, Chapter 8C should be consulted.

Traffic control signals operating under preemption control or under priority control should be operated in a manner designed to keep traffic moving.

Traffic control signals that are designed to respond under preemption or priority control to more than one type or class of vehicle should be designed to respond in the relative order of importance or difficulty in stopping the type or class of vehicle. ~~Typically,~~ The order of priority ~~is~~ should be: train, boat, heavy vehicle (fire vehicle, emergency medical service), light vehicle (law enforcement), light rail transit, rubber-tired transit.

Option:

A distinctive indication may be provided at the intersection to show that an emergency vehicle has been given control of the traffic control signal (see Section 11-106 of the "Uniform Vehicle Code"). In order to assist in the understanding of the control of the traffic signal, a common distinctive indication may be used where drivers from different agencies travel through the same intersection when responding to emergencies.

If engineering judgment indicates that light rail transit signal indications would reduce road user confusion that might otherwise occur if standard traffic signal indications were used to control these movements, light rail transit signal indications complying with Section 10D.08 and as illustrated in Figure 10D-1 may be used for preemption or priority control of the following exclusive movements at signalized intersections:

A. Public transit buses in "queue jumper" lanes, and
B. Bus rapid transit in semiexclusive or mixed-use alignments.

Section 4D.28 Flashing Operation of Traffic Control Signals – General

Standard:

The light source of a flashing signal indication shall be flashed continuously at a rate of not less than 50 or more than 60 times per minute. relocated from Section 4D.11

The ~~illuminated~~ displayed period of each flash shall be not less than half and not more than two-thirds of the total flash cycle. relocated from Section 4D.11

Flashing signal indications shall comply with the requirements of other Sections of this Manual regarding ~~shielding~~ visibility-limiting or positioning of conflicting signal indications, except that flashing yellow signal indications for through traffic shall not be required to be ~~shielded~~ visibility-limited or positioned to ~~prevent~~ minimize visual conflict for road users in separately controlled turn lanes. relocated from Section 4D.11

Each traffic control signal shall be provided with an independent flasher mechanism that operates in compliance with this Section. relocated from Section 4D.12

The flashing operation shall not be terminated by removal or turn off of the controller unit or of the conflict monitor (malfunction management unit) or both. relocated from Section 4D.12

A manual switch, a conflict monitor (malfunction management unit) circuit, and, if appropriate, automatic means shall be provided to initiate the flashing mode. relocated from Section 4D.12

Option:

Based on engineering study or engineering judgment, traffic control signals may be operated in the flashing mode on a scheduled basis during one or more periods of the day rather than operated continuously in the steady (stop-and-go) mode.

Support:

Sections 4E.09 and 4E.10 contains information regarding the operation of accessible pedestrian signal detector pushbutton locator tones and pedestrian signal heads, respectively, during flashing operation. relocated from Section 4D.12

Section 4D.29 Flashing Operation – Transition Into Flashing Mode paragraphs relocated from Section 4D.12

Standard:

The transition from steady (stop-and-go) mode to flashing mode, if initiated by a conflict monitor (malfunction management unit) or by a manual switch, shall be permitted to be made at any time.

Programmed changes from steady (stop-and-go) mode to flashing mode shall be made under either of the following circumstances:

A. At the end of the common major-street red interval (such as just prior to the start of the green in both directions on the major street), or

B. Directly from a steady CIRCULAR GREEN ~~or GREEN ARROW~~ signal indication to a flashing CIRCULAR YELLOW ~~or YELLOW ARROW~~ signal indication, ~~respectively~~ or from a steady GREEN ARROW signal indication to a flashing YELLOW ARROW signal indication, or from a flashing YELLOW ARROW signal indication (see Sections 4D.17 to 4D.24) to a flashing YELLOW ARROW signal indication in a different signal section.

During programmed changes into flashing mode, no steady green signal indication or flashing yellow signal indication shall be terminated and immediately followed by a steady red or flashing red signal indication without first displaying the steady yellow signal indication.

Section 4D.30 Flashing Operation – Signal Indications During Flashing Mode

Guidance:

When a traffic control signal is operated in the flashing mode, a flashing yellow signal indication should be used for the major street and a flashing red signal indication should be used for the other approaches unless flashing red signal indications are used on all approaches. relocated from Section 4D.11

Standard:

~~When a traffic control signal is operated in the flashing mode:~~ relocated from Section 4D.12

When a traffic control signal is operated in the flashing mode, all of the green signal indications at the signalized location shall be dark (non-illuminated) and shall not be displayed in either a steady or flashing manner, except for single-section GREEN ARROW signal indications as noted elsewhere in this Section.

~~A.~~ Flashing yellow signal indications shall be used on more than one approach to a signalized location only if those approaches do not ~~be displayed for approaches with~~ conflict~~ing traffic movements with each other, except for permissive left-turn movements~~. relocated from Section 4D.12

~~B. At least~~ When a traffic control signal is operated in the flashing mode, one and only one signal indication in ~~each~~ every signal face ~~on an approach~~ at the signalized location shall be flashed. ~~except in the following circumstance:~~ No steady indications, other than a single-section signal face consisting of a continuously-~~illuminated~~ displayed GREEN ARROW signal ~~lens~~ indication that is used alone to indicate a continuous movement in the steady (stop-and-go) mode, shall be displayed at the signalized location during the flashing mode. A single-section GREEN ARROW signal indication shall remain continuously-~~illuminated~~ displayed when the traffic control signal is operated in the flashing mode. relocated from Section 4D.12

~~The following applications shall apply whenever a traffic control signal is operated in the flashing mode:~~ relocated from Section 4D.11

~~A. Each approach or protected only mode turn movement that is controlled during steady mode (stop-and-go) operation shall display a signal indication during flashing operation.~~ relocated from Section 4D.11

~~D.~~ If a signal face includes both circular and arrow signal ~~lenses~~ indications of the color that is to be flashed, only the circular signal indication shall be flashed. relocated from Section 4D.11

**~~B.~~ All signal faces that are flashed on an approach shall flash the same color, either yellow or red, except that separate left-turn signal faces, ~~for protected only mode turn movements~~ flashing yellow

arrow signal faces, and ~~separate~~ flashing red arrow signal faces (see Section 4D.17) for ~~protected/permissive~~ left-turn movements shall be permitted to flash a ~~CIRCULAR RED or~~ left-turn RED ARROW signal indication when the adjacent through movement signal indications are flashed yellow. Shared signal faces (see Section 4D.17) for ~~protected/permissive~~ left-turn movements shall not be permitted to flash a CIRCULAR RED signal indication when the adjacent through movement signal indications are flashed yellow. relocated from Section 4D.11

~~C.~~ The appropriate RED ARROW or YELLOW ARROW signal indication shall be flashed when a signal face consists entirely of arrow ~~lenses~~ indications. relocated from Section 4D.11 A signal face that consists entirely of arrow indications and that provides a protected only left-turn movement during the steady (stop-and-go) mode or that provides a flashing yellow arrow or flashing red arrow for a permissive left-turn movement during the steady (stop-and-go) mode shall be permitted to flash the YELLOW ARROW signal indication during the flashing mode if the adjacent through movement signal indications are flashed yellow and if it is intended that a permissive left-turn movement be provided during the flashing mode.

Section 4D.31 Flashing Operation – Transition Out of Flashing Mode paragraphs relocated from Section 4D.12

Standard:

All changes from flashing mode to steady (stop-and-go) mode shall be made under one of the following procedures:

A. Yellow-red flashing mode: Changes from flashing mode to steady (stop-and-go) mode shall be made at the beginning of the major-street green interval (when a green signal indication is ~~shown~~ displayed to through traffic in both directions on the major street), or if there is no common major-street green interval, at the beginning of the green interval for the major traffic movement on the major street.

B. Red-red flashing mode: Changes from flashing mode to steady (stop-and-go) mode shall be made by changing the flashing red indications to steady red indications followed by appropriate green indications to begin the steady mode cycle. These green indications shall be the beginning of the major-street green interval (when a green signal indication is ~~shown~~ displayed to through traffic in both directions on the major street) or if there is no common major-street green interval, at the beginning of the green interval for the major traffic movement on the major street.

Guidance:

The steady red clearance interval provided during the change from red-red flashing mode to steady (stop-and-go) mode should have a duration of 6 seconds.

When changing from the yellow-red flashing mode to steady (stop-and-go) mode, if there is no common major-street green interval, the provision of a steady red clearance interval for the other approaches before changing from a flashing yellow or a flashing red signal indication to a green signal indication on the major approach should be considered.

Standard:

During programmed changes out of flashing mode, no flashing yellow signal indication shall be terminated and immediately followed by a steady red or flashing red signal indication without first displaying the steady yellow signal indication. repeated in slightly edited form from new Section 4D.29

Option:

Because special midblock signals that rest in flashing yellow in the position normally occupied by the steady green indication do not have a green indication in the signal face, these signals may go directly from flashing yellow (in the position normally occupied by the steady green indication) to steady yellow directly above without going first to steady green.

Section ~~4D.20~~ 4D.32 Temporary and Portable Traffic Control Signals

Standard:

A temporary traffic control signal shall be defined as a traffic control signal that is installed for a limited time period.

A portable traffic control signal shall be defined as a temporary traffic control signal that is designed so that it can be easily transported and reused at different locations.

Support:

A temporary traffic control signal is generally installed using methods that minimize the costs of installation, relocation, and/or removal. Typical temporary traffic control signals are for specific purposes, such as for one-lane, two-way facilities in temporary traffic control zones (see Chapter 4H), for a haul-road intersection, or for access to a site that will have a permanent access point developed at another location in the near future.

Standard:

Advance signing shall be used when employing a temporary traffic control signal.

A temporary traffic control signal shall:

A. Meet the physical display and operational requirements of a conventional traffic control signal.
B. Be removed when no longer needed.
C. Be placed in the flashing mode when not being used if it will be operated in the steady mode within 5 working days; otherwise, it shall be removed.
D. Be placed in the flashing mode during periods when it is not desirable to operate the signal, or the signal heads shall be covered, turned, or taken down to indicate that the signal is not in operation.

Guidance:

A temporary traffic control signal should be used only if engineering judgment indicates that installing the signal will improve the overall safety and/or operation of the location.

The use of temporary traffic control signals by a work crew on a regular basis in their work area should be subject to the approval of the jurisdiction having authority over the roadway.

A temporary traffic control signal should not operate longer than 30 days unless associated with a longer-term temporary traffic control zone project.

For use of temporary traffic control signals in temporary traffic control zones, reference should be made to Section 6F.80.

Section ~~4D.19~~ 4D.33 Lateral ~~Placement~~ Offset of Signal Supports and Cabinets

Guidance:

The following items should be considered when placing signal supports and cabinets:

A. Reference should be made to the American Association of State Highway and Transportation Officials (AASHTO) "Roadside Design Guide" (see Section 1A.11) and to the "Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG)" (see Section 1A.11).
B. Signal supports should be placed as far as practical from the edge of the traveled way without adversely affecting the visibility of the signal indications.
C. Where supports cannot be located based on the recommended AASHTO clearances, consideration should be given to the use of appropriate safety devices.
D. No part of a concrete base for a signal support should extend more than 100 mm (4 in) above the ground level at any point. This limitation does not apply to the concrete base for a rigid support.
E. In order to minimize hindrance to the passage of persons with physical disabilities, a signal support or controller cabinet should not obstruct the sidewalk, or access from the sidewalk to the crosswalk.
F. Controller cabinets should be located as far as practical from the edge of the roadway.
G. On medians, the above minimum clearances for signal supports should be obtained if practical.

Section ~~4D.21~~ 4D.34 ~~Traffic Signal~~ Use of Signs~~,~~ at Signalized Locations ~~Auxiliary~~

Support:

Traffic signal signs are sometimes used at highway traffic signal locations to instruct or guide pedestrians, bicyclists, or motorists. Among the signs typically used at or on the approaches to signalized locations are turn prohibition signs (see Section 2B.18), lane control signs (see Sections 2B.19 to 2B.22), pedestrian crossing signs (see Section 2B.58), traffic signal signs (see Sections 2B.59 and 2C.50), street name signs (see Section 2D.45), and advance street name signs (see Section 2D.46).

Guidance:

Regulatory, warning, and guide signs should be used at traffic control signal locations as provided in Part 2 and as specifically described elsewhere in Part 4.

Traffic signal signs should be located adjacent to the signal face to which they apply.

On signalized approaches where lane drops, multiple-lane turns involving shared through-and-turn lanes, or other lane-use regulations that would be unexpected by unfamiliar road users are present, overhead lane control signs (see Sections 2B.19 to 2B.22) should be installed at the signalized location over the appropriate lanes or projections thereof and in advance of the intersection over the appropriate lanes. Where overhead mounting on the approach is impractical for the advance and/or intersection lane-use signs, post-mounted R3-8 series signs should be installed in prominent locations in advance of the intersection and oversized versions should be considered.

Standard:

If used, illuminated traffic signal signs shall be designed and mounted in such a manner as to avoid glare and reflections that seriously detract from the signal indications. Traffic control signal faces shall be given dominant position and brightness to maximize their priority in the overall display.

The minimum vertical and horizontal clearance of the total assembly of traffic signal signs (see Section 2B.59) shall ~~conform to~~ comply with the provisions of Sections 4D.15 and 4D.16.

STOP signs shall not be used in conjunction with any traffic control signal operation, except in either of the following cases: relocated from Section 4D.01

A. If the signal indication for an approach is a flashing red at all times, or
B. If a minor street or driveway is located within or adjacent to the area controlled by the traffic control signal, but does not require separate traffic signal control because an extremely low potential for conflict exists.

Section 4D.35 Use of Pavement Markings at Signalized Locations paragraphs relocated from Section 4D.01

Support:

Pavement markings (see Part 3) that clearly communicate the operational plan of an intersection to road users play an important role in the effective operation of traffic control signals. By designating the number of lanes, the use of each lane, the length of additional lanes on the approach to an intersection, and the proper stopping points, the engineer can design the signal phasing and timing to best match the goals of the operational plan.

Guidance:

Pavement markings should be used at traffic control signal locations as provided in Part 3. If the road surface will not retain pavement markings, signs should be installed to provide the needed road user information.

~~Section 4D.08 Prohibited Steady Signal Indications~~ **all paragraphs relocated to Section 4D.10**

~~Section 4D.09 Unexpected Conflicts During Green or Yellow Intervals~~ **all paragraphs relocated to Section 4D.10**

~~Section 4D.11 Application of Flashing Signal Indications~~ **paragraphs relocated to Sections 4D.28 and 4D.30**

~~Section 4D.12 Flashing Operation of Traffic Control Signals~~ **paragraphs relocated to Sections 4D.28 to 4D.31**

~~Section 4D.14 Coordination of Traffic Control Signals~~ **all three paragraphs relocated to Section 4D.01**

~~Section 4D.15 Size, Number, and Location of Signal Faces by Approach~~ **paragraphs relocated to Sections 4D.05, 4D.10, 4D.11, 4D.12, 4D.13, 4D.14, and 4D.15**

~~Support:~~

~~Sections 4D.05, and 4D.16 through 4D.18 contain additional information regarding the design of signal faces.~~

~~Section 4D.16 Number and Arrangement of Signal Sections in Vehicular Traffic Control Signal Faces~~ **paragraphs relocated to Sections 4D.04, 4D.06, 4D.07, and 4D.08**

~~Section 4D.17 Visibility, Shielding, and Positioning of Signal Faces~~ **paragraphs relocated to Sections 4D.12, 4D.15, and 4D.16**

CHAPTER 4E. PEDESTRIAN CONTROL FEATURES

Section 4E.01 Pedestrian Signal Heads

Support:

Pedestrian signal heads provide special types of traffic signal indications exclusively intended for controlling pedestrian traffic. These signal indications consist of the illuminated symbols of a WALKING PERSON (symbolizing WALK) and an UPRAISED HAND (symbolizing DONT WALK).

Guidance:

Engineering judgment should determine the need for separate pedestrian signal heads (see Section 4D.03) and accessible pedestrian signals (see Section 4E.06).

Support:

Chapter 4F contains information regarding the use of pedestrian hybrid signals and Chapter 4N contains information regarding the use of In-Roadway Warning Lights at unsignalized marked crosswalks. added to remind the reader of other less restrictive alternatives to traditional pedestrian signals

Section 4E.02 Meaning of Pedestrian Signal Head Indications

Standard:

Pedestrian signal head indications shall have the following meanings:

- **A. A steady WALKING PERSON (symbolizing WALK) signal indication means that a pedestrian facing the signal indication is permitted to start to cross the roadway in the direction of the signal indication, possibly in conflict with turning vehicles. The pedestrian shall yield the right-of-way to vehicles lawfully within the intersection at the time that the WALKING PERSON (symbolizing WALK) signal indication is first shown.**
- **B. A flashing UPRAISED HAND (symbolizing DONT WALK) signal indication means that a pedestrian shall not start to cross the roadway in the direction of the signal indication, but that any pedestrian who has already started to cross on a steady WALKING PERSON (symbolizing WALK) signal indication shall proceed ~~out~~ to the far side of the traveled way of the street or highway, unless otherwise directed by signs or signals to proceed only to the median of a divided highway or only to some other island or pedestrian refuge area. If a countdown pedestrian signal indication is also shown, pedestrians shall be permitted to leave the curb if they are able to travel to the far side of the traveled way or to a median by the time a conflicting vehicular movement is allowed to proceed.**
- **C. A steady UPRAISED HAND (symbolizing DONT WALK) signal indication means that a pedestrian shall not enter the roadway in the direction of the signal indication.**
- **D. A flashing WALKING PERSON (symbolizing WALK) signal indication has no meaning and shall not be used.**

Section 4E.03 Application of Pedestrian Signal Heads

Standard:

Pedestrian signal heads shall be used in conjunction with vehicular traffic control signals under any of the following conditions:

- **A. If a traffic control signal is justified by an engineering study and meets either Warrant 4, Pedestrian Volume or Warrant 5, School Crossing (see Chapter 4C);**
- **B. If an exclusive signal phase is provided or made available for pedestrian movements in one or more directions, with all conflicting vehicular movements being stopped;**
- **C. At an established school crossing at any signalized location; or**
- **D. Where engineering judgment determines that multiphase signal indications (as with split-phase timing) would tend to confuse or cause conflicts with pedestrians using a crosswalk guided only by vehicular signal indications.**

Guidance:

Pedestrian signal heads should be used under any of the following conditions:

- A. If it is necessary to assist pedestrians in ~~making a reasonably safe crossing~~ deciding when to begin crossing the roadway in the chosen direction or if engineering judgment determines that pedestrian signal heads are justified to minimize vehicle-pedestrian conflicts;

B. If pedestrians are permitted to cross a portion of a street, such as to or from a median of sufficient width for pedestrians to wait, during a particular interval but are not permitted to cross the remainder of the street during any part of the same interval; and/or

C. If no vehicular signal indications are visible to pedestrians, or if the vehicular signal indications that are visible to pedestrians starting ~~or continuing~~ a crossing provide insufficient guidance for them to decide when ~~it is reasonably safe~~ to ~~cross~~ begin crossing the roadway in the chosen direction, such as on one-way streets, at T-intersections, or at multiphase signal operations.

Standard:

When the pedestrian signal heads associated with a crosswalk are displaying either a steady WALKING PERSON (symbolizing WALK) or a flashing UPRAISED HAND (symbolizing DONT WALK) signal indication, a steady or a flashing red signal indication shall be shown to any conflicting vehicular movement that is perpendicular or nearly perpendicular to the crosswalk.

Section 4E.04 Size, Design, and Illumination of Pedestrian Signal Head Indications

Standard:

All new pedestrian signal head indications shall be displayed within a rectangular background and shall consist of symbolized messages (see Figure 4E-1), except that existing pedestrian signal head indications with lettered or outline style symbol messages ~~may~~ shall be permitted to be retained for the remainder of their useful service life. The symbol designs that are set forth in the "Standard Highway Signs and Markings" book (see Section 1A.11) shall be used. Each pedestrian signal head indication shall be independently ~~illuminated~~ displayed and emit a single color.

If a two-section pedestrian signal head is used, the UPRAISED HAND (symbolizing DONT WALK) signal section shall be mounted directly above ~~or integral with~~ the WALKING PERSON (symbolizing WALK) signal section. If a one-section pedestrian signal head is used, the symbols shall be either overlaid upon each other or arranged side-by-side with the UPRAISED HAND symbol to the left of the WALKING PERSON symbol, and a light source that can display each symbol independently shall be used.

The WALKING PERSON (symbolizing WALK) signal indication shall be white, conforming to the publication entitled "Pedestrian Traffic Control Signal Indications" (see Section 1A.11), with all except the symbol obscured by an opaque material.

The UPRAISED HAND (symbolizing DONT WALK) signal indication shall be Portland orange, conforming to the publication entitled "Pedestrian Traffic Control Signal Indications" (see Section 1A.11), with all except the symbol obscured by an opaque material.

When not illuminated, the WALKING PERSON (symbolizing WALK) and UPRAISED HAND (symbolizing DONT WALK) symbols shall not be readily visible to pedestrians at the far end of the crosswalk that the pedestrian signal head indications control.

For pedestrian signal head indications, the symbols shall be at least 150 mm (6 in) high.

The light source of a flashing UPRAISED HAND (symbolizing DONT WALK) signal indication shall be flashed continuously at a rate of not less than 50 or more than 60 times per minute. The ~~illuminated~~ displayed period of each flash shall be not less than half and not more than two-thirds of the total flash cycle.

Guidance:

Pedestrian signal head indications should be conspicuous and recognizable to pedestrians at all distances from the beginning of the controlled crosswalk to a point 3 m (10 ft) from the end of the controlled crosswalk during both day and night.

For crosswalks where the pedestrian enters the crosswalk more than 30 m (100 ft) from the pedestrian signal head indications, the symbols should be at least 225 mm (9 in) high.

If the pedestrian signal indication is so bright as to cause excessive glare in nighttime conditions, some form of automatic dimming should be used to reduce the brilliance of the signal indication.

Option:

An animated eyes symbol may be added to a pedestrian signal head in order to prompt pedestrians to look for vehicles in the intersection during the time that the WALKING PERSON (symbolizing WALK) added to improve consistency signal indication is displayed.

Standard:

If used, the animated eyes symbol shall consist of an outline of a pair of white steadily-illuminated eyes with white eyeballs that scan from side to side at a rate of approximately once per second. The animated eyes symbol shall be at least 300 mm (12 in) wide with each eye having a width of at least 125 mm (5 in) and a height of at least 62 mm (2.5 in). The animated eyes symbol shall be illuminated at the start of the walk interval and shall terminate at the end of the walk interval.

Section 4E.05 Location and Height of Pedestrian Signal Heads

Standard:

Pedestrian signal heads shall be mounted with the bottom of the signal housing including brackets not less than 2.1 m (7 ft) or more than 3 m (10 ft) above sidewalk level, and shall be positioned and adjusted to provide maximum visibility at the beginning of the controlled crosswalk.

If pedestrian signal heads are mounted on the same support as vehicular signal heads, there shall be a physical separation between them.

Section 4E.06 Accessible Pedestrian Signals paragraphs have been relocated in this Section

Support:

The primary technique that pedestrians who have visual disabilities use to cross streets at signalized locations is to initiate their crossing when they hear the traffic in front of them stop and the traffic alongside them begin to move, ~~corresponding~~ which often corresponds to the onset of the green interval. ~~This technique is effective at many signalized locations.~~ The existing environment is often not sufficient to provide the information that pedestrians who have visual disabilities need to ~~operate reasonably safely~~ cross a roadway at a signalized location. ~~Therefore, many signalized locations will not require any accessible pedestrian signals.~~

Guidance:

If a particular signalized location presents difficulties for pedestrians who have visual disabilities to cross ~~reasonably safely and effectively~~ the roadway, an engineering study should be conducted that considers the ~~safety and effectiveness for~~ needs of pedestrians in general, as well as the information needs of pedestrians with visual disabilities. The ~~installation of accessible pedestrian signals at signalized locations should be based on an~~ engineering study~~, which~~ should consider the following factors:

A. Potential demand for accessible pedestrian signals;
B. A request for accessible pedestrian signals;
C. Traffic volumes during times when pedestrians might be present, including periods of low traffic volumes or high turn-on-red volumes;
D. The complexity of traffic signal phasing (such as split phases, protected turn phases, leading pedestrian intervals, and exclusive pedestrian phases); and
E. The complexity of intersection geometry.

Support:

The factors that ~~might~~ make crossing at a signalized location difficult for pedestrians who have visual disabilities include: increasingly quiet cars, right turn on red (which masks the beginning of the through phase), continuous right-turn movements, complex signal operations, traffic circles, and wide streets. Furthermore, low traffic volumes might make it difficult for pedestrians who have visual disabilities to discern signal phase changes.

Local organizations, providing support services to pedestrians who have visual and/or hearing disabilities, can often act as important advisors to the traffic engineer when consideration is being given to the installation of devices to assist such pedestrians. Additionally, orientation and mobility specialists or similar staff also might be able to provide a wide range of advice. The U.S. Access Board~~'s Document A-37, "Accessible Pedestrian Signals,"~~ (www.access-board.gov) provides various techniques for making pedestrian signal information available to persons with visual disabilities (see Page i for the address for the U.S. Access Board).

Accessible pedestrian signals provide information in nonvisual format (such as audible tones, ~~verbal~~ speech messages, and/or vibrating surfaces).

Information regarding detectors for accessible pedestrian signals is found in Section 4E.09.

Standard:

When used, accessible pedestrian signals shall be used in combination with pedestrian signal timing. The information provided by an accessible pedestrian signal shall clearly indicate which pedestrian crossing is served by each device.

Under stop-and-go operation, accessible pedestrian signals shall not be limited in operation by the time of day or day of week.

Support:

Accessible pedestrian signals that are located as close as possible to pedestrians waiting to cross the street provide the clearest and least ambiguous indication of which pedestrian crossing is served by a device. Technology that provides different sounds for each nonconcurrent signal phase has frequently been found to provide ambiguous information.

Research indicates that a rapid tick tone for each crossing on separated poles located close to each crosswalk provides unambiguous information to pedestrians who are blind or visually impaired. Vibrotactile indications provide information to pedestrians who are blind and deaf and are also used by pedestrians who are blind or who have low vision to confirm the walk signal in noisy situations.

Standard:

~~**When choosing audible tones, possible extraneous sources of sounds (such as wind, rain, vehicle back-up warnings, or birds) shall be considered in order to eliminate potential confusion to pedestrians who have visual disabilities.**~~

Accessible pedestrian signals shall have both audible and vibrotactile walk indications.

~~**When**~~ **Accessible pedestrian signals shall have an audible ~~tone(s), they shall have a tone for~~ walk indication during the walk interval only. The audible tone(s) shall be audible from the beginning of the associated crosswalk. ~~If the tone for the walk interval is similar to the pushbutton locator tone, the walk interval tone shall have a faster repetition rate than the associated pushbutton locator tone.~~**

Accessible pedestrian signals shall not provide an audible pedestrian change interval indication.

Audible walk indications shall be a percussive tone. Audible tone walk indications shall repeat at 8 to 10 ticks per second. Audible tones used as walk indications shall consist of multiple frequencies with a dominant component at 880 Hz.

Vibrotactile walk indications shall be provided by a tactile arrow on the pushbutton that vibrates during the walk interval (see Section 4E.09).

Guidance:

The sound level of audible pedestrian ~~tones~~ indications should be ~~carefully selected~~ adjusted to be low enough to avoid misleading pedestrians who have visual disabilities when the following conditions exist:

A. Where there is an island that allows unsignalized right turns across a crosswalk between the island and the sidewalk.
B. Where multileg approaches or complex signal phasing require more than two pedestrian phases, such that it might be unclear which crosswalk is served by each audible tone.
C. At intersections where a diagonal pedestrian crossing is allowed, or where one street receives a WALKING PERSON (symbolizing WALK) signal indication simultaneously with another street.

Support:

A pushbutton locator tone is a repeating sound that informs approaching pedestrians that ~~they are required to push a button~~ a pushbutton to actuate pedestrian timing or receive additional information exists, and that enables ~~visually impaired~~ pedestrians who have visual disabilities to locate the pushbutton (see Section 4E.09).

~~**Guidance**~~ **Standard:**

~~**The accessible walk signal**~~ **Tone~~s~~ ~~should~~ shall be set to be no more than 5 dBA louder than ~~the locator tone,~~ ambient sound except when ~~there is optional activation to provide~~ a louder signal ~~tone for a single pedestrian phase~~ is provided in response to an extended button press. Automatic volume adjustment in response to ambient traffic sound level ~~should~~ shall be provided up to a maximum volume of ~~80~~ 100 dBA. ~~Where automatic volume adjustment is used, tones should be no more than 5 dBA louder than ambient sound. The A-weighted sound pressure level should conform to the requirements of "ISO 1996-1:1982" and "ISO 1996-2:1987" (see Page i for the address for the International Organization for Standards).~~**

The accessible walk signal shall have the same duration as the pedestrian walk signal except when the pedestrian signal rests in walk.

Guidance:

If the pedestrian signal rests in walk, the accessible walk signal should be limited to the first 7 seconds of the walk interval. The accessible walk signal should be recalled by a button press during the walk interval provided that the crossing time remaining is greater than the pedestrian change interval.

Option:

An alert tone, which is a very brief burst of high-frequency sound at the beginning of the audible walk indication that rapidly decays to the frequency of the walk tone, may be used to alert pedestrians to the beginning of the walk interval. An alert tone may be particularly useful if the walk tone is not easily audible in some traffic conditions.

Support:

Speech messages communicate to pedestrians which street has the walk interval. Speech messages might be either directly audible or transmitted, requiring a personal receiver to hear the message. To be a useful system, the words and their meaning must be correctly understood by all users in the context of the street environment where they are used. Because of this, tones are the preferred means of providing audible walk indications.

If speech messages are used, pedestrians have to know the names of the streets that they are crossing in order for the speech walk messages to be unambiguous. In getting directions to travel to a new location, pedestrians who are blind do not always get the name of each street to be crossed. Therefore, it is desirable to give users of accessible pedestrian signals the name of the street controlled by the pushbutton. This can be done by means of a speech pushbutton information message during the flashing or steady don't walk intervals, or by raised print and Braille labels on the pushbutton housing.

By combining the information from the pushbutton message or Braille label, the tactile arrow aligned in the direction of travel on the relevant crosswalk, and the speech walk message, pedestrians with visual disabilities are able to correctly respond to speech walk messages even if there are two pushbuttons on the same pole.

Standard:

~~When verbal~~ If speech messages are used to communicate the pedestrian interval, they shall provide a clear message that the walk interval is in effect, as well as to which crossing it applies. Speech walk messages shall be used only at intersections where it is technically infeasible to install two accessible pedestrian signals at one corner separated by a distance of at least 3 m (10 ft).

~~The verbal message that is provided at regular intervals throughout the timing of the walk interval shall be the term "walk sign," which may be followed by the name of the street to be crossed.~~

Speech messages that are used at intersections having pedestrian phasing that is concurrent with vehicular phasing shall be patterned after the model: "Broadway. Walk sign is on to cross Broadway."

Speech messages that are used at intersections having exclusive pedestrian phasing shall be patterned after the model: "Walk sign is on for all crossings."

Walk interval messages shall not contain any additional information, except they shall include designations such as "Street" or "Avenue" where this information is necessary to avoid ambiguity at a particular location.

Guidance:

Speech messages should not state or imply a command to the pedestrian, such as "Cross Broadway now." Speech messages should not tell pedestrians that it is "safe to cross," because it is always the pedestrian's responsibility to check actual traffic conditions.

Standard:

A ~~verbal~~ speech message is not required at times when the walk interval is not timing, but, if provided:

A. It shall ~~be~~ begin with the term "wait."
B. It need not be repeated for the entire time that the walk interval is not timing.

Support:

Section 4E.09 contains additional information regarding speech pushbutton information messages when the walk interval is not timing.

Option:

Accessible pedestrian signals that provide ~~verbal~~ speech messages may provide similar messages in languages other than English, if needed, except for the terms "walk sign" and "wait."

~~Support:~~

~~A vibrotactile pedestrian device communicates information about pedestrian timing through a vibrating surface by touch.~~

~~**Standard:**~~

~~**Vibrotactile pedestrian devices, where used, shall indicate that the walk interval is in effect, and for which direction it applies, through the use of a vibrating directional arrow or some other means.**~~

~~Guidance:~~

~~When provided, vibrotactile pedestrian devices should be located next to, and on the same pole as, the pedestrian pushbutton, if any, and adjacent to the intended crosswalk.~~

Pedestrians may be provided with additional features such as increased crossing time, audible beaconing, or a pushbutton information message as a result of an extended pushbutton press.

Standard:

If an extended pushbutton press is used to provide any additional feature(s), a pushbutton press of less than one second shall actuate only the pedestrian timing and any associated accessible walk signal, and a pushbutton press of one second or more shall actuate the pedestrian timing, any associated accessible walk signal, and any additional feature(s).

Support:

Audible beaconing is the use of an audible signal in such a way that blind pedestrians can home in on the signal from the target corner as they cross the street.

Not all crosswalks at an intersection need audible beaconing; audible beaconing can actually cause confusion if used at all crosswalks at some intersections. Audible beaconing is not appropriate at locations with channelized turns or split phasing, because of the possibility of confusion.

Guidance:

Audible beaconing should only be considered following an engineering study at:

A. Crosswalks longer than 21 m (70 ft), unless they are divided by a median that has another accessible pedestrian signal with a locator tone;
B. Crosswalks that are skewed;
C. Intersections with irregular geometry, such as multiple legs;
D. Crosswalks where audible beaconing is requested by an individual with visual disabilities; or
E. Other locations where a study indicates audible beaconing would be beneficial.

Option:

Audible beaconing may be provided in several ways, any of which are initiated by an extended pushbutton press.

Standard:

If audible beaconing is used, the volume of the locator tone during the pedestrian change interval of the called pedestrian phase shall be increased and operated in one of the following ways:

A. The louder audible walk indication and louder locator tone comes from the target corner, as pedestrians cross the street,
B. The louder locator tone comes from both ends of the crosswalk, or
C. The louder locator tone comes from an additional speaker that is aimed at the center of the crosswalk and that is mounted on a pedestrian signal head.

Section 4E.07 Countdown Pedestrian Signals

~~**Option**~~ **Standard:**

Except at crosswalks that are so short that the duration of the pedestrian change interval is 3 seconds or less, all new pedestrian signal heads shall include a pedestrian change interval countdown display ~~may be added to a pedestrian signal head~~ in order to inform pedestrians of the number of seconds remaining in the pedestrian change interval. A pedestrian change interval countdown display shall be added to all existing pedestrian signal heads, except those being used for crosswalks that are so short that the duration of the pedestrian change interval is 3 seconds or less, within the 10-year compliance period specified in the Introduction of this Manual.

~~**Standard:**~~

~~If used,~~ Countdown pedestrian signals shall consist of Portland orange numbers that are at least 150 mm (6 in) in height on a black opaque background. The countdown pedestrian signal shall be located immediately adjacent to the associated UPRAISED HAND (symbolizing DONT WALK) pedestrian signal head indication.

~~If used,~~ The display of the number of remaining seconds shall begin only at the beginning of the pedestrian change interval (flashing UPRAISED HAND). added to improve clarity After the countdown displays zero, the display shall remain dark until the beginning of the next countdown.

~~If used,~~ The countdown pedestrian signal shall display the number of seconds remaining until the termination of the pedestrian change interval (flashing UPRAISED HAND). added to improve clarity Countdown displays shall not be used during the walk interval or during the yellow change interval of a concurrent vehicular phase.

Guidance:

If used with a pedestrian signal head that does not have a concurrent vehicular phase, the pedestrian change interval (flashing UPRAISED HAND) should be set to be approximately 4 seconds less than the required pedestrian crossing time (see Section 4E.10) and an additional clearance interval (during which a steady UPRAISED HAND is displayed) should be provided prior to the start of the conflicting vehicular phase. In this case, the countdown pedestrian signal should display ~~of~~ the number of remaining seconds ~~should be displayed~~ only during the display of the flashing UPRAISED HAND, should display zero at the time when the flashing UPRAISED HAND changes to a steady UPRAISED HAND, and should be dark during the additional clearance interval prior to the start of a conflicting vehicular phase.

Standard:

If a concurrent vehicular green indication continues to be displayed after the display of the flashing UPRAISED HAND has terminated, such as when an actuated phase has a maximum green interval that is longer than the pedestrian crossing time or when the duration of the green interval for a parallel concurrent vehicular movement has been intentionally set higher than the pedestrian clearance time to provide turning drivers additional green time to make their turns (see Section 4E.10), the countdown pedestrian signal shall be dark during the additional green time.

Guidance:

For crosswalks where the pedestrian enters the crosswalk more than 30 m (100 ft) from the countdown pedestrian signal display, the numbers should be at least 225 mm (9 in) in height.

Because some technology includes the countdown pedestrian signal logic in a separate timing device that is independent of the timing in the traffic signal controller, care should be exercised by the engineer when timing changes are made to pedestrian change intervals.

If the pedestrian change interval is interrupted or shortened as a part of a transition into a preemption sequence (see Section 4E.10), the countdown pedestrian signal display should be discontinued and go dark immediately upon activation of the preemption transition.

Section 4E.08 Pedestrian Detectors paragraphs have been relocated in this Section

Option:

Pedestrian detectors may be pushbuttons or passive detection devices.

Support:

The provisions in this Section place pedestrian pushbuttons within easy reach of pedestrians who are intending to cross each crosswalk and make it obvious which pushbutton is associated with each crosswalk. These provisions also position pushbutton poles in optimal locations for installation of accessible pedestrian signals. Information regarding reach ranges can be found in the "Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG)" (see Section 1A.11).

~~Guidance~~ **Standard:**

~~When~~ If pedestrian ~~actuation~~ pushbuttons ~~is~~ are used, ~~pedestrian pushbutton detectors~~ they ~~should~~ shall be capable of easy activation and conveniently located near each end of the crosswalks. Except as noted in the Guidance below, pedestrian pushbuttons shall be located to meet all of the following criteria (see Figure 4E-2):

A. Unobstructed and adjacent to a level all-weather surface to provide access from a wheelchair;

B. Where there is an all-weather surface, a wheelchair accessible route from the pushbutton to the ramp;

C. **Between the edge of the crosswalk line (extended) farthest from the center of the intersection and the side of a curb ramp (if present), but not greater than 1.5 m (5 ft) from said crosswalk line;**

D. **Between 0.45 m (1.5 ft) and 1.8 m (6 ft) from the edge of the curb, shoulder, or pavement;**

E. **With the face of the pushbutton parallel to the crosswalk to be used; and**

F. **At a maximum mounting height of 1.2 m (4 ft) above the sidewalk.**

Guidance:

Where there are constraints that make it impractical to place the pedestrian pushbutton adjacent to a level all-weather surface, the surface should be as level as feasible.

Where there are constraints that make it impractical to place the pedestrian pushbutton between 0.45 m (1.5 ft) and 1.8 m (6 ft) from the edge of the curb, shoulder, or pavement, it should not be farther than 3 m (10 ft) from the edge of curb, shoulder, or pavement.

A mounting height of approximately 1.1 m (3.5 ft) above the sidewalk should be used for pedestrian pushbuttons ~~detectors~~.

Except as noted in the Option below, where two pedestrian pushbuttons are provided on the same corner of a signalized location, the pushbuttons should be separated by a distance of at least 3 m (10 ft) (see Figure 4E-2).

Option:

Where there are constraints on a particular corner that make it impractical to provide the 3 m (10 ft) separation between the two pedestrian pushbuttons, the pushbuttons may be placed closer together or on the same pole.

Support:

Figure 4E-3 shows typical pushbutton locations for a variety of situations.

Standard:

If two accessible pedestrian pushbuttons are placed on the same pole, the accessible pedestrian pushbuttons shall be provided with the features described in Section 4E.09 for this situation.

Signs (see Section 2B.59) shall be mounted adjacent to or integral with pedestrian pushbuttons ~~detectors~~, explaining their purpose and use.

Option:

At certain locations, a supplemental sign in a more visible location may be used to call attention to the pedestrian ~~detector~~ pushbutton.

~~Guidance~~ **Standard:**

~~**If two crosswalks, oriented in different directions, end at or near the same location,**~~ **The positioning of pedestrian ~~detectors~~ pushbuttons and~~/or~~ the legends on the pedestrian ~~detector~~ pushbutton signs ~~should~~ shall clearly indicate which crosswalk signal is actuated by each pedestrian ~~detector~~ pushbutton.**

~~**Standard:**~~

If the pedestrian clearance time is sufficient only to cross from the curb or shoulder to a median of sufficient width for pedestrians to wait and the signals are pedestrian actuated, an additional pedestrian detector shall be provided in the median.

Guidance:

The use of additional pedestrian detectors on islands or medians where a pedestrian might become stranded should be considered.

If used, special purpose pushbuttons (to be operated only by authorized persons) should include a housing capable of being locked to prevent access by the general public and do not need an instructional sign.

Standard:

If used, a pilot light or other means of indication installed with a pedestrian pushbutton shall not be illuminated until actuation. Once it is actuated, ~~it~~ the pilot light shall remain illuminated until the pedestrian's green or WALKING PERSON (symbolizing WALK) signal indication is displayed.

If a pilot light is used at an accessible pedestrian signal location, each actuation shall be accompanied by the speech message "wait."

Option:

At signalized locations with a demonstrated need and subject to equipment capabilities, pedestrians with special needs may be provided with additional crossing time by means of an extended pushbutton press.

Standard:

If additional crossing time is provided by means of an extended pushbutton press, a FOR MORE CROSSING TIME: HOLD BUTTON DOWN FOR 2 SECONDS (R10-32P) plaque (see Figure 2B-29) shall be mounted adjacent to or integral with the pedestrian pushbutton.

Section 4E.09 Accessible Pedestrian Signal Detectors paragraphs have been relocated in this Section

Standard:

An accessible pedestrian signal detector shall be defined as a device designated to assist the pedestrian who has visual or physical disabilities in activating the pedestrian phase.

Option:

Accessible pedestrian signal detectors may be pushbuttons or passive detection devices.

Standard:

At accessible pedestrian signal locations ~~with~~ where pedestrian ~~actuation~~ pushbuttons are used, each pushbutton shall activate both the walk interval and the accessible pedestrian signals.

An accessible pedestrian **pushbutton shall incorporate a locator tone~~s may be used with accessible pedestrian signals~~.**

~~When used,~~ **Pushbutton locator tones shall ~~be easily locatable, shall~~ have a duration of 0.15 seconds or less~~,~~ and shall repeat at 1-second intervals.**

~~Pushbuttons should be audibly locatable.~~ **Pushbutton locator tones ~~should~~ shall be intensity responsive to ambient sound, and be audible 1.8 to 3.7 m (6 to 12 ft) from the pushbutton, or to the building line, whichever is less. Pushbutton locator tones ~~should~~ shall be no more than 5 dBA louder than ambient sound.**

Pushbutton locator tones ~~should~~ shall be deactivated ~~during flashing operation of~~ when the traffic control signal is operating in a flashing mode.

~~Guidance:~~

To enable pedestrians who have visual disabilities to distinguish and locate the appropriate pushbutton at an **accessible pedestrian signal location~~s~~, pushbuttons ~~should~~ shall clearly indicate by means of tactile arrows which crosswalk signal is actuated by each pushbutton. ~~Pushbuttons and~~ Tactile arrows ~~should~~ shall be located on the pushbutton, have high visual contrast ~~as described in the "Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG)" (see Section 1A.11)~~ (light on dark or dark on light), and shall be aligned parallel to the~~. Tactile arrows should point in the same~~ direction ~~as~~ of travel on the associated crosswalk.**

Guidance:

Pushbuttons for accessible pedestrian signals should be located ~~(see Figure 4E-2)~~ as ~~follows:~~ close as possible to the crosswalk line furthest from the center of the intersection and as close as possible to the curb ramp.

~~A. Adjacent to a level all-weather surface to provide access from a wheelchair, and where there is an all-weather surface, wheelchair accessible route to the ramp;~~

~~B. Within 1.5 m (5 ft) of the crosswalk extended;~~

~~C. Within 3 m (10 ft) of the edge of the curb, shoulder, or pavement; and~~

~~D. Parallel to the crosswalk to be used.~~

~~At corners of signalized locations with accessible pedestrian signals~~ Except as noted in the Option below, where two accessible pedestrian pushbuttons are provided, the pushbuttons should be separated by a distance of at least 3 m (10 ft) such that they clearly indicate which crosswalk has the WALKING PERSON (symbolizing WALK) indication. ~~This enables pedestrians who have visual disabilities to distinguish and locate the appropriate pushbutton.~~

Option:

Where there are constraints on a particular corner that make it impractical to provide the 3 m (10 ft) of separation between the two accessible pedestrian pushbuttons, the pushbuttons may be placed closer together or on the same pole.

Standard:

If two accessible pedestrian pushbuttons are placed on the same pole, each accessible pedestrian pushbutton shall be provided with the following features:

A. A pushbutton locator tone,
B. A tactile arrow,
C. A speech walk message for the WALKING PERSON (symbolizing WALK) indication (see Section 4E.06), and
D. A speech pushbutton information message.

If the pedestrian clearance time is sufficient only to cross from the curb or shoulder to a median of sufficient width for pedestrians to wait and accessible pedestrian detectors are used, an additional accessible pedestrian detector ~~should~~ shall be provided in the median.

Option:

At locations with pretimed traffic control signals or nonactuated approaches, pedestrian pushbuttons may be used to activate the accessible pedestrian signals.

~~The audible tone(s) may be made louder (up to a maximum of 89 dBA) by holding down the pushbutton for a minimum of 3 seconds. The louder audible tone(s) may also alternate back and forth across the crosswalk, thus providing optimal directional information.~~

Additional features may be provided for pedestrians such as additional crossing time, audible beaconing, or a speech pushbutton information message as a result of an extended pushbutton press.

Standard:

If an extended pushbutton press is used to provide any additional feature(s), a pushbutton press of less than one second shall actuate only the pedestrian timing and any associated accessible walk interval, and a pushbutton press of one second or more shall actuate the pedestrian timing, any associated accessible walk interval, and any additional feature(s).

If additional crossing time is provided by means of an extended pushbutton press, a FOR MORE CROSSING TIME: HOLD BUTTON DOWN FOR 2 SECONDS (R10-32P) plaque (see Figure 2B-29) shall be mounted adjacent to or integral with the pedestrian pushbutton.

Option:

The name of the street to be crossed may also be provided in accessible format, such as Braille or raised print.

Support:

Specifications regarding the use of Braille or raised print for traffic control devices can be found in the "Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG)" (see Section 1A.11).

Option:

Tactile maps of crosswalks may be provided.

Speech pushbutton information messages may be made available by actuating the accessible pedestrian signal detector when the walk interval is not timing. These messages may provide intersection identification, as well as information about unusual intersection signalization and geometry, such as notification regarding exclusive pedestrian phasing, leading pedestrian intervals, split phasing, diagonal crosswalks, and medians or islands.

Standard:

If speech pushbutton information messages are made available by actuating the accessible pedestrian signal detector, they shall only be actuated when the walk interval is not timing. They shall begin with the term "Wait," followed by intersection identification information modeled after: "Wait to cross Broadway at Grand." If information on intersection signalization or geometry is also given, it shall follow the intersection identification information.

Guidance:

Speech pushbutton information messages should not be used to provide landmark information or to inform pedestrians with visual impairments about detours or temporary traffic control situations.

Support:

Additional information on structure and wording of pushbutton messages is included in ITE's "Electronic Toolbox for Making Intersections More Accessible for Pedestrians Who Are Blind or Visually Impaired," which is available at ITE's website (see Page i).

Section 4E.10 Pedestrian Intervals and Signal Phases paragraphs have been relocated in this Section

Standard:

At intersections equipped with pedestrian signal heads, the pedestrian signal indications shall be displayed except when the vehicular traffic control signal is being operated in the flashing mode. At those times, the pedestrian signal ~~lenses~~ indications shall not be ~~illuminated~~ displayed.

When pedestrian signal heads are used, a WALKING PERSON (symbolizing WALK) signal indication shall be displayed only when pedestrians are permitted to leave the curb or shoulder.

A pedestrian clearance time shall begin immediately following the WALKING PERSON (symbolizing WALK) signal indication. The first portion of the pedestrian clearance time shall consist of a pedestrian change interval during which a flashing UPRAISED HAND (symbolizing DONT WALK) signal indication shall be displayed. The ~~remaining portions~~ second portion, if used, shall consist of the yellow change interval ~~and any red clearance interval (prior to a conflicting green being displayed),~~ during which a ~~flashing or~~ steady UPRAISED HAND (symbolizing DONT WALK) signal indication shall be displayed. The third portion, if used, shall consist of the red clearance interval (prior to a conflicting green being displayed), during which a steady UPRAISED HAND (symbolizing DONT WALK) signal indication shall be displayed.

~~**If countdown pedestrian signals are used, a steady UPRAISED HAND (symbolizing DONT WALK) signal indication shall be displayed during the yellow change interval and any red clearance interval (prior to a conflicting green being displayed) (see Section 4E.07).**~~

Option:

The pedestrian clearance time may be:

A. Entirely contained within the vehicular green interval, such that the yellow change and red clearance intervals provide pedestrians with crossing time in addition to that calculated for the pedestrian clearance time;

B. ~~or may be~~ Entirely contained within the vehicular green and yellow change intervals, such that the red clearance interval provides pedestrians with crossing time in addition to that calculated for the pedestrian clearance time; or

C. Entirely contained within the vehicular green, yellow change, and red clearance intervals.

Guidance:

Except as noted in the Option immediately below, the pedestrian clearance time should be sufficient to allow a pedestrian crossing in the crosswalk who left the curb or shoulder ~~during~~ at the end of the WALKING PERSON (symbolizing WALK) signal indication to travel at a walking speed of ~~1.2~~ 1.1 m (~~4~~ 3.5 ft) per second to at least the far side of the traveled way or to a median of sufficient width for pedestrians to wait.

Option:

~~Passive pedestrian detection equipment, which can detect pedestrians who need more time to complete their crossing and can extend the length of the pedestrian clearance time for that particular cycle, may be used in order to avoid using a lower walking speed to determine the pedestrian clearance time.~~

A walking speed of up to 1.2 m (4 ft) per second may be used to evaluate the sufficiency of the pedestrian clearance time at locations where equipment such as an extended pushbutton press or passive pedestrian detection has been installed to provide slower pedestrians an opportunity to request and receive a longer pedestrian clearance time.

Guidance:

Where pedestrians who walk slower than ~~1.2~~ 1.1 m (~~4~~ 3.5 ft) per second, or pedestrians who use wheelchairs, routinely use the crosswalk, a walking speed of less than ~~1.2~~ 1.1 m (~~4~~ 3.5 ft) per second should be considered in determining the pedestrian clearance time.

Except as noted in the Option below, the walk interval should be at least 7 seconds in length so that pedestrians will have adequate opportunity to leave the curb or shoulder before the pedestrian clearance time begins.

Option:

If pedestrian volumes and characteristics do not require a 7-second walk interval, walk intervals as short as 4 seconds may be used.

Support:

The walk interval ~~itself need not equal or exceed the pedestrian clearance time calculated for the roadway width, because many pedestrians will complete their crossing during the pedestrian clearance time~~ is usually shorter than the pedestrian clearance time calculated for the roadway width, because the walk interval is intended only for pedestrians to start their crossing. The pedestrian clearance time is intended to allow pedestrians who started crossing during the walk interval to complete their crossing. Longer walk intervals are often used when the duration of the vehicular green phase associated with the pedestrian crossing is long enough to allow it.

Guidance:

The total of the walk interval and pedestrian clearance time should be sufficient to allow a pedestrian crossing in the crosswalk who left the pedestrian detector (or, if no pedestrian detector is present, a location 1.8 m (6 ft) from the face of the curb or from the edge of the pavement) at the beginning of the WALKING PERSON (symbolizing WALK) signal indication to travel at a walking speed of 0.9 m (3 ft) per second to the far side of the traveled way being crossed. Any additional time that is required to satisfy the conditions of this paragraph should be added to the walk interval.

Option:

On a street with a median of sufficient width for pedestrians to wait, a pedestrian clearance time that allows the pedestrian to cross only from the curb or shoulder to the median may be provided.

~~**Guidance**~~ **Standard:**

Where the pedestrian clearance time is sufficient only for crossing from the curb or shoulder to a median of sufficient width for pedestrians to wait, ~~additional measures should be considered, such as~~ median-mounted pedestrian signals (with pedestrian detectors if actuated operation is used) shall be provided (see Sections 4E.08 and 4E.09) and ~~or additional~~ signing such as the R10-3d sign (see Section 2B.59) shall be provided to notify pedestrians to cross only to the median to await the next WALKING PERSON (symbolizing WALK) signal indication.

Option:

During the transition into preemption, the walk interval and the pedestrian change interval may be shortened or omitted as described in Section 4D.27.

At intersections with high pedestrian volumes and high turning vehicle volumes, a brief leading pedestrian interval, during which an advance WALKING PERSON (symbolizing WALK) indication is displayed for the crosswalk while red indications continue to be displayed to parallel through and/or turning traffic, may be used to reduce conflicts between pedestrians and turning vehicles.

Guidance:

When a leading pedestrian indication is used, it should be no less than 3 seconds in duration and should be timed to allow pedestrians to cross at least one lane of traffic before turning traffic is released. During a leading pedestrian interval, right turns across the crosswalk should be prohibited by the display of:

A. A steady RED ARROW indication in a separate right-turn signal face, a flashing yellow arrow signal face, or a flashing red arrow signal face (see Sections 4D.21 through 4D.24);
B. Steady CIRCULAR RED indications for the approach, accompanied by the display of a NO TURN ON RED (R10-11) or No Right Turn (R3-1) message on a changeable message or blank-out sign; or
C. Steady green indications for the approach, accompanied by the display of a No Right Turn (R3-1) message on a changeable message or blank-out sign.

Option:

If a static NO TURN ON RED (R10-11) sign or No Right Turn (R3-1) sign is in place to prohibit such movements on a full-time or part-time basis (see Section 2B.59), a changeable message or blank-out sign may not be needed.

At intersections with pedestrian volumes that are so high that drivers have difficulty finding an opportunity to turn across the crosswalk, the duration of the green interval for a parallel concurrent vehicular movement may be intentionally set higher than the pedestrian clearance time to provide turning drivers additional green time to make their turns while the pedestrian signal head is displaying a steady UPRAISED

HAND (symbolizing DONT WALK) signal indication after pedestrians have had time to complete their crossings.

CHAPTER 4F. PEDESTRIAN HYBRID SIGNALS

Section 4F.01 Application of Pedestrian Hybrid Signals

Support:

A pedestrian hybrid signal is a special type of hybrid signal used to warn and control traffic at an unsignalized location to assist pedestrians in crossing a street or highway at a marked crosswalk.

Option:

A pedestrian hybrid signal may be considered for installation at a location that does not meet other traffic signal warrants to facilitate pedestrian crossings.

Standard:

If used, pedestrian hybrid signals shall be used in conjunction with signs and pavement markings to warn and control traffic at locations where pedestrians enter or cross a street or highway. A pedestrian hybrid signal shall only be installed at a marked crosswalk.

Guidance:

If a location meets the traffic control signal warrants under Sections 4C.05 and/or 4C.06 and a decision is made not to install a traffic control signal, a pedestrian hybrid signal should be considered. If one of the signal warrants of Chapter 4C is met and a traffic control signal is justified by an engineering study, and if a decision is made to install a traffic control signal, it should be installed based upon the provisions of Chapters 4D and 4E.

If a traffic control signal is not justified under the signal warrants of Chapter 4C and if gaps in traffic are not adequate to permit pedestrians to cross, or if the speed for vehicles approaching on the major street is too high to permit pedestrians to cross, or if pedestrian delay is excessive, the need for a pedestrian hybrid signal should be considered on the basis of an engineering study that considers major-street volumes, speeds, widths, and gaps in conjunction with pedestrian volumes, walking speeds, and delay.

For a major street where the posted or statutory speed limit or the 85th-percentile speed is 60 km/h or less or is 35 mph or less, the need for a pedestrian hybrid signal should be considered if the engineering study finds that the plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding total of all pedestrians crossing the major street for 1 hour (any four consecutive 15-minute periods) of an average day falls above the applicable curve in Figure 4F-1 for the length of the crosswalk.

For a major street where the posted or statutory speed limit or the 85th-percentile speed exceeds 60 km/h or exceeds 35 mph, the need for a pedestrian hybrid signal should be considered if the engineering study finds that the plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding total of all pedestrians crossing the major street for 1 hour (any four consecutive 15-minute periods) of an average day falls above the applicable curve in Figure 4F-2 for the length of the crosswalk.

For crosswalks that have lengths other than the four that are specifically shown in Figures 4F-1 and 4F-2, the values should be interpolated between the curves.

Section 4F.02 Design of Pedestrian Hybrid Signals

Standard:

Except as otherwise specified in this Section, a pedestrian hybrid signal shall meet the provisions of Chapters 4D and 4E.

A pedestrian hybrid signal face shall consist of three signal sections, with a CIRCULAR YELLOW signal indication centered below two horizontally aligned CIRCULAR RED signal indications (see Figure 4F-3).

When an engineering study finds that installation of a pedestrian hybrid signal is justified, then:

A. At least two pedestrian hybrid signal faces shall be installed for each approach of the major street,

B. A stop line shall be installed for each approach of the major street,

C. A pedestrian signal head conforming to the provisions set forth in Chapter 4E shall be installed at each end of the marked crosswalk, and

D. The pedestrian hybrid signal shall be pedestrian actuated.

Guidance:

When an engineering study finds that installation of a pedestrian hybrid signal is justified, then:

A. Parking and other sight obstructions should be prohibited for at least 30 m (100 ft) in advance of and at least 6.1 m (20 ft) beyond the marked crosswalk,
B. The installation should include suitable standard signs and pavement markings, and
C. If installed within a signal system, the pedestrian hybrid signal should be coordinated.

On approaches having posted speed limits or 85th-percentile speeds in excess of 60 km/h (35 mph) and on approaches having traffic or operating conditions that would tend to obscure visibility of roadside hybrid signal face locations, both of the minimum of two pedestrian hybrid signal faces should be installed over the roadway.

On multi-lane approaches having posted speed limits or 85th-percentile speeds of 60 km/h (35 mph) or less, either a pedestrian hybrid signal face should be installed on each side of the approach (if a median of sufficient width exists) or at least one of the pedestrian hybrid signal faces should be installed over the roadway.

Support:

Section 4D.11 contains additional provisions regarding lateral and longitudinal positioning of signal faces for approaches having a posted or 85th-percentile speed exceeding 60 km/h or exceeding 40 mph.

Standard:

A CROSSWALK STOP ON RED (symbolic circular red) (R10-23) sign (see Section 2B.59) shall be mounted adjacent to a pedestrian hybrid signal face on each major street approach. If an overhead pedestrian hybrid signal face is provided, the sign shall be mounted adjacent to the overhead signal face.

Option:

A Pedestrian (W11-2) sign (see Section 2C.52) with an AHEAD (W16-9P) supplemental plaque may be placed in advance of a pedestrian hybrid signal. A warning beacon may be installed to supplement the W11-2 sign.

Guidance:

If a warning beacon supplements a W11-2 sign in advance of a pedestrian hybrid signal, it should be programmed to flash only during the yellow and red signal indications of the pedestrian hybrid signal.

Standard:

If a warning beacon is installed to supplement the W11-2 sign, the design and location of the beacon shall comply with the provisions of Sections 4L.01 and 4L.03.

If a pedestrian hybrid signal is installed at or immediately adjacent to an intersection with a side road or driveway, vehicular traffic on the side road or driveway shall be controlled by STOP signs.

Section 4F.03 Operation of Pedestrian Hybrid Signals

Standard:

Pedestrian hybrid signal indications shall be dark (not illuminated) during periods between actuations.

Upon actuation by a pedestrian, a pedestrian hybrid signal face shall display a flashing CIRCULAR YELLOW signal indication, followed by a steady CIRCULAR YELLOW signal indication, followed by both steady CIRCULAR RED signal indications during the pedestrian walk interval, followed by alternating flashing CIRCULAR RED signal indications during the pedestrian clearance interval (see Figure 4F-3). Upon termination of the pedestrian clearance interval, the pedestrian hybrid signal faces shall revert to a dark (not illuminated) condition.

Except as noted in the Option below, the pedestrian signal heads shall continue to display a steady UPRAISED HAND (symbolizing DONT WALK) signal indication when the pedestrian hybrid signal faces are either dark or displaying flashing or steady CIRCULAR YELLOW signal indications. The pedestrian signal heads shall display a WALKING PERSON (symbolizing WALK) signal indication when the pedestrian hybrid signal faces are displaying steady CIRCULAR RED signal indications. The pedestrian signal heads shall display a flashing UPRAISED HAND (symbolizing DONT WALK) signal indication when the pedestrian hybrid signal faces are displaying alternating flashing CIRCULAR RED signal indications. Upon termination of the pedestrian clearance interval, the pedestrian signal heads shall revert to a steady UPRAISED HAND (symbolizing DONT WALK) signal indication.

Option:

Where the pedestrian hybrid signal is installed adjacent to a roundabout to facilitate crossings by pedestrians with visual disabilities and an engineering study determines that pedestrians without visual disabilities can be allowed to cross the roadway without actuating the pedestrian hybrid signal, the pedestrian signal heads may be dark (not illuminated) when the pedestrian hybrid signal faces are dark.

Guidance:

The duration of the flashing yellow interval should be determined by engineering judgment.

The steady yellow interval should not have a duration of less than 3 seconds or more than 6 seconds (see Section 4D.26). The longer intervals should be reserved for use on approaches with higher speeds.

CHAPTER ~~4F.~~ 4G. TRAFFIC CONTROL SIGNALS AND HYBRID SIGNALS FOR EMERGENCY VEHICLE ACCESS

Section ~~4F.01~~ 4G.01 Application of Emergency-Vehicle Traffic Control Signals and Hybrid Signals

Support:

An emergency-vehicle traffic control signal is a special traffic control signal that assigns the right-of-way to an authorized emergency vehicle.

Option:

An emergency-vehicle traffic control signal may be installed at a location that does not meet other traffic signal warrants such as at an intersection or other location to permit direct access from a building housing the emergency vehicle.

An emergency-vehicle hybrid signal may be installed instead of an emergency-vehicle traffic control signal under conditions described in Section 4G.04.

Guidance:

If a traffic control signal is not justified under the signal warrants of Chapter 4C and if gaps in traffic are not adequate to permit ~~reasonably safe~~ the timely entrance of emergency vehicles, or the stopping sight distance for vehicles approaching on the major street is insufficient ~~to permit reasonably safe entrance of~~ for emergency vehicles, installing an emergency-vehicle traffic control signal should be considered. If one of the signal warrants of Chapter 4C is met and a traffic control signal is justified by an engineering study, and if a decision is made to install a traffic control signal, it should be installed based upon the provisions of Chapter 4D.

The sight distance determination should be based on the location of the visibility obstruction for the critical approach lane for each street or drive and the posted or statutory speed limit or 85th-percentile speed on the major street, whichever is higher.

Section ~~4F.02~~ 4G.02 Design of Emergency-Vehicle Traffic Control Signals

Standard:

Except as otherwise ~~specified~~ noted edited to increase consistency in this Section, an emergency-vehicle traffic control signal shall meet the requirements of this Manual.

An Emergency Vehicle (W11-8) sign (see Section 2C.51) with an EMERGENCY SIGNAL AHEAD (W11-12P) supplemental plaque shall be placed in advance of all emergency-vehicle traffic control signals. If a warning beacon is installed to supplement the W11-8 sign, the design and location of the beacon shall ~~conform to~~ comply with the Standards specified in Sections 4L.01 and 4L.03.

Guidance:

At least one of the two required signal faces for each approach on the major street should be located over the roadway.

The following size signal ~~lenses~~ indications should be used for emergency-vehicle traffic control signals: 300 mm (12 in) diameter for steady added to increase accuracy red and steady yellow circular signal indications and any arrow indications, and 200 mm (8 in) diameter for green or flashing yellow ~~or steady green~~ circular signal indications.

Standard:

An EMERGENCY SIGNAL (R10-13) sign shall be mounted adjacent to a signal face on each major street approach (see Section 2B.59). If an overhead signal face is provided, the EMERGENCY SIGNAL sign shall be mounted adjacent to the overhead signal face.

Option:

An approach that only serves emergency vehicles may be provided with only one signal face consisting of one or more signal sections.

Besides using a 200 mm (8 in) diameter signal indication, other appropriate means to reduce the flashing yellow light output may be used.

Section ~~4F.03~~ 4G.03 Operation of Emergency-Vehicle Traffic Control Signals

Standard:

Right-of-way for emergency vehicles at signalized locations operating in the steady (stop-and-go) mode shall be obtained as specified in Section 4D.27.

