

DEPARTMENT OF TRANSPORTATION**Federal Highway Administration****23 CFR Part 655**

[FHWA Docket No. FHWA-2001-11159]

RIN 2125-AE93

National Standards for Traffic Control Devices: Manual on Uniform Traffic Control Devices for Streets and Highways; Revision

AGENCY: Federal Highway Administration (FHWA), DOT.

ACTION: Final rule.

SUMMARY: The Manual on Uniform Traffic Control Devices (MUTCD) is incorporated by reference in 23 CFR part 655, subpart F, approved by the Federal Highway Administration, and recognized as the national standard for traffic control devices used on all public roads. The purpose of this final rule is to revise standards, guidance, options, and supporting information relating to the traffic control devices in all parts of the MUTCD, to expedite traffic, promote uniformity, improve safety, and incorporate technology advances in traffic control device application. The MUTCD, with these changes incorporated, is being designated as the 2003 edition of the MUTCD.

EFFECTIVE DATE: This final rule is effective December 22, 2003. The incorporation by reference of the publication listed in this regulation is approved by the Director of the Office of the Federal Register as of December 22, 2003.

FOR FURTHER INFORMATION CONTACT: Mr. Ernest Huckaby, Office of Transportation Operations, Room 3408, (202) 366-9064, or Mr. Raymond Cuprill, Office of the Chief Counsel, Room 4230, (202) 366-0791, U.S. Department of Transportation, Federal Highway Administration, 400 Seventh Street, SW., Washington, DC 20590. Office hours are from 7:45 a.m. to 4:15 p.m., e.t., Monday through Friday, except Federal holidays.

SUPPLEMENTARY INFORMATION:**Electronic Access**

This document, the notice of proposed amendments (NPA), and all comments received may be viewed online through the Document Management System (DMS) at <http://dms.dot.gov>. The DMS is available 24 hours each day, 365 days each year. Electronic submission and retrieval help and guidelines are available under the help section of the Web site.

An electronic copy of this document may also be downloaded by using a computer, modem and suitable communications software from the Government Printing Office's Electronic Bulletin Board Service at (202) 512-1661. Internet users may also reach the Office of the Federal Register's home page at: <http://www.archives.gov> and the Government Printing Office's Web page at: <http://www.gpo.gov>.

Background

On May 21, 2002, at 67 FR 35850, the FHWA published a notice of proposed amendments (NPA) proposing revisions to the Manual on Uniform Traffic Control Devices (MUTCD). Those changes were proposed to be designated as Revision No. 2 of the Millennium (2000) edition of the MUTCD. Interested persons were invited to submit comments to FHWA Docket No. FHWA-2001-11159. Based on the comments received and its own experience, the FHWA is issuing a final rule and is designating the MUTCD, with these changes incorporated, as the 2003 Edition of the MUTCD. The FHWA believes that the title "2003 Edition" would be easier for readers to follow rather than the title "Revision No. 2 of the Millennium (2000) edition."

A list of all of the items in this final rule and the text of the 2003 edition of the MUTCD, with these final rule changes incorporated, are available for inspection and copying, as prescribed in 49 CFR part 7, at the FHWA Office of Transportation Operations, Room 3408, 400 Seventh Street, SW., Washington, DC 20590. Furthermore, the list of all items in this final rule and the text of the 2003 edition of the MUTCD, with these final rule changes incorporated, are available on the FHWA's MUTCD Internet site <http://mutcd.fhwa.dot.gov>. The previous version of the MUTCD, the 2000 MUTCD with Revision 1 text incorporated is also available on this Internet site. The 2003 edition supersedes all previous editions and revisions of the MUTCD.

Summary of Comments

The FHWA received 293 letters submitted to the docket, containing over 5,000 individual comments on the MUTCD in general or on one or more parts, chapters, sections, or paragraphs contained in the MUTCD. Comments were received from the National Committee on Uniform Traffic Control Devices (NCUTCD), State Departments of Transportation (DOTs), city and county government agencies, Federal government agencies, consulting firms, private industry, associations, other organizations, and individual private

citizens. The FHWA has reviewed and analyzed all the comments received. The significant comments and summaries of the FHWA's analyses and determinations are discussed below. General comments and significant global changes throughout the MUTCD are discussed first, followed by discussion of significant comments and adopted changes in each of the individual Parts of the MUTCD.

Discussion of Adopted General and Global Changes Throughout the MUTCD

In the NPA, the FHWA proposed designating the changes to the MUTCD as Revision No. 2 of the Millennium (2000) edition of the MUTCD. Comments were received from the American Association of State Highway Transportation Officials (AASHTO), the American Traffic Safety Services Association (ATSSA) and the Institute of Transportation Engineers (ITE) (the three associations who publish the MUTCD in hard-copy book format) and from other individuals opposing this proposed designation as Revision No. 2. The commenters expressed the opinion that the number and extent of changes are too great in scope to be considered a mere revision of the 2000 edition and that the MUTCD, with the changes incorporated, should be designated as a complete new edition of the MUTCD, to minimize user confusion. The commenters also stated that a new graphical design for the cover and title pages of each part of the MUTCD are needed to make the new edition clearly distinguishable by users from earlier editions. The FHWA agrees with these comments and designates the MUTCD, with the adopted final rule changes incorporated, as the 2003 Edition of the MUTCD and also adopts new graphical designs for the cover and title pages of each part of the 2003 MUTCD. The FHWA revises Table I-1 and all page headers to reflect this designation.

Additionally, the FHWA received comments from ITE, ATSSA, traffic engineering consultants and private citizens that the proposed continuation of the 2000 MUTCD's page layout format and graphics formats is inappropriate and that these elements need improvement to adequately serve users. Suggestions included reducing the amount of "white space" on text pages to reduce the total number of pages in the MUTCD, using accurate fonts and letter spacing on illustrations of signs, using more accurate proportioning of lanes and pavement markings on figures, and various other adjustments to graphics to aid in user understanding and to make the figures more accurately reflect the standards,

guidance, and options contained in the text of the MUTCD. The FHWA agrees that the page layout and graphics formatting of the 2000 MUTCD needs to be improved in the 2003 edition to make the document more usable by the public. Accordingly, in this final rule the FHWA revises the text page layouts to reduce white space and thereby reduce the number of text pages by about one-third, while still maintaining good layout for readability both online and in printed book format. The FHWA also revises many of the figures in the MUTCD to make sign illustrations pattern-accurate and illustrations of pavement markings and other devices more understandable and to accurately reflect provisions in the MUTCD text.

The FHWA also received many comments about the lack of consistency between some of the signs and pavement markings illustrated in various figures in the MUTCD and the illustrations in the "Standard Highway Signs" (SHS) book.¹ The FHWA agrees that these inconsistencies cause inordinate confusion to users, and in this final rule the FHWA revises many of the MUTCD figures to illustrate or refer to all SHS signs that are consistent with this 2003 MUTCD. This will better serve users by greatly improving the consistency of the MUTCD with the SHS.

Additionally, in the NPA, the FHWA proposed minor grammatical or style changes to the MUTCD text to improve consistency with related text or figures, to improve clarity, or to correct minor errors. Where the FHWA proposed to add new sections within a chapter of the MUTCD, the FHWA proposed to renumber the sections that followed accordingly. The FHWA proposed to revise all Tables of Contents, Lists of Figures, Lists of Tables, and page headers and footers as appropriate to reflect the proposed changes. The FHWA received many comments, both in general and on many specific sections throughout the MUTCD, agreeing with these minor editorial changes. Some commenters opposed the proposed use of some specific words or phrases and recommended substitute words or phrases and/or additional minor editorial revisions to correct errors, improve grammar, clarity, consistency,

and accuracy. Where appropriate, the FHWA incorporates minor editorial revisions and corrections in this final rule.

The FHWA also received comments on the fact that many of the new sections proposed in the NPA were to be added at the end of the chapter in various parts of the MUTCD. Several commenters, particularly State DOTs, suggested that the new material would be more logically located near other similar subjects within the chapter rather than at the end. The FHWA agrees with many of the comments of this nature and makes editorial changes in the text and figures as appropriate in this final rule. The FHWA also relocates and renumbers some of the new sections to appropriate locations within the chapters to enhance user understanding, and renumbers subsequent sections accordingly.

In the discussions below, the section numbers and titles refer to those in this final rule, with parenthetical reference to the section numbers and titles in the NPA and/or the 2000 Edition if different, as appropriate.

The FHWA also received comments from traffic engineering consultants and others about inconsistency and errors in the 2000 MUTCD and in the NPA regarding conversions of English units to metric units. Accordingly, the FHWA made a comprehensive review of all dimensions and units of measure in the MUTCD and identified a variety of errors in conversions of English units to metric units that had occurred during the process of preparing the 2000 edition of the MUTCD and that had been perpetuated or inaccurately corrected in the NPA. The FHWA corrects these metric conversions in this final rule.

In the NPA, to facilitate easy reference, the FHWA also proposed giving figure numbers and titles to all pages that did not have a figure number for images of traffic control devices in the 2000 MUTCD. The FHWA also proposed changing the titles of a number of figures to clarify a figure as either "typical" or "example(s) of." In general, the FHWA proposed using the word "typical" in the title if the figure portrays preferred or recommended practice, and the words "example(s) of" in the title if the figure portrays one or several of a variety of things that would be acceptable practice with no recommended preference. Also, the FHWA proposed modifying figures, where appropriate, to reflect proposed changes in the text. Most of the commenters agreed with these proposed changes. In a few cases, the FHWA received comments opposing a

proposed change of a specific figure's title from "example(s) of" to "typical," citing reasons why the figure or figures in question were inaccurately named based on the FHWA's stated criteria. The FHWA adopts the proposed addition of or changes to figure numbers and titles with revisions to address comments as appropriate.

The FHWA also received several comments from the U.S. Access Board and from organizations representing the blind, visually impaired, and people with other disabilities, requesting that the MUTCD be changed throughout to make it fully consistent with the Draft Guidelines for Accessible Public Rights-of-Way that were published by the Access Board on June 17, 2002, on its Web site (<http://www.access-board.gov>). The FHWA disagrees because the draft guidelines published by the Access Board are only a preliminary draft for initial public comments, and they have not been finalized. The Access Board is currently reviewing the large number of initial public comments received on the draft and plans to issue a notice of proposed rulemaking (NPRM) with a revised proposal for Guidelines for Accessible Public Rights-of-Way in 2004. After the Access Board completes its rulemaking on this matter and issues a final rule, the FHWA plans to propose changes to the MUTCD to make it consistent with the Access Board's guidelines. However, in recognition of and support for the importance of accessibility issues related to traffic control devices, in the NPA the FHWA proposed a variety of changes to the MUTCD to assure consistency with existing requirements of the Americans With Disabilities Act (ADA), 42 U.S.C. 12101 *et seq.*, and other regulatory requirements concerning accessibility as they pertain to traffic control devices. In this final rule, the FHWA adopts most of those proposed changes. Further discussion of accessibility issues may be found elsewhere in this preamble to this final rule, especially under the discussion of adopted revisions to Part 6 of the MUTCD, Temporary Traffic Controls.

The FHWA is aware that section 508 of the Rehabilitation Act, 29 U.S.C. 794 (2001), requires that certain electronic and information technology (EIT) be accessible to individuals with disabilities. By regulation, 36 CFR 1194.4 (2001), EIT includes information contained on world wide Web sites. Because the FHWA distributes the MUTCD via the Internet site (<http://mutcd.fhwa.dot.gov>), it is aware that it must comply with section 508, and it has done so by providing, in addition to the PDF file format, an alternative

¹ "Standard Highway Signs," FHWA, 2002 Edition is available for purchase from the U.S. Government Printing Office Bookstore, Superintendent of Documents, Room 118, Federal Building, 1000 Liberty Avenue, Pittsburgh, PA 15222. Internet Web site at <http://bookstore.gpo.gov>. It is also available on the FHWA's Web site at <http://mutcd.fhwa.dot.gov> and is available for inspection and copying at the FHWA Washington Headquarters and all FHWA Division Offices prescribed at 49 CFR part 7.

format (hypertext markup language—HTML), that is accessible to individuals with disabilities. Included within those HTML files are accessible narrative descriptions of all of the illustrations (figures) that are contained in the MUTCD. The FHWA notes that, while every effort has been made to assure complete consistency between the PDF and HTML file formats, the PDF version is the official version of the MUTCD and takes precedence over any potentially conflicting text in that may occur in the HTML version.

A summary of the significant changes for each of the parts of the MUTCD is included in the following discussion.

Discussion of Adopted Amendments to the Introduction

1. On Page i the FHWA adds addresses for four additional organizations whose publications are referenced in the various parts of the MUTCD. There were no comments on these additions and the FHWA adopts the changes as proposed in the NPA, with further revisions to add Web site addresses for each of the organizations listed, to assist users of the MUTCD with contacting each of the organizations.

2. In the Introduction, the FHWA revises the second paragraph of the first STANDARD statement to correct an incorrect reference in the 2000 MUTCD and to accurately reflect the referenced text of the Code of Federal Regulations and with Section 1A.07 Responsibility for Traffic Control Devices. There were no comments on these changes. The FHWA adopts the changes.

In the second SUPPORT statement, the FHWA makes a minor editorial change to correct the section reference to the Uniform Vehicle Code² in the fourth sentence of the first paragraph to Section 15–116 of the UVC. The 2000 MUTCD and the NPA incorrectly referenced Section 15–117 of the UVC regarding traffic control devices on private property used by the public.

The FHWA also adds a second paragraph to the GUIDANCE statement to clarify that, except when a specific numeral is required by the MUTCD text, numerals shown in sign images in the figures that specify times, distances, speed limits, and weights should be regarded as examples only, and that the numerals installed on actual signs

should be appropriately altered to fit the specific signing situation. This clarification is necessary to address comments about some of the sign images throughout the MUTCD in the NPA.

The FHWA also adds a fourth SUPPORT statement to clarify the organization of the MUTCD and explain how one could reference portions of the MUTCD. There were no comments on this SUPPORT statement and the FHWA adopts it as proposed in the NPA.

The FHWA also adds a new STANDARD that lists special phase-in target compliance dates for various portions of the MUTCD. The purpose of this list is to provide a convenient reference guide to the user of phase-in target compliance dates for various portions of the MUTCD. The FHWA received comments from the City of Plano, Texas, and the Association of Pedestrian and Bicycle Professionals supporting the presence of this new text. Some commenters also questioned the use of the word “issuance” in the STANDARD stating that States or other Federal agencies shall adopt changes to the MUTCD within two years of issuance. “Issuance” in this usage refers to the date that the FHWA Administrator signs the final rule, which occurs prior to the publication date and effective date of the final rule. This language is as proposed in 23 CFR 655.603(b)(1) and cannot be changed in the MUTCD Introduction until the Code of Federal Regulations is changed. Such a change may be considered in a future rulemaking.

The National Committee on Uniform Traffic Control Devices (NCUTCD), including members of the Railroad-Light Rail Transit Technical Committee of the NCUTCD opposed the wording in the first paragraph of the proposed new STANDARD that would require replacement of damaged devices upon adoption of the MUTCD by the State or other Federal agency. The commenters stated that replacement of damaged devices is normal maintenance that should not be covered by this STANDARD. While it is usually desirable to replace damaged devices with ones that conform to the current MUTCD, there are times that doing so may not be practical, or may cause the replacement device to be inconsistent with other portions of the Manual or other devices in a series, and thereby cause a potential safety issue for road users. The FHWA agrees and revises the statement by deleting replacement of damaged devices from the STANDARD statement and, in conjunction with this, at the end of the MUTCD Introduction the FHWA adds new OPTION and

SUPPORT statements regarding the replacement of damaged, non-compliant devices as part of maintenance activities following a crash or other event. The FHWA also modifies the new STANDARD statement to accurately reflect existing provisions of the Code of Federal Regulations in regard to different requirements that apply on Federal-aid projects, and to clarify the FHWA’s authority to establish phase-in target compliance dates for particular changes to the MUTCD.

The NCUTCD, State and local DOTs, and private citizens suggested changes to some specific proposed special phase-in target compliance dates. The FHWA deletes the word “proposed” from each of the phase-in target compliance dates which appeared in the NPA, and changes the phase-in target compliance dates (from what was proposed in the NPA) for the following: Section 2B.28 Preferential Only Lane Sign Placement and Application (numbered 2B.50 in the NPA), Section 2B.52 Hazardous Material Signs (R14–2, R14–3) (numbered 2B.46 in the NPA), Section 2C.30 Speed Reduction Signs (W3–5, W3–5a) (numbered 2C.51 in the NPA), Section 2D.38 Street Name Sign (D3–1), Section 2D.39 Advance Street Name Signs (D3–2), Section 2E.28 Interchange Exit Numbering, Section 2I.03 EVACUATION ROUTE Sign (EM–1), Section 4D.12 Flashing Operation of Traffic Control Signals, Section 4E.07 Countdown Pedestrian Signals, Section 6D.03 Worker Safety Considerations (numbered 6D.02 in the NPA), Section 6E.02 High-Visibility Safety Apparel, Section 6F.58 Channelizing Devices (numbered 6F.55 in the NPA), Section 6F.63 Type I, II, or III Barricades (numbered 6F.60 in the NPA), and Part 10 (Traffic Controls for Highway-Light Rail Transit Grade Crossings).

The FHWA also adds phase-in target compliance dates for the following: Section 2A.19 Lateral Offset, Section 2B.06 STOP Sign Placement, Section 2B.09 YIELD Sign Applications, Section 2B.10 YIELD Sign Placement, Section 2B.13 Speed Limit Sign (numbered 2B.11 in the NPA), Section 2C.16 NARROW BRIDGE Sign (W5–2) (numbered 2C.14 in the NPA), Section 2B.26 Preferential Only Lane Signs (R3–10 through R3–15) (numbered 2B.48 in the NPA), Section 2C.34 Two-Way Traffic Sign (W6–3) (numbered 2C.31 in the NPA), Section 2E.54 Reference Location Signs, Section 2E.59 Preferential Only Lane Signs, Section 3B.03 Other Yellow Longitudinal Pavement Markings, Section 3B.17 Crosswalk Markings, Section 3B.19 Pavement Word and Symbol Markings, Section 5C.05 NARROW BRIDGE Sign,

² The “Uniform Vehicle Code and Model Traffic Ordinance,” 2000 edition, is published by the National Committee on Uniform Traffic Laws and Ordinances, 107 S. West Street, #110, Alexandria, Virginia 22314. It is available for inspection as prescribed at 49 CFR part 7. Purchase information is available on the Web site for the National Committee at <http://www.ncutlo.org>.

Section 6D.02 Accessibility Considerations, Section 6F.03 Sign Placement, 6F.66 Longitudinal Channelizing Barricades (numbered 6F.53 in the NPA), Section 6F.82 Crash Cushions (numbered 6F.78 in the NPA), and Section 7B.12 Reduced Speed School Zone Ahead Sign (S4–5, S4–5a).

The FHWA is not including in this final rule the following phase-in target compliance dates that had been proposed in the NPA: Section 3B.14 Raised Pavement Markers Substituting for Pavement Markings, Section 4E.04 Size, Design, and Illumination of Pedestrian Signal Head Indications, Sections 4F.04 and 4L.03 (these sections are removed from this final rule), Section 6F.69 Temporary Raised Islands (numbered 6F.63 in the NPA), and for Section 8B.02 Highway-Rail Grade Crossing (Crossbuck) Sign (R15–1) and Number of Tracks Sign (R15–2). Discussion of these changes, additions, and removals of phase-in target compliance dates may be found under the discussions of the individual sections.

Discussion of Adopted Amendments to the Table of Contents

3. The FHWA condenses the Table of Contents to include only the list of Parts and Chapters. Each Part continues to begin with a “table of contents” that contains the page number of every section, figure, and table. This change simplifies the search for an item by those with visual disabilities by enabling them to advance to the appropriate Part and then page more quickly and easily. There were no comments on the Table of Contents and the FHWA adopts the changes.

Discussion of Adopted Amendments to Part 1—General

4. In Section 1A.05 Maintenance of Traffic Control Devices, in the second paragraph of the GUIDANCE statement, the FHWA revises the text to eliminate redundancy. The FHWA received one editorial comment from a traffic engineering consultant, and adopts the suggested editorial changes with minor revision.

5. In Section 1A.07 Responsibility for Traffic Control Devices, the FHWA makes a minor editorial change to correct the section reference to the Uniform Vehicle Code (UVC) in the first sentence of the second paragraph of the SUPPORT statement to Section 15–116 of the UVC. The 2000 MUTCD and the NPA incorrectly referenced Section 15–117 of the UVC regarding traffic control

devices on private property used by the public.

6. In Section 1A.10 Interpretations, Experimentations, Changes and Interim Approvals, titled “Interpretations, Experimentations, and Changes” in the NPA, the FHWA changes the first GUIDANCE statement to a STANDARD statement to require that requests for interpretations, permission to experiment, interim approval, or changes to the MUTCD must be submitted to the FHWA’s Office of Transportation Operations. There were no comments on this change.

The FHWA received three comments from the NCUTCD and the Minnesota and Ohio DOTs regarding item E of the second GUIDANCE statement and item D of the fourth GUIDANCE statement, both of which pertain to patented or copyrighted traffic control devices. The commenters suggested that certifying that a “concept” for a traffic control device is not protected by a patent or copyright is vague and difficult to interpret. The FHWA agrees and inserts an example of a traffic control device concept in both items to clarify the intent.

Additionally, following the fourth GUIDANCE statement the FHWA adds SUPPORT, GUIDANCE, OPTION, and STANDARD statements describing the “interim approval” process for the FHWA to approve or allow the use of new traffic control devices. Seven commenters representing industry and local governments were all in general support of the new interim approval process.

The NPA included an additional new STANDARD statement between the new SUPPORT and GUIDANCE statements. In response to comments from the NCUTCD and the California Department of Transportation (Caltrans), the FHWA removes as incorrect the proposed STANDARD statement to the effect that interim approvals will be considered only when submitted by the public agency or private toll facility responsible for the operations of the road or street. It is not FHWA’s intent to limit requests for interim approvals to only public agencies or private toll road authorities. Requests for interim approvals, interpretations, and changes can be made by anyone. However, requests for experimentation approvals will continue to be accepted only from public agencies or private toll road authorities.

The FHWA also modifies Figure 1A–2 to reflect the “interim approval”

process and to make the figure more accurately reflect the text of the MUTCD.

7. In Section 1A.11 Relation to Other Publications, the FHWA modifies the STANDARD statement to update the documents listed to the latest editions. The FHWA also adds additional sources of information in the SUPPORT statement and revises the order of the sources of information, alphabetizing first by source, then by the title of the document. There were several editorial comments suggesting revisions to reflect current editions of documents that the FHWA incorporates in this final rule.

8. In Section 1A.12 Color Code, the FHWA adds to the STANDARD statement the assignment of the color fluorescent pink to incident management to make it easier for road users to follow directions relating to traffic incidents. This color was referred to as fluorescent coral in the NPA. The FHWA received several comments from the NCUTCD, ATSSA, the Ohio, California, Virginia and Missouri DOTs, and traffic control device manufacturers, regarding this color. ATSSA, the Virginia DOT, and several traffic control device manufacturers felt that the color should be called fluorescent pink, other traffic control device manufacturers agreed with the color coral, and Minnesota DOT wanted more studies regarding effectiveness of the color. The FHWA believes that the study³ that found this color to be effective is sufficient and that further study is not needed. The coordinates of the color box are most appropriately titled “fluorescent pink,” and the FHWA intends for the color to appear pinker in nature, similar to the sample signs that were studied and found effective, rather than coral. The FHWA reorders the items in the STANDARD statement so that the colors appear in alphabetical order, adds the color “fluorescent pink,” and restores the color “coral” as unassigned. The color coordinates for the color fluorescent pink are indicated below.

³ “Improvement of Conspicuity of Trailblazing Signs: Phase III—Evaluation of Fluorescent Colors”, Virginia Transportation Research Council (VTRC) Report No. FHWA/VTRC 01–CR4, February 2001, by Neale, Anders, Schreiner, and Brich, may be ordered from VTRC at the following URL: http://www.virginiadot.org/vtrc/main/index_main.htm. The color tested and recommended in this report is referred to as fluorescent coral, however the characteristics (color box coordinates, etc.) of the color tested are more accurately described as fluorescent pink.

The Commission Internationale de l'Eclairage (CIE) (English: International Commission on Illumination) chromaticity coordinates (x,y), defining

the corners of the Fluorescent Pink daytime color region are as follows:

x	y
0.450	0.270

x	y
0.590	0.350
0.644	0.290
0.536	0.230

	Luminance factor limits (Y)				
	D ₆₅			D ₁₅₀	
	Min	Max	Y _F	Min	Max
	25	none	15	25	none

Fluorescent Pink

Fluorescent materials differ from non-fluorescent materials in that the total luminance is the sum of the luminances due to reflection and fluorescence. The luminance factor Y of such materials is the sum of the luminance due to reflection (Y_R) and the luminance due to fluorescence (Y_F). Therefore, Y=Y_R+Y_F. If the value Y_F is greater than zero, the material is fluorescent; if Y_F equals zero, then the luminance factor Y is equal to Y_R.

These four pairs of chromaticity coordinates determine the acceptable color in terms of CIE 1931 Standard Colorimetric System (2 degree standard observer) measured with CIE Standard Illuminant D65 in accordance with the American Society for Testing Materials (ASTM) standard E991. In addition, the color shall be fluorescent, as determined by ASTM E1247.⁴ The FHWA amends title 23, Code of Federal Regulations, part 655, appendix to subpart F, to add chromaticity coordinates and luminance factor limits for the color of fluorescent pink retroreflective sign materials.

Additionally, to be consistent with Section 2C.42 Playground Sign (W15-1), the FHWA adds "playground warning" to the list of signs assigned the fluorescent yellow-green color.

9. In Section 1A.13 Definitions of Words and Phrases in This Manual, the FHWA revises definitions in the STANDARD statement for: "Active Grade Crossing Warning System," "Average Day," "Beacon," "Crosswalk," "Highway Traffic Signal," "Raised Pavement Marker," "Road User," "Shared-Use Path," "Sidewalk," "Sign Illumination" and "Traffic Control Device" to better reflect accepted practice and terminologies and to provide consistency between the

definitions shown here and in other parts of the Manual. Additionally, the FHWA adds definitions for "Crashworthy," "Detectable," "Inherently Low Emission Vehicle (ILEV)," "Pedestrian Facilities," and "Roundabout Intersection" because they are used in the MUTCD. There were a few editorial comments regarding some of these definitions that the FHWA incorporates in this final rule as appropriate. Also, the FHWA revises the definition of "Inherently Low Emission Vehicle (ILEV)" to clarify that only the U.S. Environmental Protection Agency has the authority to certify ILEVs.

Additionally, the FHWA removes the definition for "Preferential Lane Marking" because it is no longer used in the MUTCD. There were no comments regarding this change.

10. In Section 1A.14 Abbreviations Used on Traffic Control Devices, the FHWA revises the text in the first STANDARD statement to clarify that the abbreviations for the word messages shown in Table 1A-1 are the only abbreviations to be used for those word messages. The FHWA also adds a GUIDANCE statement at the end of this section to give guidance regarding the consistency of abbreviations within a single jurisdiction. Additionally, the FHWA revises Tables 1A-1 and 1A-2 to include additional abbreviations, delete some abbreviations, and modify some abbreviations, based on Texas research on driver understanding of abbreviations. The Illinois DOT was opposed to the abbreviations for northbound, eastbound, and the like, suggesting that the use of "NB", etc. should be allowed. The 2000 Texas Transportation Institute (TTI) study (by Durkop and Dudek)⁵ on which many of

the abbreviation requirements were based found very low driver comprehension rates in Texas for NB, EB, SB, and WB when used as "NB Traffic" or "US 75 NB." The Texas study suggested that a better alternative would be just the initial letter N, S, E, or W. The FHWA reviewed that study and has determined that abbreviations such as "N-BND" would further enhance understanding. Accordingly, the FHWA adopts the changes to this section as proposed in the NPA, with minor editorial clarifications.

Discussion of Adopted Amendments to Part 2—Signs

11. In Section 2A.06 Design of Signs, the FHWA adds to the SUPPORT statement that the "general appearance" of the sign legends, colors and sizes are shown in the illustrations, because the illustrations may not exactly correspond to the letter brush stroke widths of the "Standard Highway Signs" book and the FHWA central values and tolerance limits of colors, due to variations in computer display monitors and printing processes.