As a minimum, the signal indications, sequence, and manner of operation of an emergency-vehicle traffic control signal installed at a midblock location shall be as follows:

A. The signal indication, between emergency-vehicle actuations, shall be either steady green or flashing yellow. If the flashing yellow signal indication is used instead of the steady green signal indication, it shall be displayed in the normal position of the steady green signal indication, while the steady added to increase accuracy red and steady yellow signal indications shall be displayed in their normal positions.

B. When an emergency vehicle actuation occurs, a steady yellow change interval followed by a steady red interval shall be displayed to traffic on the major street.

C. A yellow change interval is not required following the green interval for the emergency-vehicle driveway.

Emergency-vehicle traffic control signals located at intersections shall either be operated in the flashing mode between emergency-vehicle actuations (see Sections 4D.28 and 4D.30) or be fully- actuated or semi- ~~traffic~~ actuated, to accommodate normal vehicular and pedestrian traffic on the streets.

Warning beacons, if used with an emergency-vehicle traffic control signal, shall be flashed only:

A. For an appropriate time in advance of and during the steady yellow change interval for the major street; and

B. During the steady red interval for the major street.

Guidance:

The duration of the steady added to increase accuracy red interval for traffic on the major street should be determined by on-site test-run time studies, but should not exceed 1.5 times the time required for the emergency vehicle to clear the path of conflicting vehicles.

Option:

An emergency-vehicle traffic control signal sequence may be initiated manually from a local control point such as a fire station or law enforcement headquarters or from an emergency vehicle equipped for remote operation of the signal.

Section 4G.04 Emergency-Vehicle Hybrid Signals

Standard:

Emergency-vehicle hybrid signals shall be used only in conjunction with signs to warn and control traffic at an unsignalized location where emergency vehicles enter or cross a street or highway. Emergency-vehicle hybrid signals shall be actuated only by authorized emergency or maintenance personnel.

Support:

Ordinarily emergency-vehicle hybrid signals are installed immediately adjacent to a fire station or rescue service facility, but in some cases the emergency services facility is on a side road, away from the point where emergency vehicles enter or cross the approaches equipped with emergency-vehicle hybrid signals.

Guidance:

Emergency-vehicle hybrid signals should only be used when both of the following criteria are satisfied:

A. The conditions justifying an emergency-vehicle traffic control signal (see Section 4G.01) are met; and

B. An engineering study, considering the road width, approach speeds, and other pertinent factors, determines that emergency-vehicle hybrid signals can be designed and located in compliance with the requirements contained in this Section and in Section 4L.01, such that they effectively warn and control traffic at the location.

Standard:

An emergency-vehicle hybrid signal shall consist of three signal sections, with a CIRCULAR YELLOW signal indication centered below two horizontally aligned CIRCULAR RED signal indications (see Figure 4G-1). Stop lines and EMERGENCY SIGNAL—STOP WHEN FLASHING RED (R10-14 or R10-14a) signs (see Section 2B.59) shall be used with emergency-vehicle hybrid signals.

Emergency-vehicle hybrid signals shall be placed in a dark mode (no indications displayed) during periods between actuations.

Upon actuation by authorized emergency personnel, the emergency-vehicle hybrid signals shall display a flashing yellow signal indication, followed by a steady yellow change interval, prior to displaying two CIRCULAR RED signal indications in an alternating flashing array for a duration of time adequate for egress of the emergency vehicles. The alternating flashing red signal indications shall only be displayed when it is required that drivers on the major street stop and then proceed subject to the rules applicable after making a stop at a STOP sign. Upon termination of the flashing red signal indications, the emergency-vehicle hybrid signals shall revert to a dark mode (no indications displayed) condition.

The duration of the steady yellow change interval shall be determined using engineering practices.

Guidance:

The steady yellow change interval should not have a duration of less than 3 seconds or more than 6 seconds (see Section 4D.26). The longer intervals should be reserved for use on approaches with higher speeds.

The duration of the flashing yellow interval should be determined by engineering judgment.

Option:

Emergency-vehicle hybrid signals may be equipped with a light or other display visible to the operator of the egressing emergency vehicle to provide confirmation that the beacons are operating.

Emergency-vehicle hybrid signals may be supplemented with an advance warning sign, which may also be supplemented with a Warning Beacon (see Section 4L.03).

Guidance:

If a warning beacon is used to supplement the advance warning sign, it should be programmed to flash only during the yellow and red signal indications of the emergency-vehicle hybrid signal.

Standard:

When used, at least two emergency-vehicle hybrid signals shall be installed for each approach of the major street. When emergency-vehicle hybrid signals are used, a stop line shall be installed for each approach of the major street.

Guidance:

On approaches having posted or 85th-percentile speeds in excess of 60 km/h or in excess of 40 mph, and on approaches having traffic or operating conditions that would tend to obscure visibility of roadside beacon locations, both of the minimum of two emergency-vehicle hybrid signals should be installed over the roadway.

On multi-lane approaches having posted or 85th-percentile speeds of 60 km/h or less or of 40 mph or less, either an emergency-vehicle hybrid signal should be installed on each side of the approach (if a median of sufficient width exists) or at least one of the emergency-vehicle hybrid signals should be installed over the roadway.

An emergency-vehicle hybrid signal should comply with the signal location provisions described in Sections 4D.11 through 4D.16.

CHAPTER ~~4G.~~ 4H. TRAFFIC CONTROL SIGNALS FOR ONE-LANE, TWO-WAY FACILITIES

Section ~~4G.01~~ 4H.01 Application of Traffic Control Signals for One-Lane, Two-Way Facilities

Support:

A traffic control signal at a narrow bridge, tunnel, or roadway section is a special signal that assigns the right-of-way for vehicles passing over a bridge or through a tunnel or roadway section that is not of sufficient width for two opposing vehicles to pass ~~reasonably safely~~.

Temporary traffic control signals (see Sections 4D.32 and 6F.80) are the most frequent application of one-lane, two-way facilities.

Guidance:

Sight distance across or through the one-lane, two-way facility should be considered as well as the approach speed and sight distance approaching the facility when determining whether traffic control signals should be installed.

Option:

At a narrow bridge, tunnel, or roadway section where a traffic control signal is not justified under the conditions of Chapter 4C, a traffic control signal may be used if gaps in opposing traffic do not permit the ~~reasonably safe~~ flow of traffic through the one-lane section of roadway.

Section ~~4G.02~~ 4H.02 Design of Traffic Control Signals for One-Lane, Two-Way Facilities

Standard:

The provisions of Chapter 4D shall apply to traffic control signals for one-lane, two-way facilities, except that:

A. Durations of red clearance intervals shall be adequate to clear the one-lane section of conflicting vehicles.

B. Adequate means, such as interconnection, shall be provided to prevent conflicting signal indications, such as green and green, at opposite ends of the section.

Section ~~4G.03~~ 4H.03 Operation of Traffic Control Signals for One-Lane, Two-Way Facilities

Standard:

Traffic control signals at one-lane, two-way facilities shall operate in a manner consistent with traffic requirements.

When in the flashing mode, the signal indications shall flash red.

Guidance:

Adequate time should be provided to allow traffic to clear the narrow facility before opposing traffic is allowed to move. Engineering judgment should be used to determine the proper timing for the signal.

CHAPTER ~~4H.~~ 4I. TRAFFIC CONTROL SIGNALS FOR FREEWAY ENTRANCE RAMPS

Section ~~4H.01~~ 4I.01 Application of Freeway Entrance Ramp Control Signals

Support:

Ramp control signals are traffic control signals that control the flow of traffic entering the freeway facility. This is often referred to as "ramp metering."

Freeway entrance ramp control signals are sometimes used if controlling traffic entering the freeway could reduce the total expected delay to traffic in the freeway corridor, including freeway ramps and local streets~~, and if at least one of the following conditions is present:~~

~~A. Congestion recurs on the freeway because traffic demand is in excess of the capacity, or congestion recurs or a high frequency of crashes exist at the freeway entrance because of inadequate ramp-merging area. A good indicator of recurring freeway congestion is freeway operating speeds less than 80 km/h (50 mph) occurring regularly for at least a half-hour period. Freeway operating speeds less than 50 km/h (30 mph) for a half-hour period or more would indicate severe congestion.~~

~~B. Controlling traffic entering a freeway assists in meeting local transportation system management objectives identified for freeway traffic flow, such as the following:~~

~~1. Maintenance of a specific freeway level of service.~~

~~2. Priority treatments with higher levels of service for mass transit and carpools.~~

~~3. Redistribution of freeway access demand to other on-ramps.~~

~~C. Predictable, sporadic congestion occurs on isolated sections of freeway because of short-period peak traffic loads from special events or from severe peak loads of recreational traffic~~.

Guidance:

The installation of ramp control signals should be preceded by an engineering study of the physical and traffic conditions on the highway facilities likely to be affected. The study should include the ramps and ramp connections and the surface streets that would be affected by the ramp control, as well as the freeway section concerned. ~~Types of traffic data that should be obtained include, but are not limited to, traffic volumes, traffic crashes, freeway operating speeds, and travel time and delay on the freeway, approaches, ramps, and alternate surface routes.~~

~~Capacities and demand/capacity relationships should be determined for each freeway section. The locations and causes of capacity restrictions and those sections where demand exceeds capacity should be identified. From these and other data, estimates should be made of desirable metering rates, probable reductions in the delay of freeway traffic, likely increases in delay to ramp traffic, and the potential impact on surface streets. The study should include an evaluation of the ramp's storage capacities for vehicles delayed at the signal, the impact of queued traffic on the local street intersection, and the availability of suitable alternate surface routes having adequate capacity to accommodate any additional traffic volume.~~

~~Before installing ramp control signals, consideration should be given to their potential acceptance by the public and the requirements for enforcing ramp control, as well as alternate means of increasing the capacity, reducing the demand, or improving the characteristics of the freeway.~~

Support:

Information on conditions that might justify freeway entrance ramp control signals, factors to be evaluated in traffic engineering studies for ramp control signals, design of ramp control signals, and operation of ramp control signals can be found in the FHWA's "Ramp Management and Control Handbook" (see Section 1A.11).

Section ~~4H.02~~ 4I.02 Design of Freeway Entrance Ramp Control Signals

Standard:

Ramp control signals shall meet all of the standard design specifications for traffic control signals, except as otherwise noted ~~herein~~ in this Section~~.~~.

~~A.~~ The signal face for freeway entrance ramp control signals shall be either a two-~~lens~~ section signal face containing red and green signal ~~lenses~~ indications or a three-~~lens~~ section signal face containing red, yellow, and green signal ~~lenses~~ indications.

~~B.~~ If only one lane is present on an entrance ramp or if more than one lane is present on an entrance ramp and the ramp control signals are operated such that green signal indications are always displayed simultaneously to all of the lanes on the ramp, then a minimum of two signal faces per ramp shall face

entering traffic. If more than one lane is present on an entrance ramp and the ramp control signals are operated such that green signal indications are not always displayed simultaneously to all of the lanes on the ramp, then each separately-controlled lane or lanes shall be provided with a minimum of two signal faces.

Ramp control signals shall be located and designed to minimize their viewing by mainline freeway traffic.

Option:

~~C.~~ Ramp control signals ~~faces need not~~ may be ~~illuminated~~ placed in the dark mode (no indications displayed) when not in use. relocated from Standard paragraph

Ramp control signals may be used to control some, but not all, lanes on a ramp, such as when non-metered HOV bypass lanes are provided on a ramp.

The required signal faces, if located at the side of the ramp roadway, may be mounted such that the height above the pavement grade at the center of the ramp roadway to the bottom of the signal housing of the lowest signal face is between 1.4 m (4.5 ft) and 1.8 m (6 ft).

For entrance ramps with only one controlled lane, the two required signal faces may both be mounted at the side of the roadway on a single pole, with one face at the normal mounting height and one face mounted lower as noted in the previous paragraph, as a specific exception to the normal 2.4 m (8 ft) minimum lateral separation of signal faces required by Section 4D.13.

Guidance:

Regulatory signs with legends appropriate to the control, such as XX VEHICLE(S) PER GREEN or XX VEHICLE(S) PER GREEN EACH LANE (see Section 2B.61), should be installed adjacent to the ramp control signal faces. When ramp control signals are installed on a freeway-to-freeway ramp, special consideration should be given to assuring adequate visibility of the ramp control signals, and multiple advance warning signs with flashing warning beacons should be installed to warn road users of the metered operation.

Section 4I.03 Operation of Freeway Entrance Ramp Control Signals

Guidance:

Operational strategies for ramp control signals, such as periods of operation, metering rates and algorithms, and queue management, should be determined by the operating agency prior to the installation of the ramp control signals and should be closely monitored and adjusted as needed thereafter. When ramp control signals are operated only during certain periods of the day, a RAMP METERED WHEN FLASHING (W3-7) sign (see Section 2C.36) with a warning beacon (see Section 4L.03) should be installed in advance of the ramp entrance on the arterial, and on the ramp, to alert road users to the presence and operation of ramp meters.

CHAPTER ~~4I.~~ 4J. TRAFFIC CONTROL FOR MOVABLE BRIDGES

Section ~~4I.01~~ 4J.01 Application of Traffic Control for Movable Bridges

Support:

Traffic control signals for movable bridges are a special type of highway traffic signal installed at movable bridges to notify road users to stop because of a road closure rather than alternately giving the right-of-way to conflicting traffic movements. The signals are operated in coordination with the opening and closing of the movable bridge, and with the operation of movable bridge warning and resistance gates, or other devices and features used to warn, control, and stop traffic.

Movable bridge warning gates installed at movable bridges decrease the likelihood of vehicles and pedestrians passing the stop line and entering an area where potential hazards exist because of bridge operations.

A movable bridge resistance gate is sometimes used at movable bridges and located downstream of the movable bridge warning gate. A movable bridge resistance gate provides a physical deterrent to road users when placed in the appropriate position. The movable bridge resistance gates are considered a design feature and not a traffic control device; requirements for them are contained in AASHTO's "Standard Specifications for Movable Highway Bridges" (see Page i for AASHTO's address).

Standard:

Traffic control at movable bridges shall include both signals and gates, except in the following cases:

A. Neither is required if other traffic control devices or measures considered appropriate are used under either of the following conditions:

1. On low-volume roads (roads of less than 400 vehicles average daily traffic), or
2. At manually operated bridges if electric power is not available.

B. Only signals are required in urban areas if intersecting streets or driveways make gates ineffective.

C. Only movable bridge warning gates are required if a traffic control signal that is controlled as part of the bridge operations exists within 150 m (500 ft) of the movable bridge resistance gates and no intervening traffic entrances exist.

Section ~~4I.02~~ 4J.02 Design and Location of Movable Bridge Signals and Gates paragraphs and sentences were relocated within this Section to improve continuity

Standard:

The signal heads and mountings of movable bridge signals shall ~~follow~~ comply with the provisions of Chapter 4D except as noted in this Section.

Signal faces with 300 mm (12 in) diameter signal ~~lenses~~ indications ~~should~~ shall be used for all new movable bridge signals.

Option:

Movable bridge signals may be supplemented with audible warning devices to provide additional warning to drivers and pedestrians.

~~If prevailing approach speeds are 40 km/h (25 mph) or less,~~ Existing signal heads with 200 mm (8 in) diameter lenses may be ~~used~~ retained for the remainder of their useful service life.

Since movable bridge operations cover a variable range of time periods between openings, the signal faces shall be one of the following types:

A. Three-section signal faces with red, yellow, and green signal ~~lenses~~ indications; or
B. Two one-section signal faces with red signal ~~lenses~~ indications in a vertical array separated by a STOP HERE ON RED (R10-6) sign (see Section 2B.59).

Regardless of which signal type is selected, at least two signal faces shall be provided for each approach to the movable span and a stop line (see Section 3B.16) shall be installed to indicate the point behind which vehicles are required to stop.

Guidance:

If movable bridge operation is frequent, the use of three-section signal faces should be considered.

Insofar as practical, the height and lateral placement of signal faces should ~~conform to~~ comply with the requirements for other traffic control signals in accordance with ~~Section 4D.15~~ Chapter 4D. They should be located not more than 15 m (50 ft) in advance of the movable bridge warning gate.

Option:

Movable bridge signals may be supplemented with audible warning devices to provide additional warning to drivers and pedestrians.

Standard:

A DRAWBRIDGE AHEAD ~~warning~~ (W3-6) sign (see Section 2C.38) shall be used in advance of movable bridge signals and gates to give warning to road users, except in urban conditions where such signing would not be practical. this paragraph was relocated

If physical conditions prevent a road user from having a continuous view of at least two signal indications for the distance specified in Table 4D-1, an auxiliary device (either a supplemental signal face or the mandatory DRAWBRIDGE AHEAD ~~warning~~ (W3-6) sign to which has been added a warning beacon that is interconnected with the movable bridge controller unit) shall be provided in advance of movable bridge signals and gates.

Option:

The DRAWBRIDGE AHEAD (W3-6) sign may be supplemented by a Warning Beacon (see Section 4L.03).

Standard:

If two sets of gates (both a warning and a resistance gate) are used for a single direction, highway traffic signals ~~need~~ shall not be required to accompany the resistance gate nearest the span opening~~, but there shall be flashing red lights on the movable bridge warning gate~~.

~~Highway traffic signals need not accompany the gates nearest the span opening.~~

Movable bridge warning gates, if used, shall be at least standard railroad size, striped with 400 mm (16 in) alternate ~~diagonal~~ vertical, fully reflectorized red and white stripes. Flashing red lights in accordance with the Standards for those on railroad gates (see Section 8C.04) shall be included on the gate arm and they shall only be operated if the gate is closed or in the process of being opened or closed. In the horizontal position, the top of the gate shall be approximately 1.2 m (4 ft) above the pavement.

Guidance:

Movable bridge warning gates should be of lightweight construction. In its normal upright position, the gate arm should provide adequate lateral clearance.

Option:

The movable bridge resistance gates may be delineated, if practical, in a manner similar to the movable bridge warning gate.

Standard:

Movable bridge warning gates, if used, shall extend at least across the full width of the approach lanes if movable bridge resistance gates are used. On divided highways in which the roadways are separated by a barrier median, movable bridge warning gates, if used, shall extend across all roadway lanes approaching the span openings.

Guidance:

If movable bridge resistance gates are not used on undivided highways, movable bridge warning gates, if used, should extend across the full width of the roadway.

Option:

A single full-width gate or two half-width gates may be used.

Support:

The locations of movable bridge signals and gates are determined by the location of the movable bridge resistance gate (if used) rather than by the location of the movable spans. The movable bridge resistance gates for high-speed highways are preferably located 15 m (50 ft) or more from the span opening except for bascule and lift bridges, where they are often attached to, or are a part of, the structure.

Standard:

Except where physical conditions make it impractical, movable bridge warning gates shall be located 30 m (100 ft) or more from the movable bridge resistance gates or, if movable bridge resistance gates are not used, 30 m (100 ft) or more from the movable span.

Guidance:

On bridges or causeways that cross a long reach of water and that might be hit by large marine vessels, within the limits of practicality, traffic should not be halted on a section of the bridge or causeway that is subject to impact.

In cases where it is not practical to halt traffic on a span that is not subject to impact, traffic should be halted at least one span from the opening. If traffic is halted by signals and gates more than 100 m (330 ft) from the movable bridge warning gates (or from the span opening if movable bridge warning gates are not used), a second set of gates should be installed approximately 30 m (100 ft) from the gate or span opening.

If the movable bridge is close to a highway-rail grade crossing and traffic might possibly be stopped on the crossing as a result of the bridge opening, a traffic control device should notify the road users to not stop on the railroad tracks.

Section ~~4I.03~~ 4J.03 Operation of Movable Bridge Signals and Gates

Standard:

Traffic control devices at movable bridges shall be coordinated with the movable spans, so that the signals, gates, and movable spans are controlled by the bridge tender through an interlocked control.

If the three-section type of signal face is used, the green signal indication shall be ~~illuminated~~ displayed at all times between bridge openings, except that if the bridge is not expected to open during continuous periods in excess of 5 hours, a flashing yellow signal indication ~~may~~ is permitted to be used. The signal shall display a steady red signal indication when traffic is required to stop. The duration of the yellow change interval between the display of the steady green and steady red signal indications, or flashing yellow and steady red signal indications, shall be ~~pre~~determined using engineering practices (see Section 4D.26).

If the vertical array of red signal ~~lenses~~ indications is the type of signal face selected, the red signal ~~lenses~~ indications shall flash alternately only when traffic is required to stop.

Guidance:

The ~~duration of the~~ yellow change interval should not have a ~~range from~~ duration of less than 3 ~~to 6~~ seconds or more than 6 seconds. The longer intervals should be reserved for use on approaches with higher speeds.

Traffic control signals on adjacent streets and highways should be interconnected with the drawbridge control if indicated by engineering judgment. When such interconnection is provided, the traffic control signals at adjacent intersections should be preempted by the operation of the movable bridge in the manner described in Section 4D.27.

CHAPTER 4K. TOLL PLAZA TRAFFIC SIGNALS

Section 4K.01 Traffic Signals at Toll Plazas

Option:

Traffic control signal faces may be used at toll plazas to control the flow of traffic through certain lanes of the plaza, in a manner similar to ramp metering (see Chapter 4I).

Standard:

Traffic control signal faces used at toll plazas shall comply with the provisions of Chapter 4D, except as otherwise noted in Chapter 4K.

Guidance:

When used, each toll plaza signal face should consist of a minimum of two 200 mm (8 in) or two 300 mm (12 in) signal sections, and should be post-mounted approximately 4.6 m (15 ft) beyond the downstream edge of the vehicle detector that detects vehicles that are departing from the toll plaza.

Option:

When used, only one toll plaza signal face is required for each lane and each such signal face may be mounted with lateral and vertical clearances that are less than those specified in Sections 4D.13, 4D.15, and 4D.16 for traffic control signals that are used at intersections.

As the only exception to the prohibition stated in Section 4D.04, signal faces at toll plazas may include lettering on their lenses.

Guidance:

Signal faces with circular red and circular green signal indications should be used for attended and exact change cash lanes. The red signal indication should be displayed at all times except during a short green interval to release a vehicle after payment has been made.

Signal faces with circular yellow and circular green signal indications should be used for dedicated non-stopping electronic toll collection lanes that are located within a toll plaza. The signal face should be placed in the dark mode (no indications displayed) until a vehicle approaches the toll plaza. When the non-stopping vehicle reaches the point where the signal face can be viewed, the signal face should briefly display a green signal indication if the electronic payment is accepted or briefly display a yellow signal indication if the vehicle's electronic toll collection account has a low balance.

Option:

Signal faces with circular yellow and circular green signal indications may also be used for open road electronic toll collection lanes that are not located within the toll plaza.

Guidance:

Signal faces that are used for open road electronic toll collection lanes should be operated in the same manner as the signal faces that are used for dedicated non-stopping electronic toll collection lanes that are located within toll plazas.

Support:

Section 4M.01 contains provisions regarding the use of lane-use control signals at toll plazas.

CHAPTER ~~4K.~~ 4L. FLASHING BEACONS

Section ~~4K.01~~ 4L.01 General Design and Operation of Flashing Beacons

Support:

A Flashing Beacon is a highway traffic signal with one or more signal sections that operates in a flashing mode. It can provide traffic control when used as an intersection control beacon (see Section 4L.02) or ~~warning in alternative uses~~ it can provide warning when used in other applications (see Sections 4L.03, 4L.04, and 4L.05).

Standard:

Flashing Beacon units and their mountings shall ~~follow~~ comply with the provisions of Chapter 4D, except as otherwise ~~specified~~ noted ~~herein~~ in Chapter 4L.

Beacons shall be flashed at a rate of not less than 50 or more than 60 times per minute. The illuminated period of each flash shall not be less than one-half and not more than two-thirds of the total cycle.

~~The~~ A beacon shall not be included within the border of ~~the~~ a sign except for SCHOOL SPEED LIMIT sign beacons (see Sections 4L.04 and 7B.14). relocated from Section 4K.03

Guidance:

If used to supplement a warning or regulatory sign, the edge of the beacon signal housing should normally be located no closer than 300 mm (12 in) outside of the nearest edge of the sign.

Option:

An automatic dimming device may be used to reduce the brilliance of flashing yellow signal indications during night operation.

Section ~~4K.02~~ 4L.02 Intersection Control Beacon

Standard:

An Intersection Control Beacon shall consist of one or more signal faces directed toward each approach to an intersection. Each signal face shall consist of one or more signal sections of a standard traffic signal face, with flashing CIRCULAR YELLOW or CIRCULAR RED signal indications in each signal face. They shall be installed and used only at an intersection to control two or more directions of travel.

Application of Intersection Control Beacon signal indications shall be limited to the following:

A. Yellow on one route (normally the major street) and red for the remaining approaches, and
B. Red for all approaches (if the warrant described in Section 2B.07 for a multiway stop is satisfied).

Flashing yellow signal indications shall not face conflicting vehicular approaches.

A STOP sign shall be used on approaches to which a flashing red signal indication is ~~shown~~ displayed on an Intersection Control Beacon (see Section 2B.04).

If two horizontally aligned red signal indications are used on an approach, they shall be flashed simultaneously to avoid being confused with a highway-rail grade crossing flashing-light signals. If two vertically aligned red signal indications are used on an approach, they shall be flashed alternately.

Guidance:

An Intersection Control Beacon should not be mounted on a pedestal in the roadway unless the pedestal is within the confines of a traffic or pedestrian island.

Option:

Supplemental signal indications may be used on one or more approaches in order to provide adequate visibility to approaching road users.

Intersection Control Beacons may be used at intersections where traffic or physical conditions do not justify conventional traffic control signals but crash rates indicate the possibility of a special need.

An Intersection Control Beacon is generally located over the center of an intersection; however, it may be used at other suitable locations.

Section ~~4K.03~~ 4L.03 Warning Beacon

Support:

Typical applications of Warning Beacons include the following:

A. At obstructions in or immediately adjacent to the roadway;
B. As supplemental emphasis to warning signs;
C. As emphasis for midblock crosswalks;
D. ~~On approaches to intersections where additional warning is required, or where special conditions exist; and~~
~~E.~~ As supplemental emphasis to regulatory signs, except STOP, ~~YIELD,~~ DO NOT ENTER, and SPEED LIMIT signs; and
E. In conjunction with a regulatory or warning sign that includes the phrase WHEN FLASHING in its legend to indicate that the regulation is in effect or that the condition is present only at certain times.

Standard:

A Warning Beacon shall consist of one or more signal sections of a standard traffic signal face with a flashing CIRCULAR YELLOW signal indication in each signal section.

A Warning Beacon shall be used only to supplement an appropriate warning or regulatory sign or marker. second sentence was relocated to Section 4L.01

Warning Beacons, if used at intersections, shall not face conflicting vehicular approaches.

If a Warning Beacon is suspended over the roadway, the clearance above the pavement shall be at least 4.6 m (15 ft) but not more than 5.8 m (19 ft).

Guidance:

The condition or regulation justifying Warning Beacons should largely govern their location with respect to the roadway.

If an obstruction is in or adjacent to the roadway, illumination of the lower portion or the beginning of the obstruction or a sign on or in front of the obstruction, in addition to the beacon, should be considered.

Warning Beacons, if used with a toll plaza canopy sign (see Section 2E.58) to assist drivers of such vehicles in locating the dedicated ETC lane(s), should be installed in a manner such that the beacons are distinctly separate from the lane-use control signals (see Section 4M.01) for the toll plaza lane.

Warning Beacons should be operated only during those ~~hours~~ periods or times when the condition or regulation exists.

Option:

Warning Beacons that are actuated by pedestrians, bicyclists, or other road users may be used as appropriate to provide additional warning to vehicles approaching a crossing or other location.

If Warning Beacons have more than one signal section, they may be flashed either alternately or simultaneously.

A flashing yellow beacon interconnected with a traffic signal controller assembly may be used with a traffic signal warning sign (see Section 2C.35).

Warning Beacons that are mounted on toll plaza islands, on impact attenuators in front of toll plaza islands, and/or on toll booth ramparts to identify them as objects in the roadway may be mounted at a height that is appropriate for viewing in a toll plaza context, even if that height is lower than the normal minimum of 2.4 m (8 ft) above the pavement.

Section ~~4K.04~~ 4L.04 Speed Limit Sign Beacon

Standard:

A Speed Limit Sign Beacon shall be used only to supplement a Speed Limit sign.

A Speed Limit Sign Beacon shall consist of one or more signal sections of a standard traffic control signal face, with a flashing CIRCULAR YELLOW signal indication in each signal section. The signal ~~lenses~~ indications shall have a nominal diameter of not less than 200 mm (8 in). If two signal ~~lenses~~ indications are used, they shall be vertically aligned, except that they ~~may~~ shall be permitted to be horizontally aligned if the Speed Limit (R2-1) sign is longer horizontally than vertically. If two signal ~~lenses~~ indications are used, they shall be alternately flashed.

Option:

A Speed Limit Sign Beacon may be used with a fixed or variable Speed Limit sign. If applicable, a flashing Speed Limit Sign Beacon (with an appropriate accompanying sign) may be used to indicate that the displayed speed limit ~~shown~~ edited to increase consistency is in effect.

A Speed Limit Sign Beacon may be included within the border of a School Speed Limit (S5-1) sign (see Section 7B.14).

~~Support:~~

~~Section 7B.11 contains additional Options for the use of Speed Limit Sign Beacons with SCHOOL SPEED LIMIT signs.~~

Section ~~4K.05~~ 4L.05 Stop Beacon

Standard:

A Stop Beacon shall be used only to supplement a STOP sign, a DO NOT ENTER sign, or a WRONG WAY sign.

A Stop Beacon shall consist of one or more signal sections of a standard traffic signal face with a flashing CIRCULAR RED signal indication in each signal section. If two horizontally aligned signal ~~lenses~~ indications are used, they shall be flashed simultaneously to avoid being confused with a highway-rail grade crossing flashing-light signals. If two vertically aligned signal ~~lenses~~ indications are used, they shall be flashed alternately.

The bottom of the signal housing of a Stop Beacon shall be not less than 300 mm (12 in) or more than 600 mm (24 in) above the top of a STOP sign ~~(see Section 2B.04)~~, a DO NOT ENTER sign, or a WRONG WAY sign.

CHAPTER ~~4J.~~ 4M. LANE-USE CONTROL SIGNALS

Section ~~4J.01~~ 4M.01 Application of Lane-Use Control Signals

Support:

Lane-use control signals are special overhead signals that permit or prohibit the use of specific lanes of a street or highway or that indicate the impending prohibition of their use. Lane-use control signals are distinguished by placement of special signal faces over a certain lane or lanes of the roadway and by their distinctive shapes and symbols. Supplementary signs are sometimes used to explain their meaning and intent.

Lane-use control signals are most commonly used for reversible-lane control, but are also used in nonreversible freeway lane applications and for toll plaza lanes.

Guidance:

An engineering study should be conducted to determine whether a reversible-lane operation can be controlled satisfactorily by static signs (see Section 2B.25) or whether lane-use control signals are necessary. Lane-use control signals should be used to control reversible-lane operations if any of the following conditions are present:

A. More than one lane is reversed in direction;
B. Two-way or one-way left turns are allowed during peak-period reversible operations, but those turns are from a different lane than used during off-peak periods;
C. Other unusual or complex operations are included in the reversible-lane pattern;
D. Demonstrated crash experience occurring with reversible-lane operation controlled by static signs that can be corrected by using lane-use control signals at the times of transition between peak and off-peak patterns; and/or
E. An engineering study indicates that ~~safer~~ the safety and ~~more efficient~~ efficiency of the traffic operations of a reversible-lane system would be ~~provided~~ improved by lane-use control signals.

Standard:

Pavement markings (see Section 3B.03) shall be used in conjunction with reversible-lane control signals. relocated from Section 4J.02

Option:

Lane-use control signals ~~also may be used for reversible-lane operations at toll booths. They~~ may also be used if there is no intent or need to reverse lanes, but there is a need to indicate the open or closed status of one or more lanes, ~~including~~ such as:

A. On a freeway, if it is desired to ~~keep traffic out of~~ close certain lanes at certain hours to facilitate the merging of traffic from a ramp or other freeway;
B. On a freeway, near its terminus, to indicate a lane that ends; and
C. On a freeway or long bridge, to indicate that a lane may be temporarily blocked by a crash, breakdown, construction or maintenance activities, ~~and so forth~~ or similar temporary conditions.

Standard:

At toll plazas, a lane-use control signal shall be installed above the center of each controlled lane that is not an Open Road electronic toll collection (ETC) lane to indicate the open or closed status of the controlled lane.

Option:

Lane-use control signals may also be installed above the center of each Open Road ETC lane.

Support:

Sections 2B.31 and 2E.55 through 2E.58 contain information regarding the signs that are used at toll plazas.

Section ~~4J.02~~ 4M.02 Meaning of Lane-Use Control Signal Indications

Standard:

The meanings of lane-use control signal indications ~~are~~ shall be as follows:

A. A steady DOWNWARD GREEN ARROW signal indication shall mean that a road user is permitted to drive in the lane over which the arrow signal indication is located.

B. A steady YELLOW X signal indication shall mean that a road user is to prepare to vacate~~, in a reasonably safe manner,~~ the lane over which the signal indication is located because a lane control change is being made to a steady RED X signal indication.

C. A steady WHITE TWO-WAY LEFT-TURN ARROW signal indication (see Figure 4M-1) shall mean that a road user is permitted to use a lane over which the signal indication is located for a left turn, but not for through travel, with the understanding that common use of the lane by oncoming road users for left turns is also permitted.

D. A steady WHITE ONE WAY LEFT-TURN ARROW signal indication (see Figure 4M-1) shall mean that a road user is permitted to use a lane over which the signal indication is located for a left turn (without opposing turns in the same lane), but not for through travel.

E. A steady RED X signal indication shall mean that a road user is not permitted to use the lane over which the signal indication is located and that this signal indication shall modify accordingly the meaning of ~~all~~ other traffic controls present. ~~The road user shall obey all other traffic controls and follow normal safe driving practices.~~

Section ~~4J.03~~ 4M.03 Design of Lane-Use Control Signals

Standard:

All lane-use control signal indications shall be in units with rectangular signal faces and shall have opaque backgrounds. Nominal minimum height and width of each DOWNWARD GREEN ARROW, YELLOW X, and RED X signal face shall be 450 mm (18 in) for typical applications. The WHITE TWO-WAY LEFT-TURN ARROW and WHITE ONE WAY LEFT-TURN ARROW signal faces shall have a nominal minimum height and width of 750 mm (30 in).

Each lane to be reversed or closed shall have signal faces with a DOWNWARD GREEN ARROW and a RED X symbol.

Each reversible lane that also operates as a two-way or one-way left-turn lane during certain periods shall have signal faces that also include the applicable WHITE TWO-WAY LEFT-TURN ARROW or WHITE ONE WAY LEFT-TURN ARROW symbol.

Each nonreversible lane immediately adjacent to a reversible lane shall have signal indications that display a DOWNWARD GREEN ARROW to traffic traveling in the permitted direction and a RED X to traffic traveling in the opposite direction.

If in separate signal sections, the relative positions, from left to right, of the signal indications shall be RED X, YELLOW X, DOWNWARD GREEN ARROW, WHITE TWO-WAY LEFT-TURN ARROW, WHITE ONE WAY LEFT-TURN ARROW.

The color of lane-use control signal indications shall be clearly visible for 700 m (2,300 ft) at all times under normal atmospheric conditions, unless otherwise physically obstructed.

Lane-use control signal faces shall be located approximately over the center of the lane controlled.

If the area to be controlled is more than 700 m (2,300 ft) in length, or if the vertical or horizontal alignment is curved, intermediate lane-use control signal faces shall be located over each controlled lane at frequent intervals. This location shall be such that road users will at all times be able to see at least one signal indication and preferably two along the roadway, and will have a definite indication of the lanes specifically reserved for their use.

All lane-use control signal faces shall be located in a straight line across the roadway approximately at right angles to the roadway alignment.

On roadways having intersections controlled by traffic control signals, the lane-use control signal face shall be located sufficiently far in advance of or beyond such traffic control signals to prevent them from being misconstrued as traffic control signals.

Except as noted in the Option below, the bottom of the signal housing of any lane-use control signal face shall be at least 4.6 m (15 ft) but not more than 5.8 m (19 ft) above the pavement grade.

Option:

The bottom of the signal housing of a lane-use control signal above a toll plaza lane having a canopy may be mounted lower than 4.6 m (15 ft) above the pavement, but not lower than the vertical clearance of the canopy structure.

In areas, except for toll plazas, with minimal visual clutter and with speeds of less than ~~70~~ 60 km/h or less than 40 mph, lane-use control signal faces with nominal height and width of 300 mm (12 in) may be used for

the DOWNWARD GREEN ARROW, YELLOW X, and RED X signal faces, and lane-use control signal faces with nominal height and width of 450 mm (18 in) may be used for the WHITE TWO-WAY LEFT-TURN ARROW and WHITE ONE-WAY LEFT-TURN ARROW signal faces.

Other sizes of lane-use control signal faces larger than 450 mm (18 in) with message recognition distances appropriate to signal spacing may be used for the DOWNWARD GREEN ARROW, YELLOW X, and RED X signal faces.

Nonreversible lanes not immediately adjacent to a reversible lane on any street so controlled may also be provided with signal indications that display a DOWNWARD GREEN ARROW to traffic traveling in the permitted direction and a RED X to traffic traveling in the opposite direction.

The signal indications provided for each lane may be in separate signal sections or may be superimposed in the same signal section.

Section ~~4J.04~~ 4M.04 Operation of Lane-Use Control Signals

Standard:

All lane-use control signals shall be coordinated so that all the signal indications along the controlled section of roadway are operated uniformly and consistently. The lane-use control signal system shall be designed to reliably guard against showing any prohibited combination of signal indications to any traffic at any point in the controlled lanes.

For reversible-lane control signals, the following combination of signal indications shall not be ~~shown~~ simultaneously displayed over the same lane to both directions of travel:

A. **DOWNWARD GREEN ARROW in both directions,**
B. **YELLOW X in both directions,**
C. **WHITE ONE WAY LEFT-TURN ARROW in both directions,**
D. **DOWNWARD GREEN ARROW in one direction and YELLOW X in the other direction,**
E. **WHITE TWO-WAY LEFT-TURN ARROW or WHITE ONE WAY LEFT-TURN ARROW in one direction and DOWNWARD GREEN ARROW in the other direction,**
F. **WHITE TWO-WAY LEFT-TURN ARROW in one direction and WHITE ONE WAY LEFT-TURN ARROW in the other direction, and**
G. **WHITE ONE WAY LEFT-TURN ARROW in one direction and YELLOW X in the other direction.**

A moving condition in one direction shall be terminated either by the immediate display of a RED X signal indication or by a YELLOW X signal indication followed by a RED X signal indication. In either case, the duration of the RED X signal indication shall be sufficient to allow clearance of the lane before any moving condition is allowed in the opposing direction.

Whenever a DOWNWARD GREEN ARROW signal indication is changed to a WHITE TWO-WAY LEFT-TURN ARROW signal indication, the RED X signal indication shall continue to be displayed to the opposite direction of travel for an appropriate duration to allow traffic time to vacate the lane being converted to a two-way left-turn lane.

If an automatic control system is used, a manual control to override the automatic control shall be provided.

Guidance:

The type of control provided for reversible-lane operation should be such as to permit either automatic or manual operation of the lane-use control signals.

Standard:

If used, lane-use control signals shall be operated continuously, except that lane-use control signals that are used only for special events or other infrequent occurrences and lane-use control signals on nonreversible freeway lanes ~~may~~ shall be permitted to be darkened when not in operation. The change from normal operation to nonoperation shall occur only when the lane-use control signals display signal indications that are appropriate for the lane use that applies when the signals are not operated. The lane-use control signals shall display signal indications that are appropriate for the existing lane use when changed from nonoperation to normal operations. Also, traffic control devices shall clearly indicate the proper lane use when the lane control signals are not in operation.

Support:

Section 2B.25 contains additional information concerning considerations involving left-turn prohibitions in conjunction with reversible-lane operations.

CHAPTER ~~4L.~~ 4N. IN-ROADWAY LIGHTS

Section ~~4L.01~~ 4N.01 Application of In-Roadway Lights

Support:

In-Roadway Lights are special types of highway traffic signals 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 slow down and/or come to a stop. This includes~~, but is not necessarily limited to,~~ situations warning of marked school crosswalks, marked midblock crosswalks, marked crosswalks on uncontrolled approaches, marked crosswalks in advance of roundabouts ~~intersections~~ as described in ~~Sections 3B.24 and 3B.25~~ Chapter 3C, and other roadway situations involving pedestrian crossings.

Standard:

In-Roadway Lights shall not be used for any application that is not described in this Chapter.

If used, In-Roadway Lights shall not exceed a height of 19 mm (0.75 in) above the roadway surface.

When used, In-Roadway Lights shall be flashed and shall not be steadily illuminated.

Support:

Steadily illuminated lights installed in the roadway surface are considered to be internally illuminated raised pavement markers (see Section 3B.11).

Option:

~~The flash rate for~~ In-Roadway Lights may be ~~different from the flash rate of standard beacons~~ flashed in a manner that includes a continuous flash of varying intensity and time duration that is repeated to provide a flickering effect (see Section 4N.02).

Section ~~4L.02~~ 4N.02 In-Roadway Warning Lights at Crosswalks paragraphs have been relocated within this Section

Standard:

If used, In-Roadway Warning Lights at crosswalks shall be installed only at marked crosswalks with applicable warning signs. They shall not be used at crosswalks controlled by YIELD signs, STOP signs, or traffic control signals.

If In-Roadway Warning Lights are used at a crosswalk, the following requirements shall apply:

A. ~~If used, In-Roadway Warning Lights at crosswalks~~ **Except as noted in the Option below, they shall be installed along both sides of the crosswalk and shall span its entire length.**

B. ~~If used, In-Roadway Warning Lights at crosswalks~~ **They shall initiate operation based on pedestrian actuation and shall cease operation at a predetermined time after the pedestrian actuation or, with passive detection, after the pedestrian clears the crosswalk.**

C. ~~If used, In-Roadway Warning Lights at crosswalks~~ **They shall display a flashing yellow ~~signal indication~~ light edited to increase accuracy when actuated. The flash rate ~~for In-Roadway Warning Lights at crosswalks~~ shall be at least 50, but not more than 60, flash periods per minute. ~~The flash rate~~ If they are flashed in a manner that includes a continuous flash of varying intensity and time duration that is repeated to provide a flickering effect, the flickers or pulses shall not ~~be~~ repeat at a rate that is between 5 and 30 ~~flashes~~ per second to avoid frequencies that might cause seizures.**

D. ~~If used, In-Roadway Warning Lights~~ **They shall be installed in the area between the outside edge of the crosswalk line and 3 m (10 ft) from the outside edge of the crosswalk.**

E. ~~In-Roadway Warning Lights~~ **They shall face away from the crosswalk if unidirectional, or shall face away from and across the crosswalk if bidirectional.**

If used on one-lane, one-way roadways, a minimum of two In-Roadway Warning Lights shall be installed on the approach side of the crosswalk. If used on two-lane roadways, a minimum of three In-Roadway Warning Lights shall be installed along both sides of the crosswalk. If used on roadways with more than two lanes, a minimum of one In-Roadway Warning Light per lane shall be installed along both sides of the crosswalk.

Guidance:

If used, In-Roadway Warning Lights should be installed in the center of each travel lane, at the ~~centerline~~ center line of the roadway, at each edge of the roadway or parking lanes, or at other suitable locations away from the normal tire track paths.

The location of the In-Roadway Warning Lights within the lanes should be based on engineering judgment.

Option:

On one-way streets, In-Roadway Warning Lights may be omitted on the departure side of the crosswalk.

Based on engineering judgment, the In-Roadway Warning Lights on the departure side of the crosswalk on the left side of a median may be omitted.

Unidirectional In-Roadway Warning Lights installed at crosswalk locations may have an optional, additional yellow light indication in each unit that is visible to pedestrians in the crosswalk to indicate to pedestrians in the crosswalk that the In-Roadway Warning Lights are in fact flashing as they cross the street. These yellow added to increase accuracy lights may flash with and at the same flash rate as the light module in which each is installed.

Guidance:

If used, the period of operation of the In-Roadway Warning Lights following each actuation should be sufficient to allow a pedestrian crossing in the crosswalk to leave the curb or shoulder and travel at a ~~normal~~ walking speed of ~~1.2~~ 1.1 m (~~4~~ 3.5 ft) per second to at least the far side of the traveled way or to a median of sufficient width for pedestrians to wait. Where pedestrians who walk slower than ~~normal~~ 1.1 m (3.5 ft) per second, or pedestrians who use wheelchairs, routinely use the crosswalk, a walking speed of less than ~~1.2~~ 1.1 m (~~4~~ 3.5 ft) per second should be considered in determining the period of operation.

Standard:

If pedestrian pushbuttons are used to actuate the in-roadway lights, a PUSH BUTTON TO TURN ON WARNING LIGHTS (with pushbutton symbol) (R10-25) sign (see Figure 2B-29) shall be mounted adjacent to or integral with each pedestrian pushbutton.

Where the period of operation is sufficient only for crossing from a curb or shoulder to a median of sufficient width for pedestrians to wait, ~~additional measures should be considered, such as~~ median-mounted pedestrian actuators shall be provided.

~~Option:~~

~~In-Roadway Warning Lights at crosswalks may use pedestrian detectors to determine the duration of the operation instead of ceasing operation after a predetermined time.~~ deleted because it is already said in Item B in the Standard above

CHAPTER 5A. GENERAL

Section 5A.01 Function

Support:

At some locations on low-volume roads, the use of traffic control devices might be needed to provide the road user limited, but essential, information regarding regulation, guidance, and warning.

Other Parts of this Manual contain ~~criteria~~ provisions edited to increase consistency applicable to all low-volume roads; however, Part 5 specifically supplements and references the ~~criteria~~ provisions edited to increase consistency for traffic control devices commonly used on low-volume roads.

Standard:

A low-volume road shall be defined for this Part of the Manual as follows:

A. A low-volume road shall be a facility lying outside of built-up areas of Cities, towns, and communities, and it shall have a traffic volume of less than 400 AADT.

B. A low-volume road shall not be a freeway, an expressway, an interchange ramp, a freeway service road, ~~or~~ a road on a designated State highway system, or a residential street in a neighborhood. In terms of highway classification, it shall be a variation of a conventional road or a special purpose road as defined in Section 2A.01.

C. A low-volume road shall be classified as either paved or unpaved.

Support:

Low-volume roads typically include farm-to-market, recreational, resource management and development, and local roads in rural areas.

Guidance:

The needs of unfamiliar road users for occasional, recreational, and commercial transportation purposes should be considered.

Section 5A.02 Application

Support:

It is possible, in many cases, to provide essential information to road users on low-volume roads with a limited number of traffic control devices. The focus might be on devices that:

A. Warn of conditions not normally encountered,
B. Prohibit unsafe movements, or
C. Provide minimal destination guidance.

~~As with other roads, the application of traffic control devices on low-volume roads is based on engineering judgment or studies.~~

Standard:

The ~~criteria~~ provisions edited to increase consistency contained in Part 5 shall not prohibit the installation or the full application of traffic control devices on a low-volume road where conditions justify their use.

Guidance:

Additional traffic control devices and ~~criteria~~ provisions edited to increase consistency contained in other Parts of the Manual should be considered for use on low-volume roads.

Section 5A.03 Design

Standard:

Traffic control devices for use on low-volume roads shall be designed in accordance with the ~~criteria~~ provisions edited to increase consistency contained in Part 5, and where required, in other applicable Parts of this Manual.

The typical sizes for signs and plaques installed on low-volume roads shall be as shown in Table 5A-1. The ~~minimum sign~~ sizes in the minimum column shall only be used on low-volume roads where the 85th-percentile speed or posted speed limit is less than 60 km/h (35 mph).

Guidance:

The ~~oversized sign~~ sizes in the oversized column should be used where engineering judgment indicates a need based on high vehicle operating speeds, driver expectancy, traffic operations, or roadway conditions.

Option:

Signs and plaques larger than those shown in Table 5A-1 may be used (see Section 2A.11).

Standard:

All signs shall be retroreflective or illuminated to show the same shape and similar color both day and night, unless specifically stated otherwise in other applicable Parts of this Manual. The requirements for sign illumination shall not be considered to be satisfied by street, highway, or strobe lighting.

All markings shall be visible at night and shall be retroreflective unless ambient illumination provides adequate visibility of the markings.

Section 5A.04 Placement

Standard:

The traffic control devices used on low-volume roads shall be placed and positioned in accordance with the ~~criteria~~ provisions edited to increase consistency contained in Part 5 and, where necessary, in accordance with the lateral, longitudinal, and vertical placement ~~criteria~~ provisions edited to increase consistency contained in Part 2 and other applicable Sections of this Manual.

Guidance:

The placement of warning signs should ~~conform to~~ comply with the guidance contained in Section 2C.05 and other applicable Sections of this Manual.

Option:

A lateral offset of not less than 0.6 m (2 ft) from the roadway edge to the roadside edge of a sign may be used where roadside features such as terrain, shrubbery, and/or trees prevent lateral placement in accordance with Section 2A.19.

Standard:

If located within a clear zone, ~~ground-~~ post-mounted edited to increase consistency sign supports shall be yielding, breakaway, or shielded with a longitudinal barrier or crash cushion as required in Section 2A.19.

CHAPTER 5B. REGULATORY SIGNS

Section 5B.01 Introduction

Support:

The purpose of a regulatory sign is to inform highway users of traffic laws or regulations, and to indicate the applicability of legal requirements that would not otherwise be apparent.

The ~~criteria~~ provisions edited to increase consistency for regulatory signs are contained in Chapter 2B and in other Sections of this Manual. ~~Criteria~~ Provisions edited to increase consistency for regulatory signs that are specific to low-volume roads are contained in this Chapter.

Section 5B.02 STOP and YIELD Signs (R1-1 and R1-2)

Guidance:

STOP (R1-1) and YIELD (R1-2) signs (see Figure 5B-1) should be considered for use on low-volume roads where engineering judgment or study, consistent with the provisions of Sections 2B.04 to 2B.10, indicates that either of the following conditions applies:

A. An intersection of a less-important road with a main road where application of the normal right-of-way rule might not be readily apparent.
B. An intersection that has restricted sight distance for the prevailing vehicle speeds.

Section 5B.03 Speed Limit Signs (R2 Series)

Standard:

If used, Speed Limit (R2 series) signs (see Figure 5B-1) shall display the speed limit established by law, ordinance, regulation, or as adopted by the authorized agency following an engineering study. The displayed speed limits ~~shown~~ edited to increase consistency shall be in multiples of 10 km/h or 5 mph.

Speed limits shall be established in accordance with Section 2B.13.

Option:

Speed limit signs may be used on low-volume roads that carry traffic from, onto, or adjacent to higher-volume roads that have posted speed limits.

Section 5B.04 Traffic Movement and Prohibition Signs (R3, R4, R5, R6, R9, R10, R11, R12, R13, and R14 Series)

Support:

The regulatory signs (see Figure 5B-1) in these series inform road users of required, permitted, or prohibited traffic movements involving turn, alignment, exclusion, and pedestrians.

Standard:

If used, signs for traffic prohibitions or restrictions shall be placed in advance of the prohibition or restriction so that traffic can use an alternate route or turn around.

Guidance:

Signs should be used on low-volume roads to indicate traffic prohibitions and restrictions such as road closures and weight restrictions.

~~Option~~ Support:

These signs ~~may~~ might be useful on a low-volume road near and at the intersections or the connections with a higher class of road, and where the regulatory message is essential for ~~reasonably safe~~ transition from the low-volume road to the higher-class facility ~~and~~ or vice versa.

Section 5B.05 Parking Signs (R8 Series)

Option:

Parking signs (see Figure 5B-2) may be installed selectively on low-volume roads with due consideration of enforcement.

Section 5B.06 Other Regulatory Signs

Standard:

Other regulatory signs used on low-volume roads that are not discussed in Part 5 shall ~~conform~~ comply with the ~~criteria~~ provisions edited to increase consistency contained in other Parts of this Manual.

CHAPTER 5C. WARNING SIGNS

Section 5C.01 Introduction

Support:

The purpose of a warning sign is to provide advance warning to the road user of unexpected conditions on or adjacent to the roadway that might not be readily apparent.

The ~~criteria~~ provisions edited to increase consistency for warning signs are contained in Chapter 2C and in other Sections of this Manual. ~~Criteria~~ Provisions edited to increase consistency for warning signs that are specific to low-volume roads are contained in this Chapter.

Section 5C.02 Horizontal Alignment Signs (W1-1 through W1-8)

Support:

Horizontal Alignment signs (see Sections 2C.06 through 2C.12 and Figure 5C-1) include turn, curve, reverse turn, reverse curve, winding road, large arrow, and chevron alignment signs.

Option:

Horizontal Alignment signs may be used where engineering judgment indicates a need to inform the road user of a change in the horizontal alignment of the roadway.

Section 5C.03 Intersection Warning Signs (W2-1 through W2-5)

Support:

Intersection signs (see Figure 5C-1) include the crossroad, side road, T-symbol, and Y-symbol signs.

Option:

Intersection signs may be used where engineering judgment indicates a need to inform the road user in advance of an intersection.

Section 5C.04 Stop Ahead and Yield Ahead Signs (W3-1, W3-2)

Standard:

A Stop Ahead (W3-1) sign (see Figure 5C-2) shall be used where a STOP sign is not visible for a sufficient distance to permit the road user to bring the vehicle to a stop at the STOP sign.

A Yield Ahead (W3-2) sign (see Figure 5C-2) shall be used where a YIELD sign is not visible for a sufficient distance to permit the road user to bring the vehicle to a stop, if necessary, at the YIELD sign.

~~Option:~~

~~Word message (W3-1a and W3-2a) signs may be used as alternates to symbol signs.~~

Section 5C.05 NARROW BRIDGE Sign (W5-2)

Option:

The NARROW BRIDGE (W5-2) sign (see Figure 5C-2) may be used on an approach to a bridge or culvert that has a clear width less than that of the approach roadway.

Section 5C.06 ONE LANE BRIDGE Sign (W5-3)

Guidance:

A ONE LANE BRIDGE (W5-3) sign (see Figure 5C-2) should be used on low-volume two-way roadways in advance of any bridge or culvert:

A. Having a clear roadway width of less than 4.9 m (16 ft), or
B. Having a clear roadway width of less than 5.5 m (18 ft) when commercial vehicles constitute a high proportion of the traffic, or
C. Having a clear roadway width of 5.5 m (18 ft) or less where the approach sight distance is limited on the approach to the structure.

Option:

Roadway alignment and additional warning may be provided on the approach to a bridge or culvert by the use of object markers and/or delineators.

Section 5C.07 Hill Sign (W7-1)

Option:

An engineering study of vehicles and road characteristics, such as percent grade and length of grade, may be conducted to determine hill signing requirements.

~~The use of the Hill (W7-1) sign (see Figure 5C-2) on low-volume roads may be confined to roads where commercial or recreational vehicles are anticipated.~~

~~Word messages (W7-1a) may be used as alternates to symbols.~~

Section 5C.08 PAVEMENT ENDS Sign (W8-3)

Option:

A PAVEMENT ENDS (W8-3) sign (see Figure 5C-2) may be used to warn road users where a paved surface changes to a gravel or earth road surface.

Section 5C.09 Vehicular Traffic and Nonvehicular Signs (W11 Series and W8-6)

Guidance:

Vehicular Traffic signs (see Figure 5C-2) should be used to alert road users to frequent unexpected entries into the roadway by trucks, bicyclists, farm vehicles, fire trucks, and other vehicles. Such signs should be used only at locations where the road user's sight distance is restricted or the activity would be unexpected.

Option:

Nonvehicular signs (see Figure 5C-2) may be used to alert the road user to frequent unexpected entries into the roadway by pedestrian, large animal, and other crossing activities that ~~may~~ might cause potential conflicts.

A W7-3aP, W16-2P, or W16-9P supplemental plaque (see Figure 5C-2), with the legend NEXT XX km (~~NEXT XX~~ MILES), XX METERS (~~XX~~ FEET), or AHEAD may be installed below a Vehicular Traffic or Nonvehicular sign (see Sections 2C.51 and 2C.52).

Guidance:

If the activity is seasonal or temporary, the sign should be removed or covered when the crossing activity does not exist.

Section 5C.10 Advisory Speed Plaque (W13-1P)

Option:

An Advisory Speed (W13-1P) plaque (see Figure 5C-1) may be mounted below a warning sign when the condition requires a reduced speed.

Section 5C.11 DEAD END or NO OUTLET Signs (W14-1, W14-1a, W14-2, W14-2a)

Option:

The DEAD END (W14-1) and NO OUTLET (W14-2) signs (see Figure 5C-2) and the DEAD END (W14-1a) and NO OUTLET (W14-2a) signs (see Figure 2C-5) may be used to warn road users of a road that has no outlet or that terminates in a dead end or cul-de-sac.

Guidance:

If used, these signs should be placed at a location that gives drivers of large commercial or recreational vehicles an opportunity to select a different route or turn around.

Section 5C.12 NO TRAFFIC SIGNS Sign (W18-1)

Option:

A W18-1 warning sign (see Figure 5C-2) with the legend NO TRAFFIC SIGNS may be used only on unpaved, low-volume roads to advise users that no signs are installed along the distance of the road. If used, 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 ~~may~~ might need this information.

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

Section 5C.13 Other Warning Signs

Standard:

Other warning signs used on low-volume roads that are not discussed in Part 5, but are in this Manual, shall ~~conform~~ comply with the ~~criteria~~ provisions edited to increase consistency contained in other Parts of this Manual. Warning signs that are not specified in this Manual shall ~~conform to~~ comply with the ~~criteria~~ provisions edited to increase consistency in Sections 2C.02 and 2C.03.

Section ~~5E.05~~ 5C.14 Object Markers and Barricades relocated

Support:

The purpose of object markers is to mark obstructions located within or adjacent to the roadway, such as bridge abutments, drainage structures, and other physical objects.

Guidance:

The end of a low-volume road should be marked with an end-of-roadway marker in ~~conformance~~ compliance with Section 2L.04.

Option:

A Type ~~III~~ 3 Barricade may be used where engineering studies or judgment indicates a need for a more visible end-of-roadway treatment (see Section 2L.05).

Standard:

Barricades used on low-volume roads shall comply with the provisions contained in this Manual.

CHAPTER 5D. GUIDE SIGNS

Section 5D.01 Introduction

Support:

The purpose of a guide sign is to inform road users regarding positions, directions, destinations, and routes.

The ~~criteria~~ provisions edited to increase consistency for guide signs, in general, are contained in Chapters 2D through 2K and in other Sections of this Manual. ~~Criteria~~ Provisions edited to increase consistency for guide signs that are specific to low-volume roads are contained in this Chapter.

Guidance:

The familiarity of the road users with the road should be considered in determining the need for guide signs on low-volume roads.

Support:

Low-volume roads generally do not require guide signs to the extent that they are needed on higher classes of roads. Because guide signs are typically only beneficial as a navigational aid for road users who are unfamiliar with a low-volume road, guide signs might not be needed on low-volume roads that serve only local traffic.

Guidance:

If used, destination names should be as specific and descriptive as possible. Destinations such as campgrounds, ranger stations, recreational areas, and the like should be clearly indicated so that they are not interpreted to be communities or locations with road user services.

Option:

Guide signs may be used at intersections to provide information for road users returning to a higher class of roads.

CHAPTER 5E. MARKINGS

Section 5E.01 Introduction

Support:

The purpose of markings on highways is to provide guidance and information for road users regarding roadway conditions and restrictions.

The ~~criteria~~ provisions edited to increase consistency for markings, delineators, and object markers, in general, are contained in Part 3 and in other Sections of this Manual. ~~Criteria~~ Provisions edited to increase consistency for markings that are specific to low-volume roads are contained in this Chapter.

Section 5E.02 ~~Centerline~~ Center Line Markings

Standard:

Where ~~centerline~~ center line markings are installed, no-passing zone markings in conformance with Section 3B.02 shall also be installed.

Guidance:

~~Centerline~~ Center line markings should be used on paved low-volume roads where engineering judgment or an engineering study indicates a need for them.

Section 5E.03 Edge Line Markings

Support:

The purpose of edge line markings is to delineate the left-hand edited to increase clarity or right-hand edited to increase clarity edge of the roadway.

Guidance:

Edge line markings should be considered for use on paved low-volume roads based on engineering judgment or an engineering study.

Option:

Edge line markings may be placed on highways with or without ~~centerline~~ center line markings.

Edge line markings may be placed on paved low-volume roads for roadway features such as horizontal curves, narrow bridges, pavement width transitions, curvilinear alignment, and at other locations based on engineering judgment or an engineering study.

Section 5E.04 Delineators

Support:

The purpose of delineators is to enhance driver safety where it is desirable to call attention to a changed or changing condition such as abrupt roadway narrowing or curvature.

Option:

Delineators may be used on low-volume roads based on engineering judgment, such as for curves, T-intersections, and abrupt changes in the roadway width. In addition, they may be used to mark the location of driveways or other minor roads entering the low-volume road.

Section 5E.05 was relocated to become Section 5C.14

Section ~~5E.06~~ 5E.05 Other Markings

Standard:

Other markings, such as stop lines, crosswalks, pavement legends, ~~barricades,~~ channelizing devices, and islands, used on low-volume roads shall ~~conform~~ comply with the ~~criteria~~ provisions edited to increase consistency contained in this Manual.

CHAPTER 5F. TRAFFIC CONTROL FOR HIGHWAY-RAIL GRADE CROSSINGS

Section 5F.01 Introduction

Support:

The ~~criteria~~ provisions edited to increase consistency for highway-rail grade crossing traffic control devices are contained in Part 8 and in other Sections of this Manual.

Traffic control for highway-rail grade crossings includes all signs, signals, markings, illumination, and other warning devices and their supports along roadways either approaching or at highway-rail grade crossings. The function of this traffic control is to ~~permit~~ promote the ~~reasonably safe and~~ efficient operation of both rail and ~~road~~ highway traffic and to minimize the crash rates at highway-rail grade crossings.

Section 5F.02 Highway-Rail Grade Crossing (Crossbuck) Sign and Number of Tracks Plaque (R15-1, R15-2P)

Standard:

The Highway-Rail Grade Crossing (Crossbuck) (R15-1) sign (see Figure 5F-1) shall be used at all highway-rail grade crossings. For all low-volume roads, Crossbuck signs shall be used on the right-hand edited to increase clarity side of each approach. If there are two or more tracks, the supplemental Number of Tracks (R15-2P) ~~sign~~ plaque (see Figure 5F-1) shall display the number of tracks and shall be installed below the Crossbuck sign.

A strip of retroreflective white material not less than 50 mm (2 in) in width shall be used on the back of each blade of each Crossbuck sign for the length of each blade, at all highway-rail grade crossings, except those where Crossbuck signs have been installed back-to-back.

A strip of retroreflective white material, not less than 50 mm (2 in) in width, shall be used on each support at passive highway-rail grade crossings for the full length of the front and back of the support from the Crossbuck sign or Number of Tracks ~~sign~~ plaque to within 0.6 m (2 ft) above the ~~edge of the roadway~~ ground, except on the side of those supports where a STOP (R1-1) or YIELD (R1-2) sign or flashing lights have been installed or on the back side of supports for Crossbuck signs installed on one-way streets.

Section 5F.03 Highway-Rail Grade Crossing Advance Warning Signs (W10 Series)

Standard:

Except as noted in the Option, a Highway-Rail Grade Crossing Advance Warning (W10-1) sign (see Figure 5F-1) with a supplemental plaque describing the type of traffic control at the highway-rail grade crossing shall be used on all low-volume roads in advance of every highway-rail grade crossing.

Option:

The Highway-Rail Grade Crossing Advance Warning sign may be omitted for highway-rail grade crossings that are flagged by train crews.

The W10-2, W10-3, and W10-4 signs (see Figure 5F-1) with a supplemental plaque describing the type of traffic control at the highway-rail grade crossing may be used on low-volume roads that run parallel to railroad tracks to warn road users making a turn that they will encounter a highway-rail grade crossing soon after making the turn.

Standard:

The supplemental plaque (see Figure 5F-1) shall be a No Signal (W10-10P) plaque where used in advance of a crossing that does not have active traffic control devices and shall be a SIGNAL AHEAD (W10-16P) plaque where used in advance of a crossing with active traffic control devices. The supplemental plaque shall be mounted directly below the W10-1 sign.

Section 5F.04 STOP and YIELD Signs (R1-1, R1-2)

Support:

Sections 8B.04 and 8B.05 contain information regarding the use of STOP (R1-1) signs or YIELD (R1-2) signs at highway-rail grade crossings that are not equipped with automatic traffic control devices.