In the NPA, the FHWA proposed adding to the STANDARD statement that, unless otherwise stated in the MUTCD for a specific sign, phone numbers or Internet addresses shall not be shown on any sign, to reduce the possibility of driver distraction. While there was one comment from the NCUTCD in support of this change, there were five comments from the Arizona, Washington, Virginia, and Illinois DOTs and the City of Plano, Texas, specifically opposing the language in the NPA prohibiting phone numbers on signs because these may provide important phone numbers that are used for services provided to the public by a government agency. The FHWA agrees that telephone numbers can be useful, but is concerned about driver distraction and the effect on highway safety. To address the

⁴ A list of the American Society for Testing Materials (ASTM) standards is available on the Internet at the following URL: <http://www.astm.org>. The ASTM International is a global forum for the development of consensus standards. Standard ASTM E991-98 is titled "Standard Practice for Color Measurement of Fluorescent Specimens." Standard ASTM E1247-03 is titled "Standard Practice for Detecting Fluorescence in Object-Color Specimens by Spectrophotometry."

⁵ "Texas Driver Understanding of Abbreviations for Dynamic Message Signs", February 2000, by Durkop and Dudek, Texas Transportation Institute Report number FHWA/TX-00-1882-1, can be obtained from the Texas Transportation Institute, phone (979) 845-4853. A summary of the results was also published in Transportation Research Record 1748, available for purchase from the Transportation Research Board at the following

comments, the FHWA revises the STANDARD statement and adds GUIDANCE and OPTION statements to allow phone numbers and Internet addresses on signs in certain limited circumstances, minimizing the potential effects on safety. The language in this final rule permits abbreviated telephone numbers (four characters or less) on signs. Signs with telephone numbers of more than four characters and Internet addresses may be provided in parking and pedestrian areas, or on low-speed roadways where engineering judgment indicates that vehicles can safely stop out of the traffic flow to read the sign.

12. In Section 2A.07 Changeable Message Signs, the FHWA revises the GUIDANCE statement to include safety messages as one of the types of allowable displays for changeable message signs. There were two comments from the NCUTCD and the City of Tucson, Arizona, in support of this change, while two commenters representing the Kansas DOT opposed it. The Kansas DOT stated that to encourage the display of safety messages on changeable message signs could desensitize the traveling public towards regulatory, warning, and guidance information that is displayed at other times. The FHWA adopts the proposed change because it is included in a GUIDANCE statement, which gives the individual States the flexibility to permit or not permit safety messages on changeable message signs.

Additionally, the FHWA adds at the end of the section OPTION, SUPPORT, GUIDANCE, and STANDARD statements regarding the use, design, and format of safety and other messages so that they do not adversely affect the usefulness of the sign. There were two comments from the Kansas DOT opposed to the new OPTION statement, stating that changeable message signs should be used only when there is a need. Because this is an OPTION statement, the FHWA believes that it gives any individual State the flexibility to use this option if it so chooses. To explicitly reinforce this, the FHWA adds a sentence to the OPTION statement that State and local agencies may develop and establish a policy regarding safety and transportation-related message signs, for both permanent and changeable message signs, which specifies allowable messages and applications. To mirror and reinforce the information contained in Table 2A-4, the FHWA also adds to the OPTION statement that 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.

13. In Section 2A.08 Retroreflectivity and Illumination, the FHWA revises Table 2A-1 by replacing "Patterns of incandescent light bulbs" with "Incandescent light bulbs" and by adding "Light Emitting Diodes (LEDs)" to the listed Means of Illumination to reflect current technology. There were nine comments from the NCUTCD, the City of Tucson, Arizona, traffic control device manufacturers, and private citizens supporting this change, particularly the addition of light emitting diodes (LEDs). To provide additional clarification to the table, the FHWA creates a separate row in the table for light emitting diodes under the Means of Illumination and includes symbols or word messages and portions of the sign border as sign elements to be illuminated. In addition, based on comments from the NCUTCD, the FHWA adds to the OPTION statement additional information regarding the use of LEDs within the face of a sign and in the border of a sign and adds a new STANDARD statement following this OPTION to specify the color and flash rate for LEDs used on a sign.

Additionally, the FHWA adds a new SUPPORT statement at the end of the section referencing information contained in Section 2A.21 Posts and Mountings on the use of retroreflective material on the sign support. There was one comment from the NCUTCD in support of this change. The FHWA adopts this change.

14. In Section 2A.10 Shapes, the FHWA revises Table 2A-3 by removing the Emergency Evacuation Route Sign from the listed signs for the circle shape because the FHWA changes the design of this sign to be a rectangular plate in accordance with other guide signs, as indicated in Section 2I.03 EVACUATION ROUTE Sign (EM-1). The FHWA received two comments from the NCUTCD and the City of Tucson, Arizona, in support of this change, and one comment from the Florida DOT opposed to it. The Florida DOT opposed because it currently uses the circle shape for the Emergency Evacuation Route Sign and believes that the proposed change would have a large statewide impact to its evacuation program. The FHWA notes that the Emergency Evacuation Route Sign has not been changed; it has just been put onto a white rectangular background so that the circular shape can be reserved for another use. The FHWA adopts the change, but to address the Florida DOT's comment, adds a phase-in target compliance date of 15 years from the date this final rule is effective for the

change in shape, for signs in good condition.

Additionally, the FHWA revises Table 2A-3 to list the Trapezoid shape for use as "Recreational and Cultural Interest Area Series" and "National Forest Route" signs. The FHWA received two comments from the City of Tucson, Arizona, and the NCUTCD in support of this change, and adopts this change.

15. In Section 2A.11 Sign Colors, the FHWA modifies the STANDARD statement to read "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." This modification clarifies that the color requirements apply to all signs in the MUTCD, not just those in Part 2, and refers to the correct location of the color coordinates and values. There were no comments on this change.

In the NPA, the FHWA proposed using the color coral for incident management uses, however in response to comments from traffic control device manufacturers about this section and Part 6, the FHWA changes this color assignment to fluorescent pink because this name more clearly describes the color in the color tints. See also the discussion under Section 1A.12 Color Code, which also applies to this section. As a result, the FHWA withdraws this proposal to modify the SUPPORT statement to delete the color coral from the reserved colors, and retains the text as shown in the 2000 MUTCD which includes the color coral as a reserved color for a use that will be determined in the future. Additionally, the FHWA adds to the SUPPORT statement that information regarding color coding of destinations on guide signs is contained in Section 2D.03 Color, Retroreflection, and Illumination.

The FHWA also modifies Table 2A-4 by adding a new column on the right hand side for the color fluorescent pink, by adding a new row "Incident Management" to the bottom, by adding a second new row "Changeable Message Signs" at the bottom, following Incident Management, and by adding or revising color designations and notes to reflect proposed changes in other parts of the MUTCD. The FHWA makes additional editorial changes to the table, and moves Reference Location, Street Name, and Destination signs to be listed as Guide signs, and the Evacuation Route sign to be listed under Information signs, in response to a comment from Caltrans and to maintain consistency within the MUTCD.

16. In Section 2A.12 Dimensions, the FHWA adds a second paragraph to the SUPPORT statement describing and clarifying the different sizes of signs, as detailed in the "Standard Highway Signs" book. While the City of Tucson, Arizona, supported the change, there were two comments from the NCUTCD and the Illinois DOT opposed to this new paragraph. The NCUTCD stated that this new paragraph introduced redundancy because this information is included in Sections 2B.03 Size of Regulatory Signs and 2C.04 Size of Warning Signs, and the Illinois DOT suggested that this paragraph was unnecessary. The FHWA agrees that this information needs to be included in only one place in the Manual, and adopts the text in this section and deletes this information from Sections 2B.03 and 2C.04. The FHWA revises the last sentence of this paragraph to clarify that intermediate sized signs are designed to be used on other highway types.

17. In Section 2A.14 Word Messages, the FHWA modifies the first GUIDANCE statement to clarify that the specific ratio of 25 mm (1 in) of letter height per 12 m (40 ft) of legibility distance should be a minimum. The FHWA received one comment from the NCUTCD supporting this change and adopts this change.

Additionally, the FHWA adds a new SUPPORT statement after the first paragraph of GUIDANCE to provide additional information that some research on sign legibility of older drivers⁶ indicates that a ratio of 25 mm (1 in) of letter height per 10 m (33 ft) of legibility distance could be beneficial for addressing the needs of older drivers. Three commenters from the NCUTCD, ATSSA, and the sign manufacturing industry supported this new SUPPORT statement, and the City of Tucson, Arizona, and a traffic engineering consultant opposed it. Both opposing commenters expressed concern that this additional language would add confusion as to what ratio should be used in designing signs. The FHWA disagrees with the opposing commenters because SUPPORT statements are purely informational and have no legal basis for a mandatory or recommended practice.

⁶Information about this research is summarized on pages 185 and 186 of the "Highway Design Handbook for Older Drivers and Pedestrians," Report number FHWA-RD-01-103, published by the FHWA Office of Safety Research and Development, 2001. It is available for purchase from The National Technical Information Service, Springfield, Virginia 22161, (703) 605-6000. Internet Web site address at <http://www.ntis.gov>.

The FHWA adds a new GUIDANCE heading for guidance on abbreviations after the new SUPPORT statement.

18. In Section 2A.15 Sign Borders, the FHWA modifies the STANDARD statement to require that the corners of all sign borders, except for STOP signs, shall be rounded. The FHWA received several comments from ATSSA and representatives of the blind community regarding this change. The commenters misunderstood this statement both in the NPA and in the 2000 MUTCD, thinking that it pertained to the corners of the sign itself, rather than the sign border, which is included within the sign. As noted in the next paragraph, the sign itself does not always have to have rounded corners, but the border (typically black on white) does. The NPA merely replaced the phrase "corners of the sign" with "corners of all sign borders" to provide consistency with the section title, Sign Borders. The FHWA adopts the change, as proposed in the NPA, in this final rule.

The NPA also included a proposal to modify the GUIDANCE statement to clarify that, where practical, the corners of the sign should be rounded to fit the border, except for STOP signs. The FHWA received several comments from ATSSA and representatives of the blind community supporting the rounding of sign corners. The FHWA received one comment from a traffic engineering consultant opposing the statement, suggesting that the phrase "where practical" was too vague. The FHWA agrees and revises this statement to include a reference Section 2E.15 Sign Borders for specific exemptions regarding the rounding of corners of sign.

19. In Section 2A.16 Standardization of Location, the FHWA relocates Figures 2A-3, 2A-4, 2A-5, and 2A-6 to Section 2B.37 ONE WAY Signs (R6-1, R6-2) and removes Figure 2A-7 (figure numbering cited here reflects 2000 MUTCD). These relocated figures are more appropriate in Chapter 2B Regulatory Signs. The FHWA revises the first SUPPORT statement to reflect these changes. There were no comments regarding this change, and the FHWA adopts this change.

The FHWA received several comments from Caltrans, the Ohio DOT, the City of Tucson, Arizona, and a traffic engineering consultant regarding Figures 2A-1 and 2A-2 in the NPA. In response to the comments regarding the use of the words "typical" and "examples", the FHWA changes the figure titles to: "Figure 2A-1 Examples of Heights and Lateral Locations of Signs for Typical Installations" and "Figure 2A-2 Examples of Locations for

Some Typical Signs at Intersections." The FHWA also incorporates editorial comments and notes to the figures in this final rule.

The FHWA also revises the second paragraph of the first GUIDANCE statement to state the exceptions to placing signs on separate posts in list form rather than narrative form, and to clarify that certain groupings of regulatory signs are also excepted from the recommended mounting on separate posts. These minor editorial clarifications respond to a comment from a traffic engineering consultant and reflect common practice.

20. In Section 2A.17 Overhead Sign Installations, the FHWA modifies the GUIDANCE statement to clarify that overhead guide signs should be used on freeways as well as expressways, under certain conditions. The FHWA received two comments from ATSSA and the City of Tucson, Arizona, in support of this change and adopts this change.

The FHWA received one comment from a traffic engineering consultant suggesting that the last paragraph of the OPTION statement pertaining to the placement of signs on bridges of freeways and expressways in order to enhance safety and economy is duplicative and unnecessary. The FHWA agrees with the comment and makes this minor and editorial revision to remove this text from this final rule.

21. In Section 2A.18 Mounting Height, the FHWA relocates the first OPTION and SUPPORT statements so that they appear before the last paragraph of the first STANDARD statement. This change improves the clarity of the section. The FHWA received one comment from the City of Tucson, Arizona, supporting this change, and adopts this change. The FHWA received one comment from a private citizen suggesting that in-street crosswalk signs are typically mounted much lower than the heights included in the first STANDARD statement, and that if they are to be excluded from these criteria, appropriate language should be included in the final rule. The FHWA agrees that additional language is needed and adds a new SUPPORT statement at the beginning of the Section that indicates that the provisions of this section apply unless specifically stated otherwise for a particular sign elsewhere in the MUTCD.

Additionally, the FHWA adds a paragraph to the last OPTION statement indicating that if the vertical clearance of other structures is less than 4.9 m (16 ft), the vertical clearance to overhead sign structures or supports may be as low as 0.3 m (1 ft) higher than the

vertical clearance of the other structures. These lower clearances for the sign structures are sometimes needed to maximize the visibility of the signs when low bridge structure or tunnel clearances limit the sign visibility. There was one editorial comment from the NCUTCD regarding this change, which the FHWA incorporates in this final rule.

22. In Section 2A.19 Lateral Offset, the FHWA divides the first STANDARD statement into a STANDARD and a GUIDANCE statement. The STANDARD statement refers to the lateral offset of overhead sign supports, and the GUIDANCE statement refers to the lateral offset of signs mounted at the roadside. Changing the lateral offset of roadside-mounted signs to a GUIDANCE provides additional flexibility to jurisdictions for signs mounted at the roadside. There was one comment from the NCUTCD in support of this change, the Kansas DOT opposed it, and Caltrans requested additional clarification. The Kansas DOT opposed the conversion of the minimum lateral offset for signs mounted at the roadside to a GUIDANCE, and suggested that it should remain a STANDARD in order to minimize the chance of allowing signs to be placed immediately adjacent to the shoulder or the roadway edge. The FHWA disagrees because it is more appropriate for this item to be a GUIDANCE, especially given the exemptions in the last OPTION statement. The FHWA encourages the 12-foot offset, but provides flexibility to jurisdictions for the placement of signs mounted at the roadside in places where the 12-foot offsets would not be desirable or practical. A State may choose to impose a more stringent requirement if it desires. The FHWA adopts this change, as specified in the NPA, in this final rule.