~~Option:~~

~~STOP (R1-1) or YIELD (R1-2) signs may be used at low-volume highway-rail grade crossings, at the discretion of the responsible jurisdiction, for crossings without automatic traffic control devices, consistent with the provisions of Sections 2B.04 to 2B.10.~~

Standard:

The use and application of STOP (R1-1) signs or YIELD (R1-2) signs at highway-rail grade crossings that are not equipped with automatic traffic control devices on low-volume roads shall comply with the provisions of Sections 8B.04 and 8B.05.

~~**A Stop Ahead (W3-1) sign or Yield Ahead (W3-2) sign shall be used in advance of a STOP or YIELD sign at a highway-rail grade crossing if the STOP or YIELD sign is not visible for a distance that enables the road user to bring the vehicle to a reasonably safe stop at the highway-rail grade crossing.**~~

Section 5F.05 Pavement Markings

Guidance:

Pavement markings at highway-rail grade crossings should be used on paved low-volume roads, particularly if they are already deployed at most other highway-rail grade crossings within the immediate vicinity, or when the roadway has ~~centerline~~ center line markings.

Section 5F.06 Other Traffic Control Devices

Standard:

Other traffic control devices that are used at highway-rail grade crossings on low-volume roads, such as other signs, signals, and illumination that are not in this Chapter, shall ~~conform~~ comply with the ~~criteria~~ provisions edited to increase consistency contained in Part 8 and other applicable Parts of this Manual.

CHAPTER 5G. TEMPORARY TRAFFIC CONTROL ZONES

Section 5G.01 Introduction

Guidance:

The safety of road users, including pedestrians and bicyclists, as well as personnel in work zones, should be an integral and high priority element of every project in the planning, design, maintenance, and construction phases. Part 6 should be reviewed for additional criteria, specific details, and more complex temporary traffic control zone requirements. The following principles should be applied to temporary traffic control zones:

A. Traffic movement should be disrupted as little as possible.
B. Road users should be guided in a clear and positive manner while approaching and within construction, maintenance, and utility work areas.
C. Routine inspection and maintenance of traffic control elements should be performed both day and night.
D. Both the contracting agency and the contractor should assign at least one person on each project to have day-to-day responsibility for assuring that the traffic control elements are operating effectively and any needed operational changes are brought to the attention of their supervisors.

Traffic control in temporary traffic control zones should be designed on the assumption that road users will only reduce their speeds if they clearly perceive a need to do so, and then only in small increments of speed. Temporary traffic control zones should not present a surprise to the road user. Frequent and/or abrupt changes in geometrics and other features should be avoided. Transitions should be well delineated and long enough to accommodate driving conditions at the speeds vehicles are realistically expected to travel.

A temporary traffic control plan (see Section 6C.01) should be used for a temporary traffic control zone on a low-volume road to specify particular traffic control devices and features, or to reference typical drawings such as those contained in Part 6.

Support:

Applications of speed reduction countermeasures and enforcement can be effective in reducing traffic speeds in temporary traffic control zones.

Section 5G.02 Applications

Guidance:

Planned work phasing and sequencing should be the basis for the use of traffic control devices for temporary traffic control zones. Part 6 should be consulted for specific traffic control requirements and examples where construction or maintenance work is planned.

~~Option~~ Support:

Maintenance activities ~~may~~ might not require extensive temporary traffic control if the traffic volumes and speeds are low.

Option:

The traffic applications shown in Figures 6I-1, 6I-11, 6I-15, and 6I-16 of Part 6 are among those that may be used on low-volume roads.

For temporary traffic control zones on low-volume roads that require flaggers, a single flagger may be adequate if the flagger is visible to approaching traffic from all appropriate directions.

Section 5G.03 Channelization Devices

Standard:

Channelization devices for nighttime use shall have the same retroreflective requirements as specified for higher-volume roadways.

Option:

To alert, guide, and direct road users ~~reasonably safely~~ through temporary traffic control zones on low-volume roads, tapers may be used to move a road user out of the traffic lane and around the work space using the spacing of devices that is described in Section 6F.60.

Section 5G.04 Markings

Guidance:

Pavement markings should be considered for temporary traffic control zones on paved low-volume roads, especially roads that had existing pavement markings or that have a surfaced detour or temporary roadway.

Option:

Interim pavement markings may be omitted in a temporary traffic control zone ~~may~~ if they are not ~~be~~ needed based on the criteria for these markings in Section 6F.75.

Section 5G.05 Other Traffic Control Devices

Standard:

Other traffic control devices, such as other signs, signals, and illumination that are used on low-volume roads in temporary traffic control zones, but are not described in Part 5, shall ~~conform~~ comply with the ~~criteria~~ provisions edited to increase consistency contained in other Parts of this Manual.

Support:

Some of the signs that might be applicable in a temporary traffic control zone on a low-volume road are shown in Figure 5G-1.

CHAPTER 6A. GENERAL

Section 6A.01 General

Support:

Whenever the acronym "TTC" is used in ~~this Chapter~~ Part 6, it refers to "temporary traffic control."

Standard:

The needs and control of all road users (motorists, bicyclists, and pedestrians within the highway, on public facilities, or on private property open to public travel, including persons with disabilities in accordance with the Americans with Disabilities Act of 1990 (ADA), Title II, Paragraph 35.130) through a TTC zone shall be an essential part of highway construction, utility work, maintenance operations, and the management of traffic incidents.

Support:

When the normal function of the roadway, public facility, or private property 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.

The primary function of TTC is to provide for the ~~reasonably safe and efficient~~ effective movement of road users through or around TTC zones while ~~reasonably~~ protecting workers, responders to traffic incidents, and equipment.

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 6D.03). At the same time, the TTC zone provides for the efficient completion of whatever activity interrupted the normal use of the roadway.

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.

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 not practical. Instead, Part 6 displays typical applications that depict common applications of TTC devices. The TTC selected for each situation depends on type of highway, road user conditions, duration of operation, physical constraints, and the nearness of the work space or incident management activity to road users.

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.

Operational improvements can also 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, and queue detection information, is aimed at increasing safety for both workers and road users and ensuring 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:

TTC plans and devices shall be the responsibility of the authority of a public body or official having jurisdiction for guiding road users. There shall 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 shall provide sufficient flexibility in the application of TTC to meet the needs of changing conditions in the TTC zone.

Support:

Temporary facilities, including ~~reasonably safe~~ pedestrian routes around worksites, are also covered by the accessibility requirements of the Americans with Disabilities Act of 1990 (ADA) (Public Law 101-336, 104 Stat. 327, July 26, 1990. 42 U.S.C. 12101-12213 (as amended)).

Guidance:

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 6H.

Option:

TTC plans may deviate from the typical applications described in Chapter 6I to allow for conditions and requirements of a particular site or jurisdiction.

Support:

The ~~criteria~~ provisions edited to increase consistency 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. An urban street is typically characterized by relatively low speeds, wide ranges of road user volumes, narrower roadway lanes, frequent intersections and driveways, significant pedestrian activity, and more businesses and houses.

CHAPTER 6B. FUNDAMENTAL PRINCIPLES

Section 6B.01 Fundamental Principles of Temporary Traffic Control

~~Support:~~

~~Whenever the acronym "TTC" is used in this Chapter, it refers to "temporary traffic control."~~

~~Standard:~~

~~The needs and control of all road users (motorists, bicyclists, and pedestrians within the highway, including persons with disabilities in accordance with the Americans with Disabilities Act of 1990 (ADA), Title II, Paragraph 35.130) through a TTC zone shall be an essential part of highway construction, utility work, maintenance operations, and the management of traffic incidents.~~

Support:

Construction, maintenance, utility, and incident zones can all benefit from TTC to compensate for the unexpected or unusual situations faced by road users. When planning for TTC in these zones, it can be assumed that it is appropriate for road users to exercise caution. Even though road users are assumed to be using caution, special care is still needed in applying TTC techniques.

Special plans preparation and coordination with transit, other highway agencies, law enforcement and other emergency units, utilities, schools, and railroad companies might be needed to reduce unexpected and unusual road user operation situations.

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.

Experience has shown that following the fundamental principles of Part 6 will assist road users and help protect workers in the vicinity of TTC zones.

Guidance:

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 highway-rail grade crossing, early coordination with the railroad company should take place.

Support:

Formulating specific plans for TTC at traffic incidents is difficult because of the variety of situations that can arise.

Guidance:

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:

A. 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.
B. 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 added to improve grammar knowledgeable (for example, trained and/or certified) in proper TTC practices.

Road user movement should be inhibited as little as practical, based on the following considerations:

A. 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 6C.01).
B. Frequent and abrupt changes in geometrics such as lane narrowing, dropped lanes, or main roadway transitions that require rapid maneuvers, should be ~~avoided~~ minimized.
C. Provisions should be made for the ~~reasonably safe~~ continuous operation of work, particularly on high-speed, high-volume roadways.
D. Road users should be encouraged to use alternative routes that do not include TTC zones.

E. Bicyclists and pedestrians, including those with disabilities, should be provided with access and ~~reasonably safe~~ passage through the TTC zone.

F. Roadway occupancy should be scheduled during off-peak hours on high-volume streets and highways and, if necessary, night work should be considered.

G. Early coordination with officials having jurisdiction over the affected cross streets and providing emergency services should occur ~~before roadway or ramp closings~~ if significant impacts to roadway operations are anticipated.

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:

A. 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. Providing information that is in usable formats by pedestrians with visual disabilities should also be considered.

B. 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. Providing traffic control devices that are accessible to and usable by pedestrians with disabilities should be considered.

C. Flagging procedures, when used, should provide positive guidance to road users traversing the TTC zone.

To provide acceptable levels of operations, routine day and night inspections of TTC elements should be performed as follows:

A. 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 should be to check that all TTC devices of the project are ~~reasonably~~ consistent with the TTC plan and are effective ~~in providing reasonably safe conditions~~ for motorists, bicyclists, pedestrians, and workers.

B. As the work progresses, temporary traffic controls and/or working conditions should be modified, if appropriate, in order to provide ~~reasonably safe and efficient~~ effective road user movement and to provide worker safety. The individual responsible for TTC should have the authority to halt work until applicable or remedial safety measures are taken.

C. 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.

D. 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.

Attention should be given to the maintenance of roadside safety during the life of the TTC zone by applying the following principles:

A. To accommodate run-off-the-road incidents, disabled vehicles, or emergency situations, unencumbered roadside recovery areas or clear zones should be provided where practical.

B. Channelization of road users should be accomplished by the use of pavement markings, signing, and crashworthy, detectable channelizing devices.

C. 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.

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.

Good public relations should be maintained by applying the following principles:

A. The needs of all road users should be assessed such that appropriate advance notice is given and clearly defined alternative paths are provided.

B. 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.

C. The needs of abutting property owners, residents, and businesses should be assessed and appropriate accommodations made.
D. The needs of emergency service providers (law enforcement, fire, and medical) should be assessed and appropriate coordination and accommodations made.
E. The needs of railroads and transit should be assessed and appropriate coordination and accommodations made.
F. The needs of operators of commercial vehicles such as buses and large trucks should be assessed and appropriate accommodations made.

Standard:

Before any new detour or temporary route is opened to traffic, all necessary signs shall be in place.

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.

CHAPTER 6C. TEMPORARY TRAFFIC CONTROL ELEMENTS

Section 6C.01 Temporary Traffic Control Plans

~~Support:~~

~~Whenever the acronym "TTC" is used in this Chapter, it refers to "temporary traffic control."~~

~~Standard:~~

~~The needs and control of all road users (motorists, bicyclists, and pedestrians within the highway, including persons with disabilities in accordance with the Americans with Disabilities Act of 1990 (ADA), Title II, Paragraph 35.130) through a TTC zone shall be an essential part of highway construction, utility work, maintenance operations, and the management of traffic incidents.~~

Support:

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 providing continuity of ~~reasonably safe and efficient~~ effective 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.

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.

Guidance:

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.

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.

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.

Provisions for effective continuity of accessible circulation paths for pedestrians should be incorporated into the TTC process. Where existing pedestrian routes are blocked or detoured, information should be provided about alternative routes that are usable by pedestrians with disabilities, particularly those who have visual disabilities. Access to temporary bus stops, ~~reasonably safe~~ travel across intersections with accessible pedestrian signals (see Section 4E.06), and other routing issues should be considered where temporary pedestrian routes are channelized. Barriers and channelizing devices that are detectable by people with visual disabilities should be provided.

Option:

Provisions may be incorporated into the project bid documents that enable contractors to develop an alternate TTC plan.

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:

This alternate or modified plan should have the approval of the responsible highway agency prior to implementation.

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, if applicable (see Section 10A.06 for additional light rail transit issues to consider for TTC).

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.

Reduced speed limits 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 ~~reasonably safely~~ travel through the TTC zone with a speed limit reduction of no more than ~~16~~ 20 km/h or ~~(~~10 mph~~)~~.

A reduction of more than ~~16~~ 20 km/h or ~~(~~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 ~~16~~ 20 km/h or ~~(~~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.

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.

Support:

Research has demonstrated that large reductions in the speed limit, such as a 50 km/h (30 mph) reduction, increase speed variance and the potential for crashes. Smaller reductions in the speed limit of up to ~~16~~ 20 km/h or ~~(~~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 ~~16~~ 20 km/h or ~~(~~10 mph~~)~~ from the normal speed limit has been shown to be more effective.

Section 6C.02 Temporary Traffic Control Zones

Support:

A TTC zone is an area of a highway where road user conditions are changed because of a work zone or an incident through the use of TTC devices, uniformed law enforcement officers, or other authorized personnel.

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.

An incident area is an area of a highway where temporary traffic controls are imposed by authorized officials in response to a traffic incident~~,~~ or natural disaster~~, or special event~~. 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.

Section 6C.03 Components of Temporary Traffic Control Zones

Support:

Most TTC zones are divided into four areas: the advance warning area, the transition area, the activity area, and the termination area. Figure 6C-1 illustrates these four areas. These four areas are described in Sections 6C.04 through 6C.07.

Section 6C.04 Advance Warning Area

Support:

The advance warning area is the section of highway where road users are informed about the upcoming work zone or incident area.

Option:

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:

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 800 m (0.5 mi) or more.

On urban streets, the effective placement of the first warning sign in meters (feet) should range from 0.75 to 1.5 times the speed limit in km/h (4 to 8 times the speed limit in mph), with the high end of the range being used when speeds are relatively high. When a single advance warning sign is used (in cases such as low-speed residential streets), the advance warning area can be as short as 30 m (100 ft). 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 6C-1).

Since rural highways are normally characterized by higher speeds, the effective placement of the first warning sign in meters (feet) should be substantially longer—from 1.5 to 2.25 times the speed limit in km/h (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 450 m (1,500 ft) or more for open highway conditions (see Table 6C-1).

The distances contained in Table 6C-1 are for guidance purposes and should be applied with engineering judgment. These distances should be considered minimum and adjustments for field conditions, if needed, should be made by increasing the recommended distances.

Support:

The need to provide additional reaction time for a condition is one example of justification for increasing the sign spacing.

Option:

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 6C.05 Transition Area

Support:

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:

When redirection of the road users' normal path is required, they shall be channelized from the normal path to a new path.

~~Support:~~

~~In mobile operations, the transition area moves with the work space.~~

Option:

Because it is impractical in mobile operations to redirect the road user's normal path with stationary channelization, more dominant vehicle-mounted traffic control devices, such as arrow panels, portable changeable message boards, and high-intensity rotating, flashing, oscillating, or strobe lights, may be used instead of channelizing devices to establish a transition area.

Section 6C.06 Activity Area

Support:

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.

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:

The work space may be stationary or may move as work progresses.

Guidance:

Since there might be several work spaces (some even separated by several kilometers or miles) within the project limits, each work space should be adequately signed to inform road users and reduce confusion.

Support:

The traffic space is the portion of the highway in which road users are routed through the activity area.

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:

Neither work activity nor storage of equipment, vehicles, or material should occur within a buffer space.

Option:

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.

A longitudinal buffer space may be placed in advance of a work space.

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 6C-2.

If a longitudinal buffer space is used, the values shown in Table 6C-2 may be used to determine the length of the longitudinal buffer space.

Support:

Typically, the buffer space is formed as a traffic island and defined by channelizing devices.

When a shadow vehicle, arrow panel, or changeable message sign is placed in a closed lane in advance of a work space, only the area upstream of the vehicle, arrow panel, or changeable message sign constitutes the buffer space.

Option:

The lateral buffer space may be used to separate the traffic space from the work space, as shown in Figures 6C-1 and 6C-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.

Guidance:

The width of a lateral buffer space should be determined by engineering judgment.

Option:

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.

~~Guidance:~~

~~If used, an incident response and emergency vehicle storage area should not extend into any portion of the buffer space.~~

Section 6C.07 Termination Area

Support:

The termination area is the section of the highway where road users are returned to their normal driving path.

Standard:

If road users have been diverted from their normal path, the termination area shall be used to return road users to their normal path. The termination area shall extend from the downstream end of the work area to the last TTC device such as END ROAD WORK signs, if posted.

Option:

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.

A longitudinal buffer space may be used between the work space and the beginning of the downstream taper.

Section 6C.08 Tapers

Option:

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.

Support:

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 6C-2.

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:

The appropriate taper length (L) should be determined using the criteria shown in Tables 6C-3 and 6C-4.

The maximum distance in meters (feet) between devices in a taper should not exceed 0.2 times the speed limit in km/h (1.0 times the speed limit in mph).

Support:

A merging taper requires the longest distance because drivers are required to merge into common road space.

Guidance:

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 a single lane before the downstream end of the transition.

Support:

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:

A shifting taper should have a length of approximately 0.5 L (see Tables 6C-3 and 6C-4).

Support:

A shoulder taper ~~may~~ 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:

If used, shoulder tapers should have a length of approximately 0.33 L (see Tables 6C-3 and 6C-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.

~~Option~~ Support:

A downstream taper ~~may~~ 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:

When used, a downstream taper should have a length of approximately 30 m (100 ft) per lane with devices placed at a spacing of approximately 6.1 m (20 ft).

Support:

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 way that a portion of the road is used alternately by traffic in each direction.

Guidance:

Traffic should be controlled by a flagger or temporary traffic control signal (if sight distance is limited), or a STOP or YIELD sign. A short taper having a minimum length of 15 m (50 ft) and a maximum length of 30 m (100 ft) with channelizing devices at approximately 6.1 m (20 ft) spacings should be used to guide traffic into the ~~one-way~~ one-lane section, and a downstream taper with a length of approximately 30 m (100 ft) should be used to guide traffic back into their original lane.

Support:

An example of a one-lane, two-way traffic taper is shown in Figure 6C-3.

Section 6C.09 Detours and Diversions

Support:

A detour is a temporary rerouting of road users onto an existing highway in order to avoid a TTC zone.

Guidance:

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:

A diversion is a temporary rerouting of road users onto a temporary highway or alignment placed around the work area.

Section 6C.10 One-Lane, Two-Way Traffic Control

Standard:

Except as noted in the Option below, when traffic in both directions must use a single lane for a limited distance, movements from each end shall be coordinated.

Guidance:

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.

Control points at each end should be chosen to permit easy passing of opposing lanes of vehicles.

If traffic on the affected one-lane roadway is not visible from one end to the other, then flagging procedures, a pilot car with a flagger used as described in Section 6C.13, or a traffic control signal should be used to control opposing traffic flows.

Support:

At a spot constriction, such as an isolated pavement patch on highways with lower speeds and adequate sight distance, the movement of traffic through one-lane, two-way constrictions tends to be self-regulating.

Option:

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 work site, the movement of traffic through a one-lane, two-way constriction may be self-regulating.

Section 6C.11 Flagger Method of One-Lane, Two-Way Traffic Control

Guidance:

Except as noted in the Option below, 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. the last three sentences were relocated within this section

Option:

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:

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 6C.12 Flag Transfer Method of One-Lane, Two-Way Traffic Control

Support:

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 ~~it is reasonably safe to allow~~ traffic can be allowed 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 ~~always~~ follows the last road user vehicle proceeding through the section.

Guidance:

The flag transfer method should be employed only where the one-way traffic is confined to a relatively short length of a road, usually not more than 1.6 km (1 mi) in length.

Section 6C.13 Pilot Car Method of One-Lane, Two-Way Traffic Control

Option:

A pilot car may be used to guide a queue of vehicles through the TTC zone or detour.

Guidance:

~~The operation of the pilot vehicle should be coordinated with flagging operations or other controls at each end of the one-lane section.~~ The pilot car should have the name of the contractor or contracting authority prominently displayed.

Standard:

The PILOT CAR FOLLOW ME (G20-4) sign (see Figure 6F-4~~, Sheet 4 of 4~~) shall be mounted ~~at~~ in a conspicuous ~~location~~ position on the rear of ~~the~~ a vehicle used for guiding one-way vehicular traffic through or around a TTC zone. this sentence was relocated from Section 6F.54 and combined with the existing Standard

A flagger shall be stationed on the approach to the activity area to stop vehicular traffic until the pilot vehicle is available. this sentence was relocated from Section 6F.54

Section 6C.14 Temporary Traffic Control Signal Method of One-Lane, Two-Way Traffic Control

Option:

Traffic control signals may be used to control vehicular traffic movements in one-lane, two-way TTC zones (see Figure 6I-12 and Chapter 4H).

Section 6C.15 Stop or Yield Control Method of One-Lane, Two-Way Traffic Control

Option:

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:

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.

CHAPTER 6D. PEDESTRIAN AND WORKER SAFETY

Section 6D.01 Pedestrian Considerations

~~Support:~~

~~Whenever the acronym "TTC" is used in this Chapter, it refers to "temporary traffic control."~~

~~**Standard:**~~

~~**The needs and control of all road users (motorists, bicyclists, and pedestrians within the highway, including persons with disabilities in accordance with the Americans with Disabilities Act of 1990 (ADA), Title II, Paragraph 35.130) through a TTC zone shall be an essential part of highway construction, utility work, maintenance operations, and the management of traffic incidents.**~~

Support:

A wide range of pedestrians might be affected by TTC zones, including the young, elderly, and people with disabilities such as hearing, visual, or mobility. These pedestrians need a clearly delineated and usable travel path. Considerations for pedestrians with disabilities are addressed in Section 6D.02.

~~The most desirable way to provide information to pedestrians with visual disabilities that is equivalent to visual signage 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. Signage information can also be transmitted to personal receivers, but currently such receivers are not likely to be carried or used by pedestrians with visual disabilities in TTC zones. Audible information devices might not be needed if detectable channelizing devices make an alternate route of travel evident to pedestrians with visual disabilities.~~ relocated to Section 6D.02

~~Guidance:~~

~~If a pushbutton is used to provide equivalent TTC information to pedestrians with visual disabilities, the pushbutton should be equipped with a locator tone to notify pedestrians with visual disabilities that a special accommodation is available, and to help them locate the pushbutton.~~ relocated to Section 6D.02

Standard:

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.

Advance notification of sidewalk closures shall be provided to the maintaining agency. ~~**Where pedestrians with visual disabilities normally use the closed sidewalk, a barrier that is detectable by a person with a visual disability traveling with the aid of a long cane shall be placed across the full width of the closed sidewalk.**~~ **relocated to Section 6D.02**

~~**If the TTC zone affects the movement of pedestrians, adequate pedestrian access and walkways shall be provided.**~~ **If the TTC zone affects an accessible and detectable pedestrian facility, the accessibility and detectability shall be maintained along the alternate pedestrian route. this paragraph was relocated from Section 6G.11**

Support:

It must be recognized that 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:

~~Adequate provisions should be made for persons with disabilities as determined by an engineering study or by engineering judgment. Because printed signs and surface delineation are not usable by pedestrians with visual disabilities, blocked routes, alternate crossings, and sign and signal information should be communicated to pedestrians with visual disabilities by providing audible information devices, accessible pedestrian signals, and barriers and channelizing devices that are detectable to pedestrians traveling with the aid of a long cane or who have low vision.~~ relocated to Section 6D.02

The following three items should be considered when planning for pedestrians in TTC zones:

A. Pedestrians should not be led into conflicts with worksite 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 ~~reasonably safe,~~ convenient~~,~~ and accessible path that replicates as nearly as practical the most desirable characteristics of the existing sidewalk(s) or footpath(s).

~~Where pedestrians who have visual disabilities encounter worksites that require them to cross the roadway to find an accessible route, instructions should be provided using an audible information device. Accessible pedestrian signals (see Section 4E.06) with accessible pedestrian detectors (see Section 4E.09) might be needed to enable pedestrians with visual disabilities to cross wide or heavily traveled roadways.~~

A pedestrian route should not be severed and/or moved for nonconstruction activities such as parking for vehicles and equipment.

Consideration should be made to separate pedestrian movements from both worksite activity and vehicular traffic. Unless ~~a reasonably safe~~ 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:

Figures 6I-28 and 6I-29 show typical TTC device usage and techniques for pedestrian movement through work zones.

Guidance:

~~When pedestrian movement through or around a worksite is necessary, a separate usable footpath should be provided. If the previous pedestrian facility was accessible to pedestrians with disabilities, the footpath provided during temporary traffic control should also be accessible.~~ replaced by Standard above There should not be any abrupt changes in grade or terrain on a temporary pedestrian route that could cause a tripping hazard or could be a barrier to wheelchair use. Barriers and channelizing devices should be detectable to pedestrians who have visual disabilities (see Section 6F.71).

Option:

Whenever it is feasible, closing off the worksite from pedestrian intrusion may be preferable to channelizing pedestrian traffic along the site with TTC devices.

~~Support:~~

~~Maintaining a detectable, channelized pedestrian route is much more useful to pedestrians who have visual 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.~~ relocated to Section 6D.02

Guidance:

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.

~~**Standard:**~~

~~**TTC devices used to delineate a TTC zone pedestrian walkway shall be crashworthy and, when struck by vehicles, present a minimum threat to pedestrians, workers, and occupants of impacting vehicles.**~~

~~Guidance:~~

Ballast for TTC devices should be kept to the minimum amount needed and should be mounted low to prevent penetration of the vehicle windshield.

Movement by work vehicles and equipment across designated pedestrian paths should be minimized and, when necessary, should be controlled by flaggers or 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.

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 nonintersection crossings where no curb ramps are available.

Option:

A canopied walkway may be used to protect pedestrians from falling debris, and to provide a covered passage for pedestrians.

Guidance:

Covered walkways should be sturdily constructed and adequately lighted for nighttime use.

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.

If a temporary traffic barrier is used to shield pedestrians, it should be designed to accommodate site conditions.

Support:

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 AASHTO's "Roadside Design Guide" (see Section 1A.11).

Standard:

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. All upstream leading ends that are present shall be appropriately flared or protected with properly installed and maintained crashworthy cushions. 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.

Normal vertical curbing shall not be used as a substitute for temporary traffic barriers when temporary traffic barriers are clearly needed.

Option:

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:

A major concern for pedestrians is urban and suburban building construction encroaching onto the contiguous sidewalks, which forces pedestrians off the curb into direct conflict with moving vehicles.

Guidance:

If a significant potential exists for vehicle incursions into the pedestrian path, pedestrians should be rerouted or temporary traffic barriers should be installed.

Support:

TTC devices, jersey barriers, and wood or chain link fencing with a continuous detectable edging can satisfactorily delineate a pedestrian path.

Guidance:

Tape, rope, or plastic chain strung between devices are not detectable, do not comply with the design standards in the "Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG)" (see Section 1A.11), and should not be used as a control for pedestrian movements.

~~The extent of pedestrian needs should be determined through engineering judgment for each TTC zone situation.~~ In general, pedestrian routes should be preserved in urban and commercial suburban areas. Alternative routing should be discouraged.

The highway agency in charge of the TTC zone should regularly inspect the activity area so that effective pedestrian TTC is maintained.

Section 6D.02 Accessibility Considerations

Support:

Additional information on the design and construction of accessible temporary facilities is found in publications listed in Section 1A.11 (see Documents 10 and 29 through 31).

Guidance:

The extent of pedestrian needs should be determined through engineering judgment or by the individual responsible for each TTC zone situation. ~~This individual should be aware that the absence of a continuous~~

~~pathway, including curb ramps and other accessible features, might preclude the use of the facility by~~ Adequate provisions should be made for pedestrians with disabilities.

Standard:

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. Where pedestrians with visual disabilities normally use the closed sidewalk, a barrier that is detectable by a person with a visual disability traveling with the aid of a long cane shall be placed across the full width of the closed sidewalk. relocated from Section 6D.01

Support:

Maintaining a detectable, channelized pedestrian route is much more useful to pedestrians who have visual 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. relocated from Section 6D.01

Guidance:

Because printed signs and surface delineation are not usable by pedestrians with visual disabilities, blocked routes, alternate crossings, and sign and signal information should be communicated to pedestrians with visual disabilities by providing audible information devices, accessible pedestrian signals, and barriers and channelizing devices that are detectable to pedestrians traveling with the aid of a long cane or who have low vision. relocated from Section 6D.01

Support:

The most desirable way to provide information to pedestrians with visual 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. Signing information can also be transmitted to personal receivers, but currently such receivers are not likely to be carried or used by pedestrians with visual disabilities in TTC zones. Audible information devices might not be needed if detectable channelizing devices make an alternate route of travel evident to pedestrians with visual disabilities. relocated from Section 6D.01

Guidance:

If a pushbutton is used to provide equivalent TTC information to pedestrians with visual disabilities, the pushbutton should be equipped with a locator tone to notify pedestrians with visual disabilities that a special accommodation is available, and to help them locate the pushbutton. relocated from Section 6D.01

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 process. ~~Pedestrians should be provided with a reasonably safe, convenient, and accessible path that replicates as much as practical the desirable characteristics of the existing pedestrian facilities.~~
B. Access to temporary transit stops should be provided.
C. Blocked routes, alternate crossings, and sign and signal information should be communicated to pedestrians with visual disabilities by providing devices such as audible information devices, accessible pedestrian signals, or barriers and channelizing devices that are detectable to the pedestrians traveling with the aid of a long cane or who have low vision. Where pedestrian traffic is detoured to a TTC signal, engineering judgment should be used to determine if pedestrian signals or accessible pedestrian signals should be considered for crossings along an alternate route.
D. 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 ~~adhere to~~ comply with the provisions of Section 6F.71.
E. 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 wheelchair use. The geometry and alignment of the facility should meet the applicable requirements of the "Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG)" (see Section 1A.11).
F. 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 1500 mm (60 in) throughout the entire length of the pedestrian pathway, a 1500 x 1500 mm (60 x 60 in) passing space should be provided at least every 60 m (200 ft), to allow individuals in wheelchairs to pass.

G. Signs and other devices mounted lower than 2.1 m (7 ft) above the temporary pedestrian pathway should not project more than 100 mm (4 in) into accessible pedestrian facilities.

Section 6D.03 Worker Safety Considerations

Support:

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 the road user. This creates an even higher degree of vulnerability for workers on or near the roadway.

Maintaining TTC zones with road user flow inhibited as little as possible, and using TTC devices that get the road user's 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 operator of these vehicles with a greater separation clearance and improved sight lines to minimize exposure to the hazards of moving vehicles and equipment.

Guidance:

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 a way that minimizes their vulnerability. Workers having specific TTC responsibilities should be trained in TTC techniques, device usage, and placement.

~~B. Worker Safety Apparel—all workers exposed to the risks of moving roadway traffic or construction equipment should wear high-visibility safety apparel meeting the requirements of ISEA "American National Standard for High-Visibility Safety Apparel" (see Section 1A.11), or equivalent revisions, and labeled as ANSI 107-1999 standard performance for Class 1, 2, or 3 risk exposure. A competent person designated by the employer to be responsible for the worker safety plan within the activity area of the job site should make the selection of the appropriate class of garment.~~ replaced by Standard below

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 Reduction—reducing the speed of vehicular traffic, mainly through regulatory speed zoning, funneling, lane reduction, or the use of uniformed law enforcement officers or flaggers, should be considered.

D. Activity Area—planning the internal work activity area to minimize backing-up maneuvers of construction vehicles should be considered to minimize the exposure to risk.

E. Worker Safety Planning—a ~~competent~~ 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 " (see Section 1A.11).

Standard:

All workers within the right-of-way who are exposed either to traffic (vehicles using the highway for purposes of travel) or to construction equipment within the TTC zone shall wear high-visibility safety apparel that meets the Performance Class 2 or 3 requirements of the ANSI/ISEA 107–2004 publication entitled "American National Standard for High-Visibility Safety Apparel and Headwear" (see Section 1A.11), or equivalent revisions, and labeled as meeting the ANSI 107-2004 standard performance for Class 2 or 3 risk exposure. A person designated by the employer to be responsible for the worker safety plan shall make the selection of the appropriate class of garment. When uniformed law enforcement personnel are used to direct traffic, to investigate crashes, or to handle lane closures, obstructed

roadways, and disasters, safety apparel as described in this Section shall be worn by the law enforcement personnel.

Option:

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" (see Section 1A.11), or equivalent revisions, and labeled as ANSI 207-2006, in lieu of ANSI/ISEA 107-2004 apparel.

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. This may also 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:

Judicious use of the special devices described in Item E above might be helpful for certain difficult TTC situations, but misuse or overuse of special devices or techniques might lessen their effectiveness.

CHAPTER 6E. FLAGGER CONTROL

Section 6E.01 Qualifications for Flaggers

Support:

~~Whenever the acronym "TTC" is used in this Chapter, it refers to "temporary traffic control."~~

~~**Standard:**~~

A flagger ~~shall be~~ is a person who ~~provides TTC~~ 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).

Guidance:

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 safe 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 safe 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.

Section 6E.02 High-Visibility Safety Apparel

Standard:

For daytime and nighttime activity, flaggers shall wear high-visibility safety apparel ~~meeting~~ that meets the Performance Class 2 or 3 requirements of the ANSI/ISEA 107–2004 publication entitled "American National Standard for High-Visibility Apparel and Headwear" (see Section 1A.11), or equivalent revisions, and labeled as meeting the ANSI ~~107-1999~~ 107-2004 standard performance for Class 2 or 3 risk exposure. The apparel background (outer) material color shall be either fluorescent orange-red or fluorescent yellow-green as defined in the standard. The retroreflective material shall be ~~either~~ grammar – more than two choices orange, yellow, white, silver, yellow-green, or a fluorescent version of these colors, and shall be visible at a minimum distance of 300 m (1,000 ft). The retroreflective safety apparel shall be designed to clearly identify the wearer as a person.

Guidance:

For nighttime activity, high-visibility safety apparel ~~meeting~~ that meets the Performance Class 3 requirements of the ANSI/ISEA 107–2004 publication entitled "American National Standard for High-Visibility Apparel and Headwear" (see Section 1A.11), or equivalent revisions, and labeled as meeting the ANSI ~~107-1999~~ 107-2004 standard performance for Class 3 risk exposure should be considered for flagger wear ~~(instead of the Class 2 safety apparel in the Standard above)~~.

Standard:

When uniformed law enforcement officers are used to direct traffic within a TTC zone, they shall wear high-visibility safety apparel as described in this Section ~~should be worn by the law enforcement officer~~.

Option:

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" (see Section 1A.11), or equivalent revisions, and labeled as ANSI 207-2006, in lieu of ANSI/ISEA 107-2004 apparel.

Section 6E.03 Hand-Signaling Devices

~~**Support:**~~

~~**Hand-signaling devices, such as STOP/SLOW paddles, lights, and red flags, are used to control road users through TTC zones.**~~

Guidance:

The STOP/SLOW paddle should be the primary and preferred hand-signaling device because the STOP/SLOW paddle gives road users more positive guidance than red flags. Use of flags should be limited to emergency situations.

Standard:

The STOP/SLOW paddle shall have an octagonal shape on a rigid handle. STOP/SLOW paddles shall be at least 450 mm (18 in) wide with letters at least 150 mm (6 in) high ~~and should be fabricated from light semi-rigid material~~. The background of the STOP (R1-1) face shall be red with white letters and border. The background of the SLOW (W20-8) face shall be orange with black letters and border. When used at night, the STOP/SLOW paddle shall be retroreflectorized.

Guidance:

The STOP/SLOW paddle should be fabricated from light semi-rigid material. relocated from previous paragraph

Support:

The optimum method of displaying a STOP or SLOW message that is stable and is high enough to be seen by approaching or stopped traffic is to place the STOP/SLOW paddle on a rigid staff.

Guidance:

If the STOP/SLOW paddle is placed on a rigid staff, the minimum length of the staff, measured from the bottom of the paddle to the end of the staff that rests on the ground, should be 2.1 m (7 ft).

Option:

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 6 mm (0.25 in) 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 6 mm (0.25 in) 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:

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.

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.

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.

Flags, when used, shall be a minimum of 600 mm (24 in) square, made of a good grade of red material, and securely fastened to a staff that is approximately 900 mm (36 in) in length.

Guidance:

The free edge of a flag should be weighted so the flag will hang vertically, even in heavy winds.

Standard:

When used at nighttime, flags shall be retroreflectorized red.

Option:

When flagging at night, a flashlight with a red glowcone may be held in the free hand of the flagger to supplement the STOP/SLOW paddle or flags.

Section 6E.04 Automated Flagger Assistance Devices

Support:

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 temporary traffic control 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.

There are two types of AFADs:

A. An AFAD (see Section 6E.05) 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 6E.06) that uses remotely controlled red and yellow lenses and a gate arm to alternately control right-of-way.

AFADs might be appropriate under certain conditions for daytime work activities where they are set up and then removed each day or for some nighttime work activities. Typical applications include TTC activities such as, but not limited to:

A. Bridge maintenance;
B. Haul road crossings; and
C. Pavement patching.

Standard:

AFADs shall only be used in situations where there is only one lane of approaching traffic in the direction to be controlled.

When used at night, the AFAD location shall be illuminated in accordance with Section 6E.08.

Guidance:

AFADs should only be used when determined to be appropriate based on an engineering study. Minimum or maximum traffic volume thresholds for the applicability of AFAD usage should be based upon an engineering study conducted by the agency authorizing their use.

AFADs should not be used for long-term stationary work (see Section 6G.02).

Standard:

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 6F.80.

AFADs shall meet the crashworthy performance criteria contained in the National Cooperative Highway Research Program (NCHRP) Report 350, "Recommended Procedures for the Safety Performance Evaluation of Highway Features" (see Section 6F.01).

Guidance:

If used, AFADs should be located in advance of lane closure tapers and downstream from the point where approaching traffic is to stop in response to the device.

Standard:

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.

If used, an AFAD shall be operated only by a qualified flagger (see Section 6E.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 to alternately control the right-of-way.

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).

Except as noted in the Option below, two flaggers shall be used when using either Method 1 or Method 2.

Option:

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 all three of the following conditions are present:

A. The flagger has an unobstructed view of the AFAD(s),
B. The flagger has an unobstructed view of approaching traffic in both directions, and
C. The AFADs are less than 240 m (800 ft) apart.

Guidance:

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.

When an AFAD is not in use, it should be removed from its normal operating position and stored in a manner that reduces the possibility of it being impacted by run-off-the-road vehicles.

Standard:

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:

A State or local agency that elects to use AFADs should adopt a policy governing AFAD applications that, as a minimum, complies with the provisions of this Chapter. 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 6E.05 STOP/SLOW Automated Flagger Assistance Devices

Standard:

A STOP/SLOW Automated Flagger Assistance Device (AFAD) (see Section 6E.04) 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 without the need for a flagger in the immediate vicinity of the AFAD or on the roadway (see Figure 6E-1).

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 1.8 m (6 ft) above the pavement on an appropriate support. The size of the STOP/SLOW sign shall be at least 600 x 600 mm (24 x 24 in) with letters at least 200 mm (8 in) 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.

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.

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 6E.03; or
B. A Stop Beacon (see Section 4L.05) mounted no more than 600 mm (24 in) above the STOP face and a Warning Beacon (see Section 4L.03) mounted no more than 600 mm (24 in) 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 conform to the provisions of Chapter 4L.

Option:

Type B warning light(s) (see Section 6F.79) may be used in lieu of the Warning Beacon during the display of the SLOW face of the AFAD's STOP/SLOW sign.

Standard:

If Type B warning 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.

Option:

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:

If louvers are used, the louvers shall be designed such that the aspect of the sign face to approaching traffic is a full sign face at a distance of 15 m (50 ft) or greater.

Guidance:

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:

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:

If used, the gate arm or mast arm shall be covered with alternating red and white retroreflective stripes at 150 mm (6 in) intervals measured horizontally. When the arm is in the down position blocking the approach lane:

A. The minimum vertical aspect of the arm and sheeting shall be 50 mm (2 in);

B. The stripes shall be vertical on the side of the arm facing stopped traffic, and shall slope downward at an angle of 45 degrees from the upper left to the lower right on the side of the arm facing moving traffic in the oncoming direction; and

C. The end of the arm shall reach at least to the center of the lane being controlled.

A WAIT ON STOP (R1-7) sign (see Figure 6E-1) shall be displayed to road users approaching the AFAD.

Option:

A GO ON SLOW (R1-8) sign (see Figure 6E-1) may also be displayed to road users approaching the AFAD.

Standard:

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. Both signs shall have black legends and borders on white backgrounds. Each of these signs shall be rectangular in shape and each shall be at least 600 x 750 mm (24 x 30 in) in size with letters at least 150 mm (6 in) high.

To stop road users, the AFAD shall display the STOP face and the red or white lights within the STOP face shall flash or the Stop Beacon shall flash. To permit stopped road users to proceed, the AFAD shall display the SLOW face and the yellow or white lights within the SLOW face shall flash or the Warning Beacon or the Type B warning lights shall flash.

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 shall not display the AFAD's SLOW face until all oncoming vehicles have cleared the one-lane portion of the TTC zone.

Section 6E.06 Red/Yellow Lens Automated Flagger Assistance Devices

Standard:

If used, a Red/Yellow Lens Automated Flagger Assistance Device (AFAD) (see Section 6E.04) 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 6E-2).

Red/Yellow Lens AFADs shall have at least one set of CIRCULAR RED and CIRCULAR YELLOW lenses that are 300 mm (12 in) in diameter. Unless otherwise noted in this Section, the lenses and their arrangement, CIRCULAR RED on top and CIRCULAR YELLOW below, shall conform to 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 2.1 m (7 ft) 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 4.6 m (15 ft) above the pavement.

Option:

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.

Standard:

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 covered with alternating red and white retroreflective stripes at 150 mm (6 in) intervals measured horizontally. When the gate arm is in the down position:

A. The minimum vertical aspect of the arm and sheeting shall be 50 mm (2 in),
B. The stripes shall be vertical on the side of the arm facing stopped traffic, and shall slope downward at an angle of 45 degrees from the upper left to the lower right on the side of the arm facing moving traffic in the oncoming direction, and
C. The end of the arm shall reach at least to the center of the lane being controlled.

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 6E-2).

To stop road users, the AFAD shall display a steadily illuminated CIRCULAR RED lens and the gate arm shall be in the down position. To permit road users to proceed, the AFAD shall display a flashing CIRCULAR YELLOW lens and the gate arm shall be in the upright position.

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.

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.

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:

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 4D.26, is justified by engineering judgment.

Section ~~6E.04~~ 6E.07 Flagger Procedures

Support:

The use of paddles and flags by flaggers is illustrated in Figure 6E-3.

Standard:

Flaggers shall use a STOP/SLOW paddle, a flag, or an Automated Flagger Assistance Device (AFAD) 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.

The following methods of signaling with paddles 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:

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:

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 the shoulder level toward approaching traffic.

B. To direct stopped road users to proceed, the flagger shall ~~stand parallel to the road user movement and~~ 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:

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, ~~never permitting a group of~~ away from other workers ~~to congregate around the flagger station~~. this paragraph was relocated from Section 6E.05

Option:

At a spot constriction, the flagger may have to take a position on the shoulder opposite the closed section in order to operate effectively. this paragraph was relocated from Section 6E.05

At spot lane closures where adequate sight distance is available for the ~~reasonably safe~~ effective handling of traffic, the use of one flagger may be sufficient. this paragraph was relocated from Section 6E.05

Section ~~6E.05~~ 6E.08 Flagger Stations

Standard:

Flagger stations shall be located such that approaching road users will have sufficient distance to stop at an intended stopping point.

Option:

The distances shown in Table 6E-1, 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:

Flagger stations should be located such that an errant vehicle has additional space to stop without entering the work space. An escape route for the flagger should be identified.

Standard:

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 at night.

CHAPTER 6F. TEMPORARY TRAFFIC CONTROL ZONE DEVICES

Section 6F.01 Types of Devices

~~Support:~~

~~Whenever the acronym "TTC" is used in this Chapter, it refers to "temporary traffic control."~~

~~Standard:~~

~~The needs and control of all road users (motorists, bicyclists, and pedestrians within the highway, including persons with disabilities in accordance with the Americans with Disabilities Act of 1990 (ADA), Title II, Paragraph 35.130) through a TTC zone shall be an essential part of highway construction, utility work, maintenance operations, and the management of traffic incidents.~~

Guidance:

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.

Support:

FHWA policy requires that all roadside appurtenances such as traffic barriers, barrier terminals and crash cushions, bridge railings, sign and light pole supports, and work zone hardware used on the National Highway System meet the crashworthy performance criteria contained in the National Cooperative Highway Research Program (NCHRP) Report 350, "Recommended Procedures for the Safety Performance Evaluation of Highway Features." The FHWA website at "http://safety.fhwa.dot.gov/programs/roadside_hardware.htm" identifies all such hardware and includes copies of FHWA acceptance letters for each of them. In the case of proprietary items, links are provided to manufacturers' websites as a source of detailed information on specific devices. The website also contains an "Ask the Experts" section where questions on roadside design issues can be addressed.

Various sections of the MUTCD require certain traffic control devices, their supports, and/or related appurtenances to be crashworthy. Such MUTCD crashworthiness provisions apply to all streets and highways, public facilities, and private property open to public travel. Also, State Departments of Transportation and local agencies might ~~also~~ have expanded the NCHRP Report 350 crashworthy criteria to apply to ~~other highways in addition to the National Highway System~~ certain other roadside appurtenances.

Crashworthiness and crash testing information on devices described in Part 6 are found in AASHTO's "Roadside Design Guide" (see Section 1A.11).

As ~~stated in Definition 17~~ defined in Section 1A.13, "crashworthy" is a characteristic of a roadside appurtenance that has been successfully crash tested in accordance with a national standard such as the ~~National Cooperative Highway Research Program~~ NCHRP edited to increase consistency Report 350, "Recommended Procedures for the Safety Performance Evaluation of Highway Features."

Standard:

Traffic control devices shall be defined as all signs, signals, markings, and other devices used to regulate, warn, or guide road users, placed on, over, or adjacent to a street, highway, public facility, private property open to public travel, pedestrian facility, or bikeway by authority of a public body or official having jurisdiction.

All traffic control devices used ~~on street and highway~~ for construction, maintenance, utility, or incident management operations on a street, highway, public facility, or private property open to public travel shall ~~conform to~~ comply with the applicable provisions of this Manual.

Section 6F.02 General Characteristics of Signs

Support:

TTC zone signs convey both general and specific messages by means of words or symbols and have the same three categories as all road user signs: regulatory, warning, and guide.

Standard:

The colors for regulatory signs shall follow the Standards for regulatory signs in Table 2A-4 and Chapter 2B. Warning signs in TTC zones shall have a black legend and border on an orange background, except for the Highway-Rail Grade Crossing Advance Warning (W10-1) sign which shall have a black legend and border on a yellow background, and except for signs that are ~~permitted~~ required or recommended in Parts 2 or 7 to have fluorescent yellow-green backgrounds. Colors for

guide signs shall follow the Standards in Table 2A-4 and Chapter 2D, except for guide signs as noted in Section 6F.53.

Option:

Where the color orange is required, the fluorescent ~~red-~~orange ~~or fluorescent yellow-orange~~ color~~s~~ may also be used.

Support:

The fluorescent version~~s~~ of orange provides higher conspicuity than standard orange, especially during twilight.

Option:

~~Warning and guide signs used for TTC incident management situations (see Chapter 6I) may have a black legend and border on a fluorescent pink background.~~

Existing warning signs that are still applicable may remain in place.

In order to maintain the systematic use of yellow or fluorescent yellow-green backgrounds for pedestrian, bicycle, and school warning signs in a jurisdiction, the yellow or fluorescent yellow-green background for pedestrian, bicycle, and school warning signs may be used in TTC zones.

Standard orange flags or flashing warning lights may be used in conjunction with signs.

Standard:

When standard orange flags or flashing warning lights are used in conjunction with signs, they shall not block the sign face.

Except as noted in Section 2A.11, the sizes for TTC signs and plaques shall be as shown in Table 6F-1. The sizes in the minimum column shall only be used on local streets or roadways where the 85th-percentile speed or posted speed limit is less than 60 km/h (35 mph).

Option:

The dimensions of signs and plaques shown in Table 6F-1 may be increased wherever necessary for greater legibility or emphasis~~, such as on freeways and expressways~~. deleted because freeway and expressway sizes have been added to Table 6F-1

Standard:

Deviations from standard sizes as prescribed herein shall be in 150 mm (6 in) increments.

Support:

Sign design details are contained in the "Standard Highway Signs and Markings" book (see Section 1A.11).

Section 2A.06 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:

All signs used at night shall be either retroreflective with a material that has a smooth, sealed outer surface or illuminated to show the same shape and similar color both day and night.

The requirement for sign illumination shall not be considered to be satisfied by street, highway, or strobe lighting.

Option:

Sign illumination may be either internal or external.

Signs may be made of rigid or flexible material.

Section 6F.03 Sign Placement paragraphs have been rearranged in this Section to increase clarity

Guidance:

Signs should be located on the right-hand edited to increase clarity side of the roadway unless otherwise specified in this Manual.

Option:

Where special emphasis is needed, signs may be placed on both the left-hand edited to increase clarity and right-hand edited to increase clarity 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:

The provisions of this Section regarding mounting height apply unless specifically stated otherwise for a particular sign elsewhere in this Manual.

Guidance:

~~Guidelines for~~ The mounting height and lateral ~~clearance~~ offset edited to increase consistency of temporary ~~ground-~~ post-mounted edited to increase consistency signs ~~are~~ should be as shown in Figure 6F-1.

Standard:

The minimum height, measured vertically from the bottom of the sign to the elevation of the near edge of the pavement, of ~~ground-~~ post-mounted edited to increase consistency signs installed at the side of the road in rural areas shall be ~~mounted at a height at least~~ 1.5 m (5 ft)~~, measured from the bottom of the sign to the near edge of the pavement~~ (see Figure 6F-1).

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, and residential districts~~ urban areas edited to increase consistency where parking ~~and/or bicycle~~ or pedestrian movements ~~is~~ are likely to occur, or where ~~there are other obstructions to~~ the view of the sign might be obstructed, ~~the distance between the bottom of the sign and the top of the near edge of the traveled way~~ shall be ~~at least~~ 2.1 m (7 ft) (see Figure 6F-1).

The minimum height, measured vertically from the bottom of the sign to the sidewalk, of signs installed above sidewalks shall be 2.1 m (7 ft).

Option:

~~A 2.1 m (7 ft) mounting height may be used in rural areas for increased visibility.~~

The height to the bottom of a secondary sign mounted below another sign may be 0.3 m (1 ft) less than the appropriate height specified above.

Guidance:

Neither portable nor permanent sign supports should be located on sidewalks, bicycle facilities, or areas designated for pedestrian or bicycle traffic. Signs mounted lower than 2.1 m (7 ft) should not project more than 100 mm (4 in) into pedestrian facilities.

Standard:

Where it has been determined that the accommodation of pedestrians with disabilities is necessary, signs shall be mounted and placed in accordance with Section 4.4 of the "Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG)" (see Section 1A.11).

Signs mounted on barricades and barricade/sign combinations shall be crashworthy.

Guidance:

Except as noted in the Option, signs mounted on portable supports should not be used for a duration of more than 3 days.

Option:

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 6F-3, 6F-4, and 6F-5) may be used on portable supports for longer than 3 days.

Support:

Methods of mounting signs other than on posts are illustrated in Figure 6F-2.

Guidance:

Signs mounted on Type ~~III~~ 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:

Sign supports shall be crashworthy. Where large signs having an area exceeding 5 square meters (50 square feet) ~~that~~ are installed on multiple breakaway posts, the clearance from the ground to the bottom of the sign shall be ~~mounted a minimum of~~ at least 2.1 m (7 ft) ~~above the ground~~.

The bottom of a sign~~s~~ mounted on a barricade~~s~~, or other portable support~~s~~, shall be no less than 0.3 m (1 ft) above the traveled way.

Option:

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. ~~The work vehicle, the shadow vehicle, or the trailer may or may not have an impact attenuator.~~

~~Guidance:~~

~~Unshielded sign posts placed in the clear zone should yield or breakaway upon impact to minimize obstructions to road users.~~

Support:

If alterations are made to specific traffic control device supports that have been successfully crash tested in accordance with NCHRP Report 350, the altered supports might not be considered to be crashworthy.

Section 6F.04 Sign Maintenance

Standard:

Signs shall be properly maintained for cleanliness, visibility, and correct positioning.

Signs that have lost significant legibility shall be promptly replaced.

Section 6F.05 Regulatory Sign Authority

Support:

Regulatory signs such as those shown in Figure 6F-3 inform road users of traffic laws or regulations and indicate the applicability of legal requirements that would not otherwise be apparent.

Standard:

Regulatory signs shall be authorized by the public agency or official having jurisdiction and shall conform with Chapter 2B.

Section 6F.06 Regulatory Sign Design

Standard:

TTC regulatory signs shall ~~conform to~~ comply with the Standards for regulatory signs presented in Part 2 and in the FHWA's "Standard Highway Signs and Markings" book (see Section 1A.11).

Support:

Regulatory signs are generally rectangular with a black legend and border on a white background. Exceptions include the STOP, YIELD, DO NOT ENTER, WRONG WAY, and ONE WAY signs.

Option:

The ONE WAY sign may be either a horizontal or vertical rectangular sign.

Section 6F.07 Regulatory Sign Applications

Standard:

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 conformance with applicable ordinances or statutes of the jurisdiction.

Section 6F.08 ROAD (STREET) CLOSED Sign (R11-2)

Guidance:

The ROAD (STREET) CLOSED (R11-2) sign (see Figure 6F-3~~, Sheet 2 of 2~~) 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:

The words BRIDGE OUT (or BRIDGE CLOSED) may be substituted for ROAD (STREET) CLOSED where applicable.

Guidance:

The ROAD (STREET) CLOSED sign should be installed at or near the center of the roadway on or above a Type ~~III~~ 3 Barricade that closes the roadway (see Section 6F.65).

Standard:

The ROAD (STREET) CLOSED sign shall not be used where road user flow is maintained through the TTC zone with a reduced number of lanes or where the actual closure is some distance beyond the sign.

Section 6F.09 Local Traffic Only Signs (R11-3a, R11-4)

Guidance:

The Local Traffic Only signs (see Figure 6F-3~~, Sheet 2 of 2~~) should be used where road user flow 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.

In rural applications, the Local Traffic Only sign should have the legend ROAD CLOSED XX km (MILES) AHEAD, LOCAL TRAFFIC ONLY (R11-3a).

Option:

In urban areas, the legend ROAD (STREET) CLOSED TO THRU TRAFFIC (R11-4) or ROAD CLOSED, LOCAL TRAFFIC ONLY may be used.

The words BRIDGE OUT (or BRIDGE CLOSED) may be substituted for the words ROAD (STREET) CLOSED on the R11-3a or R11-4 sign where applicable.

Section 6F.10 Weight Limit Signs (R12-1, R12-2, R12-5)

Standard:

A Weight Limit sign (see Figure 6F-3~~, Sheet 2 of 2~~), 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.

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 6F.11 STAY IN LANE Sign (R4-9)

Option:

A STAY IN LANE (R4-9) sign (see Figure 6F-3~~, Sheet 1 of 2~~) 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.

Section 6F.12 Work Zone and Higher Fines Signs and Plaques

Option:

A WORK ZONE (G20-5aP) plaque (see Figure 6F-3) 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 6F-3) may be installed at the downstream end of the reduced speed limit zone.

A FINES HIGHER, FINES DOUBLE, or $XX FINE plaque (see Section 2B.17 and Figure 6F-3) may be mounted below the Speed Limit sign if increased fines are imposed for traffic violations within the TTC zone.

A BEGIN HIGHER FINES ZONE (R2-10) sign (see Figure 6F-3) may be installed at the upstream end of a work zone where increased fines are imposed for traffic violations, and an END HIGHER FINES ZONE (R2-11) sign (see Figure 6F-3) may be installed at the downstream end of the work zone. Alternate legends such as BEGIN (or END) DOUBLE FINES ZONE may also be used for these signs.

Section ~~6F.12~~ 6F.13 PEDESTRIAN CROSSWALK Sign (R9-8)

Option:

The PEDESTRIAN CROSSWALK (R9-8) sign (see Figure 6F-3~~, Sheet 2 of 2~~) may be used to indicate where a temporary crosswalk has been established.

Standard:

If a temporary crosswalk is established, it shall be accessible to pedestrians with disabilities in accordance with Section 6D.02.

Section ~~6F.13~~ 6F.14 SIDEWALK CLOSED Signs (R9-9, R9-10, R9-11, R9-11a)

Guidance:

SIDEWALK CLOSED signs (see Figure 6F-3~~, Sheet 2 of 2~~) should be used where pedestrian flow is restricted. Bicycle/Pedestrian Detour (M4-9a) signs or Pedestrian Detour (M4-9b) signs should be used where pedestrian flow is rerouted (see Section 6F.56).

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.

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.

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.

The SIDEWALK CLOSED, (ARROW) CROSS HERE (R9-11a) sign should be installed just beyond the point to which pedestrians are being redirected.

Support:

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 visual disabilities. A barrier or barricade detectable by a person with a visual disability is sufficient to indicate that a sidewalk is closed. If the barrier is continuous with detectable channelizing devices for an alternate route, accessible ~~signage~~ signing edited to increase consistency might not be necessary. An audible information device is needed when the detectable barricade or barrier for an alternate channelized route is not continuous.

Section ~~6F.14~~ 6F.15 Special Regulatory Signs

Option:

Special regulatory signs may be used based on engineering judgment consistent with regulatory requirements.

Guidance:

Special regulatory signs should ~~conform to~~ comply with the general requirements of color, shape, and alphabet size and series. The sign message should be brief, legible, and clear.

~~Support:~~

~~Section 2B.17 contains information regarding the use of FINES HIGHER signs (see Figure 6F-3, Sheet 1 of 2).~~ deleted because it is now covered in Section 6F.12

Section ~~6F.15~~ 6F.16 Warning Sign Function, Design, and Application

Support:

TTC zone warning signs (see Figure 6F-4) notify road users of specific situations or conditions on or adjacent to a roadway that might not otherwise be apparent.

Standard:

TTC warning signs shall ~~conform to~~ comply with the Standards for warning signs presented in Part 2 and in FHWA's "Standard Highway Signs and Markings" book (see Section 1A.11). Except as noted in the Option below, TTC warning signs shall be diamond-shaped with a black legend and border on an orange background, except for the W10-1 sign which shall have a black legend and border on a yellow background, and except for signs that are ~~permitted~~ required or recommended in Parts 2 or 7 to have fluorescent yellow-green backgrounds.

Option:

Warning signs used for TTC incident management situations may have a black legend and border on a fluorescent pink background.

Mounting or space considerations may justify a change from the standard diamond shape.

In emergencies, available warning signs having yellow backgrounds may be used if signs with orange or fluorescent pink backgrounds are not at hand.

Guidance:

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.

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.

Where road users include pedestrians, the provision of supplemental audible information or detectable barriers or barricades should be considered for people with visual disabilities.

Support:

Detectable barriers or barricades communicate very clearly to pedestrians who have visual disabilities that they can no longer proceed in the direction that they are traveling.

Option:

Advance warning signs may be used singly or in combination.

~~**Standard:**~~

~~**Because of their importance, advance warning signs for higher-speed locations shall have a size of 1200 x 1200 mm (48 x 48 in) (see Part 2).**~~

~~**For freeways and expressways, the size of diamond-shaped TTC warning signs shall be a minimum of 1200 x 1200 mm (48 x 48 in).**~~

~~Option:~~

~~Where speeds and volumes are moderately low, a minimum size of 900 x 900 mm (36 x 36 in) may be used for advance warning signs.~~

~~On secondary roads or city streets where speeds are very low, signs smaller than the standard size, but not less than 600 x 600 mm (24 x 24 in), may be used for warning signs having short word messages or clear symbols.~~

~~Advance warning signs larger than the minimum standards may be used for additional emphasis of the TTC zone (see Part 2).~~

Where distances are not ~~shown~~ displayed edited to increase consistency 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 ~~6F.16~~ 6F.17 Position of Advance Warning Signs

Guidance:

Where highway conditions permit, warning signs should be placed in advance of the TTC zone at varying distances depending on roadway type, condition, and posted speed. Table 6C-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 TTC zone should be placed approximately 30 m (100 ft) for low-speed urban streets to 300 m (1,000 ft) or more for freeways and expressways.

Where multiple advance warning signs are needed on the approach to a TTC zone, the ROAD WORK AHEAD (W20-1) sign should be the first advance warning sign encountered by road users.

Support:

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:

As an alternative to a specific distance on advance warning signs, the word AHEAD may be used.

Support:

At TTC zones on lightly-traveled roads, all of the advance warning signs prescribed for major construction might not be needed.

Option:

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:

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 ~~6F.17~~ 6F.18 ROAD (STREET) WORK Sign (W20-1)

Guidance:

The ROAD (STREET) WORK (W20-1) sign (see Figure 6F-4~~, Sheet 3 of 4~~), 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.

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.

Standard:

The ROAD (STREET) WORK (W20-1) sign shall have the legend ROAD (STREET) WORK, XX m (FT), XX km (MILES), or AHEAD.

Section ~~6F.18~~ 6F.19 DETOUR Sign (W20-2)

Guidance:

The DETOUR (W20-2) sign (see Figure 6F-4~~, Sheet 3 of 4~~) should be used in advance of a road user detour over a different roadway or route.

Standard:

The DETOUR sign shall have the legend DETOUR, XX m (FT), XX km (MILES), or AHEAD.

Section ~~6F.19~~ 6F.20 ROAD (STREET) CLOSED Sign (W20-3)

Guidance:

The ROAD (STREET) CLOSED (W20-3) sign (see Figure 6F-4~~, Sheet 3 of 4~~) should be used in advance of the point where a highway is closed to all road users, or to all but local road users.

Standard:

The ROAD (STREET) CLOSED sign shall have the legend ROAD (STREET) CLOSED, XX m (FT), XX km (MILES), or AHEAD.

Section ~~6F.20~~ 6F.21 ONE LANE ROAD Sign (W20-4)

Standard:

The ONE LANE ROAD (W20-4) sign (see Figure 6F-4~~, Sheet 3 of 4~~) shall be used only in advance of that point where motor vehicle traffic in both directions must use a common single lane (see Section 6C.10). It shall have the legend ONE LANE ROAD, XX m (FT), XX km (MILES), or AHEAD.

Section ~~6F.21~~ 6F.22 Lane(s) Closed Signs (W20-5, W20-5a)

Standard:

The Lane(s) Closed sign (see Figure 6F-4~~, Sheet 3 of 4~~) shall be used in advance of that point where one or more through lanes of a multi-lane roadway are closed.

For a single lane closure, the Lane Closed (W20-5) sign (see Figure 6F-4~~, Sheet 3 of 4~~) shall have the legend RIGHT (LEFT) LANE CLOSED, XX m (FT), XX km (MILES), or AHEAD. Where two adjacent lanes are closed, the W20-5a sign (see Figure 6F-4~~, Sheet 3 of 4~~) shall have the legend RIGHT (LEFT) TWO LANES CLOSED, XX m (FT), XX km (MILES), or AHEAD.

Section ~~6F.22~~ 6F.23 CENTER LANE CLOSED AHEAD Signs (W9-3, W9-3a)

Guidance:

The CENTER LANE CLOSED AHEAD (W9-3) sign (see Figure 6F-4~~, Sheet 3 of 4~~) should be used in advance of that point where work occupies the center lane(s) and approaching motor vehicle traffic is directed to the right or left of the work zone in the center lane.

Option:

The Center Lane Closed Ahead (W9-3a) symbol sign (see Figure 6I-38) may be substituted for the CENTER LANE CLOSED AHEAD (W9-3) word message sign.

Section ~~6F.23~~ 6F.24 THRU TRAFFIC MERGE LEFT (RIGHT) Sign (W4-7)

Guidance:

The THRU TRAFFIC MERGE LEFT (RIGHT) (W4-7) sign (see Figure 6F-4~~, Sheet 1 of 4~~) should be used in advance of an intersection where one or more lane closures on the far side of a multi-lane intersection require through vehicular traffic on the approach to the intersection to use the left (right) lane to proceed through the intersection.

Section ~~6F.24~~ 6F.25 Lane Ends Sign (W4-2)

Option:

The Lane Ends (W4-2) symbol sign (see Figure 6F-4~~, Sheet 1 of 4~~) 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.