Additionally, in the 2000 edition of the MUTCD a new requirement was established in this section that, if located within the clear zone, ground-mounted sign supports shall be breakaway, yielding, or shielded with a barrier or crash cushion and that supports for overhead-mounted signs shall be shielded with a barrier or crash cushion, but no special phase-in target compliance date was established at that time. In response to comments that agencies are encountering difficulties and economic impacts given the extensive testing of devices that has to occur in accordance with NCHRP Report 350⁷ in order to determine and

certify crashworthiness, the FHWA determines that a special target compliance date is required for the crashworthiness provisions in this section. In this final rule, the FHWA establishes a phase-in target compliance date of January 17, 2013 for crashworthiness of sign supports within the clear zone for roads with posted speed limits of 80 km/h (50 mph) or above. This is consistent with guidance previously communicated informally to jurisdictions in a variety of training and presentations by the FHWA Office of Safety regarding roadside safety and countermeasures for run-off-the-road crashes, and is a reasonable target date for achieving compliance on high-speed roads.

23. In the NPA, the FHWA proposed revisions to Section 2A.20 Position of Signs, to remove the second sentence under the SUPPORT statement as the references to the figures duplicates other references elsewhere. Upon further consideration, the FHWA believes that this section is not necessary and deletes this section from the MUTCD in its entirety in this final rule. This section does not include any information that is not already contained elsewhere in the Manual. The FHWA revises the subsequent section numbers accordingly.

24. In Section 2A.21 Posts and Mountings (numbered Section 2A.22 in the NPA), the FHWA adds an OPTION statement after the SUPPORT statement, indicating that a strip of retroreflective material may be used on the supports of regulatory and warning signs to draw attention to the sign during nighttime conditions. One consultant and three State DOTs opposed this new OPTION, but the NCUTCD and several other agencies supported it. Those opposed stated several reasons, such as difficulty in deciding which signs should receive a reflective strip, lack of research support, and consistency. The FHWA agrees that additional instruction is needed regarding the use of the reflective strip, and adds the phrase "Where engineering judgment indicates a need to draw attention to the sign during nighttime conditions". Because this is an OPTION, States that oppose it can choose to not allow this use.

Additionally, the FHWA adds a second STANDARD statement after the OPTION statement specifying the size, location, and color of the strip of retroreflective material if it is used. This provides for uniformity of application. Based on comments received from a

traffic engineering consultant for this section as well as other comments in Section 8B.03 Highway-rail Grade Crossing (Crossbuck) Sign (R15-1) and Number of Tracks Sign (R15-2) regarding the placement of the strip in relation to the ground, the FHWA revises this statement to indicate that the bottom of the strip be within 0.6 m (2 ft) above the edge of the roadway. The FHWA adopts this change, along with editorial modifications, in this final rule.

25. In Section 2A.23 Median Opening Treatments for Divided Highways with Wide Medians (numbered Section 2A.24 in the NPA and title changed from 2000 MUTCD), the FHWA removes the GUIDANCE statement that appeared in the 2000 MUTCD and changes the STANDARD statement to a GUIDANCE statement. The FHWA received three comments from the NCUTCD, Caltrans, and the City of Tucson, Arizona, in support of these changes, and two comments from ATSSA and the Minnesota DOT opposing the change from STANDARD to GUIDANCE. This change makes it recommended rather than mandatory that intersections on divided highways where the median width at the median opening is 9 m (30 ft) or more, be signed as two separate intersections. The commenters suggested that the use of the mandatory word "shall" would provide for greater consistency between jurisdictions and should be maintained to assist tourists and older drivers. The FHWA believes that it is important to provide additional signing flexibility to jurisdictions regarding median openings. A GUIDANCE statement strongly encourages the practice without mandating it, and allows for engineering judgment to be used to determine if some intersections on roadways with medians wider than 9 m (30 ft) might function better without being signed as two separate intersections. Therefore, the FHWA adopts the change as specified in the NPA.

26. In Section 2B.02 Design of Regulatory Signs, the NPA included a proposal to add OPTION and GUIDANCE statements at the end of the section regarding the use of Changeable Message Signs to provide for the display of regulatory signs. The NCUTCD, the City of Tucson, Arizona, and a traffic control device manufacturer supported the new OPTION statement. Caltrans questioned whether the information also applied to portable changeable message signs. The FHWA agrees that the OPTION statement applies to more than just regulatory signs, and removes this OPTION statement from this section and places it in Section 2A.07 Changeable

⁷ NCHRP Report 350, "Recommended Procedures for the Safety Performance Evaluation of Highway Features," 1993, is available for downloading from

the Transportation Research Board at the following URL: http://gulliver.trb.org/publications/nchrp/nchrp_rpt_350-a.pdf.

Message Signs, with additional changes to the text. The NCUTCD and a traffic control device manufacturer supported the new GUIDANCE statement, however ATSSA and the Wisconsin DOT opposed it. The Wisconsin DOT stated that regulatory messages on changeable message signs should only be used to supplement standard ground mounted signs, rather than as the sole sign, because they cannot be enforced. ATSSA stated that there are previously identified problems regarding the contrast in colors of the red prohibition circle on changeable message signs. The FHWA disagrees with both of these comments and adopts the GUIDANCE statement in this final rule. Regulatory messages on changeable message signs can be enforced as long as the jurisdiction has the authority to enact temporary regulations and as long as the messages conform to MUTCD requirements. The red prohibitory circle and slash on a black background, as used on changeable message signs, generally have better contrast than those used on static signs. The FHWA adopts the changes to this section with revisions as described above.

27. In Section 2B.03 Size of Regulatory Signs, the FHWA removes the SUPPORT statement referencing the "Standard Highway Signs" book because this statement is general and applies to regulatory, warning, and guide signs, and a similar statement is included in Section 2A.12 Dimensions.

The FHWA modifies Table 2B-1 by adding, removing, and renaming signs, and by adding additional sign sizes. These changes and new sign sizes reflect changes in Part 2, are values from the "Standard Highway Signs" book, and reflect regular use by highway agencies. The FHWA received several editorial comments from the NCUTCD and Caltrans regarding these changes and incorporates those changes as appropriate.

Additionally, the FHWA increases the sizes of the ONE WAY (R6-2) sign and the DIVIDED HIGHWAY CROSSING (R6-3, R6-3a) signs for all roads based on the research⁸ addressing the needs of older road users. The FHWA adds sign sizes in the "Expressways" and "Freeways" columns for these signs and the R6-1 ONE WAY sign because these are the main signs to alert road users of

the divided highway. The FHWA received one comment from ATSSA supporting these changes. The City of Tucson, Arizona, opposed the increase in sign size, stating that the current sign sizes are adequate for urban/city street systems. The FHWA adopts the sizes as proposed in the NPA because the research indicates these sizes are needed in most cases for older drivers. However, to address the comment from the City of Tucson, the FHWA is currently reviewing ways to better incorporate the needs of urban areas into the MUTCD and plans to address those needs in a future rulemaking.

The FHWA establishes a phase-in target compliance date of 10 years from the date of this final rule for these sign sizes, for existing signs in good condition to minimize any impact on State or local governments.

Additionally, the FHWA adds to the OPTION statement that signs larger than those shown in Table 2B-1 may be used. Sometimes there are special conditions that warrant much larger signs and this flexibility is needed. There were no comments regarding this change, and the FHWA adopts this change.

28. In Section 2B.04 STOP Sign (R1-1), the FHWA received three comments, one from a traffic engineering consultant and two from private citizens regarding the use of supplemental plaques with multi-way STOP signs. The FHWA did not propose any change to this section in the NPA, and these comments are outside the scope of this final rule.

29. In Section 2B.06 STOP Sign Placement, the FHWA corrects an error in the STANDARD statement (as published in the 2000 MUTCD) by changing the word "correct" to "right" so that the statement reads, "The STOP sign shall be installed on the right side of the approach to which it applies." There was one comment from a private citizen suggesting that the FHWA replace "traffic lane" with "approach" in order to avoid this statement being misinterpreted as requiring a separate sign to the right of each stopped lane on a multi-lane approach. The FHWA agrees and revises the text accordingly.

Additionally, the NPA included a proposal that other than a DO NOT ENTER sign, no other sign shall be mounted back-to-back with a STOP sign, to assure that the shape of the STOP sign is visible to road users on other approaches to the intersection. The proposed exception for the DO NOT ENTER sign was to allow flexibility in urban areas where there may not be enough room to install separate poles for each sign and both signs must be installed at the corner. While there was

one comment from ATSSA in support of this proposed change, the NCUTCD, the Arizona, Oregon, Virginia, Wisconsin, and Illinois DOTs as well as the Cities of Plano, Texas; Beaverton, Oregon; Kennewick, Washington; and Tucson, Arizona, opposed this change, stating that it was too restrictive. The FHWA agrees with the State and local DOTs that there may be some locations where it may be appropriate to mount signs to the back of STOP signs, and changes this STANDARD to a GUIDANCE in this final rule and revises the statement to read, "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." The FHWA adds a phase-in target compliance date for this new GUIDANCE of 10 years from the effective date of this final rule for existing signs in good condition, and adds a SUPPORT statement referencing Section 2A.16 Standardization of Location for further information regarding separate and combined mounting of signs with STOP signs.

30. In Section 2B.09 YIELD Sign Applications, the FHWA clarifies the OPTION statement by adding a reference to STOP signs. The change states that instead of using a STOP sign, a YIELD sign may be used if engineering judgment indicates that one or more of the listed conditions exist. The conditions for using a YIELD sign are not being changed. The FHWA received four comments from the NCUTCD, ATSSA, the City of Tucson, Arizona, and the Association of Pedestrian and Bicycle Professionals in general support of the change. A traffic engineering consultant mistakenly thought that the change represented a major change in the method of determining if YIELD is the appropriate sign, and suggested a 10-year phase-in target compliance date. The most significant change was made in the 2000 MUTCD. The only new concept is the clarification that YIELD signs would be used "instead of STOP signs." This is only an OPTION and existing STOP signs that are in place at intersections where these conditions apply would not be in violation of the MUTCD. The FHWA adopts the change with minor editorial revisions in this final rule. There is no need for a long compliance date to comply with an OPTION. The FHWA notes that the 10-year phase-in target compliance date for the change in application of YIELD signs is tied to the effective date of the 2000 MUTCD (January 11, 2011).

Additionally, the FHWA adds a STANDARD statement after the OPTION statement to require the use of a YIELD sign to assign right-of-way at

⁸Information about this research is summarized on pages 94-100 of the "Highway Design Handbook for Older Drivers and Pedestrians," Report number FHWA-RD-01-03, published by the FHWA Office of Safety Research and Development, 2001. It is available for purchase from The National Technical Information Service, Springfield, Virginia 22161, (703) 605-6000. Internet website address at <http://www.ntis.gov>.

the entrance to a roundabout intersection. An essential design feature of a modern roundabout intersection is "yield-on-entry" therefore, a YIELD sign is necessary at all entrances to the roundabout intersection. The FHWA received one comment from ATSSA in support of this change, and one comment from the U.S. Access Board opposed to it. The U.S. Access Board suggested that the pedestrian crossing be moved away from the entry and exit points of the roundabout intersection to allow for safer interaction between pedestrians and drivers. This would create a midblock crossing, and the FHWA believes that the signing and marking of nearby midblock crosswalks should be determined on a case-by-case basis using engineering judgment. Thus, the FHWA did not make changes to this STANDARD, and adopts the new STANDARD statement as proposed in the NPA.

31. In Section 2B.10 YIELD Sign Placement, the FHWA corrects an error in the first paragraph of the STANDARD statement by changing the word "correct" to "right" so that the first sentence reads, "The YIELD sign shall be installed on the right side of the approach to which it applies." Additionally, the FHWA adds a new sentence after the first sentence of the STANDARD statement to require that YIELD signs shall be placed on both the left and right sides of the approaches to roundabout intersections with more than one approach lane on the signed approach. This is in concert with best practices of modern roundabout intersection design and to assure adequate visibility of the YIELD signs. There were two comments from ATSSA and the Kansas DOT in general support of these changes, and the FHWA adopts these changes, with minor editorial revision.

Additionally, the NPA included a proposal to add a paragraph to the STANDARD statement that other than a DO NOT ENTER sign, no other sign shall be mounted back-to-back with a YIELD sign, to assure that the shape of the YIELD sign is visible to road users on other approaches to the intersection. The proposed exception for the DO NOT ENTER sign was to allow flexibility in urban areas where there may not be enough room to install separate poles for each sign and both signs must be installed at the corner. The FHWA received nine comments from State and local DOT's opposed to this change, stating that it was too restrictive (see comments and discussion in Section 2B.06 STOP Sign Placement). The FHWA agrees and changes this STANDARD to a GUIDANCE and

revises the statement to read, "Other than a DO NOT ENTER sign, no sign should be mounted back-to-back with a YIELD sign in a manner that obscures the shape of the YIELD sign." The FHWA adds a phase-in target compliance date for this new GUIDANCE of 10 years from the effective date of this final rule for existing signs in good condition, and also adds a SUPPORT statement referencing Section 2A.16 Standardization of Location for further information regarding separate and combined mounting of signs with YIELD signs.

Additionally, the FHWA adds a paragraph to the GUIDANCE statement stating that, at a roundabout intersection, the face of the YIELD sign should not be visible from the circulating roadway. This is recommended to prevent circulating vehicles in the roundabout intersection from yielding unnecessarily. The FHWA received no comments regarding this change, and adopts this change.

The FHWA also adds an OPTION statement at the end of the section to allow the installation of an additional YIELD sign on the left side of the road and/or the use of a YIELD line at wide-throat intersections. This provides for improved visibility of the YIELD signs where needed. The FHWA received no comments regarding this change, and adopts this change.

32. The FHWA adds a new section numbered and titled, "Section 2B.11 Yield Here To Pedestrians Signs (R1-5, R1-5a)". (This section was numbered Section 2B.52 in the NPA.) These new signs alert road users of the presence of an unsignalized midblock pedestrian crossing. The FHWA includes a STANDARD statement, which states that if YIELD lines are used in advance of an unsignalized marked crosswalk, the YIELD HERE TO PEDESTRIANS (R1-5 or R1-5a) signs, shall be placed 6.1 to 15 m (20 to 50 ft) in advance of the nearest crosswalk line. The purpose of the STANDARD is to provide for the uniform use and placement of these signs and improved pedestrian safety.