Section ~~6F.25~~ 6F.26 ON RAMP Plaque (W13-4)

Guidance:

When work is being done on a ramp, but the ramp remains open, the ON RAMP (W13-4) plaque (see Figure 6F-4~~, Sheet 3 of 4~~) should be used to supplement the advance ROAD WORK sign.

Section ~~6F.26~~ 6F.27 RAMP NARROWS Sign (W5-4)

Guidance:

The RAMP NARROWS (W5-4) sign (see Figure 6F-4~~, Sheet 1 of 4~~) 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 ~~6F.27~~ 6F.28 SLOW TRAFFIC AHEAD Sign (W23-1)

Option:

The SLOW TRAFFIC AHEAD (W23-1) sign (see Figure 6F-4~~, Sheet 4 of 4~~) 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 ~~6F.28~~ 6F.29 EXIT OPEN, EXIT CLOSED, EXIT ONLY Signs (E5-2, E5-2a, E5-3)

Option:

An EXIT OPEN (E5-2), EXIT CLOSED (E5-2a), or EXIT ONLY (E5-3) sign (see Figure 6F-5) 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 motor vehicle traffic using the ramp is different from the normal condition.

Guidance:

When an exit ramp is closed, an EXIT CLOSED sign added to increase consistency panel with a black legend and border on an orange background should be placed diagonally across the interchange/intersection guide signs.

Section 6F.30 NEW TRAFFIC PATTERN AHEAD Sign (W23-2)

Option:

A NEW TRAFFIC PATTERN AHEAD (W23-2) sign (see Figure 6F-4) 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.

Section ~~6F.29~~ 6F.31 Flagger Sign (W20-7a, W20-7)

Guidance:

The Flagger (W20-7a) symbol sign (see Figure 6F-4~~, Sheet 4 of 4~~) should be used in advance of any point where a flagger is stationed to control road users.

Option:

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 6F-4~~, Sheet 1 of 4~~).

The FLAGGER (W20-7) word message sign with distance legends may be substituted for the Flagger (W20-7a) symbol sign.

Standard:

Except as noted in the Option below, **the Flagger sign shall be removed, covered, or turned away from road users when the flagging operations are not occurring.**

Option:

A Flagger sign may remain in place when flagging operations are suspended for a period of time of 15 minutes or less if the following two conditions are both satisfied:

A. The flagger(s) is not able to move away from the site of the normal flagging activity during the short period of inactivity, and

B. Engineering judgment indicates that the safety of the flagger(s) would be unduly compromised by covering and uncovering or turning and re-orienting the signs for the short period of inactivity.

Section ~~6F.30~~ 6F.32 Two-Way Traffic Sign (W6-3)

Guidance:

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 6F-4~~, Sheet 2 of 4~~) 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 ~~6F.31~~ 6F.33 Workers Sign (W21-1, W21-1a)

Option:

A Workers (W21-1a) symbol sign (see Figure 6F-4~~, Sheet 4 of 4~~) may be used to alert road users of workers in or near the roadway.

Guidance:

In the absence of other warning devices, a Workers symbol sign should be used when workers are in the roadway.

Option:

The WORKERS (W21-1) word message sign may be used as an alternate to the Workers (W21-1a) symbol sign.

Section ~~6F.32~~ 6F.34 FRESH OIL (TAR) Sign (W21-2)

Guidance:

The FRESH OIL (TAR) (W21-2) sign (see Figure 6F-4~~, Sheet 4 of 4~~) should be used to warn road users of the surface treatment.

Section ~~6F.33~~ 6F.35 ROAD MACHINERY AHEAD Sign (W21-3)

Option:

The ROAD MACHINERY AHEAD (W21-3) sign (see Figure 6F-4~~, Sheet 4 of 4~~) may be used to warn of machinery operating in or adjacent to the roadway.

Section ~~6F.34~~ 6F.36 Motorized Traffic Signs (W8-6, W11-10)

Option:

Motorized Traffic (W8-6, 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 Crossing symbol (W11-10) sign (see Figure 6F-4~~, Sheet 3 of 4~~) where there is an established construction vehicle crossing of the roadway.

Support:

These locations might be relatively confined or might occur randomly over a segment of roadway.

Section ~~6F.35~~ 6F.37 Shoulder Work Signs (W21-5, W21-5a, W21-5b)

Support:

Shoulder Work signs (see Figure 6F-4~~, Sheet 4 of 4~~) warn of maintenance, reconstruction, or utility operations on the highway shoulder where the roadway is unobstructed.

Standard:

The Shoulder Work sign shall have the legend SHOULDER WORK (W21-5), RIGHT (LEFT) SHOULDER CLOSED (W21-5a), or RIGHT (LEFT) SHOULDER CLOSED XX~~X~~ m (FT) or AHEAD (W21-5b).

Option:

The Shoulder Work sign may be used in advance of the point on a nonlimited access highway where there is shoulder work. It may be used singly or in combination with a ROAD WORK NEXT XX km (MILES) or ROAD WORK AHEAD sign.

Guidance:

On freeways and expressways, the RIGHT (LEFT) SHOULDER CLOSED XX~~X~~ m (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 ~~6F.36~~ 6F.38 SURVEY CREW Sign (W21-6)

Guidance:

The SURVEY CREW (W21-6) sign (see Figure 6F-4~~, Sheet 4 of 4~~) should be used to warn of surveying crews working in or adjacent to the roadway.

Section ~~6F.37~~ 6F.39 UTILITY WORK Sign (W21-7)

Option:

The UTILITY WORK (W21-7) sign (see Figure 6F-4~~, Sheet 4 of 4~~) may be used as an alternate to the ROAD (STREET) WORK (W20-1) sign for utility operations on or adjacent to a highway.

Support:

Typical examples of where the UTILITY WORK sign is used appear in Figures 6I-4, 6I-6, 6I-10, 6I-15, 6I-18, 6I-21, 6I-22, 6I-26, and 6I-33.

Standard:

The UTILITY WORK sign shall carry the legend UTILITY WORK, XX m (FT), XX km (MILES), or AHEAD.

Section ~~6F.38~~ 6F.40 Signs for Blasting Areas

Support:

Radio-Frequency (RF) energy can cause the premature firing of electric detonators (blasting caps) used in TTC zones.

Standard:

Road users shall be warned to turn off mobile radio transmitters and cellular telephones where blasting operations occur. A sequence of signs shall be prominently displayed 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.

Section ~~6F.39~~ 6F.41 BLASTING ZONE AHEAD Sign (W22-1)

Standard:

The BLASTING ZONE AHEAD (W22-1) sign (see Figure 6F-4~~, Sheet 4 of 4~~) shall be used in advance of any TTC zone where explosives are being used. The TURN OFF 2-WAY RADIO AND CELL PHONE and END BLASTING ZONE signs shall be used in sequence with this sign.

Section ~~6F.40~~ 6F.42 TURN OFF 2-WAY RADIO AND CELL PHONE Sign (W22-2)

Standard:

The TURN OFF 2-WAY RADIO AND CELL PHONE (W22-2) sign (see Figure 6F-4~~, Sheet 4 of 4~~) shall follow the BLASTING ZONE AHEAD sign and shall be placed at least 300 m (1,000 ft) before the beginning of the blasting zone.

Section ~~6F.41~~ 6F.43 END BLASTING ZONE Sign (W22-3)

Standard:

The END BLASTING ZONE (W22-3) sign (see Figure 6F-4~~, Sheet 4 of 4~~) shall be placed a minimum of 300 m (1,000 ft) past the blasting zone.

Option:

The END BLASTING ZONE sign may be placed either with or preceding the END ROAD WORK sign.

Section ~~6F.42~~ 6F.44 Shoulder Signs (W8-4, W8-9, ~~W8-9a~~ W8-17)

Option:

The SOFT SHOULDER (W8-4) sign (see Figure 6F-4~~, Sheet 2 of 4~~) may be used to warn of a soft shoulder condition.

The LOW SHOULDER (W8-9) sign (see Figure 6F-4~~, Sheet 2 of 4~~) may be used to warn of a shoulder condition where there is an elevation difference of less than 75 mm (3 in) between the shoulder and the travel lane.

Guidance:

The Shoulder Drop Off (W8-17) sign (see Figure 6F-4) should be used when an unprotected shoulder drop-off, adjacent to the travel lane, exceeds 75 mm (3 in) in depth for a continuous length along the roadway, based on engineering judgment.

Option:

A SHOULDER DROP OFF (W8-17P) supplemental plaque (see Figure 6F-4) may be mounted below the W8-17 sign.

The SHOULDER DROP OFF (~~W8-9a~~ W8-17a) word message sign (see Figure 6F-4~~, Sheet 2 of 4~~) ~~should~~ may be used ~~when an unprotected shoulder drop-off, adjacent to the travel lane, exceeds 75 mm (3 in) in depth for a continuous length along the roadway, based on engineering judgment~~ instead of the W8-17 sign.

Section ~~6F.43~~ 6F.45 UNEVEN LANES Sign (W8-11)

Guidance:

The UNEVEN LANES (W8-11) sign (see Figure 6F-4~~, Sheet 2 of 4~~) should be used during operations that create a difference in elevation between adjacent lanes that are open to travel.

Option:

A Shoulder Drop Off (W8-17) sign with an UNEVEN LANES (W8-11P) supplemental plaque (see Figure 6F-4) may be used instead of the W8-11 sign.

A STEEL PLATE ON PAVEMENT (W8-24) sign (see Figure 6F-4) 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 ~~6F.44~~ 6F.46 NO CENTER STRIPE Sign (W8-12)

Guidance:

The NO CENTER STRIPE (W8-12) sign (see Figure 6F-4~~, Sheet 2 of 4~~) should be used when the work obliterates the ~~centerline~~ center line pavement markings. This sign should be placed at the beginning of the TTC zone and repeated at 3.2 km (2 mi) intervals in long TTC zones.

Section 6F.47 Reverse Curve Signs (W1-4 Series)

Option:

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 6F-4) may be used when a lane (or lanes) is being shifted to the left or right.

Standard:

If a Reverse Curve sign is used, the number of lanes illustrated on the sign shall be the same as the number of through lanes available to road users, and the direction of the reverse curve shall be appropriately illustrated.

Section ~~6F.45~~ 6F.48 Double Reverse Curve Signs (W24 Series)

Option:

The Double Reverse Curve (W24-1, W24-1a, or W24-1b) sign (see Figure 6F-4~~, Sheet 4 of 4~~) may be used when the tangent distance between two reverse curves is less than 180 m (600 ft), thus making it difficult for a second Reverse Curve (W1-4 Series) sign to be placed between the curves.

Standard:

If a Double Reverse Curve sign is used, the number of lanes illustrated on the sign shall be the same as the number of through lanes available to road users, and the direction of the double reverse curve shall be appropriately illustrated.

Section ~~6F.46~~ 6F.49 Other Warning Signs

Option:

Advance warning signs may be used by themselves or with other advance warning signs.

Besides the warning signs specifically related to TTC zones, several other warning signs in Part 2 may apply in TTC zones.

Standard:

Except as noted in Section 6F.02, other warning signs that are used in TTC zones shall have black legends and borders on an orange background.

Section ~~6F.47~~ 6F.50 Special Warning Signs

Option:

Special warning signs may be used based on engineering judgment.

Guidance:

Special warning signs should ~~conform to~~ comply with the general requirements of color, shape, and alphabet size and series. The sign message should be brief, legible, and clear.

Section ~~6F.48~~ 6F.51 Advisory Speed Plaque (W13-1P)

Option:

In combination with a warning sign, an Advisory Speed (W13-1P) plaque (see Figure 6F-4~~, Sheet 3 of 4~~) may be used to indicate a recommended ~~safe~~ speed through the TTC zone.

Standard:

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. The sign shall be at least 600 x 600 mm (24 x 24 in) in size when used with a sign that is 900 x 900 mm (36 x 36 in) or larger. Except in emergencies, an Advisory Speed plaque shall not be mounted until the recommended speed is determined by the highway agency.

Section ~~6F.49~~ 6F.52 Supplementary Distance Plaque (W7-3aP)

Option:

In combination with a warning sign, a Supplementary Distance (W7-3aP) plaque with the legend NEXT XX km (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.

In long TTC zones, Supplementary Distance plaques with the legend NEXT XX km (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:

The Supplementary Distance plaque with the legend NEXT XX km (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 sign shall be at least 750 x 600 mm (30 x 24 in) in size when used with a sign that is 900 x 900 mm (36 x 36 in) or larger.

Guidance:

When used in TTC zones, the Supplementary Distance plaque with the legend NEXT XX km (MILES) should be placed below the initial warning sign designating that, within the approaching zone, a temporary work activity or condition exists.

Section ~~6F.50~~ 6F.53 Guide Signs

Support:

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:

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:

If additional temporary guide signs are used in TTC zones, they shall have a black legend and border on an orange background.

Option:

Guide signs used in TTC incident management situations may have a black legend and border on a fluorescent pink background.

When directional signs and street name signs are used in conjunction with detour routing, these signs may have a black legend and border on an orange background.

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.

Section ~~6F.51~~ 6F.54 ROAD WORK NEXT XX km (MILES) Sign (G20-1)

Guidance:

The ROAD WORK NEXT XX km (MILES) (G20-1) sign (see Figure 6F-4~~, Sheet 4 of 4~~) should be installed in advance of TTC zones that are more than 3.2 km (2 mi) in length.

Option:

The ROAD WORK NEXT XX km (MILES) sign may be mounted on a Type ~~III~~ 3 Barricade. The sign may also be used for TTC zones of shorter length.

Standard:

The distance ~~shown~~ displayed edited to increase consistency on the ROAD WORK NEXT XX km (MILES) sign shall be stated to the nearest whole kilometer (or mile).

Section ~~6F.52~~ 6F.55 END ROAD WORK Sign (G20-2)

Guidance:

When used, the END ROAD WORK (G20-2) sign (see Figure 6F-4~~, Sheet 4 of 4~~) should be placed near the downstream end of the termination area, as determined by engineering judgment.

Option:

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 ~~III~~ 3 Barricade.

Section ~~6F.53~~ 6F.56 Detour Signs (M4-8, M4-8a, M4-8b, M4-9, M4-9a, M4-9b, M4-9c, and M4-10)

Standard:

Each detour shall be adequately marked with standard temporary route signs and destination signs.

Option:

Detour signs in TTC incident management situations may have a black legend and border on a fluorescent pink background.

The Detour Arrow (M4-10) sign (see Figure 6F-5) may be used where a detour route has been established.

The DETOUR (M4-8) sign (see Figure 6F-5) 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.

Guidance:

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.

The DETOUR (M4-9) sign (see Figure 6F-5) 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.

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:

The END DETOUR (M4-8a) or END (M4-8b) sign (see Figure 6F-5) may be used to indicate that the detour has ended.

Guidance:

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.

The Pedestrian/Bicycle Detour (M4-9a) sign (see Figure 6F-5) should be used where a pedestrian/bicycle detour route has been established because of the closing of a pedestrian/bicycle facility to through traffic.

Standard:

If used, the Pedestrian/Bicycle Detour sign shall have an arrow pointing in the appropriate direction.

Option:

The arrow on a Pedestrian/Bicycle Detour sign may be on the sign face or on a supplemental plaque.

The Pedestrian Detour (M4-9b) sign or Bicycle Detour (M4-9c) sign (see Figure 6F-5) may be used where a pedestrian or bicycle detour route (not both) has been established because of the closing of the pedestrian or bicycle facility to through traffic.

~~**Section 6F.54 PILOT CAR FOLLOW ME Sign (G20-4)**~~

~~**Standard:**~~

~~**The PILOT CAR FOLLOW ME (G20-4) sign (see Figure 6F-4, Sheet 4 of 4) shall be mounted in a conspicuous position on the rear of a vehicle used for guiding one-way vehicular traffic through or around a TTC zone. A flagger shall be stationed on the approach to the activity area to stop vehicular traffic until the pilot vehicle is available.**~~ **this paragraph was relocated to Section 6C.13**

Section ~~6F.55~~ 6F.57 Portable Changeable Message Signs

~~Standard~~ Support:

Portable Changeable Message signs (PCMS) ~~shall be~~ are TTC devices installed for temporary use with the flexibility to display a variety of messages. ~~Each character module shall use at least a five-wide and seven-high pixel matrix.~~ In most cases, Portable Changeable Message signs follow the same provisions for design and application as those given for Changeable Message signs in Chapter 2M. The information in this Section describes situations where the provisions for Portable Changeable Message signs differ from those given in Chapter 2M.

~~Support:~~

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.

Portable Changeable Message signs have a wide variety of applications in TTC zones including: roadway, lane, or ramp closures; ~~crash or emergency~~ 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.

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.

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:

The components of ~~a~~ an electronic Portable Changeable Message sign should include: a message sign ~~panel~~, deleted to increase accuracy control systems, a power source, and mounting and transporting equipment. The front face of the sign should be covered with a protective material. the 2nd sentence was relocated from a later paragraph

Standard:

Portable Changeable Message signs ~~should~~ shall ~~subscribe to~~ comply with the applicable design and application principles established in ~~Section 2A.07 and other sections~~ Chapter 2A ~~of this Manual and, to the extent practical, with the design (that is, color, letter size and shape, and borders) and applications prescribed in this Manual, except that the reverse colors for the letters and the background are considered acceptable~~. Portable Changeable Message signs shall display only traffic operational, regulatory, warning, and guidance information, and shall not be used for advertising messages.

Support:

Section 2M.02 contains information regarding overly simplistic or vague messages that is also applicable to Portable Changeable Message signs.

Standard:

~~The color of the elements should be yellow or orange on a black background.~~ **The colors used for legends on Portable Changeable Message signs shall comply with those shown in Table 2A-4.**

Support:

Section 2M.04 contains information regarding the luminance, luminance contrast, and contrast orientation that is also applicable to Portable Changeable Message signs.

Guidance:

Portable Changeable Message signs should be visible from 800 m (0.5 mi) under both day and night conditions.

Support:

Section 2B.13 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:

A ~~phase shall consist of up~~ Portable Changeable Message sign should be limited to three lines of eight characters per line or should consist of a full matrix display. this sentence was relocated from the 1st paragraph

~~For a trailer or large truck mounted sign,~~ Except as noted in the Option below, the letter height used for Portable Changeable Message sign messages should be a minimum of 450 mm (18 in).

Option:

For Portable Changeable Message signs mounted on service patrol trucks or other incident response vehicles, ~~the~~ a letter height ~~should be a minimum of~~ as short as 250 mm (10 in) may be used.

The Portable Changeable Message sign ~~panel~~ deleted to increase accuracy may vary in size. this paragraph was relocated from later in this Section

Standard:

~~Each~~ Messages on an electronic Portable Changeable Message sign shall consist of ~~either one or~~ no more than two phases, and a phase shall consist of no more than three lines of text. Each phase shall be capable of being understood by itself, regardless of the phase in which it is read. Messages shall be

centered within each line of legend. If more than one Portable Changeable Message sign is simultaneously visible to road users, then only one of the signs shall display a sequential message at any given time.

Techniques of message display, such as fading, exploding, dissolving, or moving messages, shall not be used. **The text of the message~~s~~ shall not scroll or travel horizontally or vertically across the face of the sign.** **the 2nd sentence was relocated from a later paragraph**

Support:

Road users have difficulties in reading messages displayed in more than two phases on a typical three-line Portable Changeable Message sign.

Guidance:

~~The message panel should have adjustable display rates (minimum of 3 seconds per phase), so that the entire message can be read at least twice at the posted speed, the off-peak 85th percentile speed prior to work starting, or the anticipated operating speed.~~

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 no more than 8 seconds.

All messages should be designed with consideration given to the principles above and also taking into account the following ~~factors~~:

~~A. Each phase should convey a single thought.~~

~~B. If the message can be displayed in one phase, the top line should present the problem, the center line should present the location or distance ahead, and the bottom line should present the recommended driver action.~~

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. ~~When a message is longer~~ 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 300 m (1,000 ft) on freeways and expressways, and by a distance of at least 150 m (500 ft) on other types of highways.

~~C. When abbreviations are used, they should be easily understood (see Section 1A.15).~~

~~Option:~~

~~Smaller letter sizes may be used on a Portable Changeable Message sign mounted on a trailer or large truck provided that the message is legible from at least 200 m (650 ft), or mounted on a service patrol truck provided that the message is legible from at least 100 m (330 ft).~~

~~Two Portable Changeable Message signs may be used for the purpose of allowing the entire message to be read twice at the posted speed.~~

Standard:

When the word messages shown in Tables 1A-1 or 1A-2 need to be abbreviated on a Portable Changeable Message sign, the provisions described in Section 1A.15 shall be followed.

In order to maintain legibility, Portable Changeable Message signs shall automatically adjust their brightness under varying light conditions~~, to maintain legibility~~.

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.

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.

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 ~~panel~~ deleted to increase accuracy shall be a minimum of 2.1 m (7 ft) above the roadway in urban areas and 1.5 m (5 ft) above the roadway in rural areas when it is in the operating mode.

Guidance:

Portable Changeable Message signs should be used as a supplement to and not as a substitute for conventional signs and pavement markings.

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.

~~The~~ 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. ~~Multiple Portable Changeable Message signs should be placed on the same side of the roadway, separated from each other at distances based on Table 6C-1.~~

Portable Changeable Message signs should be placed ~~on~~ off the shoulder of the roadway ~~or~~ and behind a traffic barrier, if practical~~, further from the traveled lane~~. 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. ~~They~~ 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.

When Portable Changeable Message signs are used in TTC zones, they should display only TTC messages.

When Portable Changeable Message signs are not being used to display TTC messages, they should be removed from the highway or~~, if not removed, they should be~~ shielded behind a traffic barrier and turned away from traffic. ~~or~~ If ~~the previous two options are~~ removal or shielding is not ~~feasible~~ possible, they should be delineated with retroreflective TTC devices.

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 ~~6F.56~~ 6F.58 Arrow Panels

Standard:

An arrow panel 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:

An arrow panel 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.

If used, an arrow panel should be used in combination with appropriate signs, channelizing devices, or other TTC devices.

An arrow panel should be placed on the shoulder of the roadway or, if practical, farther from the traveled lane. It should be delineated with retroreflective TTC devices. When an arrow panel 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:

Arrow panels shall meet the minimum size, legibility distance, number of elements, and other specifications shown in Figure 6F-6.

Support:

Type A arrow panels are appropriate for use on low-speed urban streets. Type B arrow panels are appropriate for intermediate-speed facilities and for maintenance or mobile operations on high-speed roadways. Type C arrow panels are intended to be used on high-speed, high-volume motor vehicle traffic control projects. Type D arrow panels are intended for use on authorized vehicles.

Standard:

Type A, B, and C arrow panels shall have solid rectangular appearances. A Type D arrow panel shall conform to the shape of the arrow.

All arrow panels shall be finished in nonreflective black. The arrow panel shall be mounted on a vehicle, a trailer, or other suitable support.

Guidance:

The minimum mounting height, measured vertically from the bottom of the panel to the roadway below it or to the elevation of the near edge of the roadway, of an arrow panel should be 2.1 m (7 ft) ~~from the roadway to the bottom of the panel~~, except on vehicle-mounted panels, which should be as high as practical.

A vehicle-mounted arrow panel should be provided with remote controls.

Standard:

Arrow panel 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 panels.

Guidance:

Full brilliance should be used for daytime operation of arrow panels.

Standard:

The arrow panel shall have suitable elements capable of the various operating modes. The color presented by the elements shall be yellow.

Guidance:

If an arrow panel 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:

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.

An arrow panel 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 mode.

An arrow panel in the arrow or chevron mode shall be used only for stationary or moving lane closures on multi-lane roadways.

For shoulder work, blocking the shoulder, for roadside work near the shoulder, or for temporarily closing one lane on a two-lane, two-way roadway, an arrow panel shall be used only in the caution mode.

Guidance:

For a stationary lane closure, the arrow panel should be located on the shoulder at the beginning of the merging taper.

Where the shoulder is narrow, the arrow panel should be located in the closed lane.

Standard:

When arrow panels are used to close multiple lanes, a separate arrow panel shall be used for each closed lane.

Guidance:

When arrow panels are used to close multiple lanes, if the first arrow panel is placed on the shoulder, the second arrow panel should be placed in the first closed lane at the beginning of the second merging taper (see Figure 6I-37). When the first arrow panel is placed in the first closed lane, the second arrow panel should be placed in the second closed lane at the downstream end of the second merging taper.

For mobile operations where a lane is closed, the arrow panel should be located to provide adequate separation from the work operation to allow for appropriate reaction by approaching drivers.

Standard:

A vehicle displaying an arrow panel shall be equipped with high-intensity rotating, flashing, oscillating, or strobe lights.

Arrow panel(s) shall not be used to laterally shift traffic.

Option:

A portable changeable message sign may be used to simulate an arrow panel display.

Section ~~6F.57~~ 6F.59 High-Level Warning Devices (Flag Trees)

Option:

A high-level warning device (flag tree) may supplement other TTC devices in TTC zones.

Support:

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-2.

Standard:

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 2.4 m (8 ft). The flag shall be 400 mm (16 in) square or larger and shall be orange or fluorescent red-orange in color.

Option:

An appropriate warning sign may be mounted below the flags.

Support:

High-level warning devices are most commonly used in high-density road user situations to warn road users of short-term operations.

Section ~~6F.58~~ 6F.60 Channelizing Devices

Standard:

Designs of various channelizing devices shall be as shown in Figure 6F–7. All channelizing devices shall be crashworthy.

Support:

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 ~~temporary raised islands~~ longitudinal channelizing devices.

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 ~~separate~~ channelize vehicular traffic away from the work space, pavement drop-offs, pedestrian or shared-use paths, or opposing directions of vehicular traffic.

Standard:

Devices used to channelize pedestrians shall be detectable to users of long canes and visible to persons having low vision.

Where ~~barricades~~ channelizing devices are used to channelize pedestrians, ~~there~~ they shall be located such that there are no gaps between the bases of the devices, in order to create a continuous ~~detectable~~ bottom, and ~~top rails with no gaps between individual barricades to be detectable to users of long canes. The bottom of the bottom rail shall be no higher than 150 mm (6 in) above the ground surface. The top of the top rail shall be no lower than 900 mm (36 in) above the ground surface~~ the height of each channelizing device shall be at least 800 mm (32 in).

~~Option:~~

~~A gap not exceeding 150 mm (6 in) between the bottom rail and the ground surface may be used to facilitate drainage.~~ relocated to Section 6F.65

~~Standard:~~

~~If drums, cones, or tubular markers are used to channelize pedestrians, they shall be located such that there are no gaps between the bases of the devices, in order to create a continuous bottom, and the height of each individual drum, cone, or tubular marker shall be no less than 900 mm (36 in) to be detectable to users of long canes.~~

Guidance:

Where multiple channelizing devices are aligned to form a continuous pedestrian channelizer, connection points should be smooth to optimize long-cane and hand trailing.

Channelizing devices should be constructed and ballasted to perform in a predictable manner when inadvertently struck by a vehicle. ~~Channelizing devices should be crashworthy. Fragments or other debris from the device or the ballast should not pose a significant hazard to road users or workers.~~

The spacing ~~of~~ between channelizing device~~s~~ units should not exceed a distance in meters (feet) equal to 0.2 times the speed limit in km/h (1.0 times the speed limit in mph) when used for taper channelization, and a distance in meters (feet) equal to 0.4 times the speed limit in km/h (2.0 times the speed limit in mph) when used for tangent channelization.

When channelizing devices have the potential of leading vehicular traffic out of the intended vehicular traffic space as shown in Figure 6I-39, the channelizing devices should be extended a distance in meters (feet) of 0.4 times the speed limit in km/h (2.0 times the speed limit in mph) beyond the downstream end of the transition area.

Option:

Warning lights may be added to channelizing devices in areas with frequent fog, snow, or severe roadway curvature, or where visual distractions are present.

Standard:

Warning lights shall flash when placed on channelizing devices used alone or in a cluster to warn of a condition. Except for the sequential flashing warning lights discussed below, warning lights placed on channelizing devices used in a series to channelize road users shall be steady-burn.

Option:

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.

Standard:

When used, the successive flashing of the sequential warning 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 warning light in the sequence shall be flashed at a rate of not less than 55 nor more than 75 times per minute.

The retroreflective material used on channelizing devices shall have a smooth, sealed outer surface that will display a similar color day or night.

Option:

The name and telephone number of the highway agency, contractor, or supplier may be ~~shown~~ displayed edited to increase consistency on the nonretroreflective surface of all types of channelizing devices.

Standard:

The letters and numbers of the name and telephone number shall be nonretroreflective and not over 50 mm (2 in) in height.

Guidance:

Particular attention should be given to maintaining the channelizing devices to keep them clean, visible, and properly positioned at all times.

Standard:

Devices that are damaged or have lost a significant amount of their retroreflectivity and effectiveness shall be replaced.

Section ~~6F.59~~ 6F.61 Cones

Standard:

Cones (see Figure 6F-7, Sheet 1 of 2) 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 450 mm (18 in) 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 700 mm (28 in) in height.

For nighttime use, cones shall be retroreflectorized or equipped with lighting devices for maximum visibility. Retroreflectorization of cones that are 700 to 900 mm (28 to 36 in) in height shall be provided by a 150 mm (6 in) wide white band located 75 to 100 mm (3 to 4 in) from the top of the cone and an additional 100 mm (4 in) wide white band located approximately 50 mm (2 in) below the 150 mm (6 in) band.

Retroreflectorization of cones that are more than 900 mm (36 in) in height shall be provided by horizontal, circumferential, alternating orange and white retroreflective stripes that are 100 to 150 mm

(4 to 6 in) wide. Each cone shall have a minimum of two orange and two white stripes with the top stripe being orange. Any nonretroreflective spaces between the orange and white stripes shall not exceed 75 mm (3 in) in width.

Option:

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.

Guidance:

Steps should be taken to minimize the possibility of cones being blown over or displaced by wind or moving vehicular traffic.

Cones should not be used for pedestrian channelization or as pedestrian barriers in TTC zones on or along sidewalks unless they are continuous between individual devices and detectable to users of long canes.

Option:

Cones may be doubled up to increase their weight.

Support:

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:

Ballast should be kept to the minimum amount needed.

Section ~~6F.60~~ 6F.62 Tubular Markers

Standard:

Tubular markers (see Figure 6F-7, Sheet 1 of 2) shall be predominantly orange and shall be not less than 450 mm (18 in) high and 50 mm (2 in) wide facing road users. They shall be made of a material that can be struck without causing damage to the impacting vehicle.

Tubular markers shall be a minimum of 700 mm (28 in) 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.

For nighttime use, tubular markers shall be retroreflectorized. Retroreflectorization of ~~700 mm (28 in) or larger~~ tubular markers that have a height of less than 1050 mm (42 in) shall be provided by two 75 mm (3 in) wide white bands placed a maximum of 50 mm (2 in) from the top with a maximum of 150 mm (6 in) between the bands. Retroreflectorization of tubular markers that have a height of 1050 mm (42 in) or more shall be provided by four 100 mm (4 in) wide alternating white and orange bands placed a maximum of 100 mm (4 in) from the top with a maximum of 50 mm (2 in) between the bands.

Guidance:

Tubular markers should not be used for pedestrian channelization or as pedestrian barriers in TTC zones on or along sidewalks unless they are continuous between individual devices and detectable to users of long canes.

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.

Tubular markers should be stabilized by affixing them to the pavement, by using weighted bases, or 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:

Tubular markers may be used effectively to divide opposing lanes of road users, divide vehicular traffic lanes when two or more lanes of moving motor vehicle 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:

When a noncylindrical tubular marker is used, it shall be attached to the pavement in a manner such that the width facing road users meets the minimum requirements.

A tubular marker shall be attached to the pavement to display the minimum 50 mm (2 in) width to the approaching road users.

Section ~~6F.61~~ 6F.63 Vertical Panels

Standard:

Retroreflective material on vertical panels (see Figure 6F-7, Sheet 1 of 2) shall be 200 to 300 mm (8 to 12 in) in width and at least 600 mm (24 in) in height. They shall have orange and white diagonal stripes and be retroreflectorized.

Vertical panels shall be mounted with the top a minimum of 900 mm (36 in) above the roadway and the bottom a maximum of 300 mm (12 in) above the roadway.

Where the height of the retroreflective material on the vertical panel ~~itself~~ is more than 900 mm (36 in) ~~or greater~~, a panel stripe width of 150 (6 in) shall be used.

~~Option:~~

Where the height of the retroreflective material on the vertical panel ~~itself~~ is ~~less than~~ 900 mm (36 in) or less, a panel stripe width of 100 mm (4 in) ~~may~~ shall be used.

~~Standard:~~

Markings for vertical panels shall be alternating orange and white retroreflective stripes sloping downward at an angle of 45 degrees in the direction vehicular traffic is to pass. Vertical panels used on freeways, expressways, and other high-speed roadways shall have a minimum of 169,000 mm^2 (270 in^2) retroreflective area facing vehicular traffic.

Option:

Where space is limited, vertical panels may be used to channelize vehicular traffic, divide opposing lanes, or replace barricades.

Section ~~6F.62~~ 6F.64 Drums

Standard:

Drums (see Figure 6F-7, Sheet 1 of 2) used for road user warning or channelization shall be constructed of lightweight, deformable materials. They shall be a minimum of 900 mm (36 in) in height and have at least a 450 mm (18 in) 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 100 to 150 mm (4 to 6 in) wide. Each drum shall have a minimum of two orange and two white stripes with the top stripe being orange. Any nonretroreflectorized spaces between the horizontal orange and white stripes shall not exceed 75 mm (3 in) wide. Drums shall have closed tops that will not allow collection of construction debris or other debris.

Support:

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:

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:

Drums should not be used for pedestrian channelization or as pedestrian barriers in TTC zones on or along sidewalks unless they are continuous between individual devices and detectable to users of long canes.

~~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.~~ this sentence changed to Standard and incorporated in the next paragraph ~~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:

Ballast shall not be placed on the top of a drum. Drums shall not be weighted with sand, water, or any material to the extent that would make them hazardous to road users or workers when struck. this sentence relocated from the previous paragraph and changed to Standard

Section ~~6F.63~~ 6F.65 Type ~~I, II, or III~~ 1, 2, or 3 Barricades designation changed in the title and throughout this Section from Roman numerals to eliminate all Roman numerals in the MUTCD

Support:

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.

As shown in Figure 6F-7, Sheet 2 of 2, barricades are classified as ~~either~~ grammar – more than two choices Type 1, Type 2, or Type 3.

Standard:

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 noted in the Option, the stripes shall be 150 mm (6 in) wide.

Option:

When rail lengths are less than 900 mm (36 in), 100 mm (4 in) wide stripes may be used.

Standard:

The minimum length for Type 1 and Type 2 Barricades shall be 600 mm (24 in), and the minimum length for Type 3 Barricades shall be 1200 mm (48 in). Each barricade rail shall be 200 to 300 mm (8 to 12 in) wide. Barricades used on freeways, expressways, and other high-speed roadways shall have a minimum of 169,000 mm^2 (270 in^2) of retroreflective area facing road users.

Guidance:

Where barricades extend entirely across a roadway, the stripes should slope downward in the direction toward which road users must turn.

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.

Where no turns are intended, the stripes should be positioned to slope downward toward the center of the barricade or barricades.

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.

Standard:

Where barricades are used to channelize pedestrians, there shall be continuous detectable bottom and top rails with no gaps between individual barricades to be detectable to users of long canes. The bottom of the bottom rail shall be no higher than 150 mm (6 in) above the ground surface. The top of the top rail shall be no lower than 800 mm (32 in) above the ground surface.

Option:

A gap not exceeding 150 mm (6 in) between the bottom rail and the ground surface may be used to facilitate drainage. relocated from Section 6F.58

Guidance:

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 1500 mm (60 in) throughout the entire length of the pedestrian pathway, a 1500 x 1500 mm (60 x 60 in) passing space should be provided at least every 60 m (200 ft) to allow individuals in wheelchairs to pass.

Barricade rail supports should not project into pedestrian circulation routes more than 100 mm (4 in) from the support between 675 mm (27 in) and 2000 mm (80 in) from the surface as described in Section 4.4.1 of the "Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG)" (see Section 1A.11).

Option:

For Type 1 Barricades, the support may include other unstriped horizontal ~~panels~~ rails edited to increase accuracy necessary to provide stability.

Guidance:

~~Barricades should be crashworthy as they are located adjacent to vehicular traffic flow and are subject to impact by errant vehicles.~~

On high-speed expressways or in other situations where barricades may be susceptible to overturning in the wind, ballasting should be used.

Option:

Sandbags may be placed on the lower parts of the frame or the stays of barricades to provide the required ballast.

Standard:

Barricades shall be placed in conformance with the application and installation requirements for the specific device that is being used.

Ballast shall not be placed on top of any striped rail. Barricades shall not be ballasted by nondeformable objects such as rocks or chunks of concrete.

Guidance:

Ballast ~~shall~~ should not extend into the accessible passage width of 1500 mm (60 in).

Support:

Type 1 or Type 2 Barricades are intended for use in situations where road user flow is maintained through the TTC zone.

Option:

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.

Type 1 Barricades may be used on conventional roads or urban streets.

Guidance:

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:

Type 3 Barricades used at a road closure may be placed completely across a roadway or from curb to curb.

Guidance:

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:

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:

A sign ~~(see Section 6F.09)~~ shall be installed with the appropriate legend concerning permissible use by local road users (see Section 6F.09). Adequate visibility of the barricades from both directions shall be provided.

Option:

Signs may be installed on barricades (see Section 6F.03).

Section ~~6F.64~~ 6F.66 Direction Indicator Barricades

Standard:

The Direction Indicator Barricade (see Figure 6F-7, Sheet 2 of 2) shall consist of a One-Direction Large Arrow (W1-6) sign mounted above a diagonal striped, horizontally aligned, retroreflective rail.

The One-Direction Large Arrow (W1-6) sign shall be black 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 100 mm (4 in) wide. The One-Direction Large Arrow (W1-6) sign shall be 600 x 300 mm (24 x 12 in). The bottom rail shall have a length of 600 mm (24 in) and a height of 200 mm (8 in).

~~Guidance:~~

~~The Direction Indicator Barricade, including any associated ballast or lights, should be crashworthy.~~

Option:

The Direction Indicator Barricade may be used in tapers, transitions, and other areas where specific directional guidance to drivers is necessary.

Guidance:

If used, Direction Indicator Barricades should be used in series to direct the driver through the transition and into the intended travel lane.

Section ~~6F.65~~ 6F.67 Temporary Traffic Barriers as Channelizing Devices

Support:

Temporary traffic barriers 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:

Temporary traffic barriers serving as TTC devices shall ~~conform to~~ comply with requirements for such devices as set forth throughout Part 6.

Temporary traffic barriers (see Section 6F.81) shall not be used solely to channelize road users, but also to protect the work space ~~(see Section 6F.81)~~. ~~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.~~

Temporary traffic barriers ~~should~~ shall not be used for a merging taper except in low-speed urban areas.

Guidance:

~~Temporary traffic barriers should not be used for a constricted/restricted TTC zone.~~

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 and the taper~~ length should be designed to optimize road user operations considering the available geometric conditions.

Standard:

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.

Temporary traffic barriers shall be placed in conformance with the application and installation requirements for the specific device that is being used.

Guidance:

When used for channelization, temporary traffic barriers should be of a light color for increased visibility.

Standard:

Where temporary traffic barriers are used to channelize pedestrians, there shall be a continuous detectable bottom with no gaps between individual barricades to be detectable to users of long canes. The top of the temporary traffic barrier shall be no lower than 800 mm (32 in) above the ground surface.

Section ~~6F.66~~ 6F.68 Longitudinal Channelizing ~~Barricades~~ Devices

Support:

Longitudinal channelizing ~~barricades~~ devices are lightweight, deformable ~~channelizing~~ devices that ~~can be used singly as Type I, II, or III barricades, or connected so they~~ are highly visible, ~~and~~ have good target value, and can be connected together.

~~Guidance~~ **Standard:**

~~When~~ If used ~~as a barricade~~ singly as Type 1, 2, or 3 barricades, longitudinal channelizing ~~barricades~~ devices ~~should~~ shall ~~conform to~~ comply with the general size, color, stripe pattern, retroreflectivity, and placement characteristics established for the devices described in Chapter 6F.

Option:

Longitudinal channelizing ~~barricades~~ devices may be used instead of a line of cones, drums, or barricades.

~~Longitudinal channelizing barricades may be hollow and filled with water as a ballast.~~

Standard:

Longitudinal channelizing devices shall be placed in conformance with the application and installation requirements for the specific device that is being used.

Option:

Longitudinal channelizing ~~barricades~~ devices may be used ~~to channelize pedestrians~~ for pedestrian traffic control.

Guidance:

If used for pedestrian traffic control, longitudinal channelizing ~~barricades~~ devices should be interlocked to delineate or channelize flow ~~including pedestrian traffic control~~. The interlocking ~~barricade wall~~ devices should not have gaps that allow pedestrians ~~or vehicles~~ to stray from the channelizing path.

~~Support:~~

~~Longitudinal channelizing barricades are often located adjacent to traffic and therefore are subject to impact by errant vehicles.~~

~~Guidance:~~

~~Because of their vulnerable position, longitudinal channelizing barricades should be constructed of lightweight materials and be crashworthy.~~

Although longitudinal channelizing ~~barricades~~ devices might give the appearance of being formidable obstacles, they have not met the crashworthy requirements for temporary traffic barriers and, therefore, should not be used to ~~shield~~ provide positive protection for obstacles or provide positive protection for pedestrians, including workers, from vehicle impacts ~~or obstacles~~.

Section ~~6F.67~~ 6F.69 Other Channelizing Devices

Option:

Channelizing devices other than those described in this Chapter may be used in special situations based on an engineering study.

Guidance:

Other channelizing devices should ~~conform to~~ comply with the general size, color, stripe pattern, retroreflection, and placement characteristics established for the devices described in this Chapter.

Section 6F.70 Temporary Lane Separators

Option:

Temporary lane separators may be used to channelize road users, to divide opposing vehicular traffic lanes, to divide lanes when two or more lanes are open in the same direction, and to provide continuous pedestrian channelization.

Standard:

Temporary lane separators shall be crashworthy. Temporary lane separators shall be no more than 100 mm (4 in) in height and no more than 0.3 m (1 ft) in width, and shall have sloping sides in order to facilitate crossover by emergency vehicles.

Option:

Temporary lane separators may be supplemented with any of the approved channelizing devices contained in Chapter 6F, such as tubular markers, vertical panels, and opposing traffic lane dividers.

Standard:

If appropriate channelizing devices are used to supplement a temporary lane separator, the channelizing devices shall be retroreflectorized to provide maximum nighttime visibility. If channelizing devices are not used, the curbing of the temporary lane separator shall contain retroreflectorization to enhance its visibility.

Guidance:

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 shifted from place to place within the TTC zone in order to accommodate changing conditions. In general, temporary lane separators should be used in situations where they will remain in place for prolonged periods of time.

Section ~~6F.68~~ 6F.71 Detectable Edging for Pedestrians

Support:

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 visual disabilities and are incapable of providing detectable path guidance on temporary or realigned sidewalks or other pedestrian facilities.

Guidance:

When it is determined that a facility should be accessible to and detectable by pedestrians with visual disabilities, a continuously detectable edging should be provided throughout the length of the facility such that it can be followed by pedestrians using long canes for guidance. This edging should protrude at least 150 mm (6 in) above the surface of the sidewalk or pathway, with the bottom of the edging a maximum of 62 mm (2.5 in) 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:

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:

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 ~~6F.69~~ 6F.72 Temporary Raised Islands

Standard:

Temporary raised islands shall be used only in combination with pavement striping and other suitable channelizing devices.

Option:

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.

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:

Temporary raised islands should have the basic dimensions of 100 mm (4 in) high by at least ~~450~~ 300 mm (~~18~~ 12 in) wide and have rounded or chamfered corners.

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:

At pedestrian crossing locations, temporary raised islands shall have an opening or be shortened to provide at least a 1500 mm (60 in) wide pathway for the crossing pedestrian.

Section ~~6F.70~~ 6F.73 Opposing Traffic Lane Divider and Sign (W6-4)

Support:

Opposing traffic lane dividers are delineation devices used as center lane dividers to separate opposing vehicular traffic on a two-lane, two-way operation.

Standard:

Opposing traffic lane dividers shall not be placed across pedestrian crossings.

The Opposing Traffic Lane Divider (W6-4) sign (see Figure 6F-4~~, Sheet 2 of 4~~) ~~is~~ shall be an upright, retroreflective orange-colored sign placed on a flexible support and sized at least 300 mm (12 in) wide by 450 mm (18 in) high.

Section ~~6F.71~~ 6F.74 Pavement Markings

Support:

~~The intended vehicle~~ Pavement markings are installed or existing markings are maintained or enhanced in TTC zones to provide road users with a clearly defined path ~~should be defined~~ for travel through the TTC zone in day, night, and twilight periods under both wet and dry pavement conditions. relocated within this Section

Guidance:

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. relocated within this Section

Standard:

~~**The provisions of this Section shall not be considered applicable for short-term, mobile, or incident management TTC zones.**~~

Pavement markings shall be maintained ~~along paved streets and highways~~ in all long~~- and intermediate~~-term stationary (see Section 6G.02) TTC zones~~. All pavement markings shall be~~ in accordance with Chapters 3A and 3B, except as otherwise ~~indicated~~ noted for temporary pavement markings in Section 6F.75. 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 surfaced detour or temporary roadway prior to the detour or roadway being opened to road users.

~~**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. All pavement markings and devices used to delineate road user paths shall be carefully reviewed during daytime and nighttime periods.**~~ **relocated to Section 6F.75**

For long-term stationary operations, pavement markings in the temporary traveled way that are no longer applicable shall be removed or obliterated as soon as practical. Pavement marking obliteration shall ~~leave a minimum of pavement scars and shall~~ remove all of the ~~old~~ non-applicable pavement marking material, and the obliteration method(s) shall minimize pavement scarring. Painting over existing pavement markings with black paint or spraying with asphalt shall not be accepted as a substitute for removal or obliteration.

~~Guidance:~~

~~Road users should be provided pavement markings within a TTC zone comparable to the pavement markings normally maintained along such roadways, particularly at either end of the TTC zone.~~

~~Markings should be provided in intermediate-term stationary work zones.~~

Option:

Removable, nonreflective, preformed tape that is approximately the same color as the pavement surface may be used where markings need to be covered temporarily.

Section ~~6F.72~~ 6F.75 Temporary ~~Pavement~~ Markings

Support:

Temporary ~~pavement~~ markings are those pavement markings or devices that are ~~allowed to remain in place until the earliest date when it is practical and possible to install pavement markings that meet the Part 3 standards for pavement markings~~ 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 where traffic uses the roadway being built or improved as the construction of the new pavement surface progresses, such as where a roadway surface treatment such as a chip seal is being applied to an existing pavement, or where a new bituminous or concrete pavement is being constructed either as a completely new roadway pavement or as an overlay of an existing pavement surface.

Guidance:

Unless justified by an engineering study, temporary pavement markings should not ~~be~~ remain in place for more than ~~2 weeks~~ 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 ~~unless justified by an engineering study~~.

The temporary use of edge lines, channelizing lines, lane-reduction transitions, gore markings, and other longitudinal markings, and the various nonlongitudinal markings (such as stop lines, railroad crossings, crosswalks, words, or symbols) should be in accordance with the State's or highway agency's policy. relocated within this Section

Standard:

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. relocated from Section 6F.71

Except as otherwise noted in this Section, all temporary pavement markings~~, including pavement markings~~ for no-passing zones~~,~~ shall ~~conform to~~ 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 ~~be~~ shall have line segments that are at least 0.6 m (2 ft) long.

All pavement markings and devices used to delineate road user paths shall be carefully reviewed during daytime and nighttime periods. relocated from Section 6F.71

Option:

Half-cycle lengths with a minimum of 0.6 m (2 ft) stripes may be used on roadways with severe curvature (see Section 3A.05) for broken line ~~centerlines~~ center lines in passing zones and for lane lines.

For temporary situations of ~~3~~ 14 calendar 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.34, 2B.37, and 2C.47) 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:

If used, the Do Not Pass, PASS WITH CARE, and NO PASSING ZONE signs should be placed in accordance with Sections 2B.34, 2B.37, and 2C.47.

Section ~~6F.73~~ 6F.76 Temporary Raised Pavement Markers

Option:

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

Standard:

If used, the color of the raised pavement markers shall simulate the color of the markings for which they substitute.

Guidance:

The pattern of the raised pavement markers should simulate the pattern of the markings for which they substitute.

Standard:

If temporary raised pavement markers are used to substitute for broken line segments, ~~at least two retroreflective markers shall be placed, one at each end of a segment of 0.6 to 1.5 m (2 to 5 ft) in length.~~

~~For segments longer than 1.5 m (5 ft),~~ **a group of at least three retroreflective markers shall be equally spaced at no greater than N/8 (see Section 3B.14). The value of N for a broken or dotted line shall equal the length of one line segment plus one gap. The value of N referenced for solid lines shall equal the N for the broken or dotted lines that might be adjacent to or might extend the solid lines (see Section~~~~s 3B.13 and 3B.14~~ 3B.11).**

If temporary raised pavement markers are used to substitute for solid lines, 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.

Option:

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 0.6 to 1.5 m (2 to 5 ft) in length, using the same cycle length as permanent markings.

Guidance:

Temporary raised pavement markers used on 0.6 to 1.5 m (2 to 5 ft) segments to substitute for broken line segments should not be in place for more than 14 days unless justified by engineering judgment.

Raised pavement markers should be considered for use along surfaced detours or temporary roadways, and other changed or new travel-lane alignments.

Option:

Retroreflective or internally illuminated raised pavement markers, or nonretroreflective raised pavement markers supplemented by retroreflective or internally illuminated markers, may ~~replace or~~ also be used in TTC zones to supplement markings as prescribed in Chapters 3A and 3B.

Section ~~6F.74~~ 6F.77 Delineators

Standard:

When used, delineators shall combine with or supplement other TTC devices. They shall be mounted on crashworthy supports so that the reflecting unit is approximately 1.2 m (4 ft) above the near roadway edge. The standard color for delineators used along both sides of two-way streets and highways and the right-hand edited to increase clarity side of one-way roadways shall be white. Delineators used along the left-hand edited to increase clarity side of one-way roadways shall be yellow.

Guidance:

Spacing along roadway curves should be as set forth in Section 3D.04 and should be such that several delineators are ~~always~~ constantly visible to the driver.

Option:

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.

Section ~~6F.75~~ 6F.78 Lighting Devices

Guidance:

Lighting devices should be provided in TTC zones based on engineering judgment.

When used to supplement channelization, the maximum spacing for warning lights should be identical to the channelizing device spacing requirements.

Support:

Four types of lighting devices are commonly used in TTC zones. They are floodlights, flashing warning beacons, warning lights, and steady-burn electric lamps.

Option:

Lighting devices may be used to supplement retroreflectorized signs, barriers, and channelizing devices.

During normal daytime maintenance operations, the functions of flashing warning beacons may be provided by high-intensity rotating, flashing, oscillating, or strobe lights on a maintenance vehicle.

Standard:

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 high-intensity rotating, flashing, oscillating, or strobe lights.

~~**Section 6F.76 Floodlights**~~

~~Support:~~

~~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 6G.20).~~

~~Guidance:~~

~~When nighttime work is being performed, floodlights should be used to illuminate the work area, equipment crossings, and other areas.~~

~~**Standard:**~~

~~**Except in emergency situations, flagger stations shall be illuminated at night.**~~

~~**Floodlighting shall not produce a disabling glare condition for approaching road users, flaggers, or workers.**~~

~~Guidance:~~

~~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.~~

~~Support:~~

~~Desired illumination levels vary depending upon the nature of the task involved. An average horizontal luminance of 50 lux (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 216 lux (20 foot candles).~~

~~**Section 6F.77 Flashing Warning Beacons**~~

~~Support:~~

~~Flashing warning beacons are often used to supplement a TTC device.~~

~~**Standard:**~~

~~**Flashing warning beacons shall comply with the provisions of Chapter 4K. A flashing warning beacon shall be a flashing yellow light with a minimum nominal diameter of 200 mm (8 in).**~~

~~Guidance:~~

~~Flashing warning beacons should be operated 24 hours per day.~~

~~Support:~~

~~The temporary terminus of a freeway is an example of a location where flashing warning beacons alert drivers to the changing roadway conditions and the need to reduce speed in transitioning from the freeway to another roadway type.~~

Section ~~6F.78~~ 6F.79 Warning Lights

Support:

Type A, Type B, Type C, and Type D 360-degree warning lights are portable, powered, yellow, lens-directed, enclosed lights.

Standard:

Warning lights shall be in accordance with the current ITE "Purchase Specification for Flashing and Steady-Burn Warning Lights" (see Section 1A.11).

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:

The maximum spacing for warning lights should be identical to the channelizing device spacing requirements.

Support:

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:

Warning lights may be used in either a steady-burn or flashing mode.

Standard:

Except for the sequential flashing warning lights that are described in Section 6F.60, flashing warning lights shall not be used for delineation, as a series of flashers fails to identify the desired vehicle path.

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 900 m (3,000 ft). 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 300 m (1,000 ft).

Warning lights shall have a minimum mounting height of 750 mm (30 in), measured vertically from ~~to~~ the bottom of the lens to the elevation of the near edge of the pavement.

Support:

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:

Type A warning lights may be mounted on channelizing devices.

Support:

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:

Type B warning lights are designed to operate 24 hours per day and may be mounted on advance warning signs or on independent supports.

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:

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 6F.79 Steady-Burn Electric Lamps**~~

~~Support:~~

~~Steady-Burn electric lamps are a series of low-wattage, yellow, electric lamps, generally hard-wired to a 110-volt external power source.~~

~~Option:~~

~~Steady-Burn electric lamps may be used in place of Type C Steady-Burn warning lights (see Section 6F.78).~~

Section 6F.80 Temporary Traffic Control Signals

Standard:

Temporary traffic control signals (see Section 4D.32) used to control road user movements through TTC zones and in other TTC situations shall ~~meet~~ comply with the applicable provisions of Part 4.

Support:

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:

~~**One-lane, two-way vehicular traffic flow (see Chapter 4G) requires an all-red interval of sufficient duration for road users to clear the portion of the TTC zone controlled by the traffic control signals. Safeguards shall be incorporated to avoid the possibility of conflicting signal indications at each end of the TTC zone.**~~ **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 4H.02.**

Guidance:

Where pedestrian traffic is detoured to a temporary traffic control signal, engineering judgment should be used to determine if pedestrian signals or accessible pedestrian signals (see Section 4E.06) are needed for crossing along an alternate route.

When temporary traffic control signals are used, conflict monitors typical of traditional traffic control signal operations should be used.

Option:

Temporary traffic control signals may be portable or temporarily mounted on fixed supports.

~~**Standard:**~~

~~**The supports for temporary traffic control signals shall not encroach into the minimum required width of a "pedestrian access route" of 1200 mm (48 in) or an "alternate circulation path" of 900 mm (36 in).**~~

Guidance:

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:

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.

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:

Other TTC devices should be used to supplement temporary traffic control signals, including warning and regulatory signs, pavement markings, and channelizing devices.

Temporary traffic control signals not in use should be covered or removed.

~~The design and placement of temporary traffic control signals should include interconnection to other traffic control signals along the subject roadway.~~ If a temporary traffic control signal is located within 0.8 km (0.5 mi) of an adjacent traffic control signal, consideration should be given to interconnected operation.

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Standard:

Temporary traffic control signals shall not be located within 60 m (200 ft) of a highway-rail grade crossing or a highway-light rail transit grade crossing unless the temporary traffic control signal is provided with preemption in accordance with Section 4D.27 or unless arrangements are made to prevent traffic from queuing across the track(s).

Section 6F.81 Temporary Traffic Barriers

Support:

Temporary traffic barriers are devices designed to help prevent penetration by vehicles while minimizing injuries to vehicle occupants, and ~~are designed~~ deleted to improve grammar to protect workers, bicyclists, and pedestrians.

The four primary functions of temporary traffic barriers are:

A. To keep vehicular traffic from entering work areas, such as excavations or material storage sites;
B. To separate workers, bicyclists, and pedestrians from motor vehicle traffic;
C. To separate opposing directions of vehicular traffic; and
D. To separate vehicular traffic, bicyclists, and pedestrians from the work area such as false work for bridges and other exposed objects.

Option:

Temporary traffic barriers, including shifting portable or movable barrier installations to accommodate varying directional vehicular traffic demands, may be used to separate two-way vehicular traffic.

Guidance:

Because the protective requirements of a TTC situation have priority in determining the need for temporary traffic barriers, their use should be based on an engineering study. ~~When serving the additional function of channelizing vehicular traffic (see Section 6F.65), temporary traffic barriers should be a light color for increased visibility.~~

Standard:

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.

Temporary traffic barriers, including their end treatments, shall be crashworthy. **In order to mitigate the effect of striking the upstream end of a temporary traffic barrier, the end shall be installed in accordance with AASHTO's "Roadside Design Guide" (see Section 1A.11) by flaring until the end is outside the acceptable clear zone or by providing crashworthy end treatments.**

Option:

Warning lights or steady-burn electric lamps may be mounted on temporary traffic barrier installations.

Support:

~~A movable barrier is a linear system of connected barrier segments that can rapidly be shifted laterally by using a specially designed transfer vehicle. The transfer is accomplished in a manner that does not interfere with vehicular traffic in adjacent lanes. Applications of movable barriers include the following:~~

~~A. Closing an additional lane during work periods while maintaining the advantage of having the traveled way separated from the work space by a barrier;~~
~~B. Closing an additional lane during off-peak periods to provide extra space for work activities without adversely impacting vehicular traffic flow; and~~
~~C. Creating a temporary reversible lane, thus providing unbalanced capacity favoring the major direction of vehicular traffic flow.~~

Movable barriers are capable of being repositioned laterally using a transfer vehicle that travels along the barrier. Movable barriers enable short-term closures to be installed and removed on long-term projects. Providing a barrier-protected work space for short-term closures and providing unbalanced flow to accommodate changes in the direction of peak-period traffic flows are two of the advantages of using movable barriers.

Figure 6I-45 shows a temporary reversible lane using movable barriers. The notable feature of the movable barrier is that in both Phase A and Phase B, the lanes used by opposing traffic are separated by a barrier.

Figure 6I-34 shows an exterior lane closure using a temporary traffic barrier. Notes 7 though 9 address the option of using a movable barrier. By using a movable barrier, the barrier can be positioned to close the lane during the off-peak periods and can be relocated to open the lane during peak periods to accommodate peak traffic flows. With one pass of the transfer vehicle, the barrier can be moved out of the lane and onto the shoulder. Furthermore, if so desired, with a second pass of the transfer vehicle, the barrier could be moved to the roadside beyond the shoulder.

More specific information on the use of temporary traffic barriers is contained in Chapters 8 and 9 of AASHTO's "Roadside Design Guide" (see Section 1A.11).

~~Section 6F.82 Crash Cushions~~

~~Support:~~

~~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 AASHTO's "Roadside Design Guide" (see Section 1A.11).~~

~~**Standard:**~~

~~**Crash cushions shall be crashworthy. 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:~~

~~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:**~~

~~**Stationary crash cushions shall be designed for the specific application intended.**~~

~~**Truck-mounted attenuators shall be energy-absorbing devices attached to the rear of shadow trailers or trucks. 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:~~

~~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 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:~~

~~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:~~

~~Chapter 9 of AASHTO's "Roadside Design Guide" (see Section 1A.11) contains additional information regarding the use of shadow vehicles.~~

~~Guidance:~~

~~If used, the truck-mounted attenuator should be used in accordance with the manufacturer's specifications.~~

~~Section 6F.83 Vehicle-Arresting Systems~~

~~Support:~~

~~Vehicle-arresting systems are designed to prevent penetration into activity areas while providing for smooth, reasonably safe deceleration for the errant vehicles. They can consist of portable netting, cables, and energy-absorbing anchors.~~

~~Guidance:~~

~~When used, a vehicle-arresting system should be used in accordance with the manufacturer's specifications, and should be located so that vehicles are not likely to penetrate the location that the system is designed to protect.~~

Section ~~6F.84~~ 6F.82 Rumble Strips

Support:

Transverse rumble strips consist of intermittent, narrow, transverse areas of rough-textured or slightly raised or depressed road surface that extend across the travel lanes to alert drivers to unusual vehicular traffic conditions. Through noise and vibration they attract the driver's attention to such features as unexpected changes in alignment and to conditions requiring a stop.

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:

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.

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:

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:

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.

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.

Transverse rumble strips should not be placed on sharp horizontal or vertical curves.

Rumble strips should not be placed through pedestrian crossings or on bicycle routes.

Transverse rumble strips should not be placed on roadways used by bicyclists unless a minimum clear path of 1.2 m (4 ft) is provided at each edge of the roadway or on each paved shoulder as described in AASHTO's "Guide to the Development of Bicycle Facilities" (see Section 1A.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 1.2 m (4 ft) is also provided on the shoulder.

~~Sections 6F.85 Screens~~

~~Support:~~

~~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:~~

~~Screens should not be mounted where they could adversely restrict road user visibility and sight distance and adversely affect the reasonably safe operation of vehicles.~~

~~Option:~~

~~Screens may be mounted on the top of temporary traffic barriers that separate two-way motor vehicle traffic.~~

~~Guidance:~~

~~Design of screens should be in accordance with Chapter 9 of AASHTO's "Roadside Design Guide" (see Section 1A.11).~~

~~Section 6F.86 Future and Experimental Devices~~

~~Support:~~

~~The States, FHWA, AASHTO, the Transportation Research Board, and other organizations conduct research and experimentation on new traffic control and safety devices. Users of this Manual are encouraged to stay abreast of these current efforts and to use such devices with care so as to avoid presenting road users with unusual or confusing situations that might be abnormal or unexpected.~~

~~**Standard:**~~

~~**New traffic control devices shall conform to the provisions for design, use, and application set forth in this Manual. New traffic control devices that do not conform with the provisions in this Manual shall be subject to experimentation, documentation, and adoption following the provisions of Section 1A.10.**~~

CHAPTER 6G. TYPE OF TEMPORARY TRAFFIC CONTROL ZONE ACTIVITIES

Section 6G.01 Typical Applications

~~Support:~~

~~Whenever the acronym "TTC" is used in this Chapter, it refers to "temporary traffic control."~~

~~**Standard:**~~

~~**The needs and control of all road users (motorists, bicyclists, and pedestrians within the highway, including persons with disabilities in accordance with the Americans with Disabilities Act of 1990 (ADA), Title II, Paragraph 35.130) through a TTC zone shall be an essential part of highway construction, utility work, maintenance operations, and the management of traffic incidents.**~~

Support:

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 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.

Typical applications (TAs) of TTC zones are organized according to duration, location, type of work, and highway type. Table 6I-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.

Well-designed TTC plans for planned special events will also likely result from a combination of treatments from several of the typical applications.

Guidance:

For all planned special events, a TTC plan should be developed in conjunction with and be approved by the highway agency or agencies that have jurisdiction over the affected roadways.

Typical applications should be altered, when necessary, to fit the conditions of a particular TTC zone.

Option:

Other devices may be added to supplement the devices shown in the typical applications, while others may be deleted. The sign spacings and taper lengths may be increased to provide additional time or space for driver response.

Support:

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 four factors mentioned earlier (work duration, work location, work type, and highway type) are used to characterize the typical applications illustrated in Chapter 6I.

Section 6G.02 Work Duration

Support:

~~Chapter 6D and Sections 6F.68 and 6G.05 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.~~

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:

The five categories of work duration and their time at a location shall be:

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:

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. Generally, larger channelizing devices, temporary roadways, and temporary traffic barriers are used.

Standard:

Since long-term operations extend into nighttime, retroreflective and/or illuminated devices shall be used in long-term stationary TTC zones.

Guidance:

Inappropriate markings in long-term stationary TTC zones should be removed and replaced with temporary markings.

Support:

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. ~~In other instances, there might be insufficient pay-back time to economically justify more elaborate TTC measures.~~

Standard:

Since intermediate-term operations extend into nighttime, retroreflective and/or illuminated devices shall be used in intermediate-term stationary TTC zones.

Support:

Most maintenance and utility operations are short-term stationary work.

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.

~~Maintaining reasonably safe work and road user conditions is a paramount goal in carrying out mobile operations.~~

Guidance:

Safety in short-duration or mobile operations should not be compromised by using fewer devices simply because the operation will frequently change its location.

Option:

Appropriately colored or marked vehicles with high-intensity rotating, flashing, oscillating, or strobe lights may be used in place of signs and channelizing devices for short-duration or mobile operations. These vehicles may be augmented with signs or arrow panels.

Support:

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:

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:

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.

Guidance:

Warning signs, high-intensity rotating, flashing, oscillating, or strobe lights on a vehicle, flags, and/or channelizing devices should be used and moved periodically to keep them near the mobile work area.

Option:

Flaggers may be used for mobile operations that often involve frequent short stops.

Support:

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:

When mobile operations are being performed, a shadow vehicle equipped with an arrow panel 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.

Under high-volume conditions, consideration should be given to scheduling mobile operations work during off-peak hours.

If there are mobile operations on a high-speed travel lane of a multi-lane divided highway, arrow panels should be used.

Option:

For mobile operations that move at speeds less than 5 km/h (3 mph), mobile signs or stationary signing that is periodically retrieved and repositioned in the advance warning area may be used.

At higher speeds, vehicles may be used as components of the TTC zones for mobile operations. Appropriately colored and marked vehicles with signs, flags, high-intensity rotating, flashing, oscillating, or strobe lights, truck-mounted attenuators, and arrow panels or portable changeable message signs may follow a train of moving work vehicles.

For some continuously moving operations, such as street sweeping and snow removal, a single work vehicle with appropriate warning devices on the vehicle may be used to provide warning to approaching road users.

Standard:

Mobile operations that move at speeds greater than 30 km/h (20 mph), such as pavement marking 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.

Section 6G.03 Location of Work

Support:

Chapter 6D and Sections 6F.71 and 6G.05 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.

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:

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 indicate how vehicular traffic can move through the TTC zone.

Section 6G.04 Modifications To Fulfill Special Needs

Support:

~~Chapter 6D and Sections 6F.68 and 6G.05 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.~~

The typical applications in Chapter 6I illustrate commonly encountered situations in which TTC devices are employed.

Option:

Other devices may be added to supplement the devices indicated 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:

When conditions are more complex, typical applications should be modified by giving particular attention to the provisions set forth in Chapter 6B and by incorporating appropriate devices and practices from the following list:

A. Additional devices:
   1. Signs
   2. Arrow panels
   3. More channelizing devices at closer spacing (see Section 6F.71 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 pedestrian signals and accessible pedestrian signals)
   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

~~Where pedestrian or bicycle usage is high, typical applications should also be modified by giving particular attention to the provisions set forth in Chapter 6D, Section 6F.68, and other Sections of Part 6 related to accessibility and detectability provisions in TTC zones.~~

Section 6G.05 Work Affecting Pedestrian and Bicycle Facilities

Support:

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.

In addition to specific provisions identified in Sections 6G.06, 6G.07, 6G.08, 6G.10, 6G.11, 6G.12, and 6G.13, there are a number of provisions that might be applicable for all of the types of activities identified in this Chapter.

Guidance:

Where pedestrian or bicycle usage is high, the typical applications should be modified by giving particular attention to the provisions set forth in Chapters 6D and 6G, Section 6F.71, and in other Sections of Part 6 related to accessibility and detectability provisions in TTC zones.

Pedestrians should be separated from the worksite by appropriate devices that maintain the accessibility and detectability for pedestrians with disabilities.

Bicyclists and pedestrians should not be exposed to unprotected excavations, open utility access, overhanging equipment, or other such conditions.

Except for short duration 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 2.4 m (8 ft) 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 1200 mm (48 in).

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:

Where pedestrian routes are closed, alternate pedestrian routes shall be provided.

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.

Section 6G.06 Work Outside of Shoulder

Support:

~~Chapter 6D and Sections 6F.68 and 6G.05 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.~~

When work is being performed off the roadway (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 4.6 m (15 ft) 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). For work beyond the shoulder, see Figure 6I-1.

Guidance:

Where the above situations 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.

Option:

If work vehicles are on the shoulder, a SHOULDER WORK (W21-5) sign may be used. For mowing operations, the sign MOWING AHEAD (W21-8) may be used.

Where the activity is spread out over a distance of more than 3.2 km (2 mi), the SHOULDER WORK (W21-5) sign may be repeated every 1.6 km (1 mi).

A supplementary plaque with the message NEXT XX km (MILES) (W7-3aP) may be used.

Guidance:

A general warning sign like ROAD MACHINERY AHEAD (W21-3) should be used if workers and equipment must occasionally move onto the shoulder.

Section 6G.07 Work on the Shoulder with No Encroachment

Support:

~~Chapter 6D and Sections 6F.68 and 6G.05 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.~~

The provisions of this Section apply to short-term through long-term stationary operations.

Standard:

When paved shoulders having a width of 2.4 m (8 ft) 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:

When paved shoulders having a width of 2.4 m (8 ft) 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 ~~which~~ that can be perceived by road users, a supplementary plaque bearing the message NEXT XX METERS (FEET) (W16-4P) or km (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.

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 0.33 L using the formulas in Tables 6C-3 and 6C-4.

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.

Where the condition extends over a distance in excess of 1.6 km (1 mi), the sign should be repeated at 1.6 km (1 mi) intervals.

Option:

In addition, a supplementary plaque bearing the message NEXT XX km (MILES) (W7-3aP) may be used. Temporary traffic barriers may be needed to inhibit encroachment of errant vehicles into the work space and to protect workers.

Standard:

When used for shoulder work, arrow panels shall operate only in the caution mode.

Support:

A typical application for stationary work operations on shoulders is shown in Figure 6I-3. Short duration or mobile work on shoulders is shown in Figure 6I-4. Work on freeway shoulders is shown in Figure 6I-5.

Section 6G.08 Work on the Shoulder with Minor Encroachment

Support:

Chapter 6D and Sections 6F.71 and 6G.05 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.

Guidance:

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 3 m (10 ft), the lane should be closed.

Truck off-tracking should be considered when determining whether the minimum lane width of 3 m (10 ft) is adequate.

Option:

A lane width of 2.7 m (9 ft) 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:

Figure 6I-6 illustrates a method for handling vehicular traffic where the stationary or short duration work space encroaches slightly into the traveled way.

Section 6G.09 Work Within the Median

Support:

Chapter 6D and Sections 6F.71 and 6G.05 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.

Guidance:

If work in the median of a divided highway is within 4.6 m (15 ft) 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 6G.10 Work Within the Traveled Way of Two-Lane Highways

Support:

Chapter 6D and Sections 6F.71 and 6G.05 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.

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 6I-7, 6I-8, and 6I-9. Figure 6I-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:

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.

When an entire roadway is closed, as illustrated in Figure 6I-8, a detour should be provided and road users should be warned in advance of the closure, which in this example is a closure 16 km (10 mi) 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.

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 6I-9.

Support:

Techniques for controlling vehicular traffic under one-lane, two-way conditions are described in Section 6C.10.

Option:

Flaggers may be used as shown in Figure 6I-10.

STOP/YIELD sign control may be used on roads with low traffic volumes as shown in Figure 6I-11.

A temporary traffic control signal may be used as shown in Figure 6I-12.

Section 6G.11 Work Within the Traveled Way of Urban Streets

Support:

Chapter 6D and Sections 6F.71 and 6G.05 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.

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, and how to maintain access to business, industrial, and residential areas.

Pedestrian traffic needs separate attention. Chapter 6D contains information regarding pedestrian movements near TTC zones.

Standard:

~~**If the TTC zone affects the movement of pedestrians, adequate pedestrian access and walkways shall be provided. If the TTC zone affects an accessible and detectable pedestrian facility, the accessibility and detectability shall be maintained along the alternate pedestrian route.**~~ **relocated to Section 6D.01**

If the TTC zone affects the movement of bicyclists, adequate access to the roadway or shared-use paths shall be provided (see Part 9).

Where transit stops are affected or relocated because of work activity, access to temporary transit stops shall be provided.

Guidance:

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.

Worksites within the intersection should be protected against inadvertent pedestrian incursion by providing detectable channelizing devices.

Support:

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.

Standard:

All TTC devices shall be retroreflective or illuminated if utility work is performed during nighttime hours.

Guidance:

As discussed under short-duration projects, however, the reduced number of devices in utility work 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:

Figures 6I-6, 6I-10, 6I-15, 6I-18, 6I-21, 6I-22, 6I-23, 6I-26, and 6I-33 are examples of typical applications for utility operations. Other typical applications might apply as well.

Section 6G.12 Work Within the Traveled Way of Multi-lane, Nonaccess Controlled Highways

Support:

Chapter 6D and Sections 6F.71 and 6G.05 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.

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:

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:

When justified by an engineering study, temporary traffic barriers (see Section 6F.67) should be used to prevent incursions of errant vehicles into hazardous areas or work space.

~~**Standard:**~~

~~**When temporary traffic barriers are placed immediately adjacent to the traveled way, they shall be equipped with appropriate channelizing devices, delineation, and/or other TTC devices. For lane closures, the merging taper shall use channelizing devices and the temporary traffic barrier shall be placed beyond the transition area.**~~

Support:

~~It must be recognized that although temporary traffic barriers are shown in several of the typical applications of Chapter 6H, they are not considered to be TTC devices in themselves.~~

Figure 6I-34 illustrates a lane closure in which temporary traffic barriers are used.

Option:

When the right lane is closed, TTC similar to that shown in Figure 6I-33 may be used for undivided or divided four-lane roads.

Guidance:

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 edited to increase clarity 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 6I-31.

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 back to the ~~centerline~~ center line. When it is necessary to create a temporary ~~centerline~~ center line that is not consistent with the pavement markings, channelizing devices should be used and closely spaced.

Option:

When closing a left lane on a multi-lane undivided road, as vehicular traffic flow permits, the two interior lanes may be closed, as shown in Figure 6I-30, to provide drivers and workers additional lateral clearance and to provide access to the work space.

Standard:

When only the left lane is closed on undivided roads, channelizing devices shall be placed along the ~~centerline~~ center line as well as along the adjacent lane.

Guidance:

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.

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 6I-37, the tapers should be separated by a distance of 2L, with L being determined by the formulas in Tables 6C-3 and 6C-4.

Standard:

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:

When half the road is closed on an undivided highway, both directions of vehicular traffic may be accommodated as shown in Figure 6I-32. When both interior lanes are closed, temporary traffic controls may be used as indicated in Figure 6I-30. When a roadway must be closed on a divided highway, a median crossover may be used (see Section 6G.16).

Support:

TTC for lane closures on five-lane roads is similar to other multi-lane undivided roads. Figure 6I-32 can be adapted for use on five-lane roads. Figure 6I-35 can be used on a five-lane road for short duration and mobile operations.

Section 6G.13 Work Within the Traveled Way at an Intersection

Support:

Chapter 6D and Sections 6F.71 and 6G.05 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.

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.

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:

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 ~~for ensuring~~ to provide adequate capacity, maintaining or adjusting signal detectors, and ~~ensuring~~ relocating ~~the appropriate visibility of~~ signal heads to provide improved visibility.

Standard:

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:

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 60 km/h (40 mph), additional warning signs should be used in the advance warning area.

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:

Near-side work spaces, as depicted in Figure 6I-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 backups.

Option:

When near-side work spaces are used, an exclusive turn lane may be used for through vehicular traffic.

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:

Far-side work spaces, as depicted in Figures 6I-22 through 6I-25, involve additional treatment because road users typically enter the activity area by straight-through and left-turning edited to improve grammar or right-turning movements.

Guidance:

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:

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 an exclusive turn lane.

Support:

Figures 6I-26 and 6I-27 provide guidance on applicable procedures for work performed within the intersection.

Option:

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 6I-26;
B. Flaggers or uniformed law enforcement officers to direct road users, as shown in Figure 6I-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:

Depending on road user conditions, a flagger(s) and/or a uniformed law enforcement officer(s) should be used to control road users.

Section 6G.14 Work Within the Traveled Way of Freeways and Expressways

Support:

Problems of TTC might occur under the special conditions encountered where vehicular traffic must be moved through or around TTC zones on high-speed, high-volume roadways. Although the general principles outlined in the previous Sections of this Manual are applicable to all types of highways, high-speed, access-controlled highways need special attention in order to ~~reasonably safely and efficiently~~ accommodate vehicular traffic while also protecting work forces. The road user volumes, road 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. These situations often require more conspicuous devices than specified for normal rural highway or urban street use. However, the

same important basic considerations of uniformity and standardization of general principles apply for all roadways.

Work under high-speed, high-volume vehicular traffic on a controlled access highway is complicated by the roadway design and operational features. The presence of a median that establishes separate roadways for directional vehicular traffic flow might prohibit the closing of one of the roadways or the diverting of vehicular traffic to the other roadway. Lack of access to and from adjacent roadways prohibits rerouting of vehicular traffic away from the work space in many cases. Other conditions exist where work must be limited to night hours, thereby necessitating increased use of warning lights, illumination of work spaces, and advance warning systems.

TTC for a typical lane closure on a divided highway is shown in Figure 6I-33. Temporary traffic controls for short duration and mobile operations on freeways are shown in Figure 6I-35. A typical application for shifting vehicular traffic lanes around a work space is shown in Figure 6I-36. TTC for multiple and interior lane closures on a freeway is shown in Figures 6I-37 and 6I-38.

Guidance:

The method for closing an interior lane when the open lanes have the capacity to carry vehicular traffic should be as shown in Figure 6I-37. When the capacity of the other lanes is needed, the method shown in Figure 6I-38 should be used.

Section 6G.15 Two-Lane, Two-Way Traffic on One Roadway of a Normally Divided Highway

Support:

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:

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) or with channelizing devices throughout the length of the two-way operation. The use of markings and complementary signing, by themselves, shall not be used.

Support:

Figure 6I-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 6I-40 and 6I-41.

Section 6G.16 Crossovers

Guidance:

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 6I-39.
B. Crossovers should be designed for speeds no lower than 16 km/h (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:

Temporary traffic barriers and the excessive use of TTC devices cannot compensate for poor geometric and roadway cross-section design of crossovers.

Section 6G.17 Interchanges

Guidance:

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:

If access is not possible, ramps may be closed by using signs and Type ~~III~~ 3 Barricades. As the work space changes, the access area may be changed, as shown in Figure 6I-42. A TTC zone in the exit ramp may be handled as shown in Figure 6I-43.

When a work space interferes with an entrance ramp, a lane may need to be closed on the freeway (see Figure 6I-44). A TTC zone in the entrance ramp may require shifting ramp vehicular traffic (see Figure 6I-44).

~~**Section 6G.18 Movable Barriers**~~

~~Support:~~

~~Figure 6I-45 shows a temporary reversible lane using movable barriers.~~

~~Option:~~

~~If the work activity in Figure 6H-34 permits, a movable barrier may be used and relocated to the shoulder during nonwork periods or peak-period vehicular traffic conditions.~~

Section ~~6G.19~~ 6G.18 Work in the Vicinity of Highway-Rail Grade Crossings

Standard:

When highway-rail 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 railroad 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:

Figure 6I-46 shows work in the vicinity of a highway-rail grade crossing.

Guidance:

Early coordination with the railroad company should occur before work starts.

Section ~~6G.20~~ 6G.19 Temporary Traffic Control During Nighttime Hours

Support:

Chapter 6D and Sections 6F.71 and 6G.05 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.

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.

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.

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.

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.

Guidance:

Considering the safety issues inherent to night work, consideration should be given to enhancing traffic controls (see Section 6G.04) to provide added visibility and driver guidance, and increased protection for workers.

In addition to the enhancements listed in Section 6G.04, consideration should be given to providing additional lights and retroreflective markings to workers, work vehicles, and equipment.

Option:

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:

Because typical street and highway lighting is rarely adequate to provide sufficient levels of illumination for work tasks, temporary lighting should be provided where workers are active to supply sufficient illumination to ~~reasonably safely~~ perform the work tasks.

Temporary lighting for night work should be designed such that glare does not interfere with driver visibility, or create visibility problems for truck drivers, equipment operators, flaggers, or other workers.

Consideration should also 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:

Except in emergencies, temporary lighting shall be provided at all flagger stations.

Support:

Desired illumination levels vary depending upon the nature of the task involved. An average horizontal luminance of 50 lux (5 foot candles) can be adequate for general activities. An average horizontal luminance of 108 lux (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 216 lux (20 foot candles).

CHAPTER ~~6I.~~ 6H. CONTROL OF TRAFFIC THROUGH TRAFFIC INCIDENT MANAGEMENT AREAS relocated to prior to typical applications

Section ~~6I.01~~ 6H.01 General

~~Support:~~

~~Whenever the acronym "TTC" is used in this Chapter, it refers to "temporary traffic control."~~

Standard:

~~**The needs and control of all road users (motorists, bicyclists, and pedestrians within the highway, including persons with disabilities in accordance with the Americans with Disabilities Act of 1990 (ADA), Title II, Paragraph 35.130) through a TTC zone shall be an essential part of highway construction, utility work, maintenance operations, and the management of traffic incidents.**~~

In traffic incident management areas, the Incident Command System (ICS) as required by the National Incident Management System (NIMS) shall be implemented and used by all responders involved in the traffic incident.

Support:

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.

A traffic incident management area is an area of a highway where temporary traffic controls are imposed by authorized officials 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.

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.

The primary functions of TTC at a traffic incident management area are to move road users ~~reasonably safely and~~ expeditiously past or around the traffic incident, to reduce the likelihood of secondary traffic crashes, and to 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:

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.

On-scene responder~~s~~ organizations should ~~be~~ train~~ed~~ their personnel in ~~safe~~ TTC practices for accomplishing their tasks in and near traffic. 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 ~~always~~ constantly be aware of their visibility to oncoming traffic and ~~take measures to move the traffic incident as far off the traveled roadway as possible or to provide for appropriate warning~~ wear high-visibility apparel.

Emergency vehicles should be safe-positioned (see Section 1A.13) as they arrive at the incident scene. The number and placement of emergency vehicles that are safe-positioned should be such that traffic flow through the incident scene is optimized. All emergency vehicles that subsequently arrive should be positioned in a manner that does not interfere with the established temporary traffic flow.

Responders arriving at a traffic incident should, within 15 minutes of arrival on-scene, 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:

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 6H-1).

Support:

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 ~~while providing reasonably safe traffic flow~~. 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.

Option:

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.

Section ~~6I.02~~ 6H.02 Major Traffic Incidents

Support:

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:

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:

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.

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.

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.

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:

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 traffic incidents. The TTC should include the proper traffic diversions, tapered lane closures, and upstream warning devices to alert approaching traffic of the ~~end~~ back of a queue.

Attention should be paid to the upstream end of the traffic queue such that warning is given to road users approaching the ~~end~~ back of the queue.

If manual traffic control is needed, it should be provided by qualified flaggers or uniformed law enforcement officers.

Option:

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:

When flares are used to initiate TTC at traffic incidents, ~~more permanent traffic control~~ channelizing devices (see Section 6F.60) should replace them as soon as practical. Both the flare and its supporting device should then be removed from the roadway.

Option:

When light sticks are used to initiate TTC at traffic incidents, they may remain in place after channelizing devices (see Section 6F.60) have been deployed as long as the light sticks do not conflict with those devices.

~~On-scene responders should be trained in safe practices for accomplishing their tasks in and near traffic. Responders should always be aware of their visibility to oncoming traffic and take measures to move the traffic incident as far off the traveled roadway as possible or to provide for appropriate warning.~~

Section ~~6I.03~~ 6H.03 Intermediate Traffic Incidents

Support:

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.

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:

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 intermediate traffic incidents. The TTC should include the proper traffic diversions, tapered lane closures, and upstream warning devices to alert approaching traffic of the ~~end~~ back of a queue.

Attention should be paid to the upstream end of the traffic queue such that warning is given to road users approaching the ~~end~~ back of the queue.

If manual traffic control is needed, it should be provided by qualified flaggers or uniformed law enforcement officers.

Option:

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:

When flares are used to initiate TTC at traffic incidents, ~~more permanent traffic control~~ channelizing devices (see Section 6F.60) should replace them as soon as practical. Both the flare and its supporting device should then be removed from the roadway.

Option:

When light sticks are used to initiate TTC at traffic incidents, they may remain in place after channelizing devices (see Section 6F.60) have been deployed as long as the light sticks do not conflict with those devices.

~~On-scene responders should be trained in safe practices for accomplishing their tasks in and near traffic. Responders should always be aware of their visibility to oncoming traffic and take measures to move the traffic incident as far off the traveled roadway as possible or to provide for appropriate warning.~~

Section ~~6I.04~~ 6H.04 Minor Traffic Incidents

Support:

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.

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:

When a minor traffic incident blocks a travel lane, it should be removed from that lane to the shoulder as quickly as possible.

Section ~~6I.05~~ 6H.05 Use of Emergency-Vehicle Lighting

Support:

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. It is often confusing to 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.

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 advanced 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:

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.

Vehicle headlights not needed for illumination, or to provide notice to other road users of the incident response vehicle being in an unexpected location, should be turned off at night.

CHAPTER ~~6H.~~ 6I. TYPICAL APPLICATIONS relocated to end of Part 6

Section ~~6H.01~~ 6I.01 Typical Applications

~~Support:~~

~~Whenever the acronym "TTC" is used in this Chapter, it refers to "temporary traffic control."~~

~~**Standard:**~~

~~**The needs and control of all road users (motorists, bicyclists, and pedestrians within the highway, including persons with disabilities in accordance with the Americans with Disabilities Act of 1990 (ADA), Title II, Paragraph 35.130) through a TTC zone shall be an essential part of highway construction, utility work, maintenance operations, and the management of traffic incidents.**~~

Support:

Chapter 6G contains discussions of typical TTC activities. Chapter 6I 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 work zone for one street and a far-side work 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. For convenience in using the typical application diagrams, Tables 6C-1 and 6C-4 are reproduced in this Chapter as Tables 6I-3 and 6I-4, respectively.

Procedures for establishing TTC zones vary with such conditions as road configuration, location of the work, work activity, duration of work, road user volumes, road vehicle mix (buses, trucks, cars, motorcycles, and bicycles), and road user speeds. ~~Examples are presented in this Chapter showing how to apply principles and standards. Applying these guidelines to actual situations and adjusting to field conditions requires judgment.~~

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.

Option:

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:

Figures and tables found throughout Part 6 provide information for the development of TTC plans. Also, Table 6I-3 is used for the determination of sign spacing and other dimensions for various area and roadway types.

Table 6I-1 is an index of the 46 typical applications. Typical applications are shown on the right-hand edited to increase clarity page with notes on the facing page to the left. The legend for the symbols used in the typical applications is provided in Table 6I-2. In many of the typical applications, sign spacings and other dimensions are indicated by letters using the criteria provided in Table 6I-3. The formulas for determining taper lengths are provided in Table 6I-4.

Most of the typical applications show TTC devices for only one direction.

Notes for Figure 6I-1—Typical Application 1
Work Beyond ~~the~~ a 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 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 600 mm (24 in) behind the curb, or 4.6 m (15 ft) 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.

Notes for Figure 6I-2—Typical Application 2

Blasting Zone

Standard:

1. **Whenever blasting caps are used within 300 m (1,000 ft) 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 300 m (1,000 ft) 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.

Notes for Figure 6I-3—Typical Application 3
Work on Shoulders

Guidance:

1. A SHOULDER WORK sign should be placed on the left side of the roadway for a divided or one-way street only if the left shoulder is affected.

Option:

2. The Workers symbol signs may be used instead of SHOULDER WORK signs.
3. The SHOULDER WORK AHEAD 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.
4. 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.
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.

7. When paved shoulders having a width of 2.4 m (8 ft) 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 vehicular traffic to remain within the traveled way.

Notes for Figure 6I-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 practical to place stationary signs, the distance between the advance warning sign and the work should not exceed 8 km (5 mi).
2. In those situations where the distance between the advance signs and the work is 3.2 km (2 mi) to 8 km (5 mi), a Supplemental Distance plaque should be used with the ROAD WORK AHEAD sign.

Option:

3. The ROAD WORK NEXT XX km (MILES) sign may be used instead of the ROAD WORK AHEAD sign if the work locations occur over a distance of more than 3.2 km (2 mi).
4. Stationary signs may be omitted if the work is mobile.
5. Warning signs may be omitted when the work vehicle displays high-intensity rotating, flashing, oscillating, or strobe lights if the distance between work locations is 1.6 km (1 mi) or more, and if the work vehicle travels at vehicular traffic speeds between locations.
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 panel 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.**

Notes for Figure 6I-5—Typical Application 5
Shoulder Closure on a Freeway

Guidance:

1. 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 meters or kilometers (feet or miles), as appropriate.
3. The use of a temporary traffic barrier should be based on engineering judgment.

Standard:

4. ~~Where~~ Temporary traffic barriers, if used, ~~are installed, the ends of the barrier~~ shall ~~be treated in accordance~~ comply with the provisions of Section 6F.81.

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.

Notes for Figure 6I-6—Typical Application 6
Shoulder Work with Minor Encroachment

Guidance:

1. All lanes should be a minimum of 3 m (10 ft) 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. 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 2.7 m (9 ft) may be used.
4. 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 3 m (10 ft) is maintained.
5. Additional advance warning may be appropriate, such as a ROAD NARROWS sign.
6. Temporary traffic barriers may be used along the work space.
7. The shadow vehicle may be omitted if a taper and channelizing devices are used.
8. A truck-mounted attenuator may be used on the shadow vehicle.
9. 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.
10. Vehicle hazard warning signals may be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights.

Standard:

11. Vehicle hazard warning signals shall not be used instead of the vehicle's high-intensity rotating, flashing, oscillating, or strobe lights.

Notes for Figure 6I-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 shall be removed or obliterated as soon as ~~practicable~~ practical.**
4. **Temporary barriers and end treatments shall be crashworthy.**

Guidance:

5. If the tangent distance along the temporary diversion is more than 180 m (600 ft), 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 180 m (600 ft), and the diversion has sharp curves with recommended speeds of 50 km/h (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.

Option:

8. Flashing warning lights and/or flags may be used to call attention to the warning signs.
9. On sharp curves, large arrow signs may be used in addition to other advance warning signs.
10. Delineators or channelizing devices may be used along the diversion.

Notes for Figure 6I-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 ~~III~~ 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.

Notes for Figure 6I-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 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 ~~III~~ 3 Barricades.
6. Cardinal direction plaques may be used with route signs.

Notes for Figure 6I-10—Typical Application 10
Lane Closure on a Two-Lane Road Using Flaggers

Option:

1. For low-volume situations with short work 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 6E).
2. The ROAD WORK AHEAD and the END ROAD WORK signs may be omitted for short-duration operations.
3. 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.

Guidance:

4. 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:

5. **At night, flagger stations shall be illuminated, except in emergencies.**

Guidance:

6. When used, the BE PREPARED TO STOP sign should be located between the Flagger sign and the ONE LANE ROAD sign.
7. When a highway-rail 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 highway-rail grade crossing, the TTC zone should be extended so that the transition area precedes the highway-rail grade crossing.
8. When a highway-rail 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.
9. When a highway-rail grade crossing exists within the activity area, drivers operating on the left-hand edited to increase clarity side of the normal ~~centerline~~ center line should be provided with comparable warning devices as for drivers operating on the right-hand edited to increase clarity side of the normal ~~centerline~~ center line.
10. Early coordination with the railroad company should occur before work starts.

Option:

11. A flagger or a uniformed law enforcement officer may be used at the highway-rail grade crossing to minimize the probability that vehicles are stopped within 4.6 m (15 ft) of the highway-rail grade crossing, measured from both sides of the outside rails.

Notes for Figure 6I-11—Typical Application 11

Lane Closure on a Two-Lane Road with Low Traffic Volumes

Option:

1. This TTC zone application may be used as an alternate to the TTC application shown in Figure 6I-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.
2. 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.

Notes for Figure 6I-12—Typical Application 12

Lane Closure on a Two-Lane Road Using 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 intermediate and long-term closures. Existing conflicting pavement markings and raised pavement marker reflectors between the activity area and the 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. Flashing warning lights shown on the ROAD WORK AHEAD and the ONE LANE ROAD AHEAD signs may be used.
9. Removable pavement markings may be used.

Support:

10. Temporary traffic control signals are preferable to flaggers for long-term projects and other activities that would require flagging at night.
11. 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.

Notes for Figure 6I-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 noted in Sections 6E.07 and 6E.08.

Guidance:

3. The uniformed law enforcement officer, if used for this application, should follow the procedures noted in Sections 6E.07 and 6E.08.

Option:

4. A BE PREPARED TO STOP sign may be added to the sign series.

Guidance:

5. When used, the BE PREPARED TO STOP sign should be located before the Flagger symbol sign.

Notes for Figure 6I-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 ~~III~~ 3 Barricades and the Flagger symbol signs covered.
5. The flagger shall follow the procedures noted in Sections 6E.07 and 6E.08.
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 ~~III~~ 3 Barricades ~~shall be in place~~. edited to increase clarity The signals shall either flash yellow on the main road or be covered, and the Signal Ahead and STOP HERE ON RED signs shall be covered or hidden from view.
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 highway 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.

Notes for Figure 6I-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 3 m (10 ft) as measured from the near edge of the channelizing devices to the edge of the pavement or the outside edge of the paved shoulder.

Standard:

2. **Workers in the roadway ~~should~~ shall wear high-visibility safety apparel as described in Section 6D.03.**

Option:

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 2.7 m (9 ft) 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.**

Notes for Figure 6I-16—Typical Application 16

Surveying Along the ~~Centerline~~ Center Line of a Road with Low Traffic Volumes

Guidance:

1. All lanes should be a minimum of 3 m (10 ft) in width.
2. Cones should be placed 150 mm (6 in) to 300 mm (12 in) on either side of the ~~centerline~~ center line.
2. ~~When using metric units, spacing of channelizing devices should not exceed a distance in meters equal to 1/5 of the speed limit (km/h) when used for taper channelization and a distance in meters equal to 2/5 of the speed limit (km/h) when used for tangent channelization. When using English units, spacing of channelizing devices should not exceed a distance in feet equal to the speed limit (mph) when used for the taper channelization and a distance in feet of 2 times the speed limit (mph) when used for tangent channelization.~~
3. A flagger should be used to warn workers who cannot watch road users.

Standard:

4. **Workers in the roadway ~~should~~ shall wear high-visibility safety apparel as described in Section 6D.03.**
5. **For surveying on the ~~centerline~~ center line of a high-volume road, one lane shall be closed using the information illustrated in Figure 6I-10.**

Option:

6. A high-level warning device may be used to protect a surveying device, such as a target on a tripod.
7. Cones may be omitted for a cross-section survey.
8. ROAD WORK AHEAD signs may be used in place of the SURVEY CREW AHEAD signs.
9. Flags may be used to call attention to the advance warning signs.
10. If the work is along the shoulder, the flagger may be omitted.
11. For a survey along the edge of the road or along the shoulder, cones may be placed along the edge line.
12. A BE PREPARED TO STOP sign may be added to the sign series.

Guidance:

13. When used, the BE PREPARED TO STOP sign should be located before the Flagger symbol sign.

Notes for Figure 6I-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 panel 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. The distance between the work and shadow vehicles may vary according to terrain, paint drying time, and other factors.
8. 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.
9. A truck-mounted attenuator may be used on the shadow vehicle or on the work vehicle.
10. 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:

11. Shadow vehicles are used to warn motor vehicle traffic of the operation ahead.

Standard:

12. **Vehicle hazard warning signals shall not be used instead of the vehicle's high-intensity rotating, flashing, oscillating, or strobe lights.**

Notes for Figure 6I-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 6I-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.

Notes for Figure 6I-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 ~~III~~ 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.

Standard:

8. When used, the Street Name sign shall be placed above the Detour sign.

Notes for Figure 6I-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 ~~III~~ 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.

Standard:

7. When used, the Street Name sign shall be placed above the Detour sign.

Support:

8. See Figure 6I-9 for the information for detouring a numbered highway.

Notes for Figure 6I-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 edited to increase clarity or left-hand edited to increase clarity 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 6I-29.

Option:

4. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
5. A shadow vehicle with a truck-mounted attenuator may be used.
6. A work vehicle with high-intensity rotating, flashing, oscillating, or strobe lights may be used with the high-level warning device.
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.**

Notes for Figure 6I-22—Typical Application 22

Right-Hand edited to increase clarity 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 6I-29.

Option:

2. The normal procedure is to close on the near side of the intersection any lane that is not carried through the intersection. However, when this results in the closure of a right-hand edited to increase clarity lane having significant right turning movements, then the right-hand edited to increase clarity lane may be restricted to right turns only, as shown. This procedure increases the through capacity by eliminating right turns from the open through lane.
3. For intersection approaches reduced to a single lane, left-turning movements may be prohibited to maintain capacity for through vehicular traffic.
4. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
5. Where the turning radius is large, it may be possible to create a right-turn island using channelizing devices or pavement markings.

Notes for Figure 6I-23—Typical Application 23
Left 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 6I-29.

Option:

2. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
3. The normal procedure is to close on the near side of the intersection any lane that is not carried through the intersection. However, when this results in the closure of a left lane having significant left-turning movements, then the left lane may be reopened as a turn bay for left turns only, as shown.

Support:

4. By first closing off the left lane and then reopening it as a turn ~~bay~~ lane, 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.

Notes for Figure 6I-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 6I-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. A buffer space may be used between opposing directions of vehicular traffic as shown in this application.
4. The normal procedure is to close on the near side of the intersection any lane that is not carried through the intersection. However, if there is a significant right-turning movement, then the right-hand edited to increase clarity lane may be restricted to right turns only, as shown.
5. Where the turning radius is large, a right-turn island using channelizing devices or pavement markings may be used.
6. There may be 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. In this situation, the No Left Turn symbol sign may be placed on the right and the Keep Right sign may be omitted.
7. For intersection approaches reduced to a single lane, left-turning movements may be prohibited to maintain capacity for through vehicular traffic.
8. Flashing warning lights and/or flags may be used to call attention to advance warning signs.
9. Temporary pavement markings may be used to delineate the travel path through the intersection.

Support:

10. Keeping the right-hand edited to increase clarity lane open increases the through capacity by eliminating right turns from the open through lane.
11. A temporary turn island reinforces the nature of the temporary exclusive right-turn lane and enables a second RIGHT LANE MUST TURN RIGHT sign to be placed in the island.

Notes for Figure 6I-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 6I-29.
2. If the left through lane is closed on the near-side approach, the LEFT LANE MUST TURN LEFT sign should be placed in the median to discourage through vehicular traffic from entering the left-turn bay.

~~Option~~ Support:

3. The normal procedure is to close on the near side of the intersection any lane that is not carried through the intersection. this sentence was pulled out of the previous Note 3

Option:

4. If the left-turning 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.

Notes for Figure 6I-26—Typical Application 26
Closure in the Center of an Intersection

Guidance:

1. All lanes should be a minimum of 3 m (10 ft) 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 2.7 m (9 ft) may be used.
4. Flashing warning lights and/or flags may be used to call attention to advance warning signs.
5. Unless the streets are wide, it may be physically impossible to turn left, especially for large vehicles. Left turns may be prohibited as required by geometric conditions.
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.

Notes for Figure 6I-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. ONE LANE ROAD AHEAD signs may also be used to provide adequate advance warning.
5. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
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. A BE PREPARED TO STOP sign may be added to the sign series.

Guidance:

8. When used, the BE PREPARED TO STOP sign should be located before the Flagger symbol sign.

Support:

9. Turns can be prohibited as required by vehicular traffic conditions. Unless the streets are wide, it might be physically impossible to make certain turns, especially for large vehicles.

Option:

10. Vehicle hazard warning signals may be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights.

Standard:

11. Vehicle hazard warning signals shall not be used instead of the vehicle's high-intensity rotating, flashing, oscillating, or strobe lights.

Notes for Figure 6I-28—Typical Application 28

Sidewalk ~~Closures and Bypass Sidewalks~~ Detour or Diversion edited to agree with title of Figure 6I-28

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.**

Guidance:

2. Where high speeds are anticipated, a temporary traffic barrier and, if necessary, a crash cushion should be used to separate the temporary sidewalks from vehicular traffic.
3. Audible information devices should be considered where midblock closings and changed crosswalk areas cause inadequate communication to be provided to pedestrians who have visual disabilities.

Option:

4. Street lighting may be considered.
5. 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.
6. For nighttime closures, Type A Flashing warning lights may be used on barricades that support signs and close sidewalks.
7. 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.
8. Signs, such as KEEP RIGHT (LEFT), may be placed along a temporary sidewalk to guide or direct pedestrians.

Notes for Figure 6I-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 15 m (50 ft) in advance of the midblock crosswalk.**

Guidance:

3. Audible information devices should be considered where midblock closings and changed crosswalk areas cause inadequate communication to be provided to pedestrians who have visual disabilities.
4. Pedestrian traffic signal displays controlling closed crosswalks should be covered or deactivated.

Option:

5. Street lighting may be considered.
6. 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.
7. For nighttime closures, Type A Flashing warning lights may be used on barricades supporting signs and closing sidewalks.
8. 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.
9. 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.

Notes for Figure 6I-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 m (FT) should be used between the signs shown.

Option:

2. The closure of the adjacent interior lane in the opposing direction may not be necessary, depending upon the activity being performed and the work space needed for the operation.
3. Shadow vehicles with a truck-mounted attenuator may be used.

Guidance:

4. When a highway-rail grade crossing exists within or upstream of the transition area and it is anticipated that backups resulting from the lane closure might extend through the highway-rail grade crossing, the TTC zone should be extended so that the transition area precedes the highway-rail grade crossing.
5. Early coordination with the railroad company should occur before work starts.

Notes for Figure 6I-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 m (FT) sign should be added for vehicular traffic approaching the lane closure, as shown in Figure 6I-32.
4. Conflicting pavement markings should be removed for long-term projects. For short-term and intermediate-term projects where this is not practical, the channelizing devices in the area where the pavement markings conflict should be placed at a maximum spacing of 0.1 S m (0.5 S ft) where S is the speed in km/h (mph). Temporary markings should be installed where needed.
5. If the lane shift has curves with recommended speeds of 50 km/h (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 180 m (600 ft), 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. **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. A longitudinal buffer space may be used in the activity area to separate opposing vehicular traffic.
~~9. An ALL LANES THRU supplemental plaque may be used to emphasize the point that all lanes shift and no lanes are closed.~~
10. A work vehicle or a shadow vehicle may be equipped with a truck-mounted attenuator.

Notes for Figure 6I-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 2.4 m (8 ft) 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 0.1 S meters where S is the speed in km/h (0.5 S feet where S is the speed in mph).
4. If the tangent distance along the temporary diversion is more than 180 m (600 ft), 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.

Option:

5. Warning lights may be used to supplement channelizing devices at night.

Guidance:

6. When a highway-rail grade crossing exists within or upstream of the merging taper and it is anticipated that backups resulting from the lane closure might extend through the highway-rail grade crossing, the TTC zone should be extended so that the merging taper precedes the highway-rail grade crossing.
7. When a highway-rail grade crossing exists within the activity area, provisions should be made to provide road users operating on the left-hand edited to increase clarity side of the normal ~~centerline~~ center line with comparable warning devices as supplied for road users operating on the right-hand edited to increase clarity side of the normal ~~centerline~~ center line.
8. When a highway-rail grade crossing exists within the activity area, early coordination with the railroad company should occur before work starts.

Option:

9. When a highway-rail grade crossing exists within the activity area, a flagger may be used at the highway-rail grade crossing to minimize the probability that vehicles are stopped within 4.6 m (15 ft) of the highway-rail grade crossing, measured from both sides of the outside rails.
10. A truck-mounted attenuator may be used on the work vehicle and/or the shadow vehicle.

Notes for Figure 6I-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 2.4 m (8 ft) 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.

Support:

5. Where conditions permit, restricting all vehicles, equipment, workers, and their activities to one side of the roadway might be advantageous.

Notes for Figure 6I-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 ~~start~~ upstream end of the merging taper to the ~~far~~ 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. **~~Where~~ Temporary traffic barriers, if used, ~~are installed, the ends of the barrier~~ shall ~~be treated in accordance~~ comply with the provisions of Section 6F.81.**
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 nonwork periods or peak-period vehicular traffic conditions, as appropriate. the sequence of Notes 6 and 7 was reversed

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 edited to increase clarity lane is opened, the sign legends and the channelization shall be changed to indicate that only the shoulder is closed, as illustrated in Figure 6I-5. The arrow panel, 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.

Notes for Figure 6I-35—Typical Application 35
Mobile Operation on a Multi-lane Road

Standard:

1. Arrow panels shall, as a minimum, be Type B, with a size of 1500 x 750 mm (60 x 30 in).

Guidance:

2. Vehicles used for these operations should be made highly visible with appropriate equipment, such as: high-intensity rotating, flashing, oscillating, or strobe lights, flags, signs, or arrow panels.
3. Shadow Vehicle 1 should be equipped with an arrow panel and truck-mounted attenuator.
4. Shadow Vehicle 2 should be equipped with an arrow panel. An appropriate lane closure sign should be placed on Shadow Vehicle 2 so as not to obscure the arrow panel.
5. 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.
6. 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.
7. Work should normally be accomplished during off-peak hours.
8. 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 edited to increase clarity shoulder 3 m (10 ft) or more in width, Shadow Vehicle 2 should drive the right-hand edited to increase clarity shoulder with a sign indicating that work is taking place in the interior lane.

Option:

9. A truck-mounted attenuator may be used on Shadow Vehicle 2.
10. 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.
11. Where adequate shoulder width is not available, Shadow Vehicle 3 may ~~drive partially in the lane~~ also straddle the edge line.

Notes for Figure 6I-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 edited to increase clarity or left-hand edited to increase clarity lane of a divided highway and it is not practical, 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 are not met, the information shown in the typical application should be employed and all the following notes apply.

Standard:

4. ~~Where~~ **Temporary traffic barriers, if used, ~~are installed, the ends of the barrier~~ shall ~~be treated in accordance~~ comply with the provisions of Section 6F.81.**
5. **A warning sign shall be used to show the changed alignment.**
6. **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.**

Guidance:

7. Where the shifted section is longer than 180 m (600 ft), 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 180 m (600 ft), the Double Reverse Curve sign should be used instead of the first Reverse Curve sign. The second Reverse Curve sign should be omitted.
8. If a STAY IN LANE sign is used, then solid white lane lines should be used.

Standard:

9. **The minimum width of the shoulder lane shall be 3 m (10 ft).**
10. **For long-term stationary work, existing conflicting pavement markings shall be removed and temporary markings shall be installed before traffic patterns are changed.**

Option:

11. For short-term stationary work, lanes may be delineated by channelizing devices or removable pavement markings instead of temporary pavement markings.

~~11. Three Lane Reverse Curve signs may be used in place of the Reverse Curve signs. ALL LANES THRU supplemental plaques may be used to emphasize the point that all lanes shift and no lanes are closed.~~

12. If the shoulder cannot adequately accommodate trucks, trucks may be directed to use the travel lanes.

~~13. The barrier shown in this typical application is one method that may be used to close a lane for a long-term project.~~

Guidance:

13. The use of a barrier should be based on engineering judgment.

Option:

14. 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.

Notes for Figure 6I-37—Typical Application 37
Double Lane Closure on a Freeway

Standard:

1. **An arrow panel shall be used when a freeway lane is closed. When more than one freeway lane is closed, a separate arrow panel shall be used for each closed lane.**

Guidance:

2. Ordinarily, the preferred position for the second arrow panel is in the closed exterior lane at the ~~beginning~~ upstream end of the second merging taper. However, the second arrow panel 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 panel 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 panel; and
   c. When the first arrow panel 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. If a paved shoulder having a minimum width of 3 m (10 ft) and sufficient strength is available, the left and adjacent interior lanes may be closed and vehicular traffic carried around the work space on the right-hand edited to increase clarity lane and a right-hand edited to increase clarity shoulder.
6. When a shoulder lane is used that cannot adequately accommodate trucks, trucks may be directed to use the normal travel lanes.

Notes for Figure 6I-38—Typical Application 38
Interior Lane Closure on a Freeway

Standard:

1. **An arrow panel shall be used when a freeway lane is closed. When more than one freeway lane is closed, a separate arrow panel shall be used for each closed lane.**
2. **If temporary traffic barriers are installed, they shall comply with the provisions and requirements in Section 6F.81.**

Guidance:

3. 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.
4. The first arrow panel displaying ~~a right~~ an arrow pointing to the right edited to increase clarity should be on the left-hand edited to increase clarity shoulder at the beginning of the taper. The arrow panel displaying a double arrow should be centered in the closed interior lane and placed at the downstream end of the shifting taper.
5. The placement of signs should not obstruct or obscure arrow panels.
6. For long-term use, the dashed lane lines should be made solid white in the two-lane section.

Option:

7. As the arrow panel with a double arrow displayed is key, the arrow panel closing the exterior lane may be moved or omitted if the alignment is such that the two panels create confusion.
8. As an alternative to initially closing the left-hand edited to increase clarity lane, as shown in the typical application, the right-hand edited to increase clarity lane may be closed in advance of the interior lane closure with appropriate channelization and signs.
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 3 m (10 ft) and sufficient strength is available, the left-hand edited to increase clarity and center lanes may be closed and motor vehicle traffic carried around the work space on the right-hand edited to increase clarity lane and a right-hand edited to increase clarity shoulder.
12. When a shoulder lane is used that cannot adequately accommodate trucks, trucks may be directed to use the normal travel lanes.

Notes for Figure 6I-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 panel shall be used when a freeway lane is closed. When more than one freeway lane is closed, a separate arrow panel shall be used for each closed lane.**

Guidance:

3. 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 "Policy on the Geometric Design of Highways and Streets" (see Section 1A.11) 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 meters (feet) of 0.4 times the speed limit in km/h (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 1.6 km (1 mi).

Option:

9. NEXT XX km (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 ~~far~~ 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 noncrossover direction of travel are not shown. They are similar to the series shown for the crossover direction, except that the left lane is closed.

Notes for Figure 6I-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 ~~a reasonably safe~~ 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. If vehicular traffic conditions allow, the ramp may be closed.
5. A broken edge line may be carried across the temporary entrance ramp to assist in defining the through vehicular traffic lane.
6. 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.

Notes for Figure 6I-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 "Policy on the Geometric Design of Highways and Streets" (see Section 1A.11) 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 added to increase consistency 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 2.1 m (7 ft) from the pavement surface to the bottom of the sign.**

Option:

7. Guide signs referring to the exit may need to be relocated to the median.
8. The temporary EXIT sign placed in the temporary gore may be either black on orange or white on green.
9. In some instances, a temporary deceleration lane may be useful in facilitating the exiting maneuver.
10. When a temporary traffic barrier is used to separate opposing vehicular traffic, the Two-Way Traffic signs may be omitted.

Notes for Figure 6I-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 added to increase consistency panel should be placed diagonally across the interchange/intersection guide signs.
3. The design criteria contained in the AASHTO "Policy on the Geometric Design of Highways and Streets" should be used for determining the alignment (see Section 1A.11).

Standard:

4. **A temporary EXIT sign shall be located in the temporary gore. For better visibility, it shall be mounted a minimum of 2.1 m (7 ft) from the pavement surface to the bottom of the sign.**

Option:

5. The temporary EXIT sign placed in the temporary gore may be either black on orange or white on green.
6. An alternative procedure that may be used is to channelize exiting vehicular traffic onto the right-hand edited to increase clarity shoulder and close the lane as necessary.

Standard:

7. **An arrow panel shall be used when a freeway lane is closed. When more than one freeway lane is closed, a separate arrow panel shall be used for each closed lane.**

Notes for Figure 6I-43—Typical Application 43
Partial Exit Ramp Closure

Guidance:

1. Truck off-tracking should be considered when determining whether the minimum lane width of 3 m (10 ft) is adequate (see Section 6G.07).

Notes for Figure 6I-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 left diagram.

Standard:

2. For the information shown on the diagram on the right-hand edited to increase clarity 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 ~~a reasonably safe~~ 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 insufficient gaps are available, consideration should be given to closing the ramp.
4. Where STOP signs are used, a temporary stop line should be placed across the ramp at the desired stop location.
5. The mainline merging taper with the arrow panel at its starting point should be located sufficiently in advance so that the arrow panel 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 ~~speed limits~~ speeds advisory speeds are not speed limits located in advance of the entrance terminal should be placed in pairs (one on each side of the ramp).

Option:

7. A Stop Beacon (see Section 4L.05) or a Type B high-intensity warning flasher with a red lens may be placed above the STOP sign.
8. Where the acceleration distance is significantly reduced, a supplemental plaque may be placed below the Yield Ahead sign reading NO MERGE AREA.

Standard:

9. An arrow panel shall be used when a freeway lane is closed. When more than one freeway lane is closed, a separate arrow panel shall be used for each closed lane.

Notes for Figure 6I-45—Typical Application 45
Temporary Reversible Lane Using Movable Barriers

Support:

1. This application addresses one of several uses for movable barriers (see Section 6F.81) in highway work 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 behind 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 LEFT TWO LANES CLOSED AHEAD. Change the mode of the second northbound arrow panel 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 LEFT TWO LANES CLOSED AHEAD to LEFT LANE CLOSED AHEAD. Change the mode of the second southbound arrow panel 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.

Notes for Figure 6I-46—Typical Application 46
Work in the Vicinity of a Highway-Rail Grade Crossing

Guidance:

1. When highway-rail 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, ~~either~~ grammar – more than two choices by lane restrictions, flagging, or other operations, where vehicles might be stopped within the highway-rail grade crossing, considered as being 4.6 m (15 ft) 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 highway-rail grade crossing to prevent vehicles from stopping within the highway-rail grade crossing (as described in Note 1), even if automatic warning devices are in place.

Guidance:

3. Early coordination with the railroad company should occur before work starts.
4. In the example depicted, the buffer space of the activity area should be extended upstream of the highway-rail grade crossing (as shown) so that a queue created by the flagging operation will not extend across the highway-rail grade crossing.
5. The DO NOT STOP ON TRACKS sign should be used on all approaches to a highway-rail grade crossing within the limits of a TTC zone.

Option:

6. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
7. A BE PREPARED TO STOP sign may be added to the sign series.

Guidance:

8. When used, the BE PREPARED TO STOP sign should be located before the Flagger symbol sign.

Standard:

9. At night, flagger stations shall be illuminated, except in emergencies.

CHAPTER 7A. GENERAL

Section 7A.01 Need for Standards

Support:

~~It is important to stress that~~ Regardless of the school location, the best way to achieve ~~reasonably safe and~~ effective traffic control in a manner that is intended to minimize the occurrences of crashes is through the uniform application of realistic policies, practices, and standards developed through engineering judgment or studies.

Pedestrian safety depends upon public understanding of accepted methods for efficient traffic control. This principle is especially important in the control of pedestrians, bicycles, and other vehicles in the vicinity of schools. Neither pedestrians on their way to or from school nor other road users can be expected to move safely in school areas unless they understand both the need for traffic controls and how these controls function for their benefit.

Procedures and devices that are not uniform might cause confusion among pedestrians and other road users, prompt wrong decisions, and contribute to crashes. To achieve uniformity of traffic control in school areas, comparable traffic situations need to be treated in a consistent manner. Each traffic control device and control method described in Part 7 fulfills a specific function related to specific traffic conditions.

A uniform approach to school area traffic controls assures the use of similar controls for similar situations, ~~(~~which promotes appropriate and uniform behavior on the part of motorists, pedestrians, and bicyclists~~)~~.

A school traffic control plan permits the orderly review of school area traffic control needs, and the coordination of school/pedestrian safety education and engineering ~~activities~~ solutions. Engineering solutions alone will often not prompt the intended change in student and road user behavior.

Guidance:

A school route plan for each school serving elementary to high school students should be prepared in order to develop uniformity in the use of school area traffic controls and to serve as the basis for a school traffic control plan for each school.

The school route plan, developed in a systematic manner by the school, law enforcement, and traffic officials responsible for school pedestrian safety, should consist of a map (see Figure 7A-1) showing streets, the school, existing traffic controls, established school walk routes, and established school crossings.

The type(s) of school area traffic control devices used, either warning or regulatory, should be related to the volume and speed of vehicular traffic, street width, and the number and age of the students using the crossing.

School area traffic control devices should be included in a school traffic control plan.

Support:

Reduced speed limit signs for school areas and crossings are included in this Manual solely for the purpose of standardizing signing for these zones and not as an endorsement of mandatory reduced speed zones.

Section 7A.02 School Routes and Established School Crossings

Support:

To establish a safer route to and from school for schoolchildren, the application of ~~The~~ planning criterion for school walk routes might make it necessary for children to walk an indirect route to an established school crossing located where there is existing traffic control and to avoid the use of a direct crossing where there is no existing traffic control.

Guidance:

School walk routes should be planned to take advantage of existing traffic controls.

The following factors should be considered when determining the feasibility of requiring children to walk a longer distance to a crossing with existing traffic control:

A. The availability of adequate sidewalks or off-roadway sidewalk areas to and from the location with existing control,
B. The number of students using the crossing,
C. The age levels of the students using the crossing, and
D. The total extra walking distance.

Section 7A.03 School Crossing Control Criteria

Support:

~~Alternate~~ The frequency of gaps ~~and blockades are inherent~~ in the traffic stream that are sufficient for student crossing ~~and are~~ is different at each crossing location. ~~For safety, students need to wait for a gap in traffic that is of sufficient duration to permit reasonably safe crossing.~~ When the delay between the occurrences of adequate gaps becomes excessive, students might become impatient and endanger themselves by attempting to cross the street during an inadequate gap. In these instances, the creation of sufficient gaps needs to be considered to accommodate the crossing demand.

A recommended method for determining the frequency and adequacy of gaps in the traffic stream is given in the ~~Institute of Transportation Engineers' publication, "School Trip Safety Program Guidelines"~~ "Traffic Control Devices Handbook" (see Section 1A.11).

Section 7A.04 Scope

Standard:

Part 7 sets forth basic principles and prescribes standards that shall be followed in the design, application, installation, and maintenance of all traffic control devices (including signs, signals, and markings) and other controls (including adult crossing guards, student patrols, and grade-separated crossings) required for the special pedestrian conditions in school areas.

~~Option:~~

~~In-roadway signs for school traffic control areas may be used consistent with the requirements of Sections 2B.12, 7B.08, and 7B.09.~~ relocated to Section 7B.03

Support:

The introduction to this Manual contains information regarding the meaning of the headings Standard, Guidance, Option, and Support, and the use of the words "shall," "should," and "may." relocated from Section 7A.10

Sections 1A.01 and 1A.08 contain information regarding unauthorized devices and messages. Sections 1A.02 and 1A.07 contain information regarding the application of standards. Section 1A.05 contains information regarding the maintenance of traffic control devices. Section 1A.08 contains information regarding placement authority for traffic control devices. Section 1A.09 contains information regarding engineering studies. relocated from Sections 7A.05 through 7A.09

~~Requirements~~ Provisions edited to improve consistency discussed in Chapter 2A and Section 2B.06 are applicable in school areas.

Part 3 contains provisions regarding pavement markings that are applicable in school areas.

Part 4 provisions regarding highway traffic signals that are applicable in school areas. The School Crossing signal warrant is described in Section 4C.06.

~~Section 7A.05 Application of Standards~~

~~Support:~~

~~Sections 1A.02 and 1A.07 contain information regarding the application of standards.~~

~~Section 7A.06 Engineering Study Required~~

~~Support:~~

~~Section 1A.09 contains information regarding engineering studies.~~

~~Section 7A.07 Maintenance of Traffic Control Devices~~

~~Support:~~

~~Section 1A.05 contains information regarding the maintenance of traffic control devices.~~

~~Section 7A.08 Placement Authority~~

~~Support:~~

~~Section 1A.08 contains information regarding placement authority for traffic control devices.~~

~~Section 7A.09 Unauthorized Devices and Messages~~

~~Support:~~

~~Sections 1A.01 and 1A.08 contain information regarding unauthorized devices and messages.~~

~~**Section 7A.10 Meaning of Standard, Guidance, Option, and Support**~~

~~Support:~~

~~The introduction to this Manual contains information regarding the meaning of the headings Standard, Guidance, Option, and Support, and the use of the words shall, should, and may.~~ Sections 7A.05 through 7A.10 relocated to Section 7A.04

Section 7A.05 Grade-Separated School Crossings this Section was added to take the place of Chapter 7F

Support:

Grade-separated crossings (overpasses over the highway or underpasses under the highway) are sometimes used to physically separate the crossing of school pedestrian traffic and vehicular flow. Experience has shown that overpasses are more satisfactory than underpasses for school pedestrian crossings, as overpasses are easier to maintain and supervise.

If using the grade-separated crossing will be less convenient to school pedestrians than making an at-grade crossing, barriers or supervision are sometimes provided to assure a satisfactory level of use of the grade-separated crossing.

The published policies of the American Association of State Highway and Transportation Officials, such as "A Policy on Geometric Design of Highways and Streets" (see Section 1A.11), contain guidelines for the design of grade-separated crossings.

CHAPTER 7B. SIGNS

Section 7B.01 Size of School Signs

Standard:

Except as noted in Section 2A.11, the sizes of signs and plaques to be used on conventional roadways in school areas shall be as shown in Table 7B-1.

The sizes in the conventional road ~~sign size~~ column shall be used ~~on public roads, streets, and highways~~ unless engineering judgment determines that a minimum or oversized sign size would be more appropriate.

The sizes in the minimum ~~sign size~~ column, which is applicable only to the School (S1-1), SCHOOL BUS STOP AHEAD (S3-1), SCHOOL BUS TURN AHEAD (S3-2), and Reduced Speed School Zone Ahead (S4-5, S4-5a) signs, ~~may~~ shall only be used on local residential streets, in urban areas, and where there are low traffic volumes and ~~low vehicle speeds~~ the 85th-percentile speed or posted speed limit is less than 60 km/h (35 mph), as determined by engineering judgment.

The sizes in the oversized ~~sign size~~ column shall be used on expressways.

Option:

The sizes in the oversized ~~sign size~~ column may be used for applications that require increased emphasis, improved recognition, or increased legibility.

Signs and plaques larger than those shown in Table 7B-1 may be used (see Section 2A.11).

Section 7B.02 Illumination and Reflectorization

Standard:

The signs used for school area traffic control shall be retroreflectorized or illuminated.

Section 7B.03 Position of Signs

Guidance:

Signs should be placed in positions where they will convey their messages most effectively without restricting lateral ~~clearance~~ offset or sight distances. Placement therefore should consider highway design, alignment, vehicle speed, ~~and~~ roadside development, pedestrians, and other non-motorized road users.

Signs should have a ~~maximum practical~~ reasonable ~~clearance~~ lateral offset from the edge of the traveled way for the safety of vehicles that might leave the roadway and strike the sign supports. Except as noted in the Option below, signs should not be closer than 1.8 m (6 ft) from the edge of a paved shoulder, or if none, 3.7 m (12 ft) from the edge of the traveled way.

Option:

In urban areas, a lesser ~~clearance~~ lateral offset of not less than 0.6 m (2 ft) from the face of the curb may be used. In urban areas, where sidewalk width is limited or existing poles are close to the curb, a ~~clearance~~ lateral offset of 0.3 m (1 ft) from the curb face may be used.

In-roadway signs for school traffic control areas may be used consistent with the requirements of Sections 2B.12, 7B.08, and 7B.11. relocated from Section 7A.04

Section 7B.04 Height of Signs

Support:

Section 2A.18 contains information regarding the mounting height of signs.

Section 7B.05 Installation of Signs

Support:

Section 2A.16 contains information regarding the installation of signs.

Section 7B.06 Lettering

Support:

The ~~Federal Highway Administration's~~ deleted to increase consistency "Standard Highway Signs and Markings" book (see Section 1A.11) contains information regarding sign lettering.

Section 7B.07 Sign Color for School Warning Signs

Standard:

~~**Except as noted in the Option,**~~ **School warning signs, including the "SCHOOL" portion of the School Speed Limit (S5-1) sign, and any supplemental plaques used in association with these signs shall have a fluorescent yellow-green background with a black legend and border unless otherwise stated in this Manual for a specific sign.**

~~Option:~~

~~All school warning signs in addition to the following signs may have a fluorescent yellow-green background with a black legend and border:~~

~~A. School Advance Warning sign (S1-1),~~
~~B. SCHOOL BUS STOP AHEAD sign (S3-1),~~
~~C. SCHOOL plaque (S4-3),~~
~~D. The "SCHOOL" portion of the School Speed Limit sign (S5-1),~~
~~E. XXX FEET plaque (W16-2 series),~~
~~F. AHEAD plaque (W16-9p),~~
~~G. Diagonal Arrow plaque (W16-7p), and~~
~~H. Reduced Speed School Zone Ahead sign (S4-5, S4-5a).~~

~~Guidance:~~

~~When the fluorescent yellow-green background color 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 zone or area should be avoided.~~

Section 7B.08 School ~~Advance Warning Assembly~~ Sign (S1-1 ~~with Supplemental Plaque~~)

~~Guidance:~~

~~The School Advance Warning assembly (see Figure 7B-1) should be installed in advance of locations where school buildings or grounds are adjacent to the highway, except where a physical barrier such as fencing separates schoolchildren from the highway.~~

~~**Standard:**~~

~~**The School Advance Warning assembly shall be used in advance of any installation of the School Crosswalk Warning assembly (see Figure 7B-2), or in advance of the first installation of the School Speed Limit assembly (see Figure 7B-3).**~~

~~**If used, the School Advance Warning assembly shall be installed not less than 45 m (150 ft) or more than 210 m (700 ft) in advance of the school grounds or school crossings.**~~

~~**If used, the School Advance Warning assembly shall consist of a School Advance Warning (S1-1) sign supplemented with a plaque with the legend AHEAD (W16-9p) or XXX METERS (XXX FEET) (W16-2 or W16-2a) to provide advance notice to road users of crossing activity.**~~

Support:

Many state and local jurisdictions find it beneficial to advise road users that they are approaching a school that is adjacent to a highway, where additional care is needed, even though no school crossing is involved and the speed limit remains unchanged. Additionally, some jurisdictions designate school zones that have a unique legal standing in that fines for speeding or other traffic violations within designated school zones are increased or special enforcement techniques such as photo radar systems are used. It is important and sometimes legally necessary to mark the beginning and end points of these designated school zones so that the road user is given proper notice.

The School (S1-1) sign (see Figure 7B-1) has the following three applications:

A. School Area or Zone – if used alone, the S1-1 sign warns road users that they are approaching school buildings or grounds, a school crossing, or school related activity adjacent to the highway, and it marks the beginning of a designated school zone (see Figure 7B-2).
B. School Advance Crossing – if combined with an AHEAD (W16-9P) plaque or an XX METERS (FEET) (W16-2P or W16-2aP) plaque to comprise the School Advance Crossing assembly, the S1-1 sign warns road users that they are approaching a crossing where schoolchildren cross the roadway (see Figure 7B-3).

C. School Crossing – if combined with a downward diagonal pointing arrow (W16-7P) plaque to comprise the School Crossing assembly, the S1-1 sign warns approaching road users of the location of a crossing where schoolchildren cross the roadway (see Figures 7B-3 and 7B-4).

Section 7B.09 School Area or School Zone Sign

Option:

The School (S1-1) sign may be installed in advance of locations where school buildings or grounds are adjacent to the highway to warn road users that they are approaching a school area.

Standard:

If a school zone has been designated under State or local statute, a School (S1-1) sign shall be installed to mark the beginning point(s) of the designated school zone (see Figure 7B-2).

If a reduced speed zone for a school area has been established, a School (S1-1) sign shall be installed in advance (see Table 2C-4 for advance placement guidelines) of the first School Speed Limit sign assembly or S5-1 sign that is encountered in each direction as traffic approaches the reduced speed zone (see Figure 7B-4).

Option:

A School (S1-1) sign that is installed to warn road users of a school area or a school zone (see Figure 7B-2) may be supplemented with a SCHOOL (S4-3P) plaque or an appropriate enforcement sign or plaque, such as a FINES HIGHER, FINES DOUBLE, or $XX FINE plaque (see Section 2B.17).

If a school area or school zone is located on a cross street less than 38 m (125 ft) from edge of a street or highway, a School (S1-1) sign with a supplemental arrow (W16-5P or W16-6P) plaque may be installed on each approach of the street or highway to warn road users making a turn onto the cross street that they will encounter a school area or school zone soon after making the turn.

Section 7B.10 School Advance Crossing Assembly

Standard:

The School Advance Crossing assembly (see Figure 7B-1) shall consist of a School (S1-1) sign supplemented with an AHEAD (W16-9P) plaque or an XX METERS (FEET) (W16-2P or W16-2aP) plaque.

Except as noted in the Option below, a School Advance Crossing assembly shall be used in advance (see Table 2C-4 for advance placement guidelines) of the first School Crossing assembly (see Section 7B.11) that is encountered in each direction as traffic approaches a school crosswalk (see Figure 7B-3).

Option:

The School Advance Crossing assembly may be omitted (see Figure 7B-4) where a School (S1-1) sign (see Section 7B.09) is installed in advance of the School Crossing assembly.

If a school crosswalk is located on a cross street less than 38 m (125 ft) from edge of a street or highway, a School Advance Crossing assembly with a supplemental arrow (W16-5P or W16-6P) plaque may be installed on each approach of the street or highway to warn road users making a turn onto the cross street that they will encounter a school crosswalk soon after making the turn.