The FHWA received six comments from the NCUTCD, ATSSA, Cities of Tucson, Arizona, and Plano, Texas, the Association of Pedestrian and Bicycle Professionals, and a traffic engineering consultant in support of this new section. One private citizen opposed it, stating that the signs are unnecessary because they convey rules of the road, rather than site-specific regulations. The Wisconsin DOT and Pierce County, Washington, requested clarification of the placement of these signs. In response to the comments, the FHWA

adds a reference to Section 3B.16 Stop and Yield Lines to provide additional clarity that the yield line is to be placed adjacent to the Yield Here to Pedestrians sign. The FHWA adopts this section in this final rule and establishes a phase-in target compliance date of 10 years from the effective date of this final rule for existing signs in good condition to minimize any impact on State or local governments.

The FHWA received two comments from the Oregon DOT and a traffic engineering consultant suggesting that this section be expanded to include STOP HERE FOR PEDESTRIAN signs and wording added to allow the signs at any marked crosswalk not controlled by a signal, stop sign, or yield sign as an option for States or other agencies with statutes that require traffic to stop for pedestrians. This goes beyond the scope of the NPA, and a future NPA would need to be issued for discussion and comment.

33. The FHWA adds a new section numbered and titled "Section 2B.12 In-Street Pedestrian Crossing Signs (R1-6, R1-6a)." (This section was numbered Section 2B.53 in the NPA.) These in-street signs remind road users of the laws regarding right-of-way at an unsignalized pedestrian crossing. The FHWA includes OPTION, GUIDANCE, and STANDARD statements describing the use, design and application of the In-Street Pedestrian Crossing (R1-6, R1-6a) signs. These signs are included in the MUTCD in order to provide for uniformity of these regulatory messages and for improved pedestrian safety. The FHWA received four comments from ATSSA, the City of Los Angeles, California, the Association of Pedestrian and Bicycle Professionals, and a traffic engineering consultant in agreement with the new section as proposed in the NPA. Another five commenters representing the Florida and Wisconsin DOTs, the Cities of Los Angeles, California, and Tucson, Arizona, and a traffic engineering consultant agreed with the sign in general, but suggested wording changes, including deleting the reference to State law from the sign. Another five commenters representing the NCUTCD and the Kansas, Arizona, and Minnesota DOTs opposed the sign and the inclusion of this section in the MUTCD. Those opposed listed several reasons, including waiting until the results of a related Transportation Cooperative Research Program (TCRP)⁹

⁹ "Improving Pedestrian Safety at Unsignalized Roadway Crossings" is a reach study currently in progress. This is a joint effort between the National Cooperative Highway Research Program (NCHRP) and the Transportation Cooperative Research

study are released, that in-roadway signs should be discouraged for safety reasons, and that signs that remind drivers to obey the law are unnecessary. The FHWA disagrees with those opposed to this section because research, including an experimentation in Redmond, Washington,¹⁰ has found that this sign is effective at communicating important information to drivers and provides for uniformity of these regulatory messages and for improved pedestrian safety. Also, the TCRP research cited by some commenters is only just beginning and its scope of work is too broad to adequately address this specific signing issue. The use of these signs is optional, and jurisdictions may decide not to allow the use of these signs. The FHWA adopts this new section and sign in this final rule, and adds a SUPPORT statement that the provisions of Section 2A.18 Mounting Height are not applicable to the mounting height of the In-Street Pedestrian Crossing Signs.

The FHWA also adds a new figure numbered and titled "Figure 2B-2, 'Unsignalized Pedestrian Crosswalk Signs'" (numbered Figure 2B-22 in the NPA) to illustrate the design of the R1-5, R1-5a, the R1-6, and the R1-6a signs.

The FHWA renumbers the remaining sections in this chapter.

34. In Section 2B.13 Speed Limit Sign (R2-1), numbered Section 2B.11 in the NPA, the FHWA modifies the STANDARD statement to reference the speed limit signs shown in Figure 2B-1. In the NPA, the FHWA proposed a new, unique design for the metric speed limit sign. The sign had a red circle around the speed value with a "km/h" legend below, and the supplemental "km/h" plaque removed. The FHWA received eight comments from the NCUTCD, ATSSA, and private citizens in general support of the new metric speed limit design, and ten comments from the Oregon and Minnesota DOTs and private citizens opposed to the sign design. Those opposed cited concerns that the red circle is generally associated with a prohibitory regulatory message, and that a speed limit does not fall into that category of message. In response to the comments, the FHWA revises the sign in this final rule to include a black circle around the speed value, rather than red. The concept of placing a circle around the metric speed limit digits was

developed to provide a clear and easily noticed distinction between metric and English speed limit signs. Because the color red suggests prohibition, and green is already used as a permissive message with hazardous materials routing signs, the FHWA requires the black colored circle to provide distinction for a metric speed limit.

Based on this new design, the FHWA removes the first SUPPORT statement (from the 2000 MUTCD), as it is no longer needed. The new design of the metric Speed Limit sign better differentiates a metric speed limit sign from an English-unit speed limit sign, and also remedies the possible situation where the "METRIC" plaque used in the old design is damaged or stolen and the sign appears to be an English units Speed Limit sign with a higher but erroneous value. Other than comments opposed to the change in the metric sign design, there were no comments specifically regarding this change, and the FHWA adopts this change.

In the NPA, the FHWA proposed to add a new paragraph to the first GUIDANCE statement indicating that non-statutory speed limits be reevaluated at least once every five years to determine if any adjustments would be appropriate. The FHWA received one comment from a private citizen in support of this change, and four comments from the NCUTCD, City of Kennewick, Washington; Lake County, Illinois; and Pierce County, Washington, opposed to the new paragraph. Those opposed cited concerns about the five-year frequency of review, stating that there are many roads and streets on which conditions remain stable for much longer than five years and that conducting speed limit reevaluations every five years on such roads would be a major burden on the States and local governments. The FHWA agrees with some of these concerns, and therefore the FHWA expands the paragraph to clarify that this review should take place on segments of roadways that have undergone a significant change in roadway characteristics or surrounding land use since the last review.

In the NPA, the FHWA proposed clarifications to the third paragraph of the GUIDANCE statement to differentiate the rounding of a speed limit on a sign located on a non-residential street from a sign located on a residential street. The FHWA received several comments from the NCUTCD, the Wisconsin DOT, and a traffic engineering consultant opposing this change, requesting simpler terminology and the ability for jurisdictions to round speeds up or down, regardless of street

classification. A traffic engineering consultant suggested less reliance on the 85th percentile speed. Based on these comments, the FHWA simplifies the statement to read, "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."

The FHWA adds a paragraph to the end of the OPTION statement, which states that 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. The FHWA received one comment from a traffic control device manufacturer supporting this change. The FHWA adopts the change, as proposed in the NPA, in this final rule.

The FHWA also adds, following the OPTION statement, a GUIDANCE statement, which states that if a changeable message sign displaying approach speeds is installed, the legend YOUR SPEED XX KM/H (MPH) or similar legend should be shown. Changeable message signs displaying the actual speeds of approaching drivers have been widely used in many jurisdictions over the past decade or more to enhance driver compliance with speed limits. However, a variety of colors have been used for the display of the numerals of the actual speed. For consistency with Table 2A-4 and the MUTCD's general principles of sign colors, FHWA adds to this GUIDANCE statement that the color should be yellow legend on black background or the reverse of these colors. The FHWA establishes a 10-year phase-in target compliance date from the effective date of this final rule for the color of the legend of the changeable message portion of the "YOUR SPEED" sign, for existing signs in good condition, to minimize any impacts on State or local governments.

35. In Section 2B.15 Night Speed Limit Sign (R2-3) (numbered Section 2B.13 in the NPA), while there were no changes proposed in the NPA, the FHWA makes editorial changes in this section to be consistent with Section 2B.13 Speed Limit Sign. In addition, in response to comments received, the FHWA changes the metric version of the Night Speed Limit sign in Figure 2B-1 to show a white circle around the metric speed digits and include the "km/h" message all within one panel. This is necessary for consistency with the adopted concept of enclosing metric speed limit values in a circle to assure that they are easily distinguished from speed limits in English units.

36. In Section 2B.16 Minimum Speed Limit Sign (R2-4), numbered Section 2B.14 in the NPA, the FHWA received

Program (TCRP). The study is numbered NCHRP Project 3-71 and TCRP D-08. Information is available at the following URL: <http://rip.trb.org>.

¹⁰ A copy of "City of Redmond In-Street Pedestrian Crossing Sign Test", FHWA Experimentation #2-507(EX), six-month report by the City of Redmond, June 30, 2003, is available on the docket.

several comments opposing the design of the metric sign in Figure 2B-3 (numbered Figure 2B-2 in the NPA). The comments were similar to those received on Section 2B.13 Speed Limit Sign (R2-1). (See also the discussion of that section above.) Because the color red suggests prohibition, and green is already used as a permissive message with hazardous materials routing signs, the FHWA requires the black colored circle to provide distinction for a metric minimum speed limit.

37. The FHWA adds a new section numbered and titled "Section 2B.17 FINES HIGHER Plaque (R2-6)." (In the NPA, this new section was numbered and titled "Section 2B.15 Fines Higher Sign (R2-6)"). The FHWA agrees with comments from the NCUTCD and a traffic engineering consultant suggesting that the term "sign" be replaced with "plaque". This new section consists of OPTION, GUIDANCE, and STANDARD statements on the uses of the FINES HIGHER plaque to advise road users when increased fines are imposed for traffic violations within designated roadway segments. The FINES HIGHER plaque should be installed below an applicable regulatory or warning sign in a temporary traffic control zone, a school zone, or other applicable designated zone. The FHWA received one comment from ATSSA specifically in support of the new section, and one comment from the Wisconsin DOT opposing it. The Wisconsin DOT stated that the sign is not necessary because these laws are already State statutes and need not be signed. Because this is an OPTION, States can choose not to allow the use of this plaque. Many other States are finding that this sign enhances safety in school zones and temporary traffic control zones by reminding drivers of a law that might not always be prevalent on their minds. It also serves to alert drivers from other States about this law, which may not be the same as the laws in their home State. The FHWA adopts this new section, with minor editorial revisions, and renumbers the remaining sections.

38. The FHWA removes Section 2B.16 Reduced Speed Ahead Signs (R2-5) Series (as numbered and titled in the 2000 MUTCD) because these signs are warning signs and appear in Chapter 2C in this final rule. The intended message is more properly categorized as a warning message rather than a regulatory message.

See discussion in Section 2C.30 Speed Reduction Signs (W3-5, W3-5a) where FHWA adds the newly designated warning signs. That discussion applies to this section also. Accordingly, the FHWA adopts the

removal of former Section 2B.16 as proposed in the NPA. To minimize any impacts to State and local governments, in Section 2C.30 the FHWA establishes a phase-in target compliance date of 15 years from the effective date of this final rule for existing R2-5 signs in good condition to be changed to W3-5 or W3-5a signs.

39. In Section 2B.19 Turn Prohibition Signs (R3-1 through R3-4, and R3-18) (numbered and titled "Section 2B.17 Turn Prohibition Signs (R3-1 through R3-4)" in the 2000 MUTCD and in the NPA), the FHWA includes a new symbol sign which combines the No Left Turn and the No U-turn symbol signs into one symbol sign (R3-18), and adds to the OPTION and GUIDANCE statements information on the proper use of the sign. This new sign will reduce the sign clutter at an intersection where both movements are restricted and make it easier for road users to understand the multiple turn restrictions. The FHWA received six comments from the NCUTCD, ATSSA, Caltrans and the Cities of Tucson, Arizona; and Plano, Texas, supporting this new sign. The Virginia DOT opposed this change due to the fact that Virginia State law already prohibits U-turns when a No Left Turn sign is present. Because not all States have this law, the FHWA believes that this sign should be available for use by States at those locations where both U-turns and left turns are prohibited. The FHWA adopts the OPTION and GUIDANCE statements in this final rule. Because it is an OPTION, States are not obligated to use the new sign.

40. In Section 2B.21 Mandatory Movement Lane Control Signs (R3-5, R3-5a, and R3-7) (numbered Section 2B.19 in the NPA), the FHWA revises the GUIDANCE statement to clarify that the lane control pavement markings mentioned are lane-use arrow markings. The FHWA received one comment from the City of Tucson, Arizona, in support of this change, and the FHWA adopts this change.

41. In Section 2B.25, Reversible Lane Control Signs (R3-9d, R3-9f through R3-9i) (numbered and titled, "Section 2B.23 Reversible Lane Control Signs (R3-9c through R3-9i)" in the 2000 MUTCD), the FHWA removes the R3-9c and R3-9e signs and all of their references in the section. Using just the R3-9d sign will improve uniformity and maintain consistency with the red X symbol used in reversible lane signal systems. The DO NOT ENTER symbol is intended to be used to prohibit entry into a roadway or ramp, and using this symbol to prohibit use of a single lane of a roadway that is otherwise available

for travel is inconsistent and degrades the meaning of the symbol. The FHWA also revises the first STANDARD statement to clarify that the barriers mentioned are physical barriers.

Additionally, the FHWA modifies item B of the second OPTION statement to read, "An engineering study indicates that the use of the Reversible Lane Control signs alone would result in an acceptable level of safety and efficiency." This is to clarify that an engineering study needs to evaluate whether safety and efficiency will be maintained with signs alone.

The FHWA received four comments from the NCUTCD and the City of Tucson, Arizona, in support of these changes, and the FHWA adopts the changes.

The FHWA establishes a phase-in target compliance date of 10 years from the effective date of this final rule for existing signs in good condition to minimize any impact on State or local governments.

42. In Section 2B.26 Preferential Only Lane Signs (R3-10 through R3-15) (numbered and titled Section 2B.48 Preferential Lane Signs (R3-10 through R3-17) in the NPA), the FHWA changes several GUIDANCE statements to STANDARD statements to be consistent with requirements of STANDARDS in other sections of the MUTCD and to ensure that these critical signs are properly designed and applied to enhance safety and reduce road user confusion. The FHWA also includes cross-references to other sections, as appropriate. Additionally, the FHWA revises information for the R3-10 through R3-14 signs in Table 2B-1 in this final rule. The FHWA also revises Figure 2B-7 (numbered Figure 2B-21 in the NPA) to correct errors and illustrate examples of signs consistent with the text in this final rule. All of these changes respond to comments received from Caltrans, the Florida and Minnesota DOTs, traffic engineering consultants, and private citizens requesting clarity, and they provide consistency with other areas of the MUTCD.