A 300 mm (12 in) reduced size in-street School ~~Advance Warning~~ (S1-1) sign (see Figure 7B-5), installed in compliance with the mounting height and breakaway requirements for In-Street Pedestrian Crossing (R1-6 or R1-6a) signs (see Section 2B.12), may be used in advance of a school crossing to supplement the ~~ground-~~ post-mounted school warning signs. A 300 x 150 mm (12 x 6 in) reduced size AHEAD (W16-9P) plaque may be mounted below the reduced size in-street School ~~Advance Warning~~ (S1-1) sign. this paragraph was in Section 7B.08 of the 2003 MUTCD

Section ~~7B.09~~ 7B.11 School ~~Crosswalk Warning~~ Crossing Assembly ~~(S1-1 with Diagonal Arrow)~~

Standard:

If used, the School ~~Crosswalk Warning~~ Crossing assembly (see Figure 7B-1) shall be installed at the ~~marked crosswalk~~ school crossing (see Figures 7B-3 and 7B-4), or as close to it as possible, and shall consist of a School ~~Advance Warning~~ (S1-1) sign supplemented with a diagonal downward pointing arrow (W16-7P) plaque to show the location of the crossing.

The School ~~Crosswalk Warning~~ Crossing assembly shall not be used at ~~marked crosswalks~~ crossings other than those adjacent to schools and those on established school pedestrian routes.

The School ~~Crosswalk Warning~~ Crossing assembly shall not be installed on approaches controlled by a STOP sign.

~~Guidance:~~

~~The School Crosswalk Warning assembly should be installed at marked crosswalk(s), including those at signalized locations, used by students going to and from school (see Figure 7B-2) as determined by an engineering study.~~

Option:

The In-Street Pedestrian Crossing (R1-6 or R1-6a) sign (see Section 2B.12 and Figure 7B-5) or the In-Street Schoolchildren Crossing (R1-6b or R1-6c) sign (see Figure 7B-5) may be used at unsignalized school crossings. ~~When~~ If used at a school crossing, a 300 x 100 mm (12 x 4 in) SCHOOL (S4-3P) plaque (see Figure 7B-5) may be mounted above the sign.

The Overhead Pedestrian Crossing (R1-9 or R1-9a) sign (see Section 2B.12 and Figure 2B-2) may be used at unsignalized school crossings.

A 300 mm (12 in) reduced size in-street added to increase accuracy School ~~Advance Warning~~ (S1-1) sign (see Figure 7B-5) may be used at an unsignalized school crossing instead of the In-Street Pedestrian Crossing (R1-6 or R1-6a) or the In-Street Schoolchildren Crossing (R1-6b or R1-6c) sign. A 300 x 150 mm (12 x 6 in) reduced size diagonal downward pointing edited to increase consistency arrow (W16-7P) plaque may be mounted below the reduced size in-street School ~~Advance Warning~~ (S1-1) sign.

Standard:

If an In-Street Pedestrian Crossing sign, an In-Street Schoolchildren Crossing sign, or a reduced size in-street School ~~Advance Warning~~ (S1-1) sign is placed in the roadway, the sign support shall comply with the mounting height and breakaway requirements for In-Street Pedestrian Crossing (R1-6 or R1-6a) signs (see Section 2B.12).

The In-Street Pedestrian Crossing sign, the In-Street Schoolchildren Crossing sign, the Overhead Pedestrian Crossing sign, and the reduced size in-street School ~~Advance Warning~~ (S1-1) sign shall not be used at signalized locations.

Section ~~7B.10~~ 7B.12 ~~SCHOOL BUS STOP AHEAD~~ School Bus Stop Ahead Sign (S3-1)

Guidance:

The ~~SCHOOL BUS STOP AHEAD~~ School Bus Stop Ahead (S3-1) sign (see Figure 7B-1) should be installed in advance of locations where a school bus, when stopped to pick up or discharge passengers, is not visible to road users for a distance ~~of 150 m (500 ft) in advance~~ as determined by the "0" column under Condition B of Table 2C-4, and where there is no opportunity to relocate the school bus stop to provide ~~150 m (500 ft) of visibility~~ the distance specified in Table 2C-4.

Section 7B.13 SCHOOL BUS TURN AHEAD Sign (S3-2)

Option:

The SCHOOL BUS TURN AHEAD (S3-2) sign (see Figure 7B-1) may be installed in advance of locations where a school bus turns around on a roadway at a location not visible to approaching road users for a distance as determined by the "0" column under Condition B of Table 2C-4, and where there is no opportunity to relocate the school bus turn around to provide the distance specified in Table 2C-4.

Section ~~7B.11~~ 7B.14 School Speed Limit Assembly (S4-1P, S4-2P, S4-3P, S4-4P, S4-6P, S5-1)

Standard:

A School Speed Limit assembly (see Figure 7B-1) or a School Speed Limit (S5-1) sign (see Figure 7B-1) shall be used to indicate the speed limit where a reduced speed zone for a school area has been established ~~(in accordance with law~~ based upon an engineering study~~)~~ or where a speed limit is specified for such areas by statute. The School Speed Limit assembly or School Speed Limit sign shall be placed at or as near as practical to the point where the reduced speed zone begins (see Figure 7B-4).

Guidance:

The reduced speed zone should begin either at a point 60 m (200 ft) from the crosswalk, or at a point 30 m (100 ft) from the school property line, based on whichever is encountered first as traffic approaches the school.

Standard:

The School Speed Limit assembly shall be either a fixed-message sign assembly or a changeable message sign.

The fixed-message School Speed Limit assembly shall consist of a top plaque (S4-3P) with the legend SCHOOL, a Speed Limit (R2-1) sign, and a bottom plaque (S4-1P, S4-2P, S4-4P, or S4-6P) indicating the specific periods of the day and/or days of the week that the special school speed limit is in effect (see Figure 7B-1).

Option:

Changeable message signs (see ~~Sections 2A.07~~ Chapter 2M and Section 6F.57) may be used to inform drivers of the ~~special~~ school speed limit. If the sign is internally illuminated, it may have a white legend on a black background. Changeable message signs with flashing beacons may be used for ~~the more critical~~ situations~~,~~ where greater emphasis of the special school speed limit is needed.

Guidance:

Even though it might not always be practical because of special features to make changeable message signs conform in all respects to the ~~accepted~~ standards in this Manual for fixed-message signs, during the periods that the school speed limit is in effect, their basic shape, message, legend layout, and colors should ~~conform to~~ comply with the standards for fixed-message signs.

A confirmation ~~beacon~~ light or device to indicate that the speed limit message is in operation should be considered for inclusion on the back of the changeable message sign.

~~**Option**~~ **Standard:**

Fluorescent yellow-green pixels ~~may~~ shall be used when the ~~school-related~~ "SCHOOL" message~~s are~~ is ~~shown~~ displayed edited to increase consistency on a changeable message sign for a school speed limit.

Option:

Changeable message signs may use blank-out messages or other methods in order to display the school speed limit only during the periods it applies.

Changeable message signs that display the speed of approaching drivers (see Section 2B.13) may be used in a school speed limit zone.

A Speed Limit Sign Beacon (see Section 4L.04) also may be used, with a WHEN FLASHING legend, to identify the periods that the school speed limit is in effect. The signal ~~lenses~~ indications of the Speed Limit Sign Beacon may be positioned within the face of the School Speed Limit (S5-1) sign (see Figure 7B-1).

A FINES HIGHER ~~(R2-6)~~, FINES DOUBLE, or $XX FINE ~~sign~~ plaque (see Section 2B.17) may be used to advise road users when increased fines are imposed for traffic violations in school zones.

Section ~~7B.12~~ 7B.15 Reduced ~~Speed~~ School ~~Zone~~ Speed Limit Ahead Sign (S4-5, S4-5a)

Option:

The Reduced ~~Speed~~ School ~~Zone~~ Speed Limit Ahead (S4-5, S4-5a) sign (see Figure 7B-1) may be used to inform road users of a reduced speed zone when engineering judgment indicates that advance notice would be appropriate.

Standard:

If used, the Reduced ~~Speed~~ School ~~Zone~~ Speed Limit Ahead sign shall be followed by a School Speed Limit sign or a School Speed Limit assembly.

The speed limit displayed on the Reduced ~~Speed~~ School ~~Zone~~ Speed Limit Ahead sign shall be identical to the speed limit displayed on the subsequent School Speed Limit sign or School Speed Limit assembly.

Section ~~7B.13~~ 7B.16 END SCHOOL ZONE Sign (S5-2)

Standard:

The downstream end of a designated school area or school zone (see Section 7B.09) shall be marked with an END SCHOOL ZONE (S5-2) sign (see Figures 7B-1 and 7B-2).

The downstream end of an authorized and posted school speed zone shall be marked with ~~a standard Speed Limit sign showing the speed limit for the section of highway that follows or with~~ an END SCHOOL ZONE (S5-2) sign (see Figures 7B-1 and 7B-4). A standard Speed Limit sign showing the speed limit for the section of highway that is downstream from the authorized and posted school speed zone shall be mounted on the same post as the END SCHOOL ZONE (S5-2) sign.

Section ~~7B.14~~ 7B.17 Parking and Stopping Signs (R7 and R8 Series)

Option:

Parking and stopping regulatory signs may be used to prevent parked or waiting vehicles from blocking pedestrians' views, and drivers' views of pedestrians, and to control vehicles as a part of the school traffic plan.

Support:

Parking signs and other signs governing the stopping and standing of vehicles in school areas cover a wide variety of regulations. Typical examples of regulations are as follows:

A. No Parking X:XX AM to X:XX PM School Days Only,
B. No Stopping X:XX AM to X:XX PM School Days Only,
C. XX Min Loading X:XX AM to X:XX PM School Days Only, and
D. No Standing X:XX AM to X:XX PM School Days Only.

Sections 2B.53, 2B.54, and 2B.55 contain information regarding the signing of parking regulations in school zone areas.

CHAPTER 7C. MARKINGS

Section 7C.01 Functions and Limitations

Support:

Markings have definite and important functions in a proper scheme of school area traffic control. In some cases, they are used to supplement the regulations or warnings provided by other devices, such as traffic signs or signals. In other instances, they are used alone and produce results that cannot be obtained by the use of any other device. In such cases they serve as an effective means of conveying certain regulations, guidance, and warnings that could not otherwise be made clearly understandable.

Pavement markings have some potential limitations. They might be obliterated by snow, might not be clearly visible when wet, and might not be durable when subjected to heavy traffic. In spite of these potential limitations, they have the advantage, under favorable conditions, of conveying warnings or information to the road user without diverting attention from the road.

Section 7C.02 Standardization of Application

Standard:

Each ~~standard~~ marking described in Part 7 shall be used only to convey the meaning prescribed for it in this Manual.

Section 7C.03 Crosswalk Markings

Support:

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

In conjunction with signs and other measures, crosswalk markings ~~also serve~~ help to alert road users of a designated pedestrian crossing point across roadways at locations that are not controlled by ~~highway~~ traffic control signals or STOP signs. edited to be consistent with revisions to Section 3B.18

At nonintersection locations, crosswalk markings legally establish the crosswalk.

Section 3B.18 contains information regarding the detectable warning surfaces that are required by 49 CFR, Part 37 and by the Americans with Disabilities Act (ADA) where curb ramps are constructed at the junction of sidewalks and the roadway, for marked and unmarked crosswalks.

Standard:

When ~~transverse~~ crosswalk lines are used, they shall be solid white, marking both edges of the crosswalk, except as noted in the Option. They shall be not less than 150 mm (6 in) or greater than 600 mm (24 in) in width.

Guidance:

If transverse lines are used to mark a crosswalk, the gap between the lines should not be less than 1.8 m (6 ft). If diagonal or longitudinal lines are used without transverse lines to mark a crosswalk, the crosswalk should be not less than 1.8 m (6 ft) wide.

Crosswalk lines, if used on both sides of the crosswalk, should extend across the full width of pavement or to the edge of the intersecting crosswalk to discourage diagonal walking between crosswalks (see Figures 3B-16 and 3B-18).

Crosswalks should be marked at all intersections on established routes to a school where there is substantial conflict between motorists, bicyclists, and ~~pedestrian~~ student movements; where students are encouraged to cross between intersections; ~~or~~ where students would not otherwise recognize the proper place to cross; or where motorists or bicyclists might not expect students to cross (see Figure 7A-1).

Crosswalk lines should not be used indiscriminately. An engineering study considering the factors described in Section 3B.18 should be performed before ~~they are~~ a marked crosswalk is installed at a location~~s~~ away from a ~~highway~~ traffic control signal~~s~~ or an approach controlled by a STOP sign~~s~~.

Because nonintersection school crossings are generally unexpected by the road user, warning signs (see Sections 7B.10 and 7B.11) should be installed for all marked school crosswalks at nonintersection locations. Adequate visibility of students by approaching motorists and of approaching motorists by students should be provided by parking prohibitions.

Option:

For added visibility, the area of the crosswalk may be marked with white diagonal lines at a 45-degree angle to the line of the crosswalk or with white longitudinal lines parallel to traffic flow. When diagonal or longitudinal lines are used to mark a crosswalk, the transverse crosswalk lines may be omitted.

Guidance:

If used, the diagonal or longitudinal lines should be 300 to 600 mm (12 to 24 in) wide and spaced 300 to 1500 mm (12 to 60 in) apart. The spacing design should avoid the wheel paths, and the spacing should not exceed 2.5 times the line width.

Section 7C.04 Stop and Yield Lines these changes are similar to the changes being made to Section 3B.16 – some of the paragraphs in this Section have been relocated to improve continuity

Guidance:

Stop lines should be used to indicate the point behind which vehicles are required to stop in compliance with a ~~STOP (R1-1) sign (see Figure 2B-1),~~ traffic control signal~~, or some other traffic control device~~. relocated to next paragraph

Option:

Stop lines may be used to indicate the point behind which vehicles are required to stop in compliance with a STOP (R1-1) sign (see Figure 2B-1), a Stop Here For Pedestrians (R1-5b or R1-5c) sign (see Figure 2B-2), or some other traffic control device that requires vehicles to stop, except YIELD signs.

Yield lines may be used to indicate the point behind which vehicles are required to yield in compliance with a YIELD (R1-2) sign (see Figure 2B-1) or a Yield Here To Pedestrians (R1-5 or R1-5a) sign (see Figure 2B-2).

Standard:

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 or R1-5a) sign, or at locations on uncontrolled approaches where drivers are required by State law to yield to pedestrians.

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

~~If used,~~ 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.

~~If used,~~ Yield lines (see Figure 3B-15) shall consist of a row of solid white isosceles triangles pointing toward approaching vehicles extending across approach lanes to indicate the point at which the yield is intended or required to be made.

Guidance:

Stop lines should be 300 to 600 mm (12 to 24 in) wide.

The individual triangles comprising the yield line should have a base of 300 to 600 mm (12 to 24 in) wide and a height equal to 1.5 times the base. The space between the triangles should be 75 to 300 mm (3 to 12 in).

If used, stop and yield lines should be placed a minimum of 1.2 m (4 ft) in advance of and parallel to the nearest crosswalk line at controlled intersections, except for yield lines at roundabouts ~~intersections~~ as provided for in Section 3C.04 and at midblock crosswalks. In the absence of a marked crosswalk, the stop line or yield line should be placed at the desired stopping or yielding point, but should not be placed ~~no~~ edited to improve grammar more than 9 m (30 ft) or less than 1.2 m (4 ft) from the nearest edge of the intersecting traveled way. ~~Stop lines should be placed to allow sufficient sight distance to all other approaches to an intersection.~~

Stop lines at midblock signalized locations should be placed at least 12 m (40 ft) in advance of the nearest signal indication (see Section 4D.14).

Support:

When drivers ~~who~~ yield too close to crosswalks ~~on~~ that cross uncontrolled multi-lane approaches, they place pedestrians at risk by blocking other drivers' views of pedestrians and by blocking pedestrians' views of vehicles approaching in other lanes. relocated within this Section

Guidance:

If yield lines are used at ~~an unsignalized midblock~~ a crosswalk that crosses an uncontrolled multi-lane approach, the yield lines should be placed ~~adjacent to the Yield Here to Pedestrians sign located~~ 6.1 to 15 m (20 to 50 ft) in advance of the nearest crosswalk line, and parking should be prohibited in the area between the yield line and the crosswalk (see Figure 3B-16).

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

Standard:

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

Section 7C.05 Curb Markings for Parking Regulations

Standard:

~~Signs shall be used with curb markings~~ Where curbs are marked to convey parking regulations in ~~those~~ areas where curb markings are frequently obliterated by snow and ice accumulation, signs shall be used with the curb markings except as noted in the Option below ~~unless the no-parking zone is controlled by statute or local ordinance~~.

Guidance:

Except as noted in the Option below, when curb markings are used without signs to convey parking regulations, a legible word marking regarding the regulation (such as "No Parking" or "No Standing") should be placed on the curb.

Option:

Curb markings without word markings or signs may be used to convey a general prohibition by statute of parking within a specified distance of a STOP sign, driveway, fire hydrant, or crosswalk.

Local highway agencies may prescribe special colors for curb markings to supplement standard signs for parking regulation.

Support:

Since yellow and white curb markings are frequently used for curb delineation and visibility, it is advisable to establish parking regulations through the installation of standard signs (see Sections 2B.53 through 2B.55).

Section 7C.06 Pavement Word and Symbol Markings

Support:

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

Standard:

Word, ~~and~~ symbol, and arrow markings shall be white. Word, ~~and~~ symbol, and arrow markings shall not be used for mandatory messages except in support of standard signs.

All letters, numerals, and symbols ~~should~~ shall be installed in accordance with the design details in the Pavement Markings chapter of the ~~Federal Highway Administration's~~ deleted to increase consistency "Standard Highway Signs and Markings" book (see Section 1A.11).

Guidance:

Letters and numerals should be 1.8 m (6 ft) or more in height.

Word and symbol markings should not exceed three lines of information.

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

The longitudinal space between word or symbol message markings, including arrow markings, should be at least four times the height of the characters for low speed roads, but not more than ten times the height of the characters under any conditions.

The number of different word and symbol markings used should be minimized to provide effective guidance and avoid misunderstanding.

Except ~~as noted in the Option below~~ for the SCHOOL word marking, pavement word and symbol markings should be no more than one lane in width.

Option:

If used, the SCHOOL word marking may extend to the width of two approach lanes (see Figure 7C-1).

Guidance:

If the two-lane SCHOOL word marking is used, the letters should be 3 m (10 ft) or more in height.

~~CHAPTER 7D. SIGNALS~~ **cross references to Part 4 were added in Section 7A.04**

~~Section 7D.01 General~~

~~Support:~~

~~Part 4 contains information regarding highway traffic signals in school areas. The School Crossing signal warrant is described in Section 4C.06.~~

CHAPTER ~~7E.~~ 7D. CROSSING SUPERVISION

Section ~~7E.01~~ 7D.01 Types of Crossing Supervision

Support:

There are ~~two~~ three types of school crossing supervision:

A. Adult control of pedestrians and vehicles by adult crossing guards ~~or uniformed law enforcement officers~~, ~~and~~

B. Adult control of pedestrians and vehicles by uniformed law enforcement officers, and

C. Student control of only pedestrians with student patrols.

~~Information for the organization, operation, and administration of an adult crossing guard program are given in "Civilian Guards for School Crossings" (available from the Center for Public Safety of Northwestern University, 405 Church Street, Evanston, IL 60204) and "Adult School Crossing Guards" (available from the American Automobile Association, 1000 AAA Drive, Heathrow, FL 32746).~~ deleted because neither of these publications are still available

Information ~~for~~ regarding the organization, administration, and operation of a ~~student~~ school safety patrol program ~~are given~~ is contained in the "~~Policies and Practices for~~ AAA School Safety Patrol~~s~~ Operations Manual" (~~available from the American Automobile Association, 1000 AAA Drive, Heathrow, FL 32746~~ see Section 1A.11).

Section ~~7E.02~~ 7D.02 Adult Crossing Guards

Option:

Adult crossing guards may be used to provide gaps in traffic at school crossings where an engineering study has shown that adequate gaps need to be created (see Section 7A.03), and where authorized by law.

Section ~~7E.03~~ 7D.03 Qualifications of Adult Crossing Guards

Support:

High standards for selection of adult crossing guards are essential because they are responsible for schoolchildren within and in the immediate vicinity of school crosswalks.

Guidance:

Adult crossing guards should possess the following minimum qualifications:

A. Average intelligence;

B. Good physical condition, including sight, hearing, and ~~mobility~~ ability to move and maneuver quickly in order to avoid danger from errant vehicles;

C. Ability to control a STOP paddle effectively to provide approaching road users with a clear, fully direct view of the paddle's STOP message during the entire crossing movement;

D. Ability to communicate specific instructions clearly, firmly, and courteously;

E. Ability to recognize potentially dangerous traffic situations and warn and manage students in sufficient time to avoid injury.

F. Mental alertness;

G. Neat appearance;

H. Good character;

I. Dependability; and

J. An overall sense of responsibility for the safety of students.

Section ~~7E.04~~ 7D.04 Uniform of Adult Crossing Guards ~~and Student Patrols~~

~~Guidance:~~

~~Adult crossing guards should be uniformed so that road users and pedestrians can recognize them and respond to their signals. The uniforms should be distinctively different from those worn by regular law enforcement officers.~~

Standard:

Law enforcement officers performing school crossing supervision and adult crossing guards shall wear high-visibility retroreflective safety apparel labeled as ANSI ~~107-1999~~ 107-2004 standard performance for Class 2 as described in Section 6E.02.

~~Student patrols shall wear high-visibility retroreflective safety apparel labeled as ANSI 107-1999 standard performance for Class 1 as described in Section 6E.02.~~

~~Guidance:~~

~~Law enforcement officers should wear high-visibility retroreflective material over their uniforms when directing nighttime operations.~~

Section ~~7E.05~~ 7D.05 Operating Procedures for Adult Crossing Guards

~~Guidance~~ Standard:

Adult crossing guards ~~should~~ shall not direct traffic in the usual law enforcement regulatory sense. In the control of traffic, they ~~should~~ shall pick opportune times to create a ~~reasonably safe~~ sufficient gap in the traffic flow. At these times, they ~~should~~ shall stand in the roadway to indicate that pedestrians are about to use or are using the crosswalk, and that all vehicular traffic must stop.

Adult crossing guards ~~should~~ shall use a STOP paddle. The STOP paddle ~~should~~ shall be the primary hand-signaling device.

~~Standard:~~

The STOP (R1-1) paddle shall be an octagonal shape. The background of the STOP face shall be red with at least 150 mm (6 in) series ~~capital~~ upper-case white letters and border. The paddle shall be at least 450 mm (18 in) in size and have the word message STOP on both sides. The paddle shall be retroreflectorized or illuminated when used during hours of darkness.

Option:

The STOP paddle may be modified to improve conspicuity by incorporating ~~red or~~ white or red flashing lights on both sides of the paddle. The red or white flashing lights may be arranged in any of the following patterns:

A. Two ~~red or~~ white or red lights centered vertically above and below the STOP legend,
B. Two ~~red or~~ white or red lights centered horizontally on each side of the STOP legend,
C. One ~~red or~~ white or red light centered below the STOP legend,
D. A series of eight or more small ~~red or~~ white or red lights no larger than 6 mm (0.25 in) in diameter along the outer edge of the paddle, arranged in an octagonal pattern at the eight corners of the STOP paddle (more than eight lights may be used only if the arrangement of the lights is such that it clearly conveys the octagonal shape of the STOP paddle), or
E. A series of white lights forming the shapes of the letters in the legend.

Standard:

If flashing lights are used on the STOP paddle, the flash rate shall be at least 50, but not more than 60, flash periods per minute.

~~Section 7E.06 Uniformed Law Enforcement Officers~~

~~Option:~~

~~Uniformed law enforcement officers may be used for school crossing supervision.~~

~~Section 7E.07 Student Patrols~~

~~Option:~~

~~Student patrols may be used to direct and control pedestrians at crossings near schools where adequate gaps in traffic occur frequently enough so that gaps do not need to be created.~~

~~Student patrols may be used to direct and control pedestrians at signalized intersections where turning movements are not a significant problem, and may be used to assist adult crossing guards in the control of pedestrians at crossing locations used by large numbers of pedestrians.~~

~~Guidance:~~

~~Student patrols should not be responsible for directing vehicular traffic. They should not function as uniformed law enforcement officers or adult crossing guards.~~

~~Section 7E.08 Choice of Student Patrols~~

~~Guidance:~~

~~Student patrols should be carefully selected. They should be students from the fifth grade or higher. Leadership and reliability should be determining qualities for patrol membership.~~

~~Parental approval should be obtained in writing before a student is used as a member of a student patrol.~~

~~Section 7E.09 Operating Procedures for Student Patrols~~

~~Guidance:~~

~~Student patrols should use a flagging device to stop pedestrians behind the curb or edge of the roadway, and should allow them to cross only when there is an adequate gap in traffic.~~

~~**Standard:**~~

~~**Flagging devices used during periods of twilight or darkness shall be retroreflective or illuminated.**~~

~~**Because they are not authorized to direct vehicular traffic, student patrols shall not use a STOP paddle.**~~

~~CHAPTER 7F. GRADE-SEPARATED CROSSINGS~~ replaced by new Section 7A.05

~~Section 7F.01 Function~~

~~Option:~~

~~Grade-separated crossings may be used to physically separate the crossing of school pedestrian traffic and vehicular flow.~~

~~Section 7F.02 Types of Grade-Separated Crossings~~

~~Option:~~

~~Grade-separated crossings may be either overpasses over the highway or underpasses under the highway.~~

~~Guidance:~~

~~The design should follow the guidelines given in the published policies of the American Association of State Highway and Transportation Officials, such as "A Policy on Geometric Design of Highways and Streets" (see Section 1A.11).~~

~~Support:~~

~~Experience has shown that overpasses are more satisfactory than underpasses for pedestrian crossings, as overpasses are easier to maintain and supervise.~~

~~Section 7F.03 Criteria for Use of Grade-Separated Crossings~~

~~Guidance:~~

~~If use of the grade separation will be less convenient to pedestrians than an at-grade crossing, barriers or supervision should be considered to assure a satisfactory level of use.~~

CHAPTER 8A. GENERAL

Section 8A.01 Introduction

Support:

Traffic control for highway-rail grade crossings includes all signs, signals, markings, other warning devices, and their supports along highways approaching and at highway-rail grade crossings. The function of this traffic control is to ~~permit reasonably safe~~ promote safety and provide ~~efficient~~ effective operation of both rail and highway traffic at highway-rail grade crossings.

For purposes of installation, operation, and maintenance of traffic control devices at highway-rail grade crossings, it is recognized that the crossing of the highway and rail tracks is situated on a right-of-way available for the joint use of both highway traffic and railroad traffic.

The highway agency or authority with jurisdiction and the regulatory agency with statutory authority, if applicable, jointly determine the need and selection of devices at a highway-rail grade crossing.

In Part 8, the combination of devices selected or installed at a specific highway-rail grade crossing is referred to as a "traffic control system."

Standard:

The traffic control devices, systems, and practices described herein shall be used at all highway-rail grade crossings open to public travel, consistent with Federal, State, and local laws and regulations.

To promote an understanding of common terminology between highway and railroad signaling issues, the following definitions shall be used:

1. **Advance Preemption—the notification of an approaching train that is forwarded to the highway traffic signal controller unit or assembly by the railroad equipment in advance of the activation of the railroad warning devices.**
2. **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 warning devices.**
3. **Cantilevered Signal Structure—a structure that is rigidly attached to a vertical pole and is used to provide overhead support of signal units.**
4. **Clear Storage Distance—the distance available for vehicle storage measured between 1.8 m (6 ft) from the rail nearest the intersection to the intersection stop line or the normal stopping point on the highway. At skewed highway-rail grade crossings and intersections, the 1.8 m (6 ft) distance shall be measured perpendicular to the nearest rail either along the ~~centerline~~ 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 ~~centerline~~ center line or edge line of the highway, as appropriate, to obtain the shorter distance.**
5. **Constant Warning Time Train Detection—a means of train detection that provides relatively uniform warning time for the approach of a train that is not accelerating or decelerating after being detected.**
6. **Design Vehicle—the longest vehicle permitted by statute of the road authority (State or other) on that roadway.**
7. **Diagnostic Team—a group of knowledgeable representatives of the parties of interest (such as the railroad, road authority, or state regulatory agency, where applicable) in a highway-rail grade crossing or group of grade crossings who, using crossing safety management principles, evaluate conditions at a grade crossing(s) to make determinations or recommendations for the responsible public authority concerning the safety needs of that crossing(s) (see 23 CFR Part 646.204 and 49 CFR Part 222.9).**
8. **Dynamic Envelope—the clearance required for the train and its cargo overhang due to any combination of loading, lateral motion, or suspension failure (see Figure 8A-1).**
9. **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.**
10. **Exit Gate Clearance Time—for Four-Quadrant Gate systems, the exit gate clearance time is the amount of time provided to delay the descent of the exit gate arm(s) after entrance gate arm(s) begin to descend.**

11. **Exit Gate Operating Mode—for Four-Quadrant Gate systems, the mode of control used to govern the operation of the exit gate arms.**
12. **Flashing-Light Signals—a warning device consisting of two red signal indications arranged horizontally that are activated to flash alternately when a train is approaching or present at a highway-rail grade crossing.**
13. **Interconnection—the electrical connection between the railroad active warning system and the highway traffic signal controller assembly for the purpose of preemption.**
14. **Locomotive Horn—a locomotive 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.**
15. **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.**
16. **Minimum Track Clearance Distance—for standard two-quadrant railroad warning devices, the minimum track clearance distance is the length along a highway at one or more railroad tracks, measured ~~either~~ grammar – more than two choices from the highway stop line, warning device, or 3.7 m (12 ft) perpendicular to the track centerline, to 1.8 m (6 ft) beyond the track(s) measured perpendicular to the far rail, along the ~~centerline~~ center line or edge line of the highway, as appropriate, to obtain the longer distance. For Four-Quadrant Gate systems, the minimum track clearance distance is the length along a highway at one or more railroad tracks, measured either from the highway stop line or entrance warning device, to 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 ~~centerline~~ center line or edge line consistency with first sentence of this definition of the highway, as appropriate, to obtain the longer distance.**
17. **Minimum Warning Time—Through Train Movements—the least amount of time active warning devices shall operate prior to the arrival of a train at a highway-rail grade crossing.**
18. **Pathway-Rail Grade Crossing—the general area where a pathway and a railroad's right-of-way cross at the same level, within which are included the railroad tracks, pathway, and traffic control devices for pathway traffic traversing that area.**
19. **Preemption—the transfer of normal operation of highway traffic signals to a special control mode.**
20. **Pre-signal—supplemental highway traffic signal faces operated as part of the highway intersection traffic signals, located in a position that controls traffic approaching the highway-rail grade crossing in advance of the intersection.**
21. **Queue Clearance Time—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. If presignals are present, this time shall be long enough to allow the vehicle to move through the intersection, or to clear the tracks if there is sufficient clear storage distance. If a Four-Quadrant Gate system is present, this time shall be long enough to permit the exit gate arm to lower after the design vehicle is clear of the minimum track clearance distance.**
22. **Quiet Zone—a segment of a rail line, with one or a number of consecutive public highway-rail grade crossings at which locomotive horns are not routinely sounded per 49 CFR Part 222.**
23. **Right-of-Way Transfer Time—the maximum amount of time needed for the worst case condition, prior to display of the track clearance green interval. This includes any railroad or highway traffic signal control equipment time to react to a preemption call, and any traffic control signal green, pedestrian walk and clearance, yellow change, and red clearance intervals for conflicting traffic.**
24. **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 the train.**
25. **Simultaneous Preemption—notification of an approaching train is forwarded to the highway traffic signal controller unit or assembly and railroad active warning devices at the same time.**
26. **Station Crossing—a pathway-rail grade crossing that is associated with a station platform.**

27. **Timed Exit Gate Operating Mode—a mode of operation where the exit gate descent is based on a predetermined time interval.**
28. **Vehicle Intrusion Detection Devices—a detector or detectors used as a part of a system incorporating processing logic to detect the presence of vehicles within the minimum track clearance distance and to control the operation of the exit gates.**
29. **Wayside Equipment—the signals, switches, and/or control devices for railroad operations housed within one or more enclosures located along the railroad right-of-way and/or on railroad property.**
30. **Wayside Horn—a stationary horn located at a highway-rail grade crossing, designed to provide audible warning to oncoming motorists of the approach of a train.**

Section 8A.02 Use of Standard Devices, Systems, and Practices

Support:

Because of the large number of significant variables to be considered, no single standard system of traffic control devices is universally applicable for all highway-rail grade crossings.

Guidance:

The appropriate traffic control system to be used at a highway-rail grade crossing should be determined by an engineering study involving both the highway agency and the railroad company.

Option:

The engineering study may include the Highway-Rail Intersection (HRI) components of the National Intelligent Transportation Systems (ITS) architecture, which is a USDOT accepted method for linking the highway, vehicles, and traffic management systems with rail operations and wayside equipment.

Support:

More detail on Highway-Rail Intersection components is available from the USDOT's Federal Railroad Administration, 1120 Vermont Ave., NW, Washington, DC 20590, or www.fra.dot.gov.

Standard:

Traffic control devices, systems, and practices shall be consistent with the design and application of the Standards contained herein.

Before any new highway-rail grade crossing traffic control system is installed or before modifications are made to an existing system, approval shall be obtained from the highway agency with the jurisdictional and/or statutory authority, and from the railroad company.

Guidance:

To stimulate effective responses from ~~vehicle operators and pedestrians~~ road users, these devices, systems, and practices should use the five basic considerations employed generally for traffic control devices and described fully in Section 1A.02: design, placement, operation, maintenance, and uniformity.

Support:

Many other details of highway-rail grade crossing traffic control systems that are not set forth in Part 8 are contained in the publications listed in Section 1A.11.

Section 8A.03 Uniform Provisions

Standard:

All signs used in highway-rail grade crossing traffic control systems shall be retroreflectorized or illuminated as described in Section 2A.07 to show the same shape and similar color to an approaching road user during both day and night.

No sign or signal shall be located in the center of an undivided highway, except in a raised island.

Guidance:

~~Such~~ Any signs or signals mounted in a raised island in the center of an undivided highway should be installed with a clearance of at least 0.6 m (2 ft) from the outer edge of the raised island to the nearest edge of the sign or signal, except as ~~allowed~~ permitted edited to increase consistency in Section 2A.19.

Where the distance between tracks, measured along the highway between the inside rails, exceeds 30 m (100 ft), additional signs or other appropriate traffic control devices should be used to inform approaching road users, especially non-motorized users, of the long distance to cross the tracks.

Section 8A.04 Highway-Rail Grade Crossing Elimination

Guidance:

Because highway-rail grade crossings are a potential source of crashes and congestion, agencies should conduct engineering studies to determine the cost and benefits of eliminating these crossings.

Standard:

When a highway-rail grade crossing is eliminated, the traffic control devices for the crossing shall be removed.

If the existing traffic control devices at a multiple-track highway-rail grade crossing become improperly placed or inaccurate because of the removal of some of the tracks, the existing devices shall be relocated and/or modified.

Guidance:

Any highway-rail grade crossing that cannot be justified should be eliminated.

Where a roadway is removed from a highway-rail grade crossing, the roadway approaches in the railroad right-of-way should also be removed and appropriate signs should be placed at the roadway end in accordance with Section 2L.04.

Where a railroad is eliminated at a highway-rail grade crossing, the tracks should be removed or paved over.

Option:

Based on engineering judgment, the TRACKS OUT OF SERVICE (R8-9) sign (see Figure 8B-4) may be temporarily installed until the tracks are removed or paved over. The length of time before the tracks will be removed or paved over may be considered in making the decision as to whether to install the sign.

Section ~~8C.01~~ 8A.05 Illumination at Highway-Rail Grade Crossings relocated from Chapter 8C

~~Option~~ Support:

Illumination ~~may be~~ is sometimes installed at or adjacent to a highway-rail grade crossing~~.~~

~~Guidance:~~

~~If an engineering study is conducted and if the engineering study determines that~~ in order to provide better nighttime visibility of the train and the highway-rail grade crossing ~~is needed~~ (for example, where a substantial amount of railroad operations ~~is~~ are conducted at night, where train speeds are low and highway-rail grade crossings are blocked for long periods, or where crash history indicates that ~~drivers~~ road users experience difficulty in seeing trains or traffic control devices during hours of darkness)~~, then illumination should be installed at and adjacent to the highway-rail grade crossing~~.

~~Support:~~

Recommended types and locations of luminaires for illuminating highway-rail grade crossings ~~illumination~~ are contained in the American National Standards Institute's (ANSI) "Practice for Roadway Lighting RP-8," which is available from the Illuminating Engineering Society (see Section 1A.11).

Section ~~8A.05~~ 8A.06 Temporary Traffic Control Zones

Support:

Temporary traffic control planning provides for continuity of operations (such as movement of traffic, pedestrians and bicycles, transit operations, and access to property/utilities) when the normal function of a roadway at a highway-rail grade crossing is suspended because of temporary traffic control operations.

Standard:

Traffic controls for temporary traffic control zones that include highway-rail grade crossings shall be as outlined in Part 6 of this Manual.

When a highway-rail grade crossing exists either within or in the vicinity of a temporary traffic control zone, lane restrictions, flagging, or other operations shall not be performed in a manner that would cause vehicles to stop on the railroad tracks, unless a uniformed added to increase accuracy law enforcement officer or flagger (see Chapter 6E) is provided at the highway-rail grade crossing to minimize the possibility of vehicles stopping on the tracks, even if automatic warning devices are in place.

Guidance:

Public and private agencies, including emergency services, businesses, and railroad companies, should meet to plan appropriate traffic detours and the necessary signing, marking, and flagging requirements for operations during temporary traffic control zone activities. Consideration should be given to the length of time that the highway-rail grade crossing is to be closed, the type of rail and highway traffic affected, the time of day, and the materials and techniques of repair.

Temporary traffic control operations should minimize the inconvenience, delay, and crash potential to affected traffic. Prior notice should be given to affected public or private agencies, emergency services, businesses, railroad companies, and road users before the free movement of ~~vehicles~~ road users or trains is infringed upon or blocked.

Temporary traffic control zone activities should not be permitted to extensively prolong the closing of the highway-rail grade crossing.

The width, grade, alignment, and riding quality of the highway surface at a highway-rail grade crossing should, at a minimum, be restored to correspond with the quality of the approaches to the highway-rail grade crossing.

CHAPTER 8B. SIGNS AND MARKINGS

Section 8B.01 Purpose

Support:

Passive traffic control systems, consisting of signs and pavement markings, identify and direct attention to the location of a highway-rail grade crossing and advise ~~motorists, bicyclists, and pedestrians to take appropriate action~~ road users to slow down or stop at the crossing as necessary in order to yield to any rail traffic occupying, or approaching and in proximity to, the crossing.

Section 8B.02 Sizes of Grade Crossing Signs

Standard:

The sizes of grade crossing signs shall be as shown in Table 8B-1.

Option:

Signs larger than those shown in Table 8B-1 may be used (see Section 2A.11).

Section 8B.03 Highway-Rail Grade Crossing (Crossbuck) Sign (R15-1) and Number of Tracks ~~Sign~~ Plaque (R15-2P)

Standard:

Except as noted in the Option below, the Highway-Rail Grade Crossing (R15-1) sign, commonly identified as the Crossbuck sign, shall be retroreflectorized white with the words RAILROAD CROSSING in black lettering, mounted as shown in Figure 8B-1.

Option:

At non-signalized crossings, the Crossbuck sign may be retroreflectorized white with the words RAILROAD CROSSING in retroreflectorized red lettering, mounted as shown in Figure 8B-1.

Support:

The Crossbuck sign assigns the right-of-way to rail traffic at a highway-rail grade crossing.

Standard:

As a minimum, one Crossbuck sign shall be used on each highway approach to every highway-rail grade crossing, alone or in combination with other traffic control devices.

If automatic gates are not present and if there are two or more tracks at the highway-rail grade crossing, the number of tracks shall be indicated on a supplemental Number of Tracks (R15-2P) ~~sign~~ plaque of inverted T shape mounted below the Crossbuck sign in the manner and at the height indicated in Figure 8B-1.

Option:

The supplemental Number of Tracks ~~sign~~ plaque may also be used at highway-rail grade crossings with automatic gates.

Standard:

The Crossbuck sign shall be installed on the right-hand edited to increase clarity side of the highway on each approach to the highway-rail grade crossing. Where restricted sight distance or unfavorable highway geometry exists on an approach to a highway-rail grade crossing, an additional Crossbuck sign shall be installed on the left-hand edited to increase clarity side of the highway, possibly placed back-to-back with the Crossbuck sign for the opposite approach, or otherwise located so that two Crossbuck signs are displayed for that approach.

A strip of retroreflective white material not less than 50 mm (2 in) in width shall be used on the back of each blade of each Crossbuck sign for the length of each blade, at all highway-rail grade crossings, except those where Crossbuck signs have been installed back-to-back.

A strip of retroreflective white material, not less than 50 mm (2 in) in width, shall be used on each support at passive highway-rail grade crossings for the full length of the front and back of the support from the Crossbuck sign or Number of Tracks ~~sign~~ plaque to within 0.6 m (2 ft) above the ~~edge of the roadway~~ ground, except on the side of those supports where a STOP (R1-1) or YIELD(R1-2) sign or flashing lights have been installed or on the back side of supports for Crossbuck signs installed on one-way streets.

Guidance:

Crossbuck signs should be located with respect to the highway pavement or shoulder in accordance with the criteria in Chapter 2A and Figures 2A-2 and 2A-3, and should be located with respect to the nearest track in accordance with Figure 8C-2.

The minimum lateral ~~clearance~~ offset edited to increase consistency for the nearest edge of the Crossbuck sign should be 1.8 m (6 ft) from the edge of the shoulder or 3.7 m (12 ft) from the edge of the traveled way in rural areas (whichever is greater), and 0.6 m (2 ft) from the face of the curb in urban areas.

Where unusual conditions make variations in location and lateral ~~clearance~~ offset edited to increase consistency appropriate, engineering judgment should be used to provide the best practical combination of view and safety clearances.

Section ~~8B.08~~ 8B.04 Use and Meaning of STOP (R1-1) or YIELD (R1-2) Signs at Passive Highway-Rail Grade Crossings

~~Option:~~

~~At the discretion of the responsible State or local highway agency, STOP (R1-1) or YIELD (R1-2) signs (see Figure 2B-1) may be used at highway-rail grade crossings that have two or more trains per day and are without automatic traffic control devices.~~

~~Support:~~

~~Two or more trains per day means an average of two or more trains per day operating over the highway-rail grade crossing for a 12-month period prior to the installation of the STOP or YIELD control sign.~~

~~Option:~~

~~For other highway-rail grade crossings with passive warning devices, STOP or YIELD signs may be used based on an engineering study.~~

~~Guidance:~~

~~The engineering study should take into consideration such factors as highway and train traffic characteristics (including volume and speed), collision history, the need for active control devices, and sight distance to the approaching train.~~

~~Option:~~

~~If a STOP or YIELD sign is installed at a highway-rail grade crossing, it may be installed on the Crossbuck post or on a separate post at a point where the vehicle is to stop, or as near to that point as practical.~~

~~**Standard:**~~

~~**For all highway-rail grade crossings where STOP or YIELD signs are installed, the placement shall conform to the requirements of Sections 2B.06 and 2B.10. Stop Ahead (W3-1) or Yield Ahead (W3-2) Advance Warning signs (see Figure 2C-4) shall also be installed if the criteria for their installation given in Section 2C.29 is met.**~~

Standard:

A YIELD (R1-2) sign or STOP (R1-1) sign shall be installed at all passive highway rail grade crossings, except where train crews always manually stop road users from entering the crossing.

A YIELD sign shall be the default traffic control device on all highway approaches to passive highway rail grade crossings unless an engineering study determines that a STOP sign is appropriate.

Support:

Because a STOP sign establishes a legal requirement for all approaching vehicles to come to a full stop, the indiscriminate use of STOP signs at all or many passive grade crossings can result in a high rate of non-compliance by road users, thus increasing the risk of collisions that are associated with non-compliance.

Guidance:

The use of STOP signs at passive crossings should be limited to unusual conditions where requiring all vehicles to make a full stop is deemed essential by an engineering study or by engineering judgment. The following are among the factors that an engineering study or engineering judgment should consider:

A. The line of sight from an approaching highway vehicle to an approaching train;
B. The characteristics of the highway, such as the functional classification, geometric conditions, and traffic volumes and speed;
C. The characteristics of the railroad including, but not limited to, the frequency, type, and speed of trains, and the number of tracks;

D. The crash history at the crossing; and

E. The need for active control devices.

Support:

Certain commercial motor vehicles and school buses are required to stop at all highway-rail grade crossings in accordance with 49 CFR 392.10 even if a YIELD sign (or just a Crossbuck sign) is posted.

Section 8B.05 Crossbuck Assemblies with YIELD (R1-2) Signs or STOP (R1-1) Signs at Passive Highway-Rail Grade Crossings

Standard:

A highway-rail grade crossing Crossbuck Assembly at a passive crossing shall consist of a Crossbuck (R15-1) sign, a Number of Tracks (R15-2P) plaque if two or more tracks are present, and either a YIELD (R1-2) sign or STOP (R1-1) sign installed on the same support, except as noted in the Option below.

Option:

If a YIELD sign or STOP sign is installed at a highway-rail grade crossing, it may be installed on the same support as the Crossbuck sign or it may be installed on a separate support at a point where the vehicle is to stop, or as near to that point as practical, but in either case, the YIELD sign or STOP sign is considered to be a part of the Crossbuck Assembly.

Standard:

At all public highway-rail grade crossings that are not equipped with the active traffic control systems that are described in Chapter 8C, a Crossbuck Assembly shall be installed on the right-hand side of the highway on each approach to the highway-rail grade crossing. Where restricted sight distance or unfavorable highway geometry exists on an approach to a highway-rail grade crossing, or where there is a one-way multi-lane approach, an additional Crossbuck Assembly shall be installed on the left-hand side of the highway.

Guidance:

At crossings where train speeds are above 16 km/h (10 mph) or where rail traffic movements cannot appropriately yield to road users, Crossbuck Assemblies should be provided and reasonable locations for such signs should be created by necessary roadway realignment or railway relocation.

Reasonable locations for Crossbuck Assemblies should not be in conflict with turning vehicles from roadways either closely parallel to the track or visually obstructed from approaching roadway users.

Crossbuck Assemblies should be located with respect to the highway pavement or shoulder in accordance with the criteria in Chapter 2A and Figures 2A-2 and 2A-3, and should be located with respect to the nearest track in accordance with Figure 8C-2.

The minimum lateral clearance for the nearest edge of the Crossbuck Assembly should be 1.8 m (6 ft) from the edge of the shoulder or 3.7 m (12 ft) from the edge of the traveled way in rural areas (whichever is greater), and 0.6 m (2 ft) from the face of the curb in urban areas.

Where unusual conditions make variations in location and lateral clearance appropriate, engineering judgment should be used to provide the best practical combination of view and safety clearances.

Support:

The meaning of a Crossbuck Assembly that includes a YIELD sign is that a road user approaching the highway-rail grade crossing needs to be prepared to decelerate, and when necessary, yield the right-of-way to any rail traffic that might be occupying the crossing or might be approaching and in such close proximity to the crossing that it would be unsafe for the road user to cross.

The meaning of a Crossbuck Assembly that includes a STOP sign is that a road user approaching the highway-rail grade crossing must come to a full and complete stop not less than (15 ft) short of the nearest rail, and remain stopped while the road user determines if there is rail traffic either occupying the crossing or approaching and in such close proximity to the crossing that the road user must yield the right-of-way to rail traffic. The road user is permitted to proceed when it is safe to cross.

Standard:

If used at a passive crossing, a YIELD (R1-2) sign or STOP (R1-2) sign shall be installed in compliance with the provisions of Part 2, Section 2B.10, and Figures 8B-1 and 8B-2.

When the YIELD sign or STOP sign is installed on the same support as the Crossbuck sign, a strip of retroreflective material shall be used on the front and back (except as noted in the Option below) of the support. The dimensions and placement of the retroreflective strip shall be in compliance with the Standards in Section 8B.03. The color of the retroreflective strip on the back of the support shall be white.

Option:

The vertical strip of retroreflective material may be omitted from the back sides of Crossbuck Assembly supports installed on one-way streets.

The color of the retroreflective strip on the front of the support where a YIELD sign or STOP sign is installed on the same support as the Crossbuck sign may be red (see Section 2A.21) or white (see Section 8B.03).

If a YIELD (R1-2) sign is installed in conjunction with the Crossbuck sign, a yield line (see Section 3B.16) may be installed to supplement the YIELD sign.

Guidance:

If a yield line is used, it should be a transverse line at a right angle to the traveled way at a point where a vehicle is to yield or stop or as near to that point as practical. The yield line should be placed no closer than 4.6 m (15 ft) measured perpendicular from the nearest rail as shown in Figure 8B-7.

If a STOP (R1-1) sign is installed in conjunction with the Crossbuck sign, a stop line (see Section 3B.16) should be installed to indicate the point behind which vehicles are required to stop. The stop line should be placed no closer than 4.6 m (15 ft) measured perpendicular from the nearest rail as shown in Figure 8B-6.

If a YIELD sign or STOP sign is installed at a highway-rail grade crossing on a separate support than the Crossbuck sign (see Figure 8B-2), the YIELD sign or STOP sign should be placed at a point where the vehicle is to stop, or as near to that point as practical, but no closer than 4.6 m (15 ft) measured perpendicular from the nearest rail as shown in Figure 8B-7.

Standard:

At all highway-rail grade crossings where YIELD signs or STOP signs are installed, Stop Ahead (W3-1) or Yield Ahead (W3-2) signs shall also be installed if the criteria for their installation in Section 2C.35 is met.

Section ~~8B.04~~ 8B.06 Highway-Rail Grade Crossing Advance Warning Signs (W10 Series)

Standard:

A Highway-Rail Grade Crossing Advance Warning (W10-1) sign (see Figure 8B-3) with a supplemental plaque describing the type of traffic control at the highway-rail grade crossing shall be used on each highway in advance of every highway-rail grade crossing except in the following circumstances:

- **A. On an approach to a highway-rail grade crossing from a T-intersection with a parallel highway if the distance from the edge of the track to the edge of the parallel roadway is less than 30 m (100 ft) and W10-3 signs are used on both approaches of the parallel highway;**
- **B. On low-volume, low-speed highways crossing minor spurs or other tracks that are infrequently used and are flagged by train crews;**
- **C. In business or commercial ~~districts~~ areas where active highway-rail grade crossing traffic control devices are in use; or**
- **D. Where physical conditions do not permit even a partially effective display of the sign.**

The supplemental plaque shall be a No Signal (W10-10P) plaque where used in advance of a crossing that does not have active traffic control devices and shall be a SIGNAL AHEAD (W10-16P) plaque where used in advance of a crossing with active traffic control devices. The supplemental plaque shall be mounted directly below the W10-1 sign unless a NO TRAIN HORN (W10-9P) plaque (see Section 8B.15) is used, in which case the supplemental No Signal (W10-10P) or SIGNAL AHEAD (W10-16P) plaque shall be mounted directly below the W10-9P plaque.

Placement of the Highway-Rail Grade Crossing Advance Warning sign shall be in accordance with ~~Chapter 2A~~ Section 2C.05 and Table 2C-4.

A Yield Ahead (W3-2) or Stop Ahead (W3-1) Advance Warning sign (see Figure 2C-6) shall also be installed if the criteria for their installation given in Section 2C.35 is met. If a Yield Ahead or Stop Ahead sign is installed on the approach to the crossing, the W10-1 sign and supplemental plaque shall

be installed upstream from the Yield Ahead or Stop Ahead sign. The Yield Ahead or Stop Ahead sign shall be located in accordance with Table 2C-4. The minimum distance between the signs shall be in accordance with Section 2C.05 and Table 2C-4.

Option:

On divided highways and one-way streets, an additional W10-1 sign and supplemental plaque may be installed on the left-hand side of the roadway.

Standard:

If the distance between the railroad tracks and a parallel highway, from the edge of the tracks to the edge of the parallel roadway, is less than 30 m (100 ft), W10-2, W10-3, or W10-4 signs (see Figure 8B-3) with a supplemental NO SIGNAL (W10-10P) or SIGNAL AHEAD (W10-16P) plaque describing the type of traffic control at the highway-rail grade crossing shall be installed on each approach of the parallel highway to warn road users making a turn that they will encounter a highway-rail grade crossing soon after making a turn, and a W10-1 sign for the approach to the tracks shall not be required to be between the tracks and the parallel highway.

If the W10-2, W10-3, or W10-4 signs and supplemental plaques are used, sign placement in accordance with the guidelines for Intersection Warning signs in Table 2C-4 using the speed of through traffic shall be measured from the highway intersection.

Guidance:

If the distance between the railroad tracks and the parallel highway, from the edge of the tracks to the edge of the parallel roadway, is 30 m (100 ft) or more, a W10-1 sign and supplemental plaque should be installed in advance of the highway-rail grade crossing, and the W10-2, W10-3, or W10-4 signs should not be used on the parallel highway.

Section ~~8B.05~~ 8B.07 EXEMPT Highway-Rail Grade Crossing ~~Signs~~ Plaques (R15-3P, W10-1aP)

Option:

When authorized by law or regulation, a supplemental EXEMPT (R15-3P) ~~sign~~ plaque (see Figure 8B-4) with a white background bearing the word EXEMPT may be used below the Crossbuck sign or Number of Tracks ~~sign~~ plaque, if present, at the highway-rail grade crossing, and a supplemental EXEMPT (W10-1aP) ~~sign~~ plaque (see Figure 8B-6) with a yellow background bearing the word EXEMPT may be used below the Highway-Rail Advance Warning (W10-1) sign.

Support:

These supplemental ~~signs~~ plaques inform drivers of vehicles carrying passengers for hire, school buses carrying students, or vehicles carrying hazardous materials that a stop is not required at certain designated highway-rail grade crossings, except when a train, locomotive, or other railroad equipment is approaching or occupying the highway-rail grade crossing, or the driver's view is blocked.

Section ~~8B.06~~ 8B.08 Turn Restrictions During Preemption

Guidance:

At a signalized intersection that is located within 60 m (200 ft) of a highway-rail grade crossing, measured from the edge of the track to the edge of the roadway, where the intersection traffic control signals are preempted by the approach of a train, all existing turning movements toward the highway-rail grade crossing should be prohibited during the signal preemption sequences.

Option:

A blank-out or changeable message sign and/or appropriate highway traffic signal indication or other similar type sign may be used to prohibit turning movements toward the highway-rail grade crossing during preemption. The R3-1a and R3-2a signs shown in Figure 8B-4 may be used for this purpose.

Standard:

Turn prohibition signs that are associated with preemption shall be visible only when the highway-rail grade crossing restriction is in effect.

Section ~~8B.07~~ 8B.09 DO NOT STOP ON TRACKS Sign (R8-8)

Guidance:

Whenever engineering judgment determines that the potential for vehicles stopping on the tracks is high, a DO NOT STOP ON TRACKS (R8-8) sign (see Figure 8B-4) should be used.

The sign, if used, should be located on the right-hand edited to increase clarity side of the highway on either the near or far side of the highway-rail grade crossing, depending upon which side provides better visibility to approaching drivers.

Option:

DO NOT STOP ON TRACKS signs may be placed on both sides of the track.

On divided highways and one-way streets, a second DO NOT STOP ON TRACKS sign may be placed on the near or far left-hand edited to increase clarity side of the highway-rail grade crossing to further improve visibility of the sign.

Section ~~8B.09~~ 8B.10 TRACKS OUT OF SERVICE Sign (R8-9)

Option:

The TRACKS OUT OF SERVICE (R8-9) sign (see Figure 8B-4) may be used at a highway-rail grade crossing instead of a Crossbuck (R15-1) sign and a Number of Tracks (R15-2P) ~~sign~~ plaque (see Figure 8B-1) when railroad tracks have been temporarily or permanently abandoned, but only until such time that the tracks are removed or paved over.

Standard:

When tracks are out of service, traffic control devices and gate arms shall be removed and the signal heads shall be removed or hooded or turned from view to clearly indicate that they are not in operation.

The R8-9 sign shall be removed when the tracks have been removed or covered or when the highway-rail grade crossing is returned to service.

Section ~~8B.10~~ 8B.11 STOP HERE WHEN FLASHING Sign (R8-10, R8-10a)

Option:

The STOP HERE WHEN FLASHING (R8-10, R8-10a) sign (see Figure 8B-4) may be used at a highway-rail grade crossing to inform drivers of the location of the stop line or the point at which to stop when the flashing-light signals (see Section 8C.02) are activated.

Section ~~8B.11~~ 8B.12 STOP HERE ON RED Sign (R10-6, R10-6a)

Support:

The STOP HERE ON RED (R10-6, R10-6a) sign (see Figure 8B-4) defines and facilitates observance of stop lines at traffic control signals.

Option:

A STOP HERE ON RED sign may be used at locations where vehicles frequently violate the stop line or where it is not obvious to road users where to stop.

Guidance:

If possible, stop lines should be placed at a point where the vehicle driver has adequate sight distance along the track.

Section ~~8B.12~~ 8B.13 Emergency Notification Sign (I-13 ~~or I-13a~~)

Guidance:

~~An~~ Emergency Notification (I-13 ~~or I-13a~~) signs (see Figure 8B-5) should be installed at all highway-rail grade crossings to provide ~~for emergency notification~~ information to road users so that they can notify the railroad company about emergencies or malfunctioning traffic control devices. ~~The sign should have a white message on blue background.~~

~~Location and placement should be decided cooperatively by the railroad company and the public or private highway agencies based on specific site conditions. However, these signs are typically located on the railroad right-of-way.~~

~~This sign, which is for emergency notification, should convey a clear and simple message that is visible to anyone stalled or disabled on the railroad tracks, and to anyone with other emergencies.~~

~~Support:~~

~~Examples of sign messages are shown in Figure 8B-4.~~

Standard:

When Emergency Notification signs are used, they shall, at a minimum, include the U.S. DOT grade crossing inventory number and the emergency contact telephone number in letters and numbers that are at least 13 mm (0.5 in) in height.

The Emergency Notification signs shall be positioned so as to not obstruct any traffic control devices or limit the view of trains approaching the highway-rail grade crossing.

Option:

In lieu of Emergency Notification signs, the U.S. DOT grade crossing inventory number and the emergency contact telephone number may be displayed on the enclosure for the signal apparatus at crossings that are equipped with active traffic control systems if the signal apparatus enclosure is located in direct view of road users at or near the crossing.

Standard:

Emergency Notification Signs shall have a white legend and border on a blue background.

Guidance:

Emergency Notification signs should be retroreflective.

Emergency Notification signs, or the information placed on the signal apparatus enclosure, should be oriented so as to face vehicles stopped on or at the crossing or on the traveled way near the crossing.

At station crossings, Emergency Notification signs or information should be posted in a conspicuous location.

Emergency Notification signs mounted on Crossbuck Assemblies or signal masts should only be large enough to provide the necessary contact information. Use of larger signs that might obstruct the view of trains or other vehicles should be avoided.

Section ~~8B.13~~ 8B.14 TRAINS MAY EXCEED 130 km/h (80 MPH) Sign (W10-8)

Guidance:

Where trains are permitted to travel at speeds exceeding 130 km/h (80 mph), a TRAINS MAY EXCEED 130 km/h (80 MPH) (W10-8) sign (see Figure 8B-6) should be installed facing road users approaching the highway-rail grade crossing.

If used, the TRAINS MAY EXCEED 130 km/h (80 MPH) signs should be installed between the Highway-Rail Grade Crossing Advance Warning (W10-1) sign (see Figure 8B-3) and the highway-rail grade crossing on all approaches to the highway-rail grade crossing. The locations should be determined based on specific site conditions.

Section ~~8B.14~~ 8B.15 NO TRAIN HORN ~~Sign~~ Plaque (W10-9P)

Standard:

A NO TRAIN HORN (W10-9P) ~~sign~~ plaque (see Figure 8B-6) shall be installed at each highway-rail grade crossing where there is a Federal Railroad Administration authorization for trains to not sound a horn. The ~~sign~~ plaque shall ~~be mounted as a~~ supplemental ~~plaque~~ and be mounted directly below the Highway-Rail Grade Crossing Advance Warning (W10-1) sign (see Figure 8B-3).

~~**Section 8B.15 NO SIGNAL Sign (W10-10) or NO GATES OR LIGHTS Sign (W10-13)**~~ **this is now covered in Section 8B.06**

~~Option:~~

~~A NO SIGNAL (W10-10) sign or a NO GATES OR LIGHTS (W10-13) sign (see Figure 8B-5) may be installed at highway-rail grade crossings that are not equipped with automated signals.~~

~~The NO SIGNAL (W10-10) sign or the NO GATES OR LIGHTS (W10-13) sign may be mounted as a supplemental plaque below the Advance Warning (W10-1) sign.~~

Section 8B.16 LOOK Sign (R15-8)

Option:

At highway-rail grade crossings, the LOOK (R15-8) sign (see Figure 8B-4) may be mounted ~~as a supplemental plaque on the Crossbuck (R15-1) sign post, or as~~ on a separate ~~sign~~ post in the immediate vicinity of the highway-rail grade crossing on the railroad right-of-way.

Section 8B.17 Low Ground Clearance Highway-Rail Grade Crossing Sign (W10-5)

Guidance:

If the highway profile conditions are sufficiently abrupt to create a hang-up situation for long wheelbase vehicles or for trailers with low ground clearance, the Low Ground Clearance Highway-Rail Grade Crossing (W10-5) sign (see Figure 8B-6) should be installed in advance of the highway-rail grade crossing.

Standard:

Because this symbol might not be readily recognizable by the public, the Low Ground Clearance Highway-Rail Grade Crossing (W10-5) warning sign shall be accompanied by an educational plaque, LOW GROUND CLEARANCE. The LOW GROUND CLEARANCE educational plaque shall remain in place for at least 3 years after the initial installation of the W10-5 sign (see Section 2A.12).

Guidance:

Auxiliary plaques such as AHEAD, NEXT CROSSING, or USE NEXT CROSSING (with appropriate arrows), or a supplemental distance plaque should be placed below the W10-5 sign at the nearest intersecting highway where a vehicle can detour or at a point on the highway wide enough to permit a U-turn.

If engineering judgment of roadway geometric and operating conditions confirms that vehicle speeds across the railroad tracks should be below the posted speed limit, a W13-1P advisory speed plaque should be posted.

Option:

If the highway-rail grade crossing is rough, word message signs such as BUMP, DIP, or ROUGH CROSSING may be installed. A W13-1P advisory speed plaque may be installed below the word message sign in advance of rough crossings.

Support:

Information on railroad ground clearance requirements is also available in the "American Railway Engineering and Maintenance-of-Way Association's Engineering Manual," or the American Association of State Highway and Transportation Officials' "Policy on Geometric Design of Highways and Streets" (see Section 1A.11).

Section 8B.18 Storage Space Signs (W10-11, W10-11a, W10-11b)

Guidance:

A Storage Space (W10-11) sign supplemented by a word message storage distance (W10-11a) sign (see Figure 8B-6) should be used where there is a highway intersection in close proximity to the highway-rail grade crossing and an engineering study determines that adequate space is not available to store a design vehicle(s) between the highway intersection and the train dynamic envelope.

The Storage Space (W10-11 and W10-11a) signs should be mounted in advance of the highway-rail grade crossing at an appropriate location to advise drivers of the space available for vehicle storage between the highway intersection and the highway-rail grade crossing.

Option:

A Storage Space (W10-11b) sign (see Figure 8B-6) may be mounted beyond the highway-rail grade crossing at the highway intersection under the STOP or YIELD sign or just prior to the signalized intersection to remind drivers of the storage space between the tracks and the highway intersection.

Section 8B.19 Skewed Crossing Sign (W10-12)

Option:

The Skewed Crossing (W10-12) sign (see Figure 8B-6) may be used at a skewed highway-rail grade crossing to warn ~~drivers~~ road users that the railroad tracks are not perpendicular to the highway.

Guidance:

If the Skewed Crossing sign is used, the symbol should show the direction of the crossing (near left to far right as shown in Figure 8B-6, or the mirror image if the track goes from far left to near right). If the Skewed

Crossing sign is used where the angle of the crossing is significantly different than 45 degrees, the symbol should show the approximate angle of the crossing.

Standard:

The Skewed Crossing sign shall not be used as a replacement for the required Advance Warning (W10-1) sign. If used, the Skewed Crossing sign shall supplement the W10-1 sign and shall be mounted on a separate post.

Section 8B.20 Pavement Markings

Standard:

All highway-rail grade crossing pavement markings shall be retroreflectorized white. All other markings shall be in accordance with Part 3.

On paved roadways, pavement markings in advance of a highway-rail grade crossing shall consist of an X, the letters RR, a no-passing zone marking (on two-lane, two-way highways ~~where~~ with ~~centerline~~ center line markings ~~are used~~ in compliance with Section 3B.01), and certain transverse lines as shown in Figures 8B-7 and 8B-8.

Identical markings shall be placed in each approach lane on all paved approaches to highway-rail grade crossings where signals or automatic gates are located, and at all other highway-rail grade crossings where the posted or statutory highway speed is 60 km/h (40 mph) or greater.

Pavement markings shall not be required at highway-rail grade crossings where the posted or statutory highway speed is less than 60 km/h (40 mph)~~,~~. ~~or~~ In urban areas, pavement markings shall not be required at highway-rail grade crossings if an engineering study indicates that other installed devices provide suitable warning and control.

Guidance:

When pavement markings are used, ~~a portion~~ the center of the X symbol should be directly ~~opposite~~ in line with the Advance Warning sign. The X symbol and letters should be elongated to allow for the low angle at which they will be viewed.

Option:

When justified by engineering judgment, supplemental pavement marking symbol(s) may be placed between the Advance Warning sign and the highway-rail grade crossing.

Section 8B.21 Stop Lines

Standard:

On paved roadways at highway-rail grade crossings that are equipped with active control devices such as flashing-light signals, gates, or traffic control signals, a stop line (see Section 3B.16) shall be installed to indicate the point behind which vehicles are required to stop.

Guidance:

The stop line should be a transverse line at a right angle to the traveled way at a point where a vehicle is to stop or as near to that point as ~~possible~~ practical. edited to increase consistency The stop line should be placed approximately 2.4 m (8 ft) from the gate (if present), but no closer than 4.6 m (15 ft) from the nearest rail.

Support:

Section 8B.05 contains provisions regarding the use of stop lines or yield lines at passive grade crossings.

Section 8B.22 Dynamic Envelope Markings

Option:

Dynamic envelope markings may be used to mark the edges of the dynamic envelope where there is a highway intersection in close proximity to the highway-rail grade crossing and an engineering study determines that vehicles might stop within the dynamic envelope area.

Dynamic envelope markings may be installed at all highway-rail grade crossings, unless a Four-Quadrant Gate system (see Section 8C.05) is used.

Standard:

If used, pavement markings for indicating the dynamic envelope shall ~~conform to~~ comply with the provisions of Part 3 and shall be a 100 mm (4 in) normal solid white line or contrasting pavement color and/or contrasting pavement texture.

Guidance:

If used, dynamic envelope pavement markings should be placed on the highway 1.8 m (6 ft) from the nearest rail, installed parallel to the tracks, unless the operating railroad company advises otherwise. The pavement markings should extend across the roadway as shown in Figure 8B-9.

~~CHAPTER 8C. ILLUMINATION~~ relocated to Section 8A.05

CHAPTER ~~8D~~ 8C. FLASHING-LIGHT SIGNALS, GATES, AND TRAFFIC CONTROL SIGNALS

Section ~~8D.01~~ 8C.01 Introduction

Support:

Active traffic control systems inform ~~motorists, bicyclists, and pedestrians~~ road users of the approach or presence of trains, locomotives, or other railroad equipment at highway-rail grade crossings.

A composite drawing (see Figure 8C-1) shows a post-mounted flashing-light signal (two light units mounted in a horizontal line), a flashing-light signal mounted on an overhead structure, and an automatic gate assembly.

Option:

Post-mounted and overhead ~~-mounted~~ edited to increase consistency flashing-light signals may be used separately or in combination with each other as determined by an engineering study. Also, flashing-light signals may be used without automatic gate assemblies, as determined by an engineering study.

Standard:

The meaning of flashing-light signals and gates shall be as stated in the "Uniform Vehicle Code" (see Sections 11-701 and 11-703 of the "UVC"), which is available from the National Committee on Uniform Traffic Laws and Ordinances (see Page i for the address).

Location and clearance dimensions for flashing-light signals and gates shall be as shown in Figure 8C-1.

When there is a curb, a horizontal clearance of at least 0.6 m (2 ft) shall be provided from the face of the vertical curb to the closest part of the signal or gate arm in its upright position. When a cantilevered-arm flashing-light signal is used, the vertical clearance shall be at least 5.2 m (17 ft) above the crown of the highway to the lowest point of the signal unit.

Where there is a shoulder, but no curb, a horizontal clearance of at least 0.6 m (2 ft) from the edge of a paved or surfaced shoulder shall be provided, with a clearance of at least 1.8 m (6 ft) from the edge of the traveled way.

Where there is no curb or shoulder, the minimum horizontal clearance shall be 1.8 m (6 ft) from the edge of the traveled way.

Guidance:

Equipment housings (controller cabinets) should have a lateral ~~clearance~~ offset edited to increase consistency of at least 9 m (30 ft) from the edge of the highway, and where railroad property and conditions allow, at least 7.6 m (25 ft) from the nearest rail.

If a pedestrian route is provided, sufficient clearance from supports, posts, and gate mechanisms should be maintained for pedestrian travel.

When determined by an engineering study, a lateral escape route to the right of the highway in advance of the highway-rail grade crossing traffic control devices should be kept free of guardrail or other ground obstructions. Where guardrail is not deemed necessary or appropriate, barriers should not be used for protecting signal supports.

The same lateral ~~clearance~~ offset edited to increase consistency and roadside safety features should apply to flashing-light signal and automatic gate locations on both the right-hand edited to increase clarity and left-hand edited to increase clarity sides of the roadway.

Option:

In industrial or other areas involving only low-speed highway traffic or where signals are vulnerable to damage by turning truck traffic, guardrail may be installed to provide protection for the signal assembly.

Section ~~8D.02~~ 8C.02 Flashing-Light Signals, Post-Mounted

Standard:

The flashing-light signal assembly (shown in Figure 8C-1) on the side of the highway shall include a standard Crossbuck (R15-1) sign, and where there is more than one track, a supplemental Number of

Tracks (R15-2P) ~~sign~~ plaque, all of which indicate to motorists, bicyclists, and pedestrians the location of a highway-rail grade crossing.

Option:

Bells or other audible warning devices may be included in the assembly and may be operated in conjunction with the flashing lights to provide additional warning for pedestrians, ~~and~~ bicyclists, and/or other non-motorized road users.

Standard:

When indicating the approach or presence of a train, the flashing-light signal shall display toward approaching highway traffic two red lights mounted in a horizontal line flashing alternately.

Flashing-light signals shall be placed to the right of approaching highway traffic on all highway approaches to a highway-rail grade crossing. They shall be located laterally with respect to the highway in conformance with Figure 8C-1 except where such location would adversely affect signal visibility.

At highway-rail grade crossings with highway traffic in both directions, back-to-back pairs of lights shall be placed on each side of the tracks. On multi-lane one-way streets and divided highways, flashing-light signals shall be placed on the approach side of the highway-rail grade crossing on both sides of the roadway or shall be placed above the highway.

Each red signal unit in the flashing-light signal shall flash alternately. The number of flashes per minute for each lamp shall be 35 minimum and 65 maximum. Each lamp shall be illuminated approximately the same length of time. Total time of illumination of each pair of lamps shall be the entire operating time. Flashing-light units shall use either 200 mm (8 in) or 300 mm (12 in) nominal diameter lenses.

Guidance:

In choosing between the 200 mm (8 in) or 300 mm (12 in) nominal diameter lenses for use in highway-rail grade crossing flashing-light signals, consideration should be given to the principles stated in Section 4D.05.

Standard:

Highway-rail grade crossing flashing-light signals shall operate at a low voltage using storage batteries either as a primary or stand-by source of electrical energy. Provision shall be made to provide a source of energy for charging batteries.

Option:

Additional pairs of flashing-light units may be mounted on the same supporting post and directed toward vehicular traffic approaching the highway-rail grade crossing from other than the principal highway route, such as where there are approaching routes on highways closely adjacent to and parallel to the railroad.

Section ~~8D.03~~ 8C.03 Flashing-Light Signals, Overhead Structures

Option:

Flashing-light signals may be installed on overhead structures or cantilevered supports as shown in Figure 8C-1 where needed for additional emphasis, or for better visibility to approaching traffic, particularly on multi-lane approaches or highways with profile restrictions.

If it is determined by an engineering study that one set of flashing lights on the cantilever arm is not sufficiently visible to road users, one or more additional sets of flashing lights may be mounted on the supporting post and/or on the cantilever arm.

Standard:

Breakaway or frangible bases shall not be used for overhead structures or cantilevered supports.

Except as noted in this Section, flashing-light signals mounted overhead shall comply with the applicable provisions of Section 8C.02.

Section ~~8D.04~~ 8C.04 Automatic Gates

Support:

An automatic gate is a traffic control device used ~~as an adjunct to~~ in conjunction with flashing-light signals.

Standard:

The automatic gate (see Figure 8C-1) shall consist of a drive mechanism and a fully retroreflectorized red- and white-striped gate arm with lights. When in the down position, the gate arm shall extend across the approaching lanes of highway traffic.

In the normal sequence of operation, unless constant warning time or other advanced system requires otherwise, the flashing-light signals and the lights on the gate arm (in its normal upright position) shall be activated immediately upon detection of the approaching train. The gate arm shall start its downward motion not less than 3 seconds after the flashing-light signals start to operate, shall reach its horizontal position at least 5 seconds before the arrival of the train, and shall remain in the down position as long as the train occupies the highway-rail grade crossing.

When the train clears the highway-rail grade crossing, and if no other train is detected, the gate arm shall ascend to its upright position, following which the flashing-light signals and the lights on the gate arm shall cease operation.

Gate arms shall be fully retroreflectorized on both sides, have ~~45-degree diagonal~~ vertical stripes alternately red and white at 400 mm (16 in) intervals measured horizontally, and shall have at least three red lights as indicated in Figure 8C-1.

When activated, the gate arm light nearest the tip shall be illuminated continuously and the other lights shall flash alternately in unison with the flashing-light signals.

The entrance gate arm mechanism shall be designed to fail safe in the down position.

Guidance:

The gate arm should ascend to its upright position in not more than 12 seconds.

In its normal upright position, when no train is approaching or occupying the highway-rail grade crossing, the gate arm should be either vertical or nearly so (see Figure 8C-1).

In the design of individual installations, consideration should be given to timing the operation of the gate arm to accommodate large and/or slow-moving vehicles.

The gates should cover the approaching highway to block all motor vehicles from being driven around the gate without crossing the ~~centerline~~ center line.

Option:

Automatic gate installations may include median islands between opposing lanes on an approach to a highway-rail grade crossing.

Where gates are located in the median, additional median width may be required to provide the minimum clearance for the counterweight supports.

Section ~~8D.05~~ 8C.05 Four-Quadrant Gate Systems

Option:

Four-Quadrant Gate systems may be installed to improve safety at highway-rail grade crossings based on an engineering study when less restrictive measures, such as automatic gates and median islands, are not effective.

Standard:

A Four-Quadrant Gate system shall consist of a series of automatic gates used ~~as an adjunct to~~ in conjunction with flashing-light signals to control traffic on all lanes entering and exiting the highway-rail grade crossing.

The Four-Quadrant Gate system shall consist of a drive mechanism and fully retroreflectorized red- and white-striped gate arms with lights, and when in the down position the gate arms extend individually across the entrance and exit lanes of highway traffic as shown in Figure 8C-2. Standards contained in Sections 8C.01 through 8C.03 for flashing-light signals shall be followed for signal specifications, location, and clearance distances.

In the normal sequence of operation, unless constant warning time or other advanced system requires otherwise, the flashing-light signals and the lights on the gate arms (in their normal upright positions) shall be activated immediately upon detection of the approaching train. The gate arms for the entrance lanes of traffic shall start their downward motion not less than 3 seconds after the flashing-light signals start to operate and shall reach their horizontal position at least 5 seconds before the arrival of the train. Exit gate arm activation and downward motion shall be based on detection or

timing requirements established by an engineering study of the individual site. The gate arms shall remain in the down position as long as the train occupies the highway-rail grade crossing.

When the train clears the highway-rail grade crossing, and if no other train is detected, the gate arms shall ascend to their upright positions, following which the flashing-light signals and the lights on the gate arms shall cease operation.

Gate arm design, colors, and lighting requirements shall be in accordance with the Standards contained in Section 8C.04.

Except as noted in the Option below, the exit gate arm mechanism shall be designed to fail-safe in the up position.

At locations where gate arms are offset a sufficient distance for vehicles to drive between the entrance and exit gate arms, median islands shall be installed in accordance with the needs established by an engineering study.

Guidance:

The gate arm should ascend to its upright position in not more than 12 seconds.

Four-Quadrant Gate systems should only be used in locations with constant-warning-time train detection.

The operating mode of the exit gates should be determined based upon an engineering study, with input from the affected railroad company.

If the Timed Exit Gate Operating Mode is used, the engineering study, with input from the affected railroad company, should also determine the Exit Gate Clearance Time (see Section 8A.01).

If the Dynamic Exit Gate Operating Mode is used, vehicle intrusion detection devices should be installed to control exit gate operation based on vehicle presence within the minimum track clearance distance.

Regardless of which exit gate operating mode is used, the Exit Gate Clearance Time should be considered when determining additional time requirements for the Minimum Warning Time.

If a Four-Quadrant Gate system is used at a location that is adjacent to an intersection that could cause vehicles to queue within the minimum track clearance distance, the Dynamic Exit Gate Operating Mode should be used unless an engineering study indicates otherwise.

If a Four-Quadrant Gate system is interconnected with a highway traffic signal, backup or standby power should be considered for the highway traffic signal. Also, circuitry should be installed to prevent the highway traffic signal from leaving the track clearance green interval until all of the gates are lowered.

At locations where sufficient space is available, exit gates should be ~~set back~~ positioned downstream from the track a distance that provides a safety zone long enough to accommodate at least one design vehicle between the exit gate and the nearest rail.

Four-Quadrant Gate systems should include remote health (status) monitoring capable of automatically notifying railroad signal maintenance personnel when anomalies have occurred within the system.

Option:

Exit gate arms may fail in the down position if the highway-rail grade crossing is equipped with remote health (status) monitoring.

Four-Quadrant Gate installations may include median islands between opposing lanes on an approach to a highway-rail grade crossing.

Guidance:

Where sufficient space is available, median islands should be at least 18 m (60 ft) in length.

Section 8C.06 Wayside Horn Systems

Option:

Wayside horn systems may be installed to provide directional audible warning at highway-rail grade crossings, including pedestrian or other non-motorized facility grade crossings or other applications, as determined by a diagnostic team. Wayside horn systems may either be installed to provide supplemental audible warning where the locomotive-mounted horn is sounded or as an alternative to the sounding of a locomotive-mounted horn.

Standard:

A wayside horn system shall consist of a horn or series of horns used in conjunction with train-activated warning systems to provide audible warning of an approaching train for traffic on the highway approaches to the highway-rail grade crossing.

The wayside horn system shall be designed using fail-safe principles. A means shall be employed to verify the sound output from the wayside horn system.

If a wayside horn system is used at a highway-rail grade crossing where the locomotive-mounted horn is not sounded, the highway-rail grade crossing shall be equipped with flashing-light signals and gates.

Wayside horn systems used at highway-rail grade crossings where the locomotive-mounted horn is not sounded shall be equipped with a confirmation indicator and shall operate in conformance with 49 CFR Part 222. For other applications, the wayside horn minimum sound level shall be determined by a diagnostic team.

The wayside horn system shall simulate a train horn and produce sound output for a minimum of 15 seconds prior to the train's arrival at the highway-rail grade crossing, or simultaneously with the activation of the flashing-light signals or the descent of the gate, and shall continue to produce sound output until the lead locomotive has traversed the crossing. Where multiple tracks are present, the wayside horn system shall immediately reactivate when another train is detected before the previous train clears the crossing.

The wayside horn system shall be directed toward approaching road users; however, directing the wayside horn system toward approaching road users on adjacent roadways whose movement toward the crossing is controlled by a STOP sign or traffic control signal shall not be required.

The highway-rail grade crossing shall be equipped with constant warning time train detection circuitry unless conditions at the crossing would prevent the proper operation of the constant warning time device.

Guidance:

Wayside horn systems should be installed to provide audible warning for each roadway approach to the highway-rail grade crossing. The same lateral clearance and roadside safety features should apply to wayside horn systems as described in the Standards contained in Section 8C.01. Wayside horn systems, when mounted on a separate pole assembly, should be installed no closer than 4.6 m (15 ft) from the center of the nearest track and should be positioned to not obstruct the motorists' line of sight of the flashing-light signals.

Prior to installing any wayside horn system, the responsibility for maintenance of the system and all of the appurtenances, hardware, and software should be clearly established. The responsible agency should provide for the maintenance of the system and the appurtenances to retain the proper functioning of the device.

Option:

Wayside horn systems may include a delay of 3 to 5 seconds after the activation of the flashing-light signals before sounding.

Wayside horn systems may include remote health (status) monitoring capable of automatically notifying maintenance personnel when anomalies have occurred within the system.

Wayside horn systems may be equipped with a back-up power system.

Section ~~8D.06~~ 8C.07 Train Detection

Standard:

The devices employed in active traffic control systems shall be actuated by some form of train detection.

Train detection circuits, insofar as practical, shall be designed on the fail-safe principle.

Flashing-light signals shall operate for at least 20 seconds before the arrival of any train, except as noted in the Option below.

Option:

On tracks where all trains operate at less than 30 km/h (20 mph) and where ~~flagging is performed by~~ an employee on the ground manually stops road users from entering the crossing, a shorter signal operating time for the flashing-light signals may be used.

Additional warning time may be provided when determined by an engineering study.

Guidance:

Where the speeds of different trains on a given track vary considerably under normal operation, special devices or circuits should be installed to provide reasonably uniform notice in advance of all train movements over the highway-rail grade crossing. Special control features should be used to eliminate the effects of station stops and switching operations within approach control circuits to prevent excessive activation of the traffic control devices while trains are stopped on or switching upon the approach track control circuits.

Section ~~8D.07~~ 8C.08 Traffic Control Signals at or Near Highway-Rail Grade Crossings

Option:

Traffic control signals may be used instead of flashing-light signals to control road users at industrial highway-rail grade crossings and other places where train movements are very slow, such as in switching operations.

Standard:

The appropriate provisions of Part 4 relating to traffic control signal design, installation, and operation shall be applicable where traffic control signals are used to control road users instead of flashing-light signals at highway-rail grade crossings.

Traffic control signals shall not be used instead of flashing-light signals to control road users at a mainline highway-rail grade crossing.

Guidance:

If a highway-rail grade crossing is equipped with a flashing-light signal system and is located within 60 m (200 ft) of an intersection or midblock location controlled by a traffic control signal, the traffic control signal should be provided with preemption in accordance with Section 4D.27.

Coordination with the flashing-light signal system, queue detection, or other alternatives should be considered for traffic control signals located farther than 60 m (200 ft) from the highway-rail grade crossing. Factors to be considered should include traffic volumes, vehicle mix, vehicle and train approach speeds, frequency of trains, and queue lengths.

Except for traffic control signals interconnected with light rail transit systems, traffic control signals with railroad preemption or coordinated with flashing-light signal systems should be provided with a back-up power supply.

The highway agency or authority with jurisdiction~~,~~ and the regulatory agency with statutory authority, if applicable, ~~and the railroad company~~ should jointly determine the preemption operation and the timing of traffic control signals interconnected with ~~at~~ highway-rail grade crossings adjacent to signalized highway intersections.

Standard:

Information regarding the type of preemption and any related timing parameters shall be provided to the railroad company so that they can design the appropriate train detection circuitry.

If preemption is provided, the normal sequence of traffic control signal indications shall be preempted upon the approach of trains to avoid entrapment of vehicles on the highway-rail grade crossing by conflicting aspects of the traffic control signals and the highway-rail grade crossing flashing-light signals.

This preemption feature shall have an electrical circuit of the closed-circuit principle, or a supervised communication circuit between the control circuits of the highway-rail grade crossing warning system and the traffic control signal controller. The traffic control signal controller preemptor shall be activated via the supervised communication circuit or the electrical circuit that is normally energized by the control circuits of the highway-rail grade crossing warning system. The approach of a train to a highway-rail grade crossing shall de-energize the electrical circuit or activate the supervised communication circuit, which in turn shall activate the traffic control signal controller preemptor. This shall establish and maintain the preemption condition during the time the highway-rail grade crossing warning system is activated, except that when crossing gates exist, the preemption condition shall be maintained until the crossing gates are energized to start their upward movement. When multiple or successive preemptions occur, train activation shall receive first priority.

Guidance:

If a highway-rail grade crossing is located within 15 m (50 ft) (or within 23 m (75 ft) for a highway that is regularly used by multi-unit vehicles) of an intersection controlled by a traffic control signal, the use of pre-signals to control traffic approaching the grade crossing should be considered.

Standard:

If used, the pre-signals shall display a steady added to increase accuracy red signal indication during the track clearance portion of a signal preemption sequence to prohibit additional vehicles from crossing the railroad track.

Guidance:

Consideration should be given to using visibility-limited signal faces (see Section 4A.02) at the intersection for the downstream signal faces that control the approach that is equipped with pre-signals.

Option:

The pre-signal phase sequencing may be timed with an offset from the downstream signalized intersection such that the railroad track area and the area between the railroad track and the downstream signalized intersection is generally kept clear of stopped vehicles.

Standard:

If a pre-signal is installed at an interconnected highway-rail grade crossing near a signalized intersection, a STOP HERE ON RED (R10-6) sign shall be installed near the pre-signal or at the stop line if used. If there is a nearby signalized intersection with insufficient clear storage distance for a design vehicle, or the highway-rail grade crossing does not have gates, a No Turn on Red (R10-11, R10-11a, or R10-11b) added to increase accuracy sign (see Section 2B.59) shall be installed for the approach that crosses the railroad track.

Option:

At locations where a highway-rail grade crossing is located more than 15 m (50 ft) (or more than 23 m (75 ft) for a highway regularly used by multi-unit vehicles) from an intersection controlled by a traffic control signal, a pre-signal may be used if an engineering study determines a need.

If highway traffic signals must be located within close proximity to the flashing-light signal system, the highway traffic signals may be mounted on the same overhead structure as the flashing-light signals.

Support:

Section 4C.10 describes the Intersection Near a Highway-Rail Grade Crossing signal warrant that is intended for use at a location where the proximity to the intersection of a highway-rail grade crossing on an intersection approach controlled by a STOP or YIELD sign is the principal reason to consider installing a traffic control signal.

Section 4D.27 describes additional considerations regarding preemption of traffic control signals at or near highway-rail grade crossings.

Section 8C.09 Highway-Rail Grade Crossing(s) Within or In Close Proximity to Roundabouts, Traffic Circles, or Circular Intersections

Support:

At roundabouts, traffic circles, or circular intersections that include or are within close proximity to a highway-rail grade crossing, a queue of vehicular traffic could cause vehicles to stop on the highway-rail grade crossing.

Standard:

Where roundabouts, traffic circles, or circular intersections include or are within close proximity to a highway-rail grade crossing, an engineering study shall be made to determine if queuing could impact the highway-rail grade crossing. If traffic queues impact the highway-rail grade crossing, provisions shall be made to clear highway traffic from the highway-rail grade crossing prior to the arrival of a train.

Guidance:

Among the provisions that should be considered for keeping the crossing clear of traffic or for clearing traffic from the crossing prior to the arrival of a train are the following:

A. Elimination of the roundabout,
B. Geometric design revisions,
C. Highway-rail grade crossing warning devices,
D. Highway traffic signals,
E. Traffic metering devices,
F. Activated signs, or

G. A combination of these or other actions.

CHAPTER 8D. QUIET ZONE TREATMENTS AT HIGHWAY-RAIL GRADE CROSSINGS

Section 8D.01 Introduction

Support:

49 CFR Part 222 (Use of Locomotive Horns at Highway-Rail Grade Crossings; Final Rule) prescribes Quiet Zone requirements and treatments.

Standard:

Any traffic control device and its application where used as part of a Quiet Zone shall comply with all applicable provisions of the MUTCD.

CHAPTER 8E. PATHWAY-RAIL GRADE CROSSINGS

Section 8E.01 Purpose

Support:

Traffic control for pathway-rail grade crossings includes all signs, signals, markings, other warning devices, and their supports at pathway-rail grade crossings and along pathway approaches to a grade crossing. The function of this traffic control is to promote safety and provide effective operation of both rail and pathway traffic at pathway-rail grade crossings.

Except as specifically noted in this Chapter, sidewalks are considered to be part of a highway-rail grade crossing rather than a pathway-rail grade crossing, and are not covered by this Chapter.

Section 8E.02 Use of Standard Devices, Systems, and Practices

Guidance:

The public agency with jurisdiction over the pathway and the regulatory agency with statutory authority, if applicable, should jointly determine the need and selection of devices at a pathway-rail grade crossing.

The appropriate traffic control system to be used at a pathway-rail grade crossing should be determined by a diagnostic team.

Section 8E.03 Pathway-Rail Grade Crossing Signs and Markings

Standard:

Pathway-rail grade crossing signs shall be standard in shape, legend, and color.

Traffic control devices mounted adjacent to pathways at a height of less than 2.4 m (8 ft) measured vertically from the bottom edge of the device to the elevation of the near edge of the pathway surface shall have a minimum lateral clearance of 0.6 m (2 ft) from the near edge of the device to the near edge of the pathway (see Figure 9B-1).

The minimum mounting height for post-mounted signs on pathways shall be 1.2 m (4 ft), measured vertically from the bottom edge of the sign to the elevation of the near edge of the pathway surface (see Figure 9B-1).

Pathway-rail grade crossing traffic control devices shall be located a minimum of 3.7 m (12 ft) from the center of the nearest track.

The minimum sizes of pathway-rail grade crossing signs shall be as shown in the shared-use path column in Table 9B-1.

When overhead traffic control devices are used on pathways, the clearance from the bottom edge of the device to the pathway surface directly under the sign or device shall be at least 2.4 m (8 ft).

Guidance:

If pathway users include those who travel faster than pedestrians, such as bicyclists or skaters, the diagnostic team should consider the use of warning signs and pavement markings in advance of the pathway-rail grade crossing (see Figure 9B-7).

Section 8E.04 Stop Lines and Detectable Warnings

Guidance:

If used at pathway-rail-grade crossings, the stop line should be a transverse line at the point where a pathway user is to stop. The stop line should be placed at least 0.6 m (2 ft) upstream from the gate or counterweight (if present), and at least 3.7 m (12 ft) from the nearest rail.

If used on pathway-rail grade crossings or sidewalks at highway-rail grade crossings, detectable warnings (see Section 3B.18) should extend across the full width of the pathway or sidewalk and should be 0.6 m (2 ft) wide in the pedestrian direction of travel. Detectable warnings should be placed at least 0.6 m (2 ft) upstream from the gate or counterweight (if present), and no closer than the stop line (if present) or 3.7 m (12 ft) from the nearest rail.

Section 8E.05 Passive Devices for Pathway-Rail Grade Crossings

Standard:

Except as noted in the Option below, where active traffic control devices are not used, a Crossbuck Assembly shall be installed on each approach to a pathway-rail grade crossing.

Option:

The Crossbuck Assembly may be omitted at station crossings and on the approaches to a pathway-rail grade crossing that is located within 7.6 m (25 ft) of the traveled way at a highway-rail grade crossing.

Guidance:

The pathway user's ability to detect the presence of an approaching train should be considered in determining the type and placement of traffic control devices or design features (such as fencing or swing gates).

Nighttime visibility should be considered if design features (such as fencing or swing gates) are used to channelize pathway users.

When automatic gates and swing gates are used, the pathway should be channelized to direct users to the entrance to and exit from the pathway-rail grade crossing.

Standard:

If used, swing gates shall open away from the track(s) and return to the closed position after use.

Option:

When used in conjunction with automatic gates at pathway-rail grade crossings, swing gates may be equipped with a latching device that permits the gate to be opened only by pedestrians who are on the track side of the gate.

Refuge areas may be provided to provide a place for large numbers of pedestrians to congregate during the passage of a train.

Guidance:

Where refuge areas are provided, fencing should be installed to limit access to only the pathway-rail grade crossing.

Section 8E.06 Active Traffic Control Systems for Pathway-Rail Grade Crossings

Standard:

If an active traffic control system is used at a pathway-rail grade crossing, flashing-light signals and a bell or other audible warning device shall be provided for each direction of the pathway.

Support:

If a pathway-rail grade crossing is located within 7.6 m (25 ft) of the traveled way at a highway-rail grade crossing equipped with an active traffic control system, a separate active traffic control system for the pathway is usually not provided.

Standard:

If used at pathway-rail grade crossings, flashing-light signals shall be alternately flashing red lights that are aligned horizontally and the light units shall have a diameter of at least 100 mm (4 in). The mounting height for flashing red lights installed at pathway-rail grade crossings shall be a minimum of 1.2 m (4 ft), measured vertically from the bottom edge of the lights to the elevation of the near edge of the pathway surface.

Option:

At station crossings where more than one track is present, additional traffic control devices may be installed between the tracks as recommended by a diagnostic team.

Standard:

The mounting height for flashing red lights installed between the tracks at station crossings shall be a minimum of 0.3 m (1 ft), measured vertically from the bottom edge of the lights to the elevation of the near edge of the pathway surface.

Option:

Automatic gates may be used at pathway-rail grade crossings as recommended by a diagnostic team.

Guidance:

If used at a pathway-rail grade crossing, each automatic gate should be installed to rest a minimum of 0.9 m (3 ft) above the pathway when in the down position.

If used, the gate configuration should provide for full width coverage of the pathway on both approaches to the track.

Standard:

Where sidewalks are located between the edge of a roadway and active traffic control devices, the location, placement, and height prescribed for roadway gates shall be used (see Section 8C.04).

Guidance:

Separate automatic gates used at sidewalks should be installed to rest a minimum of 0.9 m (3 ft) above the sidewalk when in the down position.

If separate automatic gates are used for a sidewalk, a separate gate mechanism should be provided for the sidewalk gate, instead of a supplemental or auxiliary gate arm installed as a part of the same mechanism as the vehicular gate, in order to prevent a pedestrian from raising the vehicular gate at a highway-rail grade crossing.

CHAPTER 9A. GENERAL

Section 9A.01 Requirements for Bicyclist Traffic Control Devices

Support:

General information and definitions concerning traffic control devices are found in Part 1.

Section 9A.02 Scope

Support:

Part 9 covers signs, pavement markings, and highway traffic signals specifically related to bicycle operation on both roadways and shared-use paths.

Guidance:

Parts 1, 2, 3, and 4 should be reviewed for general provisions, signs, pavement markings, and signals.

Standard:

None of the bikeway designations in this Manual shall be construed to preclude permitted bicycle travel on roadways or portions of roadways that do not have bikeway designations.

Section 9A.03 Definitions Relating to Bicycles

Standard:

The following terms shall be defined as follows when used in Part 9:

1. **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.**
2. **Bicycle Lane—a portion of a roadway that has been designated by ~~signs and~~ pavement markings and, if used, signs for preferential or exclusive use by bicyclists.**
3. **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.**
4. **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. ~~Bicycle routes, which might be a combination of various types of bikeways, should establish a continuous routing.~~ relocated to Section 9B.21**
5. **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.**

Section 9A.04 Maintenance

Guidance:

All signs, signals, and markings, including those on bicycle facilities, should be properly maintained to command respect from both the motorist and the bicyclist. When installing signs and markings on bicycle facilities, an agency should be designated to maintain these devices.

Section 9A.05 Relation to Other Documents

Support:

"The Uniform Vehicle Code and Model Traffic Ordinance" published by the National Committee on Uniform Traffic Laws and Ordinances (see Section 1A.11) has provisions for bicycles and is the basis for the traffic control devices included herein.

Informational documents used during the development of the signing and marking recommendations in Part 9 include the following:

A. "Guide for Development of Bicycle Facilities," which is available from the American Association of State Highway and Transportation Officials (see Page i for the address); and
B. State and local government design guides.

~~C. "Selecting Roadway Design Treatments to Accommodate Bicycles," FHWA Publication No. FHWA-RD-92-073, which is available from the FHWA Research and Technology Report Center, 9701 Philadelphia Court, Unit Q, Lanham, MD 20106.~~

Other publications that relate to the application of traffic control devices in general are listed in Section 1A.11.

Section 9A.06 Placement Authority

Support:

Section 1A.08 contains information regarding placement authority for traffic control devices.

Section 9A.07 Meaning of Standard, Guidance, Option, and Support

Support:

The introduction to this Manual contains information regarding the meaning of the headings Standard, Guidance, Option, and Support, and the use of the words "shall," "should," and "may."

Section 9A.08 Colors

Support:

Section 1A.12 contains information regarding the color codes.

CHAPTER 9B. SIGNS

Section 9B.01 Application and Placement of Signs

Standard:

Bicycle signs shall be standard in shape, legend, and color.

All signs shall be retroreflectorized for use on bikeways, including shared-use paths and bicycle lane facilities.

Where signs serve both bicyclists and other road users, vertical mounting height and lateral placement shall be as specified in Part 2.

Where used on a shared-use path~~s~~, ~~lateral~~ no portion of a sign ~~clearance~~ or its support shall be ~~a minimum of 0.9 m (3 ft) and a maximum of 1.8 m (6 ft)~~ placed less than 0.6 m (2 ft) laterally from ~~the near edge of the sign to~~ the near edge of the path, or less than 2.4 m (8 ft) vertically over the entire width of the shared-use path (see Figure 9B-1).

Mounting height for ~~ground-~~ post-mounted edited to increase consistency signs on shared-use paths shall be a minimum of 1.2 m (4 ft) ~~and a maximum of 1.5 m (5 ft)~~, measured vertically from the bottom ~~edge~~ of the sign to the elevation of the near edge of the path surface (see Figure 9B-1).

~~**When overhead signs are used on shared-use paths, the clearance from the bottom edge of the sign to the path surface directly under the sign shall be a minimum of 2.4 m (8 ft).**~~

Guidance:

Signs for the exclusive use of bicyclists should be located so that other road users are not confused by them.

The clearance for overhead signs on shared-use paths should be adjusted when appropriate to accommodate path users requiring more clearance, such as equestrians, or typical maintenance or emergency vehicles.

Section 9B.02 Design of Bicycle Signs

Standard:

If the sign or plaque applies to motorists and bicyclists, then the size shall be as shown for conventional roads in Tables 2B-1, 2C-2, or 2D-1.

The minimum sign and plaque sizes for shared-use paths shall be those shown in Table 9B-1, and shall be used only for signs and plaques installed specifically for bicycle traffic applications. The minimum sign and plaque sizes for bicycle facilities shall not be used for signs or plaques that are placed in a location that would have any application to other vehicles.

Option:

Larger size signs and plaques may be used on bicycle facilities when appropriate (see Section 2A.11).

Guidance:

Except for size, the design of signs and plaques for bicycle facilities should be identical to that specified in this Manual for vehicular travel.

Support:

Uniformity in design of bicycle signs includes shape, color, symbols, wording, lettering, and illumination or retroreflectorization.

Section 9B.03 STOP and YIELD Signs (R1-1, R1-2)

Standard:

STOP (R1-1) signs (see Figure 9B-2) shall be installed on shared-use paths at points where bicyclists are required to stop.

YIELD (R1-2) signs (see Figure 9B-2) shall be installed on shared-use paths at points where bicyclists have an adequate view of conflicting traffic as they approach the sign, and where bicyclists are required to yield the right-of-way to that conflicting traffic.

Option:

A 750 x 750 mm (30 x 30 in) STOP sign or a 900 x 900 x 900 mm (36 x 36 x 36 in) YIELD sign may be used on shared-use paths for added emphasis.

Guidance:

Where conditions require path users, but not roadway users, to stop or yield, the STOP ~~sign~~ deleted to improve grammar or YIELD sign should be placed or shielded so that it is not readily visible to road users.

When placement of STOP or YIELD signs is considered, priority at a shared-use path/roadway intersection should be assigned with consideration of the following:

A. Relative speeds of shared-use path and roadway users,
B. Relative volumes of shared-use path and roadway traffic, and
C. Relative importance of shared-use path and roadway.

Speed should not be the sole factor used to determine priority, as it is sometimes appropriate to give priority to a high-volume shared-use path crossing a low-volume street, or to a regional shared-use path crossing a minor collector street.

When priority is assigned, the least restrictive control that is appropriate should be placed on the lower priority approaches. STOP signs should not be used where YIELD signs would be acceptable.

Section 9B.04 ~~Bicycle~~ Bike edited to increase consistency Lane Signs and Plaques (R3-17, R3-17aP, R3-17bP)

Standard:

The BIKE LANE (R3-17) sign (see Figure 9B-2), if used, shall be used only in conjunction with marked bicycle lanes as described in Section 9C.04~~, and shall be placed at periodic intervals along the bicycle lanes~~.

Guidance:

Bike Lane signs and plaques should be used in advance of the upstream end of a marked bicycle lane, at the downstream end of the bicycle lane, and at periodic intervals along the bicycle lane.

The BIKE LANE (R3-17) sign spacing should be determined by engineering judgment based on prevailing speed of bicycle and other traffic, block length, distances from adjacent intersections, and other considerations.

The AHEAD (R3-17aP) ~~sign~~ plaque (see Figure 9B-2) should be mounted directly below a R3-17 sign in advance of the ~~beginning~~ upstream end of a marked bicycle lane.

The ENDS (R3-17bP) ~~sign~~ plaque (see Figure 9B-2) should be mounted directly below a R3-17 sign at the downstream end of a marked bicycle lane.

Section 9B.05 BEGIN RIGHT TURN LANE YIELD TO BIKES Sign (R4-4)

Option:

Where motor vehicles entering an exclusive right-turn lane must weave across bicycle traffic in bicycle lanes, the BEGIN RIGHT TURN LANE YIELD TO BIKES (R4-4) sign (see Figure 9B-2) may be used to inform both the motorist and the bicyclist of this weaving maneuver (see Figures 9C-1 and 9C-3). added to assist the reader

Guidance:

The R4-4 sign should not be used when bicyclists need to move left because of a right-turn lane drop situation.

Section 9B.06 Bicycles May Use Full Lane Sign (R4-11)

Option:

The Bicycles May Use Full Lane (R4-11) sign (see Figure 9B-2) may be used on roadways where no bicycle lanes or adjacent shoulders usable by bicyclists are present and where travel lanes are too narrow for bicyclists and motor vehicles to operate side by side.

The Bicycles May Use Full Lane sign may be used in locations where it is important to inform road users that bicyclists might occupy the travel lane.

Support:

The Uniform Vehicle Code (UVC) defines a "substandard width lane" as a "lane that is too narrow for a bicycle and a vehicle to travel safely side by side within the same lane."

Section ~~9B.06~~ 9B.07 Bicycle WRONG WAY Sign and RIDE WITH TRAFFIC Plaque (R5-1b, R9-3cP)

Option:

The Bicycle WRONG WAY (R5-1b) sign and RIDE WITH TRAFFIC (R9-3cP) plaque (see Figure 9B-2) may be placed facing wrong-way bicycle traffic, such as on the left side of a roadway.

This sign and plaque may be mounted back-to-back with other signs to minimize visibility to other traffic.

Guidance:

The RIDE WITH TRAFFIC plaque should be used only in conjunction with the Bicycle WRONG WAY sign, and should be mounted directly below the Bicycle WRONG WAY sign.

Section ~~9B.07~~ 9B.08 NO MOTOR VEHICLES Sign (R5-3)

Option:

The NO MOTOR VEHICLES (R5-3) sign (see Figure 9B-2) may be installed at the entrance to a shared-use path.

Section ~~9B.08~~ 9B.09 ~~No Bicycles~~ Selective Exclusion Signs ~~(R5-6)~~

Option:

Where authorized by public officials under State or local statutes or ordinances, Selective Exclusion signs may be installed to notify road or facility users that designated types of traffic are excluded from using particular roadways or facilities.

Standard:

If used, Selective Exclusion signs shall clearly indicate the type of traffic that is excluded.

Guidance:

Where bicyclists are prohibited, the No Bicycles (R5-6) sign (see Figure 9B-2) should be installed at the entrance to the roadway or facility. added for consistency with the new first paragraph of this Section

Where pedestrians are prohibited, the No Pedestrians (R9-3) sign (see Figure 9B-2) should be installed at the entrance to the roadway or facility.

Where skaters are prohibited, the No Skaters (R9-13) sign (see Figure 9B-2) should be installed at the entrance to the roadway or facility.

Where equestrians are prohibited, the No Equestrians (R9-14) sign (see Figure 9B-2) should be installed at the entrance to the roadway or facility.

Option:

Where bicyclists, pedestrians, and motor-driven cycles are ~~also~~ all prohibited, it may be more desirable to use the R5-10a word message sign that is described in Section 2B.46.

Section ~~9B.09~~ 9B.10 No Parking Bike Lane Signs (R7-9, R7-9a)

Standard:

If the installation of signs is necessary to restrict parking, standing, or stopping in a bicycle lane, appropriate signs as described in Sections 2B.53 through 2B.55, or the No Parking Bike Lane (R7-9 or R7-9a) signs (see Figure 9B-2) shall be installed.

Section ~~9B.10~~ 9B.11 Bicycle Regulatory Signs (R9-5, R9-6, ~~R10-3~~ R10-4, R10-24, R10-25, and R10-26)

Option:

The R9-5 sign (see Figure 9B-2) may be used where the crossing of a street by bicyclists is controlled by pedestrian signal indications.

Where it is not intended for bicyclists to be controlled by pedestrian signal indications, the ~~R10-3~~ R10-4, R10-24, or R10-26 sign (see Figure 9B-2 and Section 2B.59) may be used.

Guidance:

If used, the R9-5, ~~or R10-3~~ R10-4, R10-24, or R10-26 signs should be installed near the edge of the sidewalk in the vicinity of where bicyclists will be crossing the street.

Option:

If bicyclists are crossing a roadway where In-Roadway Warning Lights (see Section 4N.02) have been provided, the R10-25 sign (see Figure 9B-2) may be used.

The R9-6 sign (see Figure 9B-2) may be used where a bicyclist is required to cross or share a facility used by pedestrians and is required to yield to the pedestrians.

Section ~~9B.11~~ 9B.12 Shared-Use Path Restriction Sign (R9-7)

Option:

The Shared-Use Path Restriction (R9-7) sign (see Figure 9B-2) may be installed on facilities that are to be shared by pedestrians and bicyclists. The symbols may be switched as appropriate.

A designated pavement area may be provided for each mode of travel (see Section 9C.03).

Section ~~9B.12~~ 9B.13 Bicycle Signal Actuation Sign (R10-22)

Option:

The Bicycle Signal Actuation (R10-22) sign (see Figure 9B-2) may be installed at signalized intersections where markings are used to indicate the location where a bicyclist is to be positioned to actuate the signal (see Section 9C.05).

Guidance:

If the Bicycle Signal Actuation sign is installed, it should be placed at the roadside adjacent to the marking to emphasize the connection between the marking and the sign.

Section ~~9B.13~~ 9B.14 Other Regulatory Signs

Option:

Other regulatory signs described in Chapter 2B may be installed on bicycle facilities as appropriate.

Section ~~9B.14~~ 9B.15 Turn or Curve Warning Signs (W1 Series)

Guidance:

To warn bicyclists of unexpected changes in shared-use path direction, appropriate turn or curve (W1-1 through W1-7) signs (see Figure 9B-3) should be used.

The W1-1 through W1-5 signs should be installed no less than 15 m (50 ft) in advance of the beginning of the change of alignment.

Section ~~9B.15~~ 9B.16 Intersection Warning Signs (W2 Series)

Option:

Intersection Warning (W2-1 through W2-5) signs (see Figure 9B-3) may be used on a roadway, street, or shared-use path in advance of an intersection to indicate the presence of an intersection and the possibility of turning or entering traffic.

Guidance:

When engineering judgment determines that the visibility of the intersection is limited on the shared-use path approach, Intersection Warning signs should be used.

Intersection Warning signs should not be used where the shared-use path approach to the intersection is controlled by a STOP sign, a YIELD sign, or a traffic control signal.

Section ~~9B.16~~ 9B.17 Bicycle Surface Condition Warning Sign (W8-10)

Option:

The Bicycle Surface Condition Warning (W8-10) sign (see Figure 9B-3) may be installed where roadway or shared-use path conditions could cause a bicyclist to lose control of the bicycle.

Signs warning of other conditions that might be of concern to bicyclists, including BUMP (W8-1), DIP (W8-2), PAVEMENT ENDS (W8-3), and any other word message that describes conditions that are of concern to bicyclists, may also be used.

A supplemental plaque may be used to clarify the specific type of surface condition.

Section ~~9B.17~~ 9B.18 Bicycle Warning and Combined Bicycle/Pedestrian Signs (W11-1 and W11-15)

Support:

The Bicycle Warning (W11-1) sign (see Figure 9B-3) alerts the road user to unexpected entries into the roadway by bicyclists, and other crossing activities that might cause conflicts. These conflicts might be relatively confined, or might occur randomly over a segment of roadway.

Option:

The combined Bicycle/Pedestrian (W11-15) sign (see Figure 9B-3) 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 XING (W11-15P) supplemental plaque (see Figure 9B-3) may be mounted below the W11-15 sign.

A supplemental plaque with the legend AHEAD or ~~X~~XX METERS (~~XXX~~ FEET) may be used with the Bicycle Warning or combined Bicycle/Pedestrian sign.

Guidance:

If used in advance of a specific crossing point, the Bicycle Warning or combined Bicycle/Pedestrian sign should be placed at a distance in advance of the crossing location that conforms with the guidance given in Table 2C-4.

Standard:

Bicycle Warning and combined Bicycle/Pedestrian signs, when used at the location of the crossing, shall be supplemented with a diagonal downward pointing arrow (W16-7P) plaque (see Figure 9B-3) to show the location of the crossing.

~~Option~~ Guidance:

A fluorescent yellow-green background color with a black legend and border ~~may~~ should edited to increase consistency be used for Bicycle Warning and combined Bicycle/Pedestrian signs and supplemental plaques.

~~Guidance:~~

When the fluorescent yellow-green background color 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 zone or area should be avoided.

Section ~~9B.18~~ 9B.19 Other Bicycle Warning Signs

Option:

Other bicycle warning signs (see Figure 9B-3) such as ~~BIKEWAY~~ PATH NARROWS (W5-4a) and Hill (W7-5) may be installed on ~~bicycle facilities~~ shared-use paths to warn bicyclists of conditions not readily apparent.

In situations where there is a need to warn motorists to watch for bicyclists traveling along the highway, the SHARE THE ROAD (W16-1P) plaque (see Figure 9B-3) may be used in conjunction with the W11-1 sign.

Guidance:

If used, other advance bicycle warning signs should be installed no less than 15 m (50 ft) in advance of the beginning of the condition.

Where temporary traffic control zones are present on bikeways, appropriate signs from Part 6 should be used.

Option:

Other warning signs described in Chapter 2C may be installed on bicycle facilities as appropriate.

Section ~~9B.19~~ 9B.20 Bicycle ~~Route~~ Guide Signs (D1-1b, D1-1c, D1-2b, D1-2c, D1-3b, D1-3c, D11-1, D11-1c)

~~Guidance~~ Option:

~~If used, Bicycle~~ Bike edited to increase consistency Route Guide (D11-1) signs (see Figure 9B-4) ~~should~~ may be provided ~~at decision points~~ along designated bicycle routes~~, including signs~~ to inform bicyclists of bicycle route direction changes and ~~confirmation signs for~~ to confirm route direction, distance, and destination.

If used, ~~Bicycle~~ Bike edited to increase consistency Route Guide signs ~~should~~ may be repeated at regular intervals so that bicyclists entering from side streets will have an opportunity to know that they are on a

bicycle route. Similar guide signing ~~should~~ may be used for shared roadways with intermediate signs placed for bicyclist guidance.

Alternative Bike Route Guide (D11-1c) signs may be used to provide information on route direction, destination, and/or route name in place of the "BIKE ROUTE" wording on the D11-1 sign (see Figures 9B-4 and 9B-6).

Destination (D1-1, D1-1a) signs, Street Name (D3) signs, or Bicycle Destination (D1-1b, D1-1c, D1-2b, D1-2c, D1-3b, D1-3c) signs (see Figure 9B-4) may be installed to provide direction, destination, and distance information as needed for bicycle travel. If several destinations are to be shown at a single location, they may be placed on a single panel with an arrow (and the distance, if desired) for each name. If more than one destination lies in the same direction, a single arrow may be used for the destinations.

Guidance:

Adequate separation should be made between any destination or group of destinations in one direction and those in other directions by suitable design of the arrow, spacing of lines of legend, heavy lines entirely across the panel, or separate panels.

Standard:

An arrow pointing to the right, if used, shall be at the extreme right-hand side of the sign. An arrow pointing left or up, if used, shall be at the extreme left-hand side of the sign. The distance numerals, if used, shall be placed to the right of the destination names.

On Bicycle Destination signs, a bicycle symbol shall be placed next to each destination or group of destinations. If an arrow is at the extreme left, the bicycle symbol shall be placed to the right of the respective arrow.

Guidance:

Unless a sloping arrow will convey a clearer indication of the direction to be followed, the directional arrows should be horizontal or vertical.

The bicycle symbol should be to the left of the destination legend.

If several individual name panels are assembled into a group, all panels in the assembly should have the same horizontal width.

Support:

Figure 9B-5 shows an example of the signing for the beginning and end of a designated bicycle route on a shared-use path. Figure 9B-6 shows an example of signing for an on-roadway bicycle route. Figure 9B-7 shows examples of signing and markings for shared-use paths.

Section ~~9B.20~~ 9B.21 Bicycle Route Signs (M1-8, M1-8a, M1-9)

Option:

To establish a unique identification (route designation) for a State or local bicycle route, the Bicycle Route (M1-8, M1-8a) sign (see Figure 9B-4) may be used.

Standard:

The Bicycle Route (M1-8) sign shall contain a route designation and shall have a green background with a retroreflectorized white legend and border. The Bicycle Route (M1-8a) sign shall contain the same information as the M1-8 sign and in addition shall include a pictograph or words that are associated with the route or with the agency that has jurisdiction over the route.

~~Option~~ Guidance:

Bicycle routes, which might be a combination of various types of bikeways, should establish a continuous routing. relocated from Definition 4 in Section 9A.03

Where a designated bicycle route extends ~~for long distances~~ through two or more States, a coordinated submittal by the affected States for an assignment of ~~an Interstate~~ a U.S. Bicycle Route number designation ~~may~~ should be sent to the American Association of State Highway and Transportation Officials (see Page i for the address).

Standard:

The ~~Interstate~~ U.S. Bicycle Route (M1-9) sign (see Figure 9B-4) shall contain the ~~assigned~~ route ~~number~~ designation as assigned by AASHTO and shall have a black legend and border with a retroreflectorized white background.

Guidance:

If used, the Bicycle Route or ~~Interstate~~ U.S. Bicycle Route signs should be placed at intervals frequent enough to keep bicyclists informed of changes in route direction and to remind motorists of the presence of bicyclists.

Option:

Bicycle Route or ~~Interstate~~ U.S. Bicycle Route signs may be installed on shared roadways or on shared-use paths to provide guidance for bicyclists.

The Bicycle Route Guide (D11-1) sign (see Figure 9B-4) may be installed where no unique designation of routes is desired.

Section ~~9B.21~~ 9B.22 ~~Destination Arrow and Supplemental Plaque Signs for~~ Bicycle Route Sign~~s~~ Auxiliary Plaques

Option:

Auxiliary plaques may be used in conjunction with Bike Route Guide signs, Bicycle Route signs, or U.S. Bicycle Route signs as needed.

Guidance:

If used, ~~the M4-11 through M4-13 supplemental~~ Junction (M2-1), Cardinal Direction (M3 series), and Alternative Route (M4 series) auxiliary plaques (see Figure 9B-4) ~~may~~ should be mounted above the appropriate ~~Bicycle~~ Bike edited to increase consistency Route Guide signs, Bicycle Route signs, or ~~Interstate~~ U.S. Bicycle Route signs.

If used, ~~the appropriate arrow (M7-1 through M7-7) sign~~ Advance Turn Arrow (M5 series) and Directional Arrow (M6 series) auxiliary plaques (see Figure 9B-4) should be ~~placed~~ mounted below the appropriate ~~Bicycle~~ Bike edited to increase consistency Route Guide sign, Bicycle Route sign, or ~~Interstate~~ U.S. Bicycle Route sign.

Except for the M4-8 plaque, all route sign auxiliary plaques should match the color combination of the route sign that they supplement.

~~**Standard:**~~

~~**The arrow signs and supplemental plaques used with the D11-1 or M1-8 signs shall have a white legend and border on a green background.**~~

~~**The arrow signs and supplemental plaques used with the M1-9 sign shall have a white legend and border on a black background.**~~

Route sign auxiliary plaques carrying word legends that are used on bicycle routes should have a minimum size of 300 x 150 mm (12 x 6 in). Route sign auxiliary plaques carrying arrow symbols that are used on bicycle routes should have a minimum size of 300 x 225 mm (12 x 9 in).

Option:

With route signs of larger sizes, auxiliary plaques may be suitably enlarged, but not such that they exceed the width of the route sign.

A route sign and any auxiliary plaques used with it may be combined on a single panel.

Destination (D1-1b and D1-1c) signs (see Figure 9B-4) may be mounted below ~~Bicycle~~ Bike edited to increase consistency Route Guide signs, Bicycle Route signs, or ~~Interstate~~ U.S. Bicycle Route signs to furnish additional information, such as directional changes in the route, or intermittent distance and destination information. relocated to end of Section

Section ~~9B.22~~ 9B.23 Bicycle Parking Area Sign (D4-3)

Option:

The Bicycle Parking Area (D4-3) sign (see Figure 9B-4) may be installed where it is desirable to show the direction to a designated bicycle parking area. The arrow may be reversed as appropriate.

Standard:

The legend and border of the Bicycle Parking Area sign shall be green on a retroreflectorized white background.

Section 9B.24 Reference Location Signs (D10-1 through D10-3) and Intermediate Reference Location Signs (D10-1a through D10-3a)

Support:

There are two types of reference location signs:

A. Reference Location (D10-1, 2, and 3) signs show an integer distance point along a shared-use path; and

B. Intermediate Reference Location (D10-1a, 2a, and 3a) signs also show a decimal between integer distance points along a shared-use path.

Option:

Reference Location (D10-1 to D10-3) signs (see Figure 9B-4) may be installed along any section of a shared-use path to assist users in estimating their progress, to provide a means for identifying the location of emergency incidents and crashes, and to aid in maintenance and servicing.

To augment the reference location sign system, Intermediate Reference Location (D10-1a to D10-3a) signs (see Figure 9B-4), which show the tenth of a kilometer (mile) with a decimal point, may be installed at one tenth of a kilometer (mile) intervals, or at some other regular spacing.

Standard:

When Intermediate Reference Location (D10-1a to D10-3a) signs are used to augment the reference location sign system, the reference location sign at the integer kilometer (mile) point shall display a decimal point and a zero numeral.

When placed on shared-use paths, reference location signs shall contain 113 mm (4.5 in) white numerals on a green background that is at least 150 mm (6 in) wide with a white border. The signs shall contain the abbreviation km (MILE) in 56 mm (2.25 in) white letters.

Reference location signs shall have a minimum mounting height of 0.6 m (2 ft), measured vertically from the bottom of the sign to the elevation of the near edge of the shared-use path, and shall not be governed by the mounting height requirements prescribed in Section 9B.01.

Option:

Reference location signs may be installed on one side of the shared-use path only and may be installed back-to-back.

If a reference location sign cannot be installed in the correct location, it may be moved in either direction as much as 15 m (50 ft).

Guidance:

If a reference location sign cannot be placed within 15 m (50 ft) of the correct location, it should be omitted.

Zero distance should begin at the south and west terminus points of shared-use paths.

Support:

Section 2I.02 contains additional information regarding reference location signs.

Section 9B.25 Mode-Specific Guide Signs for Shared-Use Paths (D11-1a, D11-1b, D11-2, D11-3, D11-4)

Option:

Where separate pathways are provided for different types of users, Mode-Specific Guide (D11-1a, D11-1b, D11-2, D11-3, D11-4) signs (see Figure 9B-4) may be used to guide different types of users to the traveled way that is intended for their respective modes.

Mode-Specific Guide signs may be installed at the entrance to shared-use paths where the signed mode(s) are permitted or encouraged, and periodically along these facilities as needed.

The Bicycles Permitted (D1-11a) sign, when combined with the BIKE ROUTE supplemental plaque (D11-1bP), may be substituted for the D11-1 Bicycle Route Guide sign on paths and shared roadways.

When some, but not all, non-motorized user types are encouraged or permitted on a shared-use path, Mode-Specific Guide signs may be placed in combination with each other, and in combination with signs (see Section 9B.08) that prohibit travel by particular modes.

Support:

Figure 9B-8 shows an example of signing where separate pathways are provided for different non-motorized user types.

Section 9B.26 Object Markers text for this new Section was relocated from Section 9C.03

Option:

Fixed objects adjacent to shared-use paths may be marked with Type 1, Type 2, or Type 3 object markers ~~(Type 1, 2, or 3)~~ (see Chapter 2L).

Standard:

All object markers shall be retroreflective.

Markers such as those described in Section 2L.01 shall also be used on shared-use paths, if needed.

Obstructions in the traveled way of a shared-use path shall be marked with retroreflectorized material or appropriate object markers.

On Type 3 markers, the alternating black and retroreflective yellow stripes shall be sloped down at an angle of 45 degrees toward the side on which traffic is to pass the obstruction.

CHAPTER 9C. MARKINGS

Section 9C.01 Functions of Markings

Support:

Markings indicate the separation of the lanes for road users, assist the bicyclist by indicating assigned travel paths, indicate correct position for traffic control signal actuation, and provide advance information for turning and crossing maneuvers.

Section 9C.02 General Principles

Guidance:

Bikeway design guides (see Section 9A.05) should be used when designing markings for bicycle facilities ~~(see Section 9A.05)~~.

Standard:

Markings used on bikeways shall be retroreflectorized.

Guidance:

Pavement marking symbols and/or word messages should be used in bikeways where appropriate. Consideration should be given to selecting pavement marking materials that will minimize loss of traction for bicycles under wet conditions.

Standard:

The colors, width of lines, patterns of lines, and symbols used for marking bicycle facilities shall be as defined in Sections 3A.04, 3A.05, and 3B.20.

Support:

Figures 9B-7 and 9C-1 through 9C-9 show examples of the application of lines, word messages, and symbols on designated bikeways.

Option:

A dotted line may be used to define a specific path for a bicyclist crossing an intersection (see Figure 9C-1) as described in Sections 3A.05 and 3B.08.

Section 9C.03 Marking Patterns and Colors on Shared-Use Paths last five paragraphs were relocated to a new Section 9B.26

Option:

Where shared-use paths are of sufficient width to designate two minimum width lanes, a solid yellow line may be used to separate the two directions of travel where passing is not permitted, and a broken yellow line may be used where passing is permitted (see Figure 9C-2).

Guidance:

Broken lines used on shared-use paths should have the usual 1-to-3 segment-to-gap ratio. A nominal 0.9 m (3 ft) segment with a 2.7 m (9 ft) gap should be used.

If conditions make it desirable to separate two directions of travel on shared-use paths at particular locations, a solid yellow line should be used to indicate no passing and no traveling to the left of the line.

Markings as shown in Figure 9C-2 should be used at the location of obstructions in the center of the path, including vertical elements intended to physically prevent unauthorized motor vehicles from entering the path.

Option:

A solid white line may be used on shared-use paths to separate different types of users traveling in the same direction. The R9-7 sign (see Figure 9B-2) may be used to supplement the solid white line.

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

Section 9C.04 Markings For Bicycle Lanes

~~Guidance:~~

~~Longitudinal pavement markings should be used to define bicycle lanes.~~

Support:

Pavement markings designate that portion of the roadway for preferential use by bicyclists. Markings inform all road users of the restricted nature of the bicycle lane.

Examples of bicycle lane markings at right-turn lanes are shown in Figures 9C-1, 9C-3, and 9C-4. Examples of pavement markings for bicycle lanes on a two-way street are shown in Figure 9C-5. Pavement symbols and markings for bicycle lanes are shown in Figure 9C-6.

Standard:

Longitudinal pavement markings shall be used to define bicycle lanes.

~~If used, the bicycle lane symbol marking (see Figure 9C-6) shall be placed immediately after an intersection and at other locations as needed.~~ **The bicycle lane symbol marking shall be white. If the bicycle lane symbol marking is used in conjunction with other word or symbol messages, it shall precede them.**

~~If the word or symbol pavement markings shown in Figure 9C-6 are used, Bicycle Lane signs (see Section 9B.04) shall also be used, but the signs need not be adjacent to every symbol to avoid overuse of the signs.~~

A through bicycle lane shall not be positioned to the right of a right turn only lane.

Support:

A bicyclist continuing straight through an intersection from the right of a right-turn lane would be inconsistent with normal traffic behavior and would violate the expectations of right-turning motorists.

Guidance:

If used, the bicycle lane symbol marking (see Figure 9C-6) should be placed at the beginning of a bicycle lane and at periodic intervals along the bicycle lane based on engineering judgment.

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

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

Posts or raised pavement markers should not be used to separate bicycle lanes from adjacent travel lanes.

Support:

Using raised devices creates a collision potential for bicyclists by placing fixed objects immediately adjacent to the travel path of the bicyclist. In addition, raised devices can prevent vehicles turning right from merging with the bicycle lane, which is the preferred method for making the right turn. Raised devices used to define a bicycle lane can also cause problems in cleaning and maintaining the bicycle lane.

Option:

If the word or symbol pavement markings shown in Figure 9C-6 are used, Bike Lane signs (see Section 9B.04) may also be used, but to avoid overuse of the signs not necessarily adjacent to every symbol.

Standard:

Bicycle lanes shall not be provided on the circular roadway of a roundabout ~~intersection~~ or other circular intersection.

Section 9C.05 Bicycle Detector Symbol

Option:

A symbol (see Figure 9C-7) may be placed on the pavement indicating the optimum position for a bicyclist to actuate the signal.

An R10-22 sign (see Section 9B.13 and Figure 9B-2) may be installed to supplement the pavement marking.

Section 9C.06 Pavement Markings for Obstructions

Guidance:

In roadway situations where it is not practical to eliminate a drain grate or other roadway obstruction that is inappropriate for bicycle travel, white markings applied as shown in Figure 9C-8 should be used to guide bicyclists around the condition.

Section 9C.07 Shared Lane Marking

Option:

The Shared Lane Marking shown in Figure 9C-9 may be used to:

A. Assist bicyclists with lateral positioning in a shared lane with on-street parallel parking in order to reduce the chance of a bicyclist's impacting the open door of a parked vehicle,
B. Assist bicyclists with lateral positioning in lanes that are too narrow for a motor vehicle and a bicycle to travel side by side within the same traffic lane,
C. Alert road users of the lateral location bicyclists are likely to occupy within the traveled way,
D. Encourage safe passing of bicyclists by motorists, and
E. Reduce the incidence of wrong-way bicycling.

Guidance:

The Shared Lane Marking should not be placed on roadways that have a speed limit above 50 km/h or 35 mph.

Standard:

Shared Lane Markings shall not be used on shoulders or in designated bicycle lanes.

If used in a shared lane with on-street parallel parking, Shared Lane Markings shall be placed so that the centers of the markings are at least 3.4 m (11 ft) from the face of the curb, or from the edge of the pavement where there is no curb.

Guidance:

If used on a street without on-street parking that has an outside travel lane that is less than 4.3 m (14 ft) wide, the centers of the Shared Lane Markings should be at least 1.2 m (4 ft) from the face of the curb, or from the edge of the pavement where there is no curb.

If used, the Shared Lane Marking should be placed immediately after an intersection and spaced at intervals not greater than 75 m (250 ft) thereafter.

CHAPTER 9D. SIGNALS

Section 9D.01 Application

Support:

Part 4 contains information regarding signal warrants and other requirements relating to signal installations.

Option:

For purposes of signal warrant evaluation, bicyclists may be counted as either vehicles or pedestrians.

Section 9D.02 Signal Operations for Bicycles

Standard:

At installations where visibility-limited signal faces are used, signal faces shall be adjusted so bicyclists for whom the indications are intended can see the signal indications. If the visibility-limited signal faces cannot be aimed to serve the bicyclist, then separate signal faces shall be provided for the bicyclist.

On bikeways, signal timing and actuation shall be reviewed and adjusted to consider the needs of bicyclists.

CHAPTER 10A. GENERAL

Section 10A.01 Introduction

Support:

Part 10 provides standards and guidelines for the design, installation, and operation of traffic control devices at grade crossings of highway traffic and light rail transit vehicles to ~~facilitate the reasonably safe, orderly,~~ promote safety and to provide for the effective, integrated movement of all traffic. The principles in Section 8A.01 are the same but, because light rail vehicles sometimes operate along streets and highways in mixed traffic with automotive vehicles, the traffic controls and associated standards and guidelines for highway-light rail transit grade crossings presented in Part 10 can be different than those presented in Part 8.