In the NPA, the FHWA proposed modifying the first paragraph of the third GUIDANCE statement regarding types of preferential lane signs for which the diamond symbol should not be used (because the diamond symbol is intended to be used only to denote HOV lanes). The restriction of using the diamond symbol only for HOV lanes is now included in a STANDARD statement in Section 2B.27 Preferential Only Lanes for High-Occupancy Vehicles (HOVs) (numbered 2B.49 in the NPA), and is cross-referenced in

Section 2B.26 Preferential Only Lane Signs (R3–10 through R3–15). As a result, the FHWA is not making the change to the first paragraph of the third GUIDANCE statement that was proposed in the NPA.

The FHWA changes the last paragraph of the third GUIDANCE statement (of the 2000 MUTCD) to a fifth STANDARD statement (second in the NPA) to be consistent with requirements in Section 2A.07 Changeable Message Signs. These requirements indicate that changeable message signs serving as HOV signs shall be the required sign size and shall display the required letter height and legend format that corresponds to the type of facility and design speed. This change from a recommended practice to a required practice is made to preclude the use of insufficiently sized or designed changeable message signs to display these important regulatory messages for HOV lane use. The FHWA received one comment from the NCUTCD in support of this change, and one comment from Caltrans suggesting further clarification. To respond to the comments, the FHWA inserts an OPTION statement prior to the STANDARD, indicating appropriate uses of changeable message signs, and the FHWA includes editorial modifications to the STANDARD.

Additionally, the FHWA adds a new GUIDANCE statement at the end of the section stating that the Inherently Low Emission Vehicle (ILEV) (R3–10b) sign should be used when it is permissible for a properly labeled and certified ILEV, regardless of the number of occupants, to operate in the HOV lanes and that, when used, the ILEV signs should be ground mounted in advance of the HOV lanes and at intervals along the HOV lanes based upon engineering judgment. A uniform sign design and application is needed to enhance driver understanding and compliance regarding ILEV use of HOV lanes and also to correspond to changes in Section 2B.27 Preferential Only Lanes for High Occupancy Vehicles (HOVs). The FHWA received one comment from ATSSA in support of this new statement, and two comments from Caltrans and the Minnesota DOT opposed to it. The opposing commenters suggested that there are different types of ILEV vehicles, and that the text needed to be clarified. To respond to those comments, the FHWA adds a SUPPORT statement, following the GUIDANCE, that explains what an ILEV is, similar to the definition in Section 1A.13, and also providing citations of applicable sections of the Code of Federal Regulations (CFR). The R3–10b sign is recommended for use

when a State or local jurisdiction permits ILEVs to use a particular HOV lane facility.

The FHWA establishes a 10-year phase-in target compliance date from the effective date of this final rule for signs in good condition to comply with the new requirements of Section 2B.26 Preferential Only Lane Signs (R3–10 through R3–15), to minimize any impact on State or local governments.

43. In Section 2B.27 Preferential Only Lanes for High-Occupancy Vehicles (numbered and titled Section 2B.49 High Occupancy Vehicle (HOV) Lanes in the NPA), the FHWA adds a second paragraph to the first STANDARD statement that 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 during 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 FHWA also adds in the last paragraph the requirement of a Federal review (as outlined in Section 2 of the Federal-aid Highway Program Guidance on HOV Lanes¹¹) prior to initiating a proposed project (including a proposed test or demonstration project) that seeks to significantly change the operation of the HOV lanes for any length of time. The FHWA received two comments from the NCUTCD and the City of Tucson, Arizona, in general support of the changes to this section, and one comment from Caltrans opposed to the specific change regarding Federal review of a proposed test or demonstration project. Caltrans felt that FHWA review is not currently required. However, the Federal review is required because of provisions in Titles 23 and 49 of the United States Code as well as a variety of commitments, agreements, transportation planning requirements, and transportation conformity requirements under the Clean Air Act. The FHWA responds by providing an additional reference to the Federal-Aid Highway Program Guidance on HOV Lanes, which gives very detailed information about the basis of the review and factors considered.

In the NPA, the FHWA proposed to modify the first STANDARD statement to allow motorcycles to use HOV lanes that received Federal-aid program funding. The FHWA also proposed to require agencies to allow a vehicle with

less than the required number of occupants to operate in the 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.¹²

The FHWA adopts this requirement as it pertains to motorcycles because, under the provisions of 23 U.S.C. 102(a)(1), motorcycles are specifically identified as not a single-occupant vehicle. However, the FHWA recognizes that the provisions of 23 U.S.C. 102(a)(2) and Environmental Protection Agency (EPA) regulations in 40 CFR section 88.313–93 permit, but do not require, States to allow ILEVs to use HOV lanes. Further, the FHWA recognizes that the applicable provisions of the Transportation Equity Act for the 21st Century (TEA–21) permit, but do not require, States to allow vehicles with fewer than two occupants to operate in HOV lanes if the vehicles are part of a value pricing program. Therefore, the FHWA revises the paragraph in Section 2B.27 about these uses of HOV lanes to OPTION statements rather than STANDARD statements.

The FHWA also revises the first SUPPORT statement to clarify the examples of significant operational changes to HOV lanes. While most of this information was included in the NPA (and the 2000 MUTCD), the FHWA provides examples in the form of individual items in this final rule for clarity. The FHWA adds implementing a pricing option to an existing HOV lane, such as High Occupancy Toll (HOT) lane or toll lane to the list of example items to reflect current practice.

The FHWA modifies this section to add a SUPPORT statement at the end of the section. The SUPPORT statement states that the Inherently Low Emissions Vehicle (ILEV) program requirements, certification program, and other regulatory provisions are developed and administered through the U.S. Environmental Protection Administration (EPA). The U.S. EPA is the only entity with the authority to certify ILEVs. Vehicle manufacturers must request the U.S. EPA to grant an ILEV certification for any vehicle to be considered and labeled as meeting these standards. According to the U.S. EPA,

¹¹ The "Federal-Aid Highway Program Guidance on High Occupancy Vehicle (HOV) Lanes" dated March 28, 2001, is available at the following URL: <http://www.fhwa.dot.gov/operations/hovguide01.htm>.

¹² The Value Pricing Pilot Program is an experimental program to learn the potential of different value pricing approaches for reducing congestion authorized by Section 1216(a) of the Transportation Equity Act for the 21st Century (TEA–21). Information is available at the following URL: <http://www.fhwa.dot.gov/policy/vppp.htm>.

1996 was the first year that they certified any ILEVs. The U.S. 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 88.311–93(c).

The changes in Section 2B.27 are also necessary to assure consistency with the FHWA requirements to comply with the National Environmental Policy Act (42 U.S.C. 4321 *et seq.*) process.

44. In Section 2B.28 Preferential Only Lane Sign Applications and Placement (numbered Section 2B.50 High-Occupancy Vehicle Sign Application and Placement in the NPA), in the NPA the FHWA proposed adding a SUPPORT statement after the GUIDANCE statement, to state that Figures 2E–44 through 2E–show application and placement examples of HOV signing for entrances to barrier-separated HOV lanes and direct entrances to and exits from HOV lanes. The FHWA received four comments regarding the proposed changes to this section. The NCUTCD and the City of Tucson, Arizona, supported the changes, the Connecticut DOT suggested an editorial change to clarify the new figure, and Caltrans opposed the number of signs required for concurrent-flow HOV lanes. The FHWA revises the number of signs required for concurrent-flow HOV lanes to be more consistent with the practice of some leading States with HOV lanes. Also, the FHWA makes editorial revisions to and reorganizes the section to add clarity to differentiate between specific situations of barrier-separated, buffer-separated, concurrent flow, and direct access ramps as they relate to Preferential Only Lane signing, to address comments on this and other related sections from agencies that operate HOV facilities, suggesting that the many provisions of this section were not consistent with other provisions of the MUTCD and the section needed clarification and consistency.

The FHWA establishes a 10-year phase-in target compliance date from the effective date of this final rule for existing signs in good condition to minimize any impact on State or local governments.

45. In Section 2B.33 Keep Right and Keep Left Signs (R4–7, R4–8) (numbered Section 2B.28 in the NPA), the FHWA adds to the first OPTION statement that the Keep Left (R4–8) sign may be used at locations where it is necessary for traffic to pass only to the left of a roadway feature or obstruction.

The FHWA adds to the GUIDANCE statement to clarify that the Keep Right 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 of the sign.

Additionally, the FHWA adds a new STANDARD statement following the GUIDANCE statement indicating that the Keep Right sign shall not be installed on the right side of the roadway in a position where traffic must pass to the left of the sign.

The changes in this section clarify the proper uses of Keep Right and Keep Left signs. The FHWA received two comments from the NCUTCD and the City of Tucson, Arizona, in general support of the changes to this section, and adopts these changes.

46. In Section 2B.34 DO NOT ENTER Sign (R5–1) (numbered Section 2B.29 in the NPA), the FHWA modifies the GUIDANCE statement with respect to the placement of the DO NOT ENTER sign. The GUIDANCE states that, if used, the DO NOT ENTER sign should be placed directly in view of the road user at the point where a road user could wrongly enter a divided highway, one-way roadway, or ramp, and includes a reference to Figure 2B–10 (numbered Figure 2B–8 in the NPA). The FHWA received one comment from the City of Tucson, Arizona, supporting the overall changes to this section, and the FHWA adopts these changes.

Additionally, the FHWA rennumbers and retitles Figure 2B–2 (as numbered in the 2000 MUTCD) from “Typical Wrong-Way Signing for a Divided Highway” to “Figure 2B–10 Example of Wrong-Way Signing for a Divided Highway with a Median Width of 9 m (30 ft) or Greater” (numbered Figure 2B–8 in the NPA). The FHWA received two comments from private citizens in general support of the changes to this figure, and the FHWA adopts the changes.

47. In Section 2B.36 Selective Exclusion Signs (numbered Section 2B.31 in the NPA), the FHWA changes item H in the SUPPORT statement from “Hazardous Cargo” to “Hazardous Material” to reflect the changes in Section 2B.52 Hazardous Material Signs (R14–2, R14–3). The FHWA received two comments from ATSSA and the City of Tucson, Arizona, in support of this change, and adopts this change. The FHWA received additional editorial comments to provide consistency with other areas of the MUTCD, and the FHWA incorporates the comments in this final rule.

48. In Section 2B.37 ONE WAY Signs (R6–1, R6–2) (numbered Section 2B.32 in the NPA), the FHWA relocates four figures from Section 2A.16 to this section. The FHWA rennumbers and

retitles Figures 2A–5 and 2A–6 to “Figure 2B–12. Examples of Locations of ONE WAY Signs (Sheet 1 of 2, Sheet 2 of 2)” (numbered Figures 2B–10 and 2B–11 in the NPA); Figure 2A–4 to “Figure 2B–13. Examples of ONE WAY Signing for Divided Highways with Medians 9 m (30 ft) or Greater” (numbered Figure 2B–12 in the NPA); and Figure 2A–3 to “Figure 2B–14. Examples of ONE WAY Signing for Divided Highways with Medians Less Than 9 m (30 ft)” (numbered Figure 2B–13 in the NPA). The FHWA also adds a new figure, “Figure 2B–15. Examples of ONE WAY Signing for Divided Highways with Medians Less Than 9 m (30 ft) and Separated Left-Turn Lanes” (numbered Figure 2B–14 in the NPA). These figures are most directly associated with ONE WAY signs and are most appropriately located in this section, which contains the text about ONE WAY signs. The FHWA received a few editorial comments regarding these figures, and incorporates those changes as appropriate in this final rule.

Additionally, the FHWA revises the depiction of the optional Keep Right signs on the medians in Figures 2B–14 and 2B–15 to show them at a 45 degree angle facing the road users on the cross street, to make it easier for drivers to determine the location of the median nose and to enter the proper roadway of a divided highway. The FHWA received three comments from ATSSA and private citizens in support of these changes. The FHWA adopts the changes to these figures.

49. In Section 2B.40 Design of Parking, Standing, and Stopping Signs (numbered Section 2B.35 in the NPA), the FHWA adds to the GUIDANCE statement that where special parking restrictions are imposed during heavy snowfall, Snow Emergency signs should be installed and that 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. Signs of this type are used by many jurisdictions. The FHWA received two comments from the NCUTCD and the City of Tucson, Arizona, in support of this change, and adopts this change. In addition, the FHWA adds a paragraph at the end of the GUIDANCE statement regarding the use of the VAN ACCESSIBLE (R7–8a) plaque. A final rule adding this information to the 1988 edition of the MUTCD was adopted in 1998, however this was inadvertently left out of the 2000 MUTCD.

50. In Section 2B.44 Pedestrian Crossing Signs (R9–2, R9–3) (numbered Section 2B.39 in the NPA), the FHWA

modifies the second OPTION statement by changing "PEDESTRIANS PROHIBITED" to "NO PEDESTRIAN CROSSING" as the proper word message sign to be used as an alternate to the No Pedestrian Crossing (R9-3a) symbol sign. "NO PEDESTRIAN CROSSING" is the intended meaning of the symbol and more clearly describes the actual restriction of pedestrian movement. The FHWA received comments from the Association of Pedestrian and Bicycle Professionals and the City of Tucson, Arizona, specifically in support of this change, and adopts this change.

The FHWA also received comments from the Florida DOT and the City of Tucson, Arizona, suggesting that the section does not mention signalized crossings. These comments are outside the scope of this rulemaking and would need to be addressed in a future rulemaking.

51. In Section 2B.45 Traffic Signal Signs (R10-1 through R10-21) (numbered and titled "Section 2B.40 Traffic Signal Signs (R10-1 through R10-13)" in the 2000 MUTCD), the FHWA revises the title to reflect additional traffic signal signs. These signs are shown in Figures 2B-18 and 2B-19.