Light rail transit is a mode of metropolitan transportation that employs light rail transit vehicles (commonly known as light rail vehicles, streetcars, or trolleys) that operate on rails in streets in mixed traffic, in semiexclusive rights-of-way, or in exclusive rights-of-way. Grade crossings with light rail transit can occur at intersections or at midblock locations, including public and private driveways.

An initial educational campaign along with an ongoing program to continue to educate new drivers is beneficial when introducing light rail operations to an area and, hence, new traffic control devices.

Light rail alignments can be grouped into one of the following three types:

A. Exclusive: A light rail transit right-of-way that is grade-separated or protected by a fence or traffic barrier. Motor vehicles, pedestrians, and bicycles are prohibited within the right-of-way. Subways and aerial structures are included within this group. This type of alignment does not have grade crossings and is not further addressed in Part 10.
B. Semiexclusive: A light rail transit alignment that is in a separate right-of-way or along a street or railroad right-of-way where motor vehicles, pedestrians, and bicycles have limited access and cross at designated locations only.
C. Mixed-Use: An alignment where light rail transit operates in mixed traffic with all types of road users. This includes streets, transit malls, and pedestrian malls where the right-of-way is shared.

Standard:

Where light rail transit and railroads use the same tracks or adjacent tracks, the traffic control devices, systems, and practices for highway-rail grade crossings described in Part 8 shall be used.

Support:

Section 8A.01 contains a set of definitions, most of which also apply to Part 10.

Section 10A.02 Use of Standard Devices, Systems, and Practices

Support:

Because of the large number of significant variables to be considered, no single standard system of traffic control devices is universally applicable for all highway-light rail transit grade crossings.

Guidance:

The appropriate traffic control system to be used at a highway-light rail transit grade crossing should be determined by an engineering study conducted by the transit or highway agency in cooperation with other appropriate State and local organizations.

Standard:

Traffic control devices, systems, and practices shall be consistent with the design and application of the Standards contained herein.

The traffic control devices, systems, and practices described herein shall be used at all highway-light rail transit grade crossings.

Before any new highway-light rail transit grade crossing traffic control system is installed or modifications are made to an existing system, approval shall be obtained from the local agencies having statutory authority to grant such approval.

Guidance:

To stimulate effective responses from vehicle operators and pedestrians, these devices, systems, and practices should use the five basic considerations employed generally for traffic control devices and described fully in Section 1A.02: design, placement, operation, maintenance, and uniformity.

Support:

Many other details of highway-light rail transit grade crossing traffic control systems that are not set forth in Part 10 are contained in the publications listed in Section 1A.11.

Section 10A.03 Uniform Provisions

Standard:

All signs used in highway-light rail transit grade crossing traffic control systems shall be retroreflectorized or illuminated as described in Section 2A.07 to show the same shape and similar color to an approaching road user during both day and night.

No sign or signal shall be located in the center of an undivided highway, except in a raised island.

Guidance:

~~Such~~ Any signs or signals located in a raised island in the center of an undivided highway should be installed with a clearance of at least 0.6 m (2 ft) from outer edge of the raised island to the nearest edge of the sign or signal, except as ~~allowed~~ permitted edited to increase consistency in Section 2A.19.

Where the distance between tracks, measured along the highway between the inside rails, exceeds 30 m (100 ft), additional signs or other appropriate traffic control devices should be used.

Section 10A.04 Highway-Light Rail Transit Grade Crossing Elimination

Guidance:

Because highway-light rail transit grade crossings are a potential source of crashes and congestion, agencies should conduct engineering studies to determine the cost and benefits of eliminating these crossings.

Standard:

When a highway-light rail transit grade crossing is eliminated, the traffic control devices for the crossing shall be removed.

If the existing traffic control devices at a multiple-track highway-light rail transit grade crossing become improperly placed or inaccurate because of the removal of some of the tracks, the existing devices shall be relocated and/or modified.

Guidance:

Where a roadway is removed from a highway-light rail transit grade crossing, the roadway approaches in the light rail transit right-of-way should also be removed and appropriate signs should be placed at the roadway end in accordance with Section 2L.04.

Where light rail transit is eliminated at a highway-light rail transit grade crossing, the tracks should be removed or paved over.

Option:

Based on engineering judgment, the TRACKS OUT OF SERVICE (R8-9) sign (see Figure 10C-3) may be temporarily installed until the tracks are removed or paved over. The length of time before the tracks will be removed or paved over may be considered in making the decision as to whether to install the sign.

Section ~~10 C.22~~ 10A.05 Illumination at Highway-Light Rail Transit Crossings relocated from Section 10C.22

~~Guidance~~ Support:

Illumination is sometimes installed at or adjacent to a highway-light rail transit grade crossing in order to provide better nighttime visibility of the light rail transit vehicles and the highway-light rail transit grade crossing (for example, where a substantial amount of light rail transit operations are conducted at night~~,~~ or where crash history indicates that drivers experience difficulty in seeing trains or traffic control devices during hours of darkness) ~~illumination at and adjacent to the highway-light rail transit grade crossing should be considered~~.

~~Support:~~

Recommended types and locations of luminaires for illuminating highway-rail (light rail transit) grade crossings are contained in the American National Standards Institute's (ANSI) "Practice for Roadway Lighting RP-8," which is available from the Illuminating Engineering Society (see Section 1A.11).

Section ~~10A.05~~ 10A.06 Temporary Traffic Control Zones

Support:

Temporary traffic control planning provides for continuity of operations (such as movement of traffic, pedestrians and bicycles, transit operations, and access to property/utilities) when the normal function of a roadway at a highway-light rail transit grade crossing is suspended because of temporary traffic control operations.

Standard:

Temporary traffic control operations on highways with highway-light rail transit grade crossings shall be as outlined in Part 6.

When a highway-light rail transit grade crossing exists either within or in the vicinity of a temporary traffic control zone, lane restrictions, flagging (see Chapter 6E), or other operations shall not be performed in a manner that would cause vehicles to stop on the light rail transit tracks, unless a uniformed added to increase accuracy law enforcement officer or flagger is provided at the highway-light rail transit grade crossing to minimize the possibility of vehicles stopping on the tracks, even if automatic warning devices are in place.

Guidance:

The agencies responsible for the operation of the light rail transit and highway should be contacted when the initial planning begins for any temporary traffic control zone that ~~may~~ might directly or indirectly influence the flow of traffic on mixed-use facilities where light rail transit and road users operate. Responsible agencies, along with others affected, such as emergency services and businesses, should meet to plan appropriate traffic detours and the necessary signing, marking, and flagging requirements for operations during temporary traffic control activities. Consideration should be given to the length of time that the grade crossing is to be closed, roadway classification, type of vehicle and traffic affected, the time of day, and the materials and techniques of repair.

Temporary traffic control operations should minimize the inconvenience, delay, and crash potential to affected traffic. Prior notice should be given to affected public or private parties, emergency services, businesses, and road users before the free movement of vehicles or light rail transit is infringed on or blocked.

Temporary traffic control activities should not be permitted to extensively prolong the closing of a grade crossing.

The width, grade, alignment, and riding quality of the highway surface at a light rail transit crossing should, at a minimum, be restored to correspond with the quality of the approaches to the highway-light rail transit grade crossing.

CHAPTER 10B. HIGHWAY-LIGHT RAIL TRANSIT GRADE CROSSING CONTROL SYSTEMS

Section 10B.01 Introduction

Support:

The combination of devices selected or installed at a specific highway-light rail transit grade crossing is referred to as a Light Rail Transit Traffic Control System.

For the safety and integrity of operations by highway and light rail transit users, the highway agency with jurisdiction, the regulatory agency with statutory authority, if applicable, and the light rail transit authority jointly determine the need and selection of traffic control devices and the assignment of priority to light rail transit at a highway-light rail transit grade crossing.

The normal rules of the road and traffic control priority identified in the "Uniform Vehicle Code" govern the order assigned to the movement of vehicles at an intersection unless the local agency determines that it is appropriate to assign a higher priority to light rail transit. Examples of different types of light rail transit priority control include separate traffic control signal phases for light rail transit movements, restriction of movement of roadway vehicles in favor of light rail transit operations, and preemption of highway traffic signal control to accommodate light rail transit movements.

Standard:

Highway-light rail transit grade crossings in semiexclusive alignments shall be equipped with a combination of automatic gates and flashing-light signals, or flashing-light signals only, or traffic control signals, unless an engineering study indicates that the use of Crossbuck Assemblies, STOP signs, or YIELD~~, or advance warning~~ signs alone would be adequate.

Option:

Highway-light rail transit grade crossings in mixed-use alignments may be equipped with traffic control signals unless an engineering study indicates that the use of Crossbuck Assemblies, STOP signs, or YIELD~~, or advance warning~~ signs alone would be adequate.

Support:

Section 8B.03 contains information regarding the use and placement of Crossbuck Assemblies. Section 10C.04 describes the appropriate conditions for the use of STOP or YIELD signs alone at a highway-light rail transit grade crossing.

CHAPTER 10C. SIGNS~~, ILLUMINATION,~~ AND MARKINGS

Section 10C.01 Purpose

Support:

Signs and markings regulate, warn, and guide the road users so that they, as well as light rail transit vehicle operators, can take appropriate action.

Standard:

The design and location of signs shall ~~conform to~~ comply with the provisions of Part 2.

Support:

Section 8B.02 contains information regarding the sizes of signs for grade crossings.

Section 10C.02 ~~Highway-Rail Grade Crossing (Crossbuck) Sign (R15-1) and Number of Tracks Sign (R15-2)~~ Use of Crossbuck Assemblies at Passive Highway-Light Rail Transit Grade Crossings

Standard:

Except as noted in the Option below, the Highway-Rail Grade Crossing (R15-1) sign, commonly identified as the Crossbuck sign, shall be retroreflectorized white with the words RAILROAD CROSSING in black lettering, mounted as shown in Figure 10C-1.

~~**As a minimum, one Crossbuck sign shall be used on each highway approach to every highway-light rail transit grade crossing on a semiexclusive alignment, alone or in combination with other traffic control devices.**~~

Option:

At non-signalized crossings, the Crossbuck sign may be retroreflectorized white with the words RAILROAD CROSSING in retroreflectorized red lettering, mounted as shown in Figure 10C-1.

A Crossbuck sign may be used on a highway approach to a highway-light rail transit grade crossing on a semiexclusive or mixed-use alignment, alone or in combination with other traffic control devices.

Standard:

If automatic gates are not present where a Crossbuck sign is being used and if there are two or more tracks at the highway-light rail transit grade crossing, the number of tracks shall be indicated on a supplemental Number of Tracks (R15-2P) ~~sign~~ plaque of inverted T shape mounted below the Crossbuck sign in the manner and at the height indicated in Figure 10C-1.

Option:

The supplemental Number of Tracks ~~sign~~ plaque may also be used at highway-light rail transit grade crossings with automatic gates.

Standard:

If used, the Crossbuck ~~sign~~ Assembly (see Section 8B.05) comprised of a Crossbuck sign and either a STOP (R1-1) sign or a YIELD (R1-2) sign (see Figure 10C-1) shall be installed on the right-hand edited to increase clarity side of the highway on each approach to the highway-light rail transit grade crossing. Where restricted sight distance or unfavorable highway geometry exists on an approach to a highway-light rail transit grade crossing, an additional Crossbuck ~~sign~~ Assembly shall be installed on the left-hand edited to increase clarity side of the highway, possibly placed back-to-back with the Crossbuck ~~sign~~ Assembly for the opposite approach, or otherwise located so that two Crossbuck ~~signs~~ Assemblies are displayed for that approach.

A strip of retroreflective white material not less than 50 mm (2 in) in width shall be used on the back of each blade of each Crossbuck sign for the length of each blade, at all highway-light rail transit grade crossings, except those where Crossbuck signs have been installed back-to-back.

A vertical strip of retroreflective white material, not less than 50 mm (2 in) in width, shall be used on each Crossbuck Assembly support at passive highway-light rail transit grade crossings for the full length of the ~~front and~~ back of the support from the bottom of the Crossbuck sign ~~or Number of Tracks sign~~ to within 0.6 m (2 ft) above the ~~edge of the roadway~~ ground~~, except on the side of those supports where a STOP (R1-1) or YIELD (R1-2) sign or flashing lights have been installed or on the back side of supports for Crossbuck signs installed on one-way streets~~.

On Crossbuck Assemblies where the YIELD or STOP sign is installed on a separate support (see Figure 10C-2), or is omitted in accordance with Section 8B.04, a vertical strip of retroreflective white material, not less than 50 mm (2 in) in width, shall be used on the front of the Crossbuck Assembly support from the bottom of the Crossbuck sign or Number of Tracks plaque to within 0.6 m (2 ft) above the ground.

Option:

The vertical strip of retroreflective material may be omitted from the back sides of Crossbuck Assembly sign supports installed on one-way streets.

Guidance:

If used, Crossbuck ~~signs~~ Assemblies should be located with respect to the highway pavement or shoulder in accordance with the criteria in Chapter 2A and Figures 2A-2 and 2A-3, and should be located with respect to the nearest track in accordance with Figure 8C-2.

The minimum lateral ~~clearance~~ offset edited to increase consistency for the nearest edge of the Crossbuck ~~sign~~ Assembly should be 1.8 m (6 ft) from the edge of the shoulder or 3.7 m (12 ft) from the edge of the traveled way in rural areas, and 0.6 m (2 ft) from the face of the curb in urban areas.

Where unusual conditions make variations in location and lateral ~~clearance~~ offset edited to increase consistency appropriate, engineering judgment should be used to provide the best practical combination of view and safety clearances.

Section 10C.03 LOOK Sign (R15-8)

Option:

A LOOK (for light rail transit vehicles) (R15-8) sign (see Figure 10C-3) may be mounted at highway-light rail transit grade crossings ~~as a supplemental plaque on the Crossbuck (R15-1) sign post or as~~ on a separate sign post in the immediate vicinity of the highway-light rail transit grade crossing on the light rail transit right-of-way.

Section 10C.04 Use of STOP (R1-1) or YIELD (R1-2) Signs without Crossbuck Signs at Highway-Light Rail Transit Grade Crossings 3rd paragraph was relocated to Section 10C.05

Standard:

For all highway-light rail transit grade crossings where only STOP (R1-1) or YIELD (R1-2) signs are installed, the placement shall ~~conform to~~ comply with the requirements of Section 2B.10. Stop Ahead (W3-1) or Yield Ahead (W3-2) Advance Warning signs (see Figure 2C-6) shall also be installed if the criteria for their installation given in Section 2C.35 is met.

Guidance:

The use of only STOP or YIELD signs for road users at highway-light rail transit grade crossings should be limited to those crossings where the need and feasibility is established by an engineering study. Such crossings should have all of the following characteristics:

A. The crossing roadways should be secondary in character (such as a minor street with one lane in each direction, an alley, or a driveway) with low traffic volumes and low speed limits. The specific thresholds of traffic volumes and speed limits should be determined by the local agencies.
B. Light rail transit speeds do not exceed 40 km/h (25 mph).
C. The line of sight for an approaching light rail transit operator is adequate from a sufficient distance such that the operator can sound an audible signal and bring the light rail transit vehicle to a stop before arriving at the crossing.
D. The road user has sufficient sight distance at the stop line to permit the vehicle to cross the tracks before the arrival of the light rail transit vehicle.
E. If at an intersection of two roadways, the intersection does not meet the warrants for a traffic control signal as specified in Chapter 4C.
F. The light rail transit tracks are located such that vehicles are not likely to stop on the tracks while waiting to enter a cross street or highway.

~~Option:~~

~~If a STOP or YIELD sign is installed at a highway-light rail transit grade crossing, it may be installed on the Crossbuck post or on a separate post at the point where the vehicle is to stop, or as near to that point as practical.~~

Section 10C.05 DO NOT STOP ON TRACKS Sign (R8-8)

Guidance:

A DO NOT STOP ON TRACKS (R8-8) sign (see Figure 10C-3) should be installed whenever an engineering study determines that the potential for vehicles stopping on the tracks at a highway-light rail transit grade crossing is significant. Placement of the R8-8 sign should be determined as part of the engineering study. The sign, if used, should be located on the right-hand edited to increase clarity side of the highway on either the near or far side of the grade crossing, depending upon which position provides better visibility to approaching drivers.

If a STOP or YIELD sign is installed ~~beyond~~ downstream from edited to increase clarity the light rail transit crossing such that vehicle queues are likely to extend into the path of the light rail transit, a DO NOT STOP ON TRACKS sign (R8-8) should be ~~posted in accordance with Section 10C.05~~ used. relocated from Section 10C.04

Option:

DO NOT STOP ON TRACKS signs may be placed on both sides of the track.

On divided highways and one-way streets, a second DO NOT STOP ON TRACKS sign may be placed on the near or far left-hand edited to increase clarity side of the highway at the grade crossing to further improve visibility of the sign.

Section 10C.06 TRACKS OUT OF SERVICE Sign (R8-9)

Option:

The TRACKS OUT OF SERVICE (R8-9) sign (see Figure 10C-3) may be used at a highway-light rail transit grade crossing instead of a Crossbuck (R15-1) sign and a Number of Tracks (R15-2P) ~~sign~~ plaque when light rail transit tracks have been temporarily or permanently abandoned, but only until such time that the tracks are removed or paved over.

Standard:

When tracks are out of service, traffic control devices and gate arms shall be removed and the signal heads shall be removed or hooded or turned from view to clearly indicate that they are not in operation.

The R8-9 sign shall be removed when the tracks have been removed or covered or when the highway-light rail transit grade crossing is returned to service.

Section ~~10C.08~~ 10C.07 STOP HERE WHEN FLASHING Sign (R8-10, R8-10a) Sections 10C.07 and 10C.08 were reversed to be more consistent with Part 8

Option:

The STOP HERE WHEN FLASHING (R8-10, R8-10a) sign (see Figure 10C-3) may be used at a highway-light rail transit grade crossing to inform drivers of the location of the stop line or the point at which to stop when the flashing-light signals (see Section 10D.02) are activated.

Section ~~10C.07~~ 10C.08 STOP HERE ON RED Sign (R10-6, R10-6a)

Support:

The STOP HERE ON RED (R10-6, R10-6a) sign (see Figure 10C-3) defines and facilitates observance of the stop lines at traffic control signals.

Option:

A STOP HERE ON RED sign may be used at locations where vehicles frequently violate the stop line or where it is not obvious to road users where to stop.

Guidance:

If possible, stop lines should be placed at a point where the vehicle driver has adequate sight distance along the track.

Section 10C.09 Light Rail Transit-Activated Blank-Out Turn Prohibition Signs (R3-1a, R3-2a)

Support:

Light rail transit operations can include the use of activated blank-out sign technology for turn prohibition (R3-1a, R3-2a) signs (see Figure 10C-3). The signs are typically used on roads paralleling a semiexclusive or mixed-use light rail transit alignment where road users might turn across the light rail transit tracks. A blank-out sign displays its message only when activated. When not activated, the sign face is blank.

Guidance:

A light rail transit-activated blank-out turn prohibition sign should be used where an intersection adjacent to a highway-light rail transit crossing is controlled by STOP signs, or is controlled by traffic control signals with permissive turn movements for road users crossing the tracks.

Option:

A light rail transit-activated blank-out turn prohibition sign may be used for turning movements that cross the tracks.

As an alternative to light rail transit-activated blank-out turn prohibition signs at intersections with traffic control signals, exclusive traffic control signal phases such that all movements that cross the tracks have a steady added to increase accuracy red indication may be used in combination with No Turn on Red (R10-11, R10-11a, or R10-11b) added to increase accuracy signs (see Section 2B.59).

Standard:

Turn prohibition signs that are associated with preemption shall be visible only when the highway-light rail transit grade crossing restriction is in effect.

Section 10C.10 EXEMPT Highway-Rail Grade Crossing ~~Sign~~ Plaques (R15-3P, W10-1aP)

Option:

When authorized by law or regulation, a supplemental EXEMPT (R15-3P) ~~sign~~ plaque (see Figure 10C-3) with a white background may be used below the Crossbuck sign or Number of Tracks ~~sign~~ plaque, if present, at the highway-light rail transit grade crossing, and a supplemental EXEMPT (W10-1aP) ~~sign~~ plaque (see Figure 10C-4) with a yellow background may be used below the Highway-Rail Advance Warning (W10-1) sign. Where neither the Crossbuck nor the advance warning signs exist for a particular crossing, an EXEMPT (R15-3P) ~~sign~~ plaque with a white background may be placed on its own post on the near right side of the approach to the crossing.

Support:

These supplemental ~~signs~~ plaques inform drivers of vehicles carrying passengers for hire, school buses carrying students, or vehicles carrying hazardous materials that a stop is not required at certain designated highway-light rail transit grade crossings, except when a light rail transit vehicle is approaching or occupying the highway-light rail transit grade crossing, or the driver's view is blocked.

Section 10C.11 Divided Highway with Light Rail Transit Crossing Signs (R15-7 Series)

Option:

The Divided Highway with Light Rail Transit Crossing (R15-7) sign (see Figure 10C-3) may be used as a supplemental sign on the approach legs of a roadway that intersects with a divided highway where light rail transit vehicles operate in the median. The sign may be placed beneath a STOP sign or mounted separately.

Guidance:

The number of tracks ~~shown~~ displayed edited to increase consistency on the R15-7 sign should be the same as the actual number of tracks.

Standard:

When the Divided Highway With Light Rail Transit Crossing sign is used at a four-legged intersection, the R15-7 sign shall be used. When used at a T-intersection, the R15-7a sign shall be used.

Section 10C.12 No Vehicles On Tracks Signs (R15-6, R15-6a)

Support:

The No Vehicles On Tracks (R15-6) sign (see Figure 10C-3) is used where there are adjacent traffic lanes separated from the light rail transit lane by a curb or pavement markings.

Guidance:

The DO NOT ENTER (R5-1) sign should be used where a road user could wrongly enter a light rail transit only street.

Option:

A No Vehicles On Tracks sign may be used to deter vehicles from driving on the trackway. It may be installed ~~either~~ grammar – more than two choices on a 0.9 m (3 ft) flexible post between double tracks, on a post alongside the tracks, or overhead.

Instead of the R15-6 symbol sign, a regulatory sign with the word message DO NOT DRIVE ON TRACKS (R15-6a) may be used (see Figure 10C-3).

A reduced size of 300 x 300 mm (12 x 12 in) may be used if the R15-6 sign is installed between double tracks.

Standard:

The smallest size for the R15-6 sign shall be 300 x 300 mm (12 x 12 in).

Section 10C.13 Light Rail Transit Only Lane Signs (R15-4 Series)

Support:

The Light Rail Transit Only Lane (R15-4 series) signs (see Figure 10C-3) are used for multi-lane operations, where road users might need additional guidance on lane use and/or restrictions.

Option:

Light Rail Transit Only Lane signs may be used on a roadway lane limited to only light rail transit use to indicate the restricted use of a lane in semiexclusive and mixed alignments.

Guidance:

If used, the R15-4a, R15-4b, and R15-4c signs should be installed on posts adjacent to the roadway containing the light rail transit tracks or overhead above the light rail transit only lane.

Option:

If the trackway is paved, preferential lane markings (see Section 3B.25) may be installed but only in combination with light rail transit only lane signs.

Support:

The trackway is the continuous way designated for light rail transit, including the entire dynamic envelope. Section 10C.24 contains more information regarding the dynamic envelope.

Section 10C.14 Do Not Pass Light Rail Transit Signs (R15-5, R15-5a)

Support:

A Do Not Pass Light Rail Transit (R15-5) sign (see Figure 10C-3) is used to indicate that vehicles are not allowed to pass light rail transit vehicles that are loading or unloading passengers where there is no raised platform or physical separation from the lanes upon which other motor vehicles are operating.

Option:

The R15-5 sign may be used in mixed-use alignments and may be mounted overhead where there are multiple lanes.

Instead of the R15-5 symbol sign, a regulatory sign with the word message DO NOT PASS STOPPED TRAIN (R15-5a) may be used (see Figure 10C-3).

Guidance:

If used, the R15-5 sign should be located immediately before the light rail transit boarding area.

Section 10C.15 Highway-Rail Grade Crossing Advance Warning Signs (W10 Series)

Standard:

A Highway-Rail Grade Crossing Advance Warning (W10-1) sign (see Figure 10C-4) with a supplemental plaque describing the type of traffic control at the highway-light rail transit grade crossing shall be used on each highway in advance of every highway-light rail transit grade crossing in semiexclusive alignments except in the following circumstances:

A. On an approach to a highway-light rail transit grade crossing from a T-intersection with a parallel highway if the distance from the edge of the track to the edge of the parallel roadway is less than 30 m (100 ft) and W10-3 signs are used on both approaches of the parallel highway;

B. On low-volume, low-speed highways crossing minor spurs or other tracks that are infrequently used and ~~are flagged by~~ where transit crews manually stop road users from entering the crossing;

C. In business or commercial ~~districts~~ areas where active highway-light rail transit grade crossing traffic control devices are in use; or

D. Where physical conditions do not permit even a partially effective display of the sign.

The supplemental plaque shall be a No Signal (W10-10P) plaque where used in advance of a crossing that does not have active traffic control devices and shall be a SIGNAL AHEAD (W10-16P) plaque where used in advance of a crossing with active traffic control devices, except where the highway-light rail transit grade crossing traffic control devices consist solely of traffic control signals. The supplemental plaque shall be mounted directly below the W10-1 sign unless a NO TRAIN HORN (W10-9P) plaque (see Section 8B.15) is used, in which case the supplemental No Signal (W10-10P) or SIGNAL AHEAD (W10-16P) plaque shall be mounted directly below the W10-9P plaque.

Placement of the Highway-Rail Grade Crossing Advance Warning sign shall be in accordance with ~~Chapter 2A~~ Section 2C.05 and Table 2C-4.

A Yield Ahead (W3-2) or Stop Ahead (W3-1) Advance Warning sign (see Figure 2C-6) shall also be installed if the criteria for their installation given in Section 2C.35 is met. If a Yield Ahead or Stop Ahead sign is installed on the approach to the crossing, the W10-1 sign and supplemental plaque shall be installed upstream from the Yield Ahead or Stop Ahead sign. The Yield Ahead or Stop Ahead sign shall be located in accordance with Table 2C-4. The minimum distance between the signs shall be in accordance with Section 2C.05 and Table 2C-4.

Option:

On divided highways and one-way streets, an additional W10-1 sign and supplemental plaque may be installed on the left-hand side of the roadway.

Standard:

If the distance between the light rail transit tracks in a semiexclusive alignment and a parallel highway, from the edge of the tracks to the edge of the parallel roadway, is less than 30 m (100 ft), W10-2, W10-3, or W10-4 signs (see Figure 10C-4) with a NO SIGNAL (W10-10P) or SIGNAL AHEAD (W10-16P) supplemental plaque describing the type of traffic control at the highway-light rail transit grade crossing shall be installed on each approach of the parallel highway to warn road users making a turn that they will encounter a highway-light rail transit grade crossing soon after making a turn, and a W10-1 sign for the approach to the tracks shall not be required to be between the tracks and the parallel highway.

If the W10-2, W10-3, or W10-4 signs and supplemental plaques are used, sign placement in accordance with the guidelines for Intersection Warning signs in Table 2C-4 using the speed of through traffic shall be measured from the highway intersection.

Guidance:

If the distance between the light rail transit tracks and the parallel highway, from the edge of the tracks to the edge of the parallel roadway, is 30 m (100 ft) or more, a W10-1 sign and supplemental plaque should be installed in advance of the highway-light rail transit grade crossing, and the W10-2, W10-3, or W10-4 signs should not be used on the parallel highway.

Section 10C.16 Low Ground Clearance Highway-Rail Grade Crossing Sign (W10-5)

Guidance:

If the highway profile conditions are sufficiently abrupt to create a hang-up situation for long wheelbase vehicles or for trailers with low ground clearance, the Low Ground Clearance Highway-Rail Grade Crossing (W10-5) sign (see Figure 10C-4) should be installed in advance of the highway-light rail transit grade crossing.

Support:

Information regarding the use of the W10-5 sign is contained in Section 8B.17.

Section 10C.17 Light Rail Transit Approaching-Activated Blank-Out Warning Sign (W10-7)

Support:

The Light Rail Transit Approaching-Activated Blank-Out (W10-7) warning sign (see Figure 10C-4) supplements the traffic control ~~signal~~ devices to warn road users ~~turning across~~ crossing the tracks of an approaching ~~parallel~~ light rail transit vehicle.

Option:

A Light Rail Transit Approaching-Activated Blank-Out warning sign may be used at signalized intersections near grade crossings or at crossings controlled by STOP signs or automatic gates.

Section 10C.18 Storage Space Signs (W10-11, W10-11a, W10-11b)

Guidance:

A Storage Space (W10-11) sign supplemented by a word message storage distance (W10-11a) sign (see Figure 10C-4) should be used where there is a highway intersection in close proximity to the highway-light rail transit grade crossing and an engineering study determines that adequate space is not available to store a design vehicle(s) between the highway intersection and the light rail transit vehicle dynamic envelope.

Support:

Information regarding the use of the W10-11, W10-11a, and W10-11b signs is contained in Section 8B.18.

Section 10C.19 Skewed Crossing Sign (W10-12)

Option:

The Skewed Crossing (W10-12) sign (see Figure 10C-4) may be used at a skewed highway-light rail transit grade crossing to warn ~~drivers~~ road users that the light rail transit tracks are not perpendicular to the highway.

Support:

Information regarding the use of the W10-12 sign is contained in Section 8B.19.

Section 10C.20 Light Rail Transit Station Sign (I-12)

Option:

The Light Rail Transit Station (I-12) sign (see Figure 10C-4) may be used to direct road users to a light rail transit station or boarding location. It may be supplemented by the name of the transit system and by arrows as provided in Section 2D.08.

Section 10C.21 Emergency Notification Sign (I-13 ~~or I-13a~~)

Guidance:

~~An~~ Emergency Notification (I-13 ~~or I-13a~~) signs (see Figure 10C-5) should be installed at all highway-light rail transit grade crossings on semiexclusive alignments to provide ~~for emergency notification~~ information to road users so that they can notify the transit company about emergencies or malfunctioning traffic control devices. ~~The sign should have a white message on blue background.~~

~~Location and placement should be decided cooperatively by the transit company and the public or private highway agencies based on specific site conditions.~~

~~This sign, which is for emergency notification, should convey a clear and simple message that is visible to anyone stalled or disabled on the transit tracks, and to anyone with other emergencies.~~

~~Support:~~

~~Examples of sign messages are shown in Figure 10C-4.~~

Standard:

When Emergency Notification signs are used, they shall, at a minimum, include a unique crossing identifier and the emergency contact telephone number in letters and numbers that are at least 13 mm (0.5 in) in height.

The Emergency Notification signs shall be positioned so as to not obstruct any traffic control devices or limit the view of trains approaching the highway-light rail transit grade crossing.

Option:

In lieu of Emergency Notification signs, the unique crossing identifier and the emergency contact telephone number may be displayed on the enclosure for the signal apparatus at crossings that are equipped

with active traffic control systems if the signal apparatus enclosure is located in direct view of road users at or near the crossing.

Standard:

Emergency Notification Signs shall have a white legend and border on a blue background.

Guidance:

Emergency Notification signs should be retroreflective.

Emergency Notification signs, or the information placed on the signal apparatus enclosure, should be oriented so as to face vehicles stopped on or at the crossing or on the traveled way near the crossing.

At station crossings, Emergency Notification signs or information should be posted in a conspicuous location.

Emergency Notification signs mounted on Crossbuck Assemblies or signal masts should only be large enough to provide the necessary contact information. Use of larger signs that might obstruct the view of trains or other vehicles should be avoided.

~~**Section 10C.22 Illumination at Highway-Light Rail Transit Crossings**~~ **relocated to Section 10A.05**

Section ~~10C.23~~ 10C.22 Pavement Markings

Standard:

All highway-light rail transit grade crossing pavement markings shall be retroreflectorized white. All other markings shall be in accordance with Part 3.

On paved roadways, pavement markings in advance of a highway-light rail transit grade crossing shall consist of an X, the letters RR, a no-passing zone marking (on two-lane, two-way highways ~~where~~ with ~~centerline~~ center line markings ~~are used~~ in compliance with Section 3B.01), and certain transverse lines as shown in Figures 10C-6 and 10C-7.

Identical markings shall be placed in each approach lane on all paved approaches to highway-light rail transit grade crossings where signals or automatic gates are located, and at all other highway-light rail transit grade crossings where the posted or statutory highway speed is 60 km/h (40 mph) or greater.

Pavement markings shall not be required at highway-light rail transit grade crossings where the posted or statutory highway speed is less than 60 km/h (40 mph)~~,~~. ~~or~~ In urban areas, pavement markings shall not be required at highway-light rail transit grade crossings if an engineering study indicates that other installed devices provide suitable warning and control.

Guidance:

When pavement markings are used, ~~a portion~~ the center of the X symbol should be directly ~~opposite~~ in line with the Advance Warning sign. The X symbol and letters should be elongated to allow for the low angle at which they will be viewed.

Option:

When justified by engineering judgment, supplemental pavement marking symbol(s) may be placed between the Advance Warning sign and the highway-light rail transit grade crossing.

Section ~~10C.24~~ 10C.23 Stop Lines

~~Support:~~

~~Information regarding the use of stop lines at grade crossings is contained in Section 8B.21.~~

Standard:

On paved roadways at highway-light rail transit grade crossings that are equipped with active control devices such as flashing-light signals, gates, or traffic control signals, a stop line (see Section 3B.16) shall be installed to indicate the point behind which vehicles are required to stop.

Guidance:

The stop line should be a transverse line at a right angle to the traveled way at a point where a vehicle is to stop or as near to that point as practical. The stop line should be placed approximately 2.4 m (8 ft) from the gate (if present), but no closer than 4.6 m (15 ft) from the nearest rail.

Support:

Section 8B.05 contains provisions regarding the use of stop lines or yield lines at passive grade crossings.

Section ~~10C.25~~ 10C.24 Dynamic Envelope Markings

Support:

The dynamic envelope (see Figure 10C-8) markings indicate the clearance required for the light rail transit vehicle overhang resulting from any combination of loading, lateral motion, or suspension failure.

Option:

The dynamic envelope may be delineated on the pavement using pavement markings (see Figures 10C-9 and 10C-10) or contrasting pavement color and/or contrasting pavement texture (see Figure 10C-11).

Standard:

If used, pavement markings for indicating the dynamic envelope shall ~~conform to~~ comply with the provisions of Part 3 and shall be a 100 mm (4 in) normal solid white line or contrasting pavement color and/or contrasting pavement texture.

Guidance:

If pavement markings are used to convey the dynamic envelope, they should be placed completely outside of the dynamic envelope. If used at light-rail transit grade crossings, dynamic envelope pavement markings should be placed on the highway 1.8 m (6 ft) from the nearest rail and installed parallel to the tracks, unless the transit authority and/or operating company advises otherwise. The pavement markings should extend across the roadway as shown in Figure 10C-9.

Option:

In semiexclusive alignments, the dynamic envelope markings may be along the light rail transit trackway between intersections where the trackway is immediately adjacent to travel lanes and no physical barrier is present.

In mixed-use alignments the dynamic envelope markings may be continuous between intersections.

Dynamic envelope markings may be installed at all highway-light rail transit grade crossings, unless a Four-Quadrant Gate system (see Section 10D.04) is used.

Pavement markings for adjacent travel or parking lanes may be used instead of dynamic envelope markings if the lines are outside the dynamic envelope.

CHAPTER 10D. HIGHWAY-LIGHT RAIL TRANSIT ACTIVE TRAFFIC CONTROL GRADE CROSSING SYSTEMS

Section 10D.01 Introduction

Support:

Active light rail transit traffic control systems inform ~~motorists, bicyclists, and pedestrians~~ road users of the approach or presence of light rail transit vehicles at highway-light rail transit grade crossings. These systems include four-quadrant gate systems, automatic gates, flashing-light signals, traffic control signals, actuated blank-out and variable message signs, and other active traffic control devices.

Guidance:

Where both traffic control signals and flashing-light signals (with or without automatic gates) are in operation at the same highway-light rail transit grade crossing, the operation of the devices should be coordinated to avoid any display of conflicting signal indications.

If a pedestrian route is provided, sufficient clearance from supports, posts, and gate mechanisms should be maintained for pedestrian travel.

~~**Option**~~ **Standard:**

If flashing-light signals or traffic control signals are in operation at a crossing that is used by pedestrians, bicyclists, and/or other non-motorized road users, audible devices ~~may~~ shall also be provided and shall be operated in conjunction with the flashing lights or traffic control signals.

Support:

Light rail transit typically operates through grade crossings in semiexclusive and mixed-use alignments at speeds between 16 km/h (10 mph) and 105 km/h (65 mph).

When light rail transit speed is cited in this Part, it refers to the maximum speed at which light rail transit vehicles are permitted to traverse a particular grade crossing.

Section 10D.02 Flashing-Light Signals

Support:

Sections 8C.02 and 8C.03 contain additional details regarding flashing-light signals.

Standard:

Highway-light rail transit grade crossings in semiexclusive alignments shall be equipped with flashing-light signals where light rail transit speeds exceed 60 km/h (35 mph). Flashing-light signals shall be clearly visible to motorists, pedestrians, and bicyclists.

Guidance:

Where the crossing is at a location other than an intersection~~, where~~ and edited to increase clarity light rail transit speeds exceed 40 km/h (25 mph), flashing-light signals should be installed.

Option:

Traffic control signals may be used instead of flashing-light signals at highway-light rail transit grade crossings within highway-highway intersections where light rail transit speeds do not exceed 60 km/h (35 mph). Traffic control signals or flashing-light signals may be used where the crossing is at a location other than an intersection, where light rail transit speeds do not exceed 40 km/h (25 mph), and when the roadway is a low-volume street where prevailing speeds do not exceed 40 km/h (25 mph).

Section 10D.03 Automatic Gates

Support:

An automatic gate is a traffic control device used ~~as an adjunct to~~ in conjunction with flashing-light signals.

Section 8C.04 contains further details regarding automatic gates.

Guidance:

Highway-light rail transit grade crossings in semiexclusive alignments should be equipped with automatic gates and flashing-light signals (see Section 10D.02) where light rail transit speeds exceed 60 km/h (35 mph).

Option:

Where the grade crossing is at a location other than an intersection, where light rail transit speeds exceed 40 km/h (25 mph), automatic gates and flashing-light signals may be installed.

Traffic control signals may be used instead of automatic gates at highway-light rail transit grade crossings within highway-highway intersections where light rail transit speeds do not exceed 60 km/h (35 mph). Traffic control signals or flashing-light signals without automatic gates may be used where the crossing is at a location other than an intersection and where light rail transit speeds do not exceed 40 km/h (25 mph) and the roadway is a low-volume street where prevailing speeds do not exceed 40 km/h (25 mph).

Automatic gates may be supplemented by cantilevered flashing-light signals (see Figure 8C-1) where there is a need for additional emphasis or better visibility.

The effectiveness of gates may be enhanced by the use of channelizing devices or raised median islands to discourage driving around lowered automatic gates.

Section 10D.04 Four-Quadrant Gate Systems

Option:

Four-Quadrant Gate systems may be installed to improve safety at highway-light rail transit grade crossings based on an engineering study when less restrictive measures, such as automatic gates and channelization devices, are not effective.

Standard:

A Four-Quadrant Gate system shall consist of a series of automatic gates used ~~as an adjunct to~~ in conjunction with flashing-light signals to control traffic on all lanes entering and exiting the highway-light rail transit grade crossing.

The Four-Quadrant Gate system shall consist of a drive mechanism and fully retroreflectorized red- and white-striped gate arms with lights, and which in the down position extends individually across the entrance and exit lanes of highway traffic as shown in Figure 8C-2. Standards contained in Section 10D.02 for flashing-light signals shall be followed for signal specifications, location, and clearance distances.

In the normal sequence of operation, unless constant warning time or other advanced system requires otherwise, the flashing-light signals and the lights on the gate arms (in their normal upright positions) shall be activated immediately upon detection of the approaching light rail transit vehicle. The gate arms for the entrance lanes of traffic shall start their downward motion not less than 3 seconds after the flashing-light signals start to operate and shall reach their horizontal position at least 5 seconds before the arrival of the light rail transit vehicle. Exit gate arm activation and downward motion shall be based on timing requirements established by an engineering study of the individual site. The gate arms shall remain in the down position as long as the light rail transit vehicle occupies the highway-light rail transit crossing.

When the light rail transit vehicle clears the highway-light rail transit grade crossing, and if no other light rail transit vehicle is detected, the gate arms shall ascend to their upright positions, following which the flashing-light signals added to improve consistency and the lights on the gate arms shall cease operation.

Gate arm design, colors, and lighting requirements shall be in accordance with the Standards contained in Section 8C.04.

Except as noted in the Option below, the exit gate arms shall be designed to fail-safe in the up position.

At locations where gate arms are offset a sufficient distance for vehicles to drive between the entrance and exit gate arms, median islands shall be installed in accordance with the needs established by an engineering study.

Guidance:

The gate arm should ascend to its upright position in not more than 12 seconds.

Four-Quadrant Gate systems should only be used in locations with constant-warning-time light rail transit vehicle detection.

The operating mode of the exit gates should be determined based upon an engineering study, with input from the affected transit agency.

If the Timed Exit Gate Operating Mode is used, the engineering study, with input from the affected transit agency, should also determine the Exit Gate Clearance Time.

If the Dynamic Exit Gate Operating Mode is used, vehicle intrusion detection devices should be installed to control exit gate operation based on vehicle presence within the minimum track clearance distance.

Regardless of which exit gate operating mode is used, the Exit Gate Clearance Time (see Section 8A.01) should be considered when determining additional time requirements for the Minimum Warning Time.

If a Four-Quadrant Gate system is used at a location that is adjacent to an intersection that could cause vehicles to queue within the minimum track clearance distance, the Dynamic Exit Gate Operating Mode should be used unless an engineering study indicates otherwise.

If a Four-Quadrant Gate system is interconnected with a highway traffic signal, backup or standby power should be considered for the highway traffic signal. Also, circuitry should be installed to prevent the highway traffic signal from leaving the track clearance green interval until all of the gates are lowered.

At locations where sufficient space is available, exit gates should be ~~set back~~ located downstream from the track a distance that provides a safety zone long enough to accommodate at least one design vehicle between the exit gate and the nearest rail.

Four-Quadrant Gate systems should include remote health (status) monitoring capable of automatically notifying light rail transit signal maintenance personnel when anomalies have occurred within the system.

Option:

Exit gate arms may fail in the down position if the highway-light rail transit grade crossing is equipped with remote health (status) monitoring.

Four-Quadrant Gate system installations may include median islands between opposing lanes on an approach to a highway-light rail transit grade crossing.

Guidance:

Where sufficient space is available, median islands should be at least 18 m (60 ft) in length.

Section 10D.05 Wayside Horn Systems

Option:

Wayside horn systems may be installed to provide directional audible warning at highway-light rail transit grade crossings, including pedestrian or other non-motorized facility grade crossings or other applications, as determined by a diagnostic team. Wayside horn systems may either be installed to provide supplemental audible warning where the train-mounted horn is sounded or as an alternative to the sounding of a train-mounted horn.

Standard:

A wayside horn system shall consist of a horn or series of horns used in conjunction with light rail transit-activated warning systems to provide audible warning of an approaching train for traffic on the highway approaches to the highway-light rail transit grade crossing.

The wayside horn system shall be designed using fail-safe principles. A means shall be employed to verify the sound output from the wayside horn system.

If a wayside horn system is used at a highway-light rail transit grade crossing where the train-mounted horn is not sounded, the highway-light rail transit grade crossing shall be equipped with flashing-light signals and gates.

Wayside horn systems used at highway-light rail transit grade crossings where the train-mounted horn is not sounded shall be equipped with a confirmation indicator and shall operate in conformance with 49 CFR Part 222 where required. For other applications and where 49 CFR Part 222 is not required, the wayside horn tone and minimum sound level shall be determined by a diagnostic team.

The wayside horn system shall produce sound output for a minimum of 15 seconds prior to the train's arrival at the highway-light rail transit grade crossing, or simultaneously with the activation of the flashing-light signals or the descent of the gate, and shall continue to produce sound output until the lead vehicle of the train has traversed the crossing. Where multiple tracks are present, the wayside horn system shall immediately reactivate when another train is detected before the previous train clears the crossing.

The wayside horn system shall be directed toward approaching road users; however, directing the wayside horn system toward approaching road users on adjacent roadways whose movement toward the crossing is controlled by a STOP sign or traffic control signal shall not be required.

Guidance:

The highway-light rail transit grade crossing should be equipped with constant warning time train detection circuitry unless conditions at the crossing would prevent the proper operation of the constant warning time device. Where the use of constant warning time circuitry is not possible, train detection circuits should be carefully reviewed to minimize the warning time provided by the wayside horn system.

Wayside horn systems should be installed to provide audible warning for each roadway approach to the highway-light rail transit grade crossing. The same lateral clearance and roadside safety features should apply to wayside horn systems as described in the Standards contained in Section 8C.01. Wayside horn systems, when mounted on a separate pole assembly, should be installed no closer than 4.6 m (15 ft) from the center of the nearest track and should be positioned to not obstruct the motorists' line of sight of the flashing-light signals.

Prior to installing any wayside horn system, the responsibility for maintenance of the system and all of the appurtenances, hardware, and software should be clearly established. The responsible agency should provide for the maintenance of the system and the appurtenances to retain the proper functioning of the device.

Option:

Wayside horn systems may include a delay of 3 to 5 seconds after the activation of the flashing-light signals before sounding.

Wayside horn systems may include remote health (status) monitoring capable of automatically notifying maintenance personnel when anomalies have occurred within the system.

Wayside horn systems may be equipped with a back-up power system.

Section ~~10D.05~~ 10D.06 Traffic Control Signals

Support:

There are two types of traffic control signals for controlling vehicular and light rail transit movements at interfaces of the two modes. The first is the standard traffic control signal described in Part 4, which is the focus of this section. The other type of signal is referred to as a light rail transit signal and is discussed in Section 10D.08.

Standard:

The provisions of Parts 4 and 8 relating to traffic control signal design, installation, and operation, including interconnection with nearby automatic gates or flashing-light signals, shall be applicable as appropriate where traffic control signals are used at highway-light rail transit grade crossings.

Guidance:

When a highway-light rail transit grade crossing equipped with a flashing-light signal system is located within 60 m (200 ft) of an intersection or midblock location controlled by a traffic control signal, the traffic control signal should be provided with preemption in accordance with Section 4D.27.

Coordination with the flashing-light signal system should be considered for traffic control signals located more than 60 m (200 ft) from the crossing. Factors to be considered should include traffic volumes, vehicle mix, vehicle and light rail transit approach speeds, frequency of light rail transit vehicles, and queue lengths.

If the highway traffic signal has emergency vehicle preemption capability, it should be coordinated with light rail transit operation.

Where light rail transit operates in a wide median, vehicles crossing the tracks and being controlled by both near and far side traffic signal faces should receive a protected left-turn green phase from the far side signal face to clear vehicles from the crossing when light rail transit vehicles are approaching the crossing.

Option:

Green indications may be provided during light rail transit phases for vehicle, pedestrian, and bicycle movements that do not conflict with light rail transit movements.

Traffic control signals may be installed in addition to four-quadrant gate systems and automatic gates at a highway-light rail transit crossing if the crossing occurs within a highway-highway intersection and if the traffic control signals meet the warrants described in Chapter 4C.

At a location other than an intersection, when light rail transit speeds are less than 40 km/h (25 mph), traffic control signals alone may be used to control road users at highway-light rail transit grade crossings only when justified by an engineering study.

Typical circumstances may include:

A. Geometric conditions preclude the installation of highway-light rail transit grade crossing warning devices.
B. Light rail transit vehicles share the same roadway with road users.
C. Traffic control signals already exist.

Support:

~~See~~ Section 4D.27 ~~for considerations~~ contains information regarding traffic control signals at or near highway-light rail transit grade crossings that are not equipped with highway-light rail transit grade crossing warning devices.

Section ~~10D.06~~ 10D.07 Highway Traffic Signal Preemption Turning Restrictions

Guidance:

When a light rail transit grade crossing exists within a signalized intersection, consideration should be given to providing separately controlled Protected Only Mode turn phases for the movements crossing the tracks (see Section 4A.02).

Standard:

Signal faces that are provided for separately controlled Protected Only Mode turn movements toward the crossing shall display a steady red indication during the approach and/or passage of light rail transit vehicles.

Guidance:

When a signalized intersection that is located within 60 m (200 ft) of a highway-light rail transit grade crossing is preempted, all existing turning movements toward the highway-light rail transit grade crossing should be prohibited.

Support:

Part 4 contains information regarding signal phasing and timing requirements.

Option:

An activated blank-out or changeable message sign and/or an appropriate highway traffic signal display may be used to prohibit turning movements toward the crossing during preemption (see Section 10C.09).

Standard:

Messages on the activated blank-out or changeable message signs shall be visible only when the highway-light rail transit intersection restriction is in effect.

Section ~~10D.07~~ 10D.08 Use of Traffic Control Signals for Control of Light Rail Transit Vehicles at Grade Crossings

Guidance:

Light rail transit movements in semiexclusive alignments at nongated grade crossings that are equipped with traffic control signals should be controlled by special light rail transit signal indications.

~~Support:~~

~~Examples of~~ Light rail transit traffic control signals~~,~~ that are used to control light rail transit movements only~~, are shown~~ should display the signal indications illustrated in Figure 10D-1.

Section 4D.27 contains information about the use of the signal indications shown in Figure 10D-1 for the control of exclusive bus movements at "queue jumper lanes" and for the control of exclusive bus rapid transit movements on semiexclusive or mixed-use alignments.

Option:

Standard traffic control signals may be used instead of light rail transit traffic control signals to control the movement of light rail transit vehicles (see Section 10D.06).

Standard:

If a separate set of standard traffic control signal indications (red, yellow, and green circular and arrow indications) is used to control light rail transit movements, the indications shall be positioned so they are not visible to motorists, pedestrians, and bicyclists (see Section 4D.12).

If the light rail transit crossing control is separate from the intersection control, the two shall be interconnected. The light rail phase shall not be terminated until after the light rail transit vehicle has cleared the crossing.

Option:

Light rail transit signals may be used at grade crossings and at intersections in mixed-use alignments in conjunction with standard traffic control signals where special light rail transit signal phases are used to accommodate turning light rail transit vehicles or where additional light rail transit clearance time is desirable.

Guidance:

Light rail transit signal faces should be separated vertically or horizontally from the nearest highway traffic signal face for the same approach by at least 0.9 m (3 ft).

Section ~~10D.08~~ 10D.09 Pedestrian and Bicycle Signals and Crossings

Guidance:

Where light rail transit tracks are immediately adjacent to other tracks or a road, pedestrian signalization should be designed to avoid having pedestrians wait between sets of tracks or between the tracks and the road. If adequate space exists for a pedestrian refuge and is justified based on engineering judgment, additional pedestrian signal ~~indicators~~ heads, signing, and detectors should be installed (see Section 4E.08).

Standard:

When used at light rail transit crossings, pedestrian signal heads shall ~~be in accordance~~ comply with the provisions of Section 4E.04.

Guidance:

Flashing-light signals (see Figure 10D-2) with a Crossbuck (R15-1) sign and an audible device should be installed at pedestrian and bicycle crossings where an engineering study has determined that the sight distance is not sufficient for pedestrians and bicyclists to complete their crossing prior to the arrival of the light rail transit vehicle at the crossing, or where light rail transit speeds exceed 60 km/h (35 mph).

If an engineering study shows that flashing-light signals ~~alone~~ with a Crossbuck sign and an audible device would not provide sufficient notice of an approaching light rail transit vehicle, the LOOK (R15-8) sign (see Figure 10D-2) and/or pedestrian gates should be considered (see Figures 10D-3, 10D-4, and 10D-5).

Support:

A pedestrian gate is similar to an automatic gate except the gate arm is shorter.

The swing gate alerts pedestrians to the light rail transit tracks that are to be crossed. Swing gates are designed to open away from the tracks, requiring users to pull the gate open to cross, but permitting a quick exit from the trackway, and to automatically close.

Option:

Swing gates may be installed across pedestrian and bicycle walkways (see Figure 10D-6).

Pedestrian barriers at offset crossings may be used at pedestrian and bicycle crossings as passive devices that force users to face approaching light rail transit before entering the trackway (see Figures 10D-7 and 10D-8).

Section 10D.10 Highway-Light Rail Transit Grade Crossing(s) Within or In Close Proximity to Roundabouts, Traffic Circles, or Circular Intersections

Support:

At roundabouts, traffic circles, or circular intersections that include or are within close proximity to a highway-light rail transit grade crossing, a queue of vehicular traffic could cause vehicles to stop on the highway-light rail transit grade crossing.

Standard:

Where roundabouts, traffic circles, or circular intersections include or are within close proximity to a highway-light rail transit grade crossing, an engineering study shall be made to determine if queuing could impact the highway-light rail transit grade crossing. If traffic queues impact the highway-light rail transit grade crossing, provisions shall be made to clear highway traffic from the highway-light rail transit grade crossing prior to the arrival of a train.

Guidance:

Among the provisions that should be considered for keeping the crossing clear of traffic or for clearing traffic from the crossing prior to the arrival of a train are the following:

A. Elimination of the roundabout,
B. Geometric design revisions,
C. Highway-light rail transit grade crossing warning devices,
D. Highway traffic signals,
E. Traffic metering devices,
F. Activated signs, or
G. A combination of these or other actions.

CHAPTER 10E. QUIET ZONE TREATMENTS AT HIGHWAY-LIGHT RAIL TRANSIT GRADE CROSSINGS

Section 10E.01 Introduction

Support:

49 CFR Part 222 (Use of Locomotive Horns at Highway-Rail Grade Crossings; Final Rule) prescribes Quiet Zone requirements and treatments.

Standard:

Any traffic control device and its application where used as part of a Quiet Zone shall comply with all applicable provisions of the MUTCD.

CHAPTER 10F. PATHWAY-LIGHT RAIL TRANSIT GRADE CROSSINGS

Section 10F.01 Purpose

Support:

Traffic control for pathway-light rail transit grade crossings includes all signs, signals, markings, other warning devices, and their supports at pathway-light rail transit grade crossings and along pathway approaches to a grade crossing. The function of this traffic control is to promote safety and provide effective operation of both light rail transit and pathway traffic at pathway-light rail transit grade crossings.

Except as specifically noted in this Chapter, sidewalks are considered to be part of a highway-light rail transit grade crossing rather than a pathway-light rail transit grade crossing, and are not covered by this Chapter.

Section 10F.02 Use of Standard Devices, Systems, and Practices

Guidance:

The public agency with jurisdiction over the pathway and the regulatory agency with statutory authority, if applicable, should jointly determine the need and selection of devices at a pathway-light rail transit grade crossing.

The appropriate traffic control system to be used at a pathway-light rail transit grade crossing should be determined by a diagnostic team.

Section 10F.03 Pathway-Light Rail Transit Grade Crossing Signs and Markings

Standard:

Pathway-light rail transit grade crossing signs shall be standard in shape, legend, and color.

Traffic control devices mounted adjacent to pathways at a height of less than 2.4 m (8 ft) measured vertically from the bottom edge of the device to the elevation of the near edge of the pathway surface shall have a minimum lateral clearance of 0.6 m (2 ft) from the near edge of the device to the near edge of the pathway (see Figure 9B-1).

The minimum mounting height for post-mounted signs on pathways shall be 1.2 m (4 ft), measured vertically from the bottom edge of the sign to the elevation of the near edge of the pathway surface (see Figure 9B-1).

Pathway-light rail transit grade crossing traffic control devices shall be located a minimum of 3.7 m (12 ft) from the center of the nearest track.

The minimum sizes of pathway-light rail transit grade crossing signs shall be as shown in the shared-use path column in Table 9B-1.

When overhead traffic control devices are used on pathways, the clearance from the bottom edge of the device to the pathway surface directly under the sign or device shall be at least 2.4 m (8 ft).

Guidance:

If pathway users include those who travel faster than pedestrians, such as bicyclists or skaters, the diagnostic team should consider the use of warning signs and pavement markings in advance of the pathway-rail grade crossing (see Figure 9B-7).

Section 10F.04 Stop Lines and Detectable Warnings

Guidance:

If used at pathway-light rail transit grade crossings, the stop line should be a transverse line at the point where a pathway user is to stop. The stop line should be placed at least 0.6 m (2 ft) upstream from the gate or counterweight (if present), and at least 3.7 m (12 ft) from the nearest rail.

If used on pathway-light rail transit grade crossings or sidewalks at highway-light rail transit grade crossings, detectable warnings (see Section 3B.18) should extend across the full width of the pathway or sidewalk and should be 0.6 m (2 ft) wide in the pedestrian direction of travel. Detectable warnings should be placed at least 0.6 m (2 ft) upstream from the gate or counterweight (if present), and no closer than the stop line (if present) or 3.7 m (12 ft) from the nearest rail.

Section 10F.05 Passive Devices for Pathway-Light Rail Transit Grade Crossings

Standard:

Except as noted in the Option below, where active traffic control devices are not used, a Crossbuck Assembly shall be installed on each approach to a pathway-light rail transit grade crossing.

Option:

The Crossbuck Assembly may be omitted at station crossings and on the approaches to a pathway-light rail transit grade crossing that is located within 7.6 m (25 ft) of the traveled way at a highway-light rail transit grade crossing.

Guidance:

The pathway user's ability to detect the presence of an approaching train should be considered in determining the type and placement of traffic control devices or design features (such as fencing or swing gates).

Nighttime visibility should be considered if design features (such as fencing or swing gates) are used to channelize pathway users.

When automatic gates and swing gates are used, the pathway should be channelized to direct users to the entrance to and exit from the pathway-light rail transit grade crossing.

Standard:

If used, swing gates shall open away from the track(s) and return to the closed position after use.

Option:

When used in conjunction with automatic gates at pathway-light rail transit grade crossings, swing gates may be equipped with a latching device that permits the gate to be opened only by pedestrians who are on the track side of the gate.

Refuge areas may be provided to provide a place for large numbers of pedestrians to congregate during the passage of a train.

Guidance:

Where refuge areas are provided, fencing should be installed to limit access to only the pathway-light rail transit grade crossing.

Section 10F.06 Active Traffic Control Systems for Pathway-Light Rail Transit Grade Crossings

Standard:

If an active traffic control system is used at a pathway-light rail transit grade crossing, flashing-light signals and a bell or other audible warning device shall be provided for each direction of the pathway.

Support:

If a pathway-light rail transit grade crossing is located within 7.6 m (25 ft) of the traveled way at a highway-light rail transit grade crossing equipped with an active traffic control system, a separate active traffic control system for the pathway is usually not provided.

Standard:

If used at pathway-light rail transit grade crossings, flashing-light signals shall be alternately flashing red lights that are aligned horizontally and the light units shall have a diameter of at least 100 mm (4 in). The mounting height for flashing red lights installed at pathway-light rail transit grade crossings shall be a minimum of 1.2 m (4 ft), measured vertically from the bottom edge of the lights to the elevation of the near edge of the pathway surface.

Option:

At station crossings where more than one track is present, additional traffic control devices may be installed between the tracks as recommended by a diagnostic team.

Standard:

The mounting height for flashing red lights installed between the tracks at station crossings shall be a minimum of 0.3 m (1 ft), measured vertically from the bottom edge of the lights to the elevation of the near edge of the pathway surface.

Option:

Automatic gates may be used at pathway-light rail transit grade crossings as recommended by a diagnostic team.

Guidance:

If used at a pathway-light rail transit grade crossing, each automatic gate should be installed to rest a minimum of 0.9 m (3 ft) above the pathway when in the down position.

If used, the gate configuration should provide for full width coverage of the pathway on both approaches to the track.

Standard:

Where sidewalks are located between the edge of a roadway and active traffic control devices, the location, placement, and height prescribed for roadway gates shall be used (see Section 10D.03).

Guidance:

Separate automatic gates used at sidewalks should be installed to rest a minimum of 0.9 m (3 ft) above the sidewalk when in the down position.

If separate automatic gates are used for a sidewalk, a separate gate mechanism should be provided for the sidewalk gate, instead of a supplemental or auxiliary gate arm installed as a part of the same mechanism as the vehicular gate, in order to prevent a pedestrian from raising the vehicular gate at a highway-light rail transit grade crossing.

PUBLIC LAW 102-240-DEC. 18, 1991 (INTERMODAL SURFACE TRANSPORTATION EFFICIENCY ACT OF 1991)

Section 1077. REVISION OF MANUAL — Not later than 90 days after the date of the enactment of this Act, the Secretary shall revise the Manual of Uniform Traffic Control Devices and such other regulations and agreements of the Federal Highway Administration as may be necessary to authorize States and local governments, at their discretion, to install stop or yield signs at any rail-highway grade crossing without automatic traffic control devices with 2 or more trains operating across the rail-highway grade crossing per day.

PUBLIC LAW 102-388-OCT. 6, 1992 (DEPARTMENT OF TRANSPORTATION AND RELATED AGENCIES APPROPRIATIONS ACT, 1993)

Section 406 — The Secretary of Transportation shall revise the Manual of Uniform Traffic Control Devices to include —

(a) a standard for a minimum level of retroreflectivity that must be maintained for pavement markings and signs, which shall apply to all roads open to public travel; and

(b) a standard to define the roads that must have a centerline or edge lines or both, provided that in setting such standard the Secretary shall consider the functional classification of roads, traffic volumes, and the number and width of lanes.

PUBLIC LAW 104-59-NOV. 28, 1995 (NATIONAL HIGHWAY SYSTEM DESIGNATION ACT OF 1995)

Section 205. RELIEF FROM MANDATES —

(c) METRIC REQUIREMENTS —

(1) PLACEMENT AND MODIFICATION OF SIGNS — The Secretary shall not require the States to expend any Federal or State funds to construct, erect, or otherwise place or to modify any sign relating to a speed limit, distance, or other measurement on a highway for the purpose of having such sign establish such speed limit, distance, or other measurement using the metric system.

(2) OTHER ACTIONS — Before September 30, 2000, the Secretary shall not require that any State use or plan to use the metric system with respect to designing or advertising, or preparing plans, specifications, estimates, or other documents, for a Federal-aid highway project eligible for assistance under title 23, United States Code.

(3) DEFINITIONS — In this subsection, the following definitions apply:

(A) HIGHWAY — The term 'highway' has the meaning such term has under section 101 of title 23, United States Code.

(B) METRIC SYSTEM — the term 'metric system' has the meaning the term 'metric system of measurement' has under section 4 of the Metric Conversion Act of 1975 (15 U.S.C. 205c).

Section 306. MOTORIST CALL BOXES — Section 111 of title 23, United States Code, is amended by adding at the end the following:

(c) MOTORIST CALL BOXES —

(1) IN GENERAL — Notwithstanding subsection (a), a State may permit the placement of motorist call boxes on rights-of-way of the National Highway System. Such motorist call boxes may include the identification and sponsorship logos of such call boxes.

(2) SPONSORSHIP LOGOS —

(A) APPROVAL BY STATE AND LOCAL AGENCIES — All call box installations displaying sponsorship logos under this subsection shall be approved by the highway agencies having jurisdiction of the highway on which they are located.

(B) SIZE ON BOX — A sponsorship logo may be placed on the call box in a dimension not to exceed the size of the call box or a total dimension in excess of 12 inches by 18 inches.

(C) SIZE ON IDENTIFICATION SIGN — Sponsorship logos in a dimension not to exceed 12 inches by 30 inches may be displayed on a call box identification sign affixed to the call box post.

(D) SPACING OF SIGNS — Sponsorship logos affixed to an identification sign on a call box post may be located on the rights-of-way at intervals not more frequently than 1 per every 5 miles.

(E) DISTRIBUTION THROUGHOUT STATE — Within a State, at least 20 percent of the call boxes displaying sponsorship logos shall be located on highways outside of urbanized areas with a population greater than 50,000.

(3) NONSAFETY HAZARDS — The call boxes and their location, posts, foundations, and mountings shall be consistent with requirements of the Manual on Uniform Traffic Control Devices or any requirements deemed necessary by the Secretary to assure that the call boxes shall not be a safety hazard to motorists.

Section 353(a) SIGNS — Traffic control signs referred to in the experimental project conducted in the State of Oregon in December 1991 shall be deemed to comply with the requirements of Section 2B-4 of the Manual on Uniform Traffic Control Devices of the Department of Transportation.

Section 353(b) STRIPES — Notwithstanding any other provision of law, a red, white, and blue center line in the Main Street of Bristol, Rhode Island, shall be deemed to comply with the requirements of Section 3B-1 of the Manual on Uniform Traffic Control Devices of the Department of Transportation.