The FHWA adds to the second OPTION statement that the R10-3d sign may be used if the pedestrian clearance time is sufficient only for the pedestrian to cross to the median. This sign is similar to the existing R10-3b sign except that next to the WALK symbol is the message "START CROSSING TO MEDIAN WATCH FOR VEHICLES." The FHWA also modifies Figure 2B-18 (numbered Figure 2B-17 in the NPA) to add illustrations of the R10-3d sign and the R10-3e sign. The R10-3e sign is a variant incorporating "time remaining to finish crossing" and is consistent with countdown pedestrian signals as adopted in Part 4. The FHWA received one comment from the City of Tucson, Arizona, in support of this change and one question from the U.S. Access Board regarding how this information would be given in audible and vibrotactile formats. The Access Board stated that, if accessible signals are used at an intersection where pedestrians should cross only to a median and then wait until a different phase to complete their crossing, it would be important for the accessible devices to communicate this fact to the pedestrian with visual disabilities. This comment actually pertains to Chapter 4E Pedestrian Signals, and it goes beyond the scope of this rulemaking and would need to be addressed in a future rulemaking. The

FHWA adopts the change, as proposed in the NPA, in this final rule.

Additionally, the FHWA revises and relocates the third OPTION statement (from the 2000 MUTCD) to follow the second STANDARD statement to indicate that a symbolic NO TURN ON RED (R10-11) sign may be used as an alternate to the R10-11a and R10-11b signs. The symbolic sign has a symbolic red ball rather than using the "No Right Turn" symbol, to avoid confusion with the R3-1 (No Right Turn) sign.

In Figure 2B-19 Traffic Signal Signs (numbered Figure 2B-18 in the NPA), the FHWA received several comments regarding the illustration of "No Right Turn on Red" signs. ATSSA and a traffic engineering consultant agreed with the return of the R10-11 sign and the removal of the R10-11c and R10-11d signs. The Cities of Plano, Texas, and Los Angeles, California, and some private citizens were opposed to the removal of the R10-11c and R10-11d signs, stating that the use of symbol signs should be encouraged over word signs. The FHWA disagrees with the opposing commenters because the use of the No Right Turn symbol sign should be reserved for actual prohibition of all right turn movements at an intersection to have the appropriate impact on safety. Extensive use of a No Right Turn on Red sign featuring the No Right Turn symbol would degrade the influence of the R3-1 sign. The City of Los Angeles and a private citizen suggested different designs for the sign. The FHWA disagrees with these different designs because they are too complex. The FHWA adopts the R10-11 sign with a red ball symbol included on the bottom line of the sign. The FHWA also revises the sign number for R10-20b to be R10-20a, and places the word "or" between the two R10-20a signs to clarify that the signs illustrate two examples of different word messages that can be used to provide times and days.

Additionally, the FHWA adds to the second GUIDANCE statement to indicate that where turns on red after the driver stops are permitted and the turn signal indication is a RED ARROW, the RIGHT (LEFT) ON RED ARROW AFTER STOP (R10-17a) sign should be installed adjacent to the RED ARROW signal indication to conform to the "Uniform Vehicle Code and Model Traffic Ordinance" (UVC) as revised. The revised UVC prohibits turns on a RED ARROW after stopping unless a sign specifically allowing the turn is in place. The FHWA received one comment from ATSSA in support of this change, and three comments from the NCUTCD, Caltrans and the City of

Kennewick, Washington, opposing it. Kennewick, Washington, opposed this new sign, because the State of Washington allows the turn on red arrow after stop in certain instances, unless otherwise prohibited by signs. The FHWA is in favor of maintaining consistency with the majority of the other States who already have laws that agree with this meaning of the red arrow.

The NCUTCD opposed this new paragraph as well as the signs, stating that it is "inappropriate." Without additional explanation, the FHWA cannot respond to this comment.

Caltrans opposed the new sign suggesting that where turns on red are permitted after stopping and the signal indication is a RED ARROW, that changing the signal indication from a RED ARROW to a Red Ball would be more appropriate than fixing the situation with a sign. The FHWA agrees that while there may not be many places where the R10-17a sign is needed, there are intersections with unusual geometrics or special lane use control for which an all-arrow right-turn signal head makes sense and from which there is no reason that turns on red should be prohibited. It is primarily for these situations that the R10-17a sign should be used. The FHWA adopts use of this sign in this final rule, with minor modifications.

Additionally, the FHWA relocates the last item in the second GUIDANCE statement to the first paragraph under the third OPTION statement (new fourth OPTION statement) and changes it to read that when right turn on red after stop is permitted and pedestrian crosswalks are marked, the TURNING TRAFFIC MUST YIELD TO PEDESTRIANS (R10-15) sign may be used. This change is necessary to prevent potential overuse and a reduced effectiveness of the sign. The FHWA received two comments from ATSSA and a traffic engineering consultant in support of this change. The U.S. Access Board opposed, stating that the use of the sign should not be restricted to just marked crosswalks. The traffic engineering consultant who supported the change also suggested that the sign would also be useful during the green interval to remind drivers to yield to pedestrians who are crossing during the concurrent WALK interval. The FHWA agrees and adds a paragraph to the OPTION stating that a TURNING TRAFFIC MUST YIELD TO PEDESTRIANS sign may be used to remind drivers who are making turns to yield to pedestrians, especially at intersections where crosswalks are

marked and right turn on red is permitted.

In the NPA, the FHWA proposed to add a paragraph to the OPTION statement allowing the use of supplemental plaques showing times of day or with the legend WHEN PEDESTRIANS ARE PRESENT below a NO TURN ON RED sign, to allow the flexibility to restrict turns on red only during certain times or when a pedestrian conflict is present. The traffic engineering consultant also supported the use of both of the suggested plaques. The Insurance Institute for Highway Safety presented results from recent field research indicating that time-of-day restrictions are effective in reducing right turn on red related safety threats to pedestrians but the WHEN PEDESTRIANS ARE PRESENT plaque is not because its vague message makes enforcement difficult.¹³ Based on this research, the FHWA revises the text to delete the WHEN PEDESTRIANS ARE PRESENT plaque. Because it is a word message, State and local highway agencies may still use the WHEN PEDESTRIANS ARE PRESENT plaque prohibiting right turns on red when pedestrians are present if their laws so dictate, but they are not encouraged to do so because research has shown these plaques are ineffective. Finally, to respond to a comment from a traffic engineering consultant, the FHWA moves the last paragraph of this OPTION statement regarding the use of Traffic Signal Speed signs to the end of the second OPTION statement because this paragraph relates more to the information provided in the second OPTION.

The FHWA proposed in the NPA to add to the third STANDARD statement that the EMERGENCY SIGNAL—STOP WHEN FLASHING RED (R10–14) sign shall be used in conjunction with emergency beacons to correspond with proposed changes in Part 4 of the MUTCD, which proposed to require the use of these signs with Emergency Beacons. Due to extensive comments in opposition to the Emergency Beacon in Part 4, the FHWA does not adopt these changes in Part 4. (See the discussion of Section 4F.03). Therefore, the FHWA removes the R10–14 sign, associated text, and illustration from Part 2.

In the NPA, the FHWA proposed adding to the STANDARD statement the requirement to use a “U Turn Yield to Right Turn” sign when U-turns on a green arrow signal conflict with right turns on a green arrow signal. While there were comments from the City of Tucson, Arizona, and a traffic engineering consultant in support of this change, the FHWA received comments from the NCUTCD, Caltrans, and the City of Kennewick, Washington, opposed it, stating that the sign would not be understood, or was inappropriate. The FHWA concurs that there is some possibility of misunderstanding. Because there is no data to support or refute these concerns, the FHWA changes this to an OPTION statement, allowing the use of the sign but not requiring it. The FHWA also modifies Sections 4D.05 Application of Steady Signal Indications and 4D.09 Unexpected Conflicts During Green or Yellow Intervals accordingly.

52. The FHWA adds a new section numbered and titled, “Section 2B.46 Photo Enforced Signs (R10–18, R10–19)” (numbered Section 2B.51 in the NPA.) This new section provides guidance to State and local agencies on the use of the photo enforcement signs to alert road users of this type of traffic enforcement. The FHWA includes an OPTION statement with two paragraphs. The first paragraph states that a TRAFFIC LAWS PHOTO ENFORCED (R10–18) sign 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. The second paragraph states that a PHOTO ENFORCED (R10–19) sign may be mounted below a regulatory sign to advise road users that the regulation is being enforced by photographic equipment.

Additionally, the FHWA includes a STANDARD statement, which states that if the PHOTO ENFORCED (R10–19) sign is used below a regulatory sign, it shall be a rectangle with black legend and border on a white background.

The FHWA received three comments from the NCUTCD, ATSSA and the City of Tucson, Arizona, in support of this new section and two comments from the Wisconsin DOT and the Insurance Institute of Highway Safety opposed to it.

The Insurance Institute of Highway Safety stated that placing the TRAFFIC LAWS PHOTO ENFORCED sign at jurisdictional boundaries is vague with regard to which traffic laws (speed, red light) are photo enforced. The FHWA disagrees because this sign can be a useful reminder to drivers to obey all

traffic laws, just speed limits and red lights. The Insurance Institute of Highway Safety also suggested that rather than the general PHOTO ENFORCED regulatory sign, specific regulatory signs should be developed for both red light cameras and automated speed enforcement. The FHWA disagrees because the consistent placement of the PHOTO ENFORCED sign should provide adequate notice and should have the desired effect on driver behavior.

The Wisconsin DOT noted that not all States allow the use of photo enforcement. Because use of these signs is optional, States that do not use photographic enforcement will not need to use these signs.

The FHWA adopts this section in its entirety, as proposed in the NPA, in this final rule. The FHWA establishes a phase-in target compliance date of 10 years from the effective date of this final rule for existing signs of different designs that are in good condition to minimize any impact on State or local governments.

53. In Section 2B.52 Hazardous Material Signs (R14–2, R14–3) (numbered and titled “Section 2B.46 Hazardous Cargo Signs (R14–2, R14–3)” in the 2000 MUTCD), the FHWA changes the title and revises the OPTION and GUIDANCE statements to replace “cargo” with the word “material” and revises the symbol for the Hazardous Material sign (R14–3) sign to be HM rather than HC, to correspond with Section 2B.36 Selective Exclusion Signs and to reflect the change in terminology in the industry. The FHWA received three comments from ATSSA, the City of Tucson, Arizona, and a private citizen in support of these changes, and three comments from private citizens suggesting changes to the design of the R14–3 sign, particularly changes in the color of the circle around the letters. The FHWA adopts the sign design as proposed in the NPA. The FHWA revises the phase-in target compliance date to 10 years from the effective date of this final rule (the NPA proposed five years) for existing signs in good condition to minimize any impact on State or local governments.

54. In Section 2B.54 Other Regulatory Signs (numbered Section 2B.51 in the 2000 MUTCD), the FHWA proposed to revise the STANDARD statement to indicate that the symbol for the seat belt symbol is in the “Standard Highway Signs” book. The FHWA received one comment from the City of Tucson, Arizona, in support of this change. However, consistent with FHWA’s desire to include illustrations of all

¹³ “Field Evaluation of Two Methods for Restricting Right Turn on Red to Promote Pedestrian Safety,” by Retting, Nitzburg, Farmer, and Knoblauch, for the Insurance Institute for Highway Safety, was published in the January 2002 issue of the “ITE Journal,” a publication of the Institute of Transportation Engineers (ITE). Information on obtaining a copy of this publication is available from ITE at the following URL: <http://www.ite.org>.

signs from the SHS that are referenced in the MUTCD, as discussed above, the FHWA retains the symbol for the seat belt symbol, and places it in a new Figure 2B–22.

55. In Section 2C.02 Application of Warning Signs, the FHWA modifies the SUPPORT statement to reflect that “categories” not “applications” of warning signs are shown in Table 2C–1. This change makes the text and Table 2C–1 consistent.

Additionally, the FHWA changes the title of Table 2C–1 from “Application of Warning Signs” to “Categories of Warning Signs” and adds new roadway related and traffic related signs and supplemental plaques to the table based on changes in other sections of Chapter 2C. The change in the title of the table better reflects the actual content of the table. There was one comment from the City of Tucson, Arizona, in agreement with the overall changes in this section. One traffic engineering consultant questioned why the Railroad Advance Warning sign is not listed in the table. This table only includes those signs that are found in Chapter 2C, not those found in other parts such as Part 8. The MUTCD has separate sign tables in other Parts as appropriate. Another traffic engineering consultant questioned why W16–8, W14–1p, and W14–2p are identified as plaques. The W16–8 plaque must be used in combination with a W2 or W3 sign according to Section 2C.49 Advance Street Name Plaque (W16–8, W16–8a), and thus is correctly referred to as a plaque. Because the W14–1P and W14–2P plaques can be used alone according to Section 2C.21 DEAD END/NO OUTLET Signs (14–1, W14–1a, W14–2, W14–2a), the FHWA revises the table to remove the “P” designation from these two signs, and the rectangular forms of these signs are designated the W14–1a and W14–2a signs.

56. In Section 2C.03 Design of Warning Signs, based on an editorial comment from a traffic engineering consultant, the FHWA adds playgrounds to the listing of signs in the OPTION statement that may have a black legend and border on a yellow background or a black legend and border on a fluorescent yellow-green background.

57. In Section 2C.04 Size of Warning Signs, the FHWA removes the SUPPORT statement referencing the “Standard Highway Signs” book because this statement is general and applies to regulatory, warning, and guide signs. A similar statement is included in Section 2A.12 Dimensions. The removal of this SUPPORT statement

responds to two comments from the NCUTCD and the Illinois DOT.

The FHWA changes Table 2C–2 to add sizes for the Expressways W1 Series Arrows signs, the Expressways and Freeways W7 Series Truck Runaway signs, the Expressways and Freeways W12–2P Low Clearance signs, and to increase the sizes for all roadways except Freeways for the W10–1 Advance Grade Crossing sign, to enhance visibility of this sign for all road users, including older drivers. The FHWA received one comment from the NCUTCD in overall agreement with the changes to the table. The Oregon DOT suggested that the size for the W1 series signs be 900 x 900 mm (36” x 36”) for conventional roads because these curvature signs are very important. The FHWA agrees that these signs are important, but these signs are in the 750 x 750 mm (30” x 30”) category because they are symbol signs that can be recognized from a greater distance than words can be read.

The FHWA adopts the changes to Table 2C–2 as proposed in the NPA and adds the W1 Combination series signs to the Diamond shaped category in this final rule. The FHWA establishes a phase-in target compliance date of 10 years from the effective date of this final rule for existing signs in good condition to minimize any impact on State or local governments.

58. In Section 2C.05 Placement of Warning Signs, the FHWA changes the STANDARD statement to a SUPPORT statement, to respond to a comment from the City of Tucson, Arizona, suggesting that using the phrase “general requirements” in a STANDARD statement was not clear. The FHWA agrees and revises the wording to reference Sections 2A.16 to 2A.21 for information on placement of warning signs.

The FHWA changes Table 2C–4 so that the distances for the placement of advance warning signs correspond to the values in the 2001 AASHTO “A Policy on Geometric Design of Highway and Streets”¹⁴ book and to make the table easier to use. The FHWA combines the “Condition B” and “Condition C”

columns (as shown in the 2000 MUTCD) and labels them “Condition B”. The FHWA also adds columns for 90, 100, and 110 km/h and 60 and 70 mph for the deceleration to the listed advisory speed and rows for 70 and 75 mph for the Posted or 85th Percentile Speed. Finally, the FHWA revises the Notes to reflect the other changes taking place throughout the MUTCD. These changes to Table 2C–4 reflect the needs of older road users and improve the clarity of the Notes. The FHWA received two comments from the NCUTCD and ATSSA in support of the changes. There were three comments from the Nevada, Wisconsin, and Oregon DOTs opposed to these changes, suggesting that the sign placement distances were either too long, or too short. Advanced placement distances have significantly decreased based on the 2001 AASHTO Policy, and the MUTCD reflects these changes. To address comments about this table the FHWA removes the word “minimum” from footnote 5 in both sheets of the table, and removes the metric units from the notes on the English units table, and vice versa.

59. In Section 2C.06, Horizontal Alignment Signs (W1–1 through W1–5, W1–11, W1–15) (titled “Horizontal Alignment Signs (W1–1 through W1–5)” in the 2000 MUTCD), the FHWA revises the section title to reflect the new Hairpin Curve (W1–11) sign and the 270 Degree Loop (W1–15) sign.

In the first OPTION statement, the FHWA adds the use of the Hairpin Curve sign and the 270 Degree Loop sign based on the change in horizontal alignment. These new signs better portray the severe curvature for these types of alignment changes. The FHWA received three comments from the NCUTCD, ATSSA, and the City of Tucson, Arizona, supporting the addition of these new signs, and adopts the OPTION statement regarding these signs.

The FHWA also adds to the GUIDANCE statement a recommendation to install a One-Direction Large Arrow (W1–6) sign or Chevron Alignment (W1–8) sign on the outside of a turn or curve when the Hairpin Curve sign or 270-Degree Loop sign is installed. This provides for enhanced warning to road users of the severe alignment change and may help reduce run-off-the-road crashes.

In the NPA, the FHWA proposed to add a second GUIDANCE statement following the STANDARD statement. This proposed GUIDANCE recommended that the need for additional curve warning signs or advisory speed reduction warning plaques be based on an engineering

¹⁴ “A Policy on Geometric Design of Highways and Streets,” 4th Edition, 2001, in both hardcopy and CD-ROM, is available from the American Association of State Highway and Transportation Officials (AASHTO) by telephone (800) 231-3475, facsimile (800) 525-5562, mail AASHTO, P.O. Box 96716, Washington, DC 20090-6716, or at its Web site <http://www.transportation.org> and click on Bookstore. This document is a guide, based on established practices and supplemented by research, to provide guidance to the highway designer to provide for the needs of highway users while maintaining the integrity of the environment. It is incorporated by reference into the CFR at 23 CFR 625.4.

study or on engineering judgment. The FHWA received one comment from the NCUTCD suggesting that this statement was redundant. The FHWA agrees with this comment because traffic engineers consider the need for additional warning signs for curves or turns using engineering judgment or studies as part of common practice. The FHWA withdraws this proposal, and deletes this GUIDANCE from this final rule.

The FHWA adds an OPTION statement at the end of the section that provides a method that may be used to determine the need for additional speed reduction warning signs. The FHWA includes these optional criteria for determining the need for additional recommended speed reduction signs to mitigate the high number of run-off-the-road crashes along curves and ramps. Similar to their comments in Section 2C.36 Advisory Exit, Ramp, and Curve Speed Signs (W13-2, W13-3, W13-5), the NCUTCD Regulatory and Warning Sign Technical Committee, Caltrans and the City of Kennewick, Washington, suggested deleting this statement as well as other statements in this section referring to the Curve Speed sign. Those opposed cited their disagreement with the whole concept of the Curve Speed sign and the lack of criteria for its use. The FHWA believes this is a helpful sign to remind drivers of the advisory speed that should be added for optional use. Most curves are very well outlined with delineators or chevron signs. However, because crashes are still occurring, the FHWA believes that this sign could be used to advantage to remind drivers of the recommended reduction in speed as they proceed along the curve or ramp. The FHWA includes this statement, as well as other references to the Curve Speed sign in this final rule.

Additionally, the FHWA adds metric information to Table 2C-5 to show the metric speed value of less than or equal to 50 km/h along with the English unit of less than or equal to 30 mph and shows the metric speed value of greater than 50 km/h along with the English unit of greater than 30 mph. The metric values were inadvertently omitted from the 2000 MUTCD.

60. In Section 2C.07 Combination Horizontal Alignment/Advisory Speed Signs (W1-1a, W1-2a) (titled "Combination Horizontal Alignment/Advisory Speed Sign (W1-9)" in the 2000 MUTCD), the NPA included several proposed revisions to this section and the addition of Figure 2C-2 to provide for enhanced uniformity of application of these types of signs and improved safety on curves and turns. While there were two comments from

the City of Tucson, Arizona, and a private citizen in support of the changes, several commenters from the NCUTCD, the Washington and Wisconsin DOTs, and the Product and Highway Safety Institute expressed concern.

The NCUTCD Regulatory and Warning Sign Technical Committee recommended deleting this section and the associated sign images on Figure 2C-1 because of a lack of consensus in the profession on the proper application of these signs. The NCUTCD offered to review applications and develop a recommendation for future consideration. As a result of the comments received, the FHWA withdraws these proposed revisions and Figure 2C-2. However, in order to distinguish between the combination curve signs, the FHWA retains the revised sign codes of W1-1a and W1-2a instead of W1-9. The FHWA also rennumbers subsequent figures (as numbered in the NPA). After the NCUTCD has reviewed existing applications of this type of signing (which exist in only a few States) and makes further recommendations on application and placement issues, the FHWA may consider changes to this section in a future rulemaking.

61. In Section 2C.10 Chevron Alignment Sign (W1-8), the FHWA adds to the STANDARD statement that a border shall not be used on the Chevron Alignment sign. This change corrects an error in the 2000 MUTCD. The FHWA adopts this change.

The FHWA received one comment from the NCUTCD suggesting that the second OPTION statement be revised to state that multiple Chevron Alignment signs may be used on the far side of a T-intersection to inform drivers of a change of horizontal alignment. The FHWA disagrees because a Two-Direction Large Arrow sign (W1-7) may be used instead. Chevron signs should be limited to use for curves only. Changes to this statement may be appropriate for a future rulemaking.

62. The FHWA adds a new section numbered and titled, "Section 2C.11 Truck Rollover Warning Signs (W1-13)." This section was numbered Section 2C.54 in the NPA. This new section includes OPTION and STANDARD statements on the use of the Truck Rollover warning sign to warn drivers of vehicles with a high center of gravity of a curve or turn having geometric conditions that are prone to cause such vehicles to lose control and overturn. This new section provides for uniform design and application of signs for this purpose, using the Pennsylvania sign design that research found to be

most effective in warning truckers of the condition.¹⁵ The FHWA received four comments from the NCUTCD, ATSSA, the City of Tucson, Arizona, and a private citizen in support of this change, and four comments from the Oregon and Wisconsin DOTs and a private citizen suggesting that the sign design be revised for clarity. As a result, the FHWA adds a SUPPORT statement clarifying that the curved arrow on the sign shows the direction of the roadway curvature, and that the truck tips in the opposite direction. In the NPA, the FHWA proposed two versions of the sign. Several commenters from State DOTs opposed the W1-13a Combination sign, stating that there was too much information on the sign for the motorist to understand. Based on these comments, the FHWA removes the W1-13a Combination sign from this final rule. The FHWA establishes a phase-in target compliance date of 10 years from the effective date of this final rule for existing signs in good condition to minimize any impact on State or local governments.

63. In Section 2C.12 Hill Signs (W7-1, W7-1a, W7-1b) (numbered Section 2C.11 in the NPA), the FHWA adds to the GUIDANCE statement to clarify that on longer grades, the Hill sign with 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. This change clarifies that the plaques should not be used alone but should supplement the Hill sign. The FHWA received one comment from the City of Tucson, Arizona, in support of this change, and adopts this change.

64. In Section 2C.13 Truck Escape Ramp Signs (W7-4 Series) (numbered Section 2C.12 in the NPA), the FHWA adds to the STANDARD statement to indicate that at least one of the W7-4 series warning signs shall be used when truck escape ramps are installed. This change clarifies that additional warning signs may be used as conditions warrant. The FHWA received one comment from the City of Tucson, Arizona, in support of this change, and adopts this change. The FHWA also adds an illustration of the regulatory RUNAWAY VEHICLES ONLY (R4-10) sign on Figure 2B-8 (numbered Figure 2B-6 in the NPA) in this final rule.

¹⁵ "Ramp Signing for Trucks," by the Center for Applied Research, Inc., December 20, 1989, a research project conducted for the Federal Highway Administration (FHWA) under contract number DTFH61-88-C-00048, is available from FHWA Turner-Fairbank Highway Research Center, 6300 Georgetown Pike, McLean, Virginia 22101, Web site <http://www.tfhrc.gov>.

65. The FHWA adds a new section numbered and titled, "Section 2C.14 HILL BLOCKS VIEW Sign (W7-6)." This section was numbered Section 2C.50 in the NPA. This section includes an OPTION statement on the use of the HILL BLOCKS VIEW sign in advance of the crest of a vertical curve to advise road users to reduce speed as they approach and traverse the hill as only limited sight distance is available. The FHWA adds this sign because it is in use, fulfills an important need, and has been found by older driver research¹⁶ to be well understood by road users. The FHWA received two comments from the City of Tucson, Arizona, and a traffic engineering consultant in support of this new section and the HILL BLOCKS VIEW sign, and seven comments from the NCUTCD, the Kansas, Minnesota, and Arizona DOTs, as well as Pierce County, Washington, and a private citizen questioning its effectiveness. Two commenters representing the Kansas DOT suggested that the side-road/cross-road warning signs, with the appropriate advisory speed, are more informative to the driver. Because this sign may be needed to warn of limited view over a hillcrest where side roads and cross roads are not present, the FHWA includes this section and the HILL BLOCKS VIEW sign in this final rule. Because this is an OPTION, some State and local DOTs may choose to use this sign, and others may not.

Additionally, the FHWA includes a GUIDANCE statement, indicating that when a HILL BLOCKS VIEW sign is used, an Advisory Speed plaque based on available stopping sight distance should accompany it. The FHWA includes the plaque because road users should be advised of the recommended speed for traversing the hillcrest.

66. In Section 2C.15 ROAD NARROWS Sign (W5-1) (numbered Section 2C.13 in the NPA), the FHWA included a proposal in NPA to renumber and retitle the Narrow Bridge (W5-2a) sign as a new symbolic Road Narrows (W5-1a) sign. The FHWA proposed these changes because it felt that the road user's understanding of the symbol is not exclusively as "narrow bridge ahead," but rather as symbolic of any narrowing of the road, such as the presence of curb bulb-outs or chicanes. The FHWA received five comments

from the NCUTCD, the Arizona and Minnesota DOTs, Caltrans, and private citizens opposing this change, stating that the symbolic sign is unsuitable for the Road Narrows message due to its depiction of a relatively short distance of narrow roadway, which may not agree with all narrow roadway situations. The FHWA agrees and deletes the W5-1a sign (designated W5-2a in the 2000 MUTCD) and associated OPTION statement as proposed in the NPA, and adopts only the word message ROAD NARROWS (W5-1) sign in this final rule.

67. In Section 2C.16 NARROW BRIDGE Sign (W5-2) (numbered Section 2C.14 in the NPA), the FHWA removes the reference to the Narrow Bridge symbol (W5-2b in the NPA, W5-2a in the 2000 MUTCD) sign from the OPTION statement. This change was proposed in the NPA to reflect the proposed change of the Narrow Bridge symbol (W5-2b) sign to the Road Narrows symbol (W5-1a) sign. The FHWA received comments from the NCUTCD, the Ohio DOT, and the City of Tucson, Arizona, in support of this change, while the Florida DOT and Caltrans opposed it. The Florida DOT felt that replacing a symbol sign with a word message sign is an exception to the international movement toward a more symbolic sign vocabulary. Caltrans indicated that the symbolic graphic provides more information than the text sign because it indicates a temporary short constriction in the roadway with the road widening back to normal after the constriction. Based on comments (see discussion regarding Section 2C.15 ROAD NARROWS Sign (W5-1)), the FHWA deletes the symbol sign in this final rule, because its meaning is not clear. The FHWA establishes a phase-in target compliance date of 10 years from the effective date of this final rule for replacing existing Narrow Bridge symbol signs in good condition with the word message signs to minimize any impact on State or local governments.

68. In Section 2C.19 Divided Highway (Road) Ends Sign (W6-2) (numbered Section 2C.17 in the NPA), the FHWA modifies the GUIDANCE statement to clarify that a Divided Highway Ends (W6-2) symbol sign should be used in advance of the end of a section of physically divided highway (not an intersection or junction) as a warning of two-way traffic ahead. The reason for this change is that the warning sign should be placed in advance of, rather than at, the start of the divided highway section. The FHWA received two comments from the NCUTCD and the City of Tucson, Arizona, supporting this change and adopts this change.

69. In Section 2C.21 DEAD END/NO OUTLET Signs (W14-1, W14-1a, W14-2, W14-2a) (numbered Section 2C.19 in the NPA), the FHWA combines Section 2C.40 DEAD END/NO OUTLET Plaques as numbered in the NPA with this section because the FHWA redesignates these plaques as signs. The FHWA modifies the STANDARD statement to clarify that 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. This change gives additional flexibility to jurisdictions when posting the sign at the exact entry point is not practical due to obstructions or other factors. The FHWA received one comment from the City of Tucson, Arizona, in support of this change, and incorporates this change.

The FHWA also received a comment from a traffic engineering consultant suggesting restoration of text from the 1988 MUTCD, that was removed in the 2000 MUTCD, restricting the use of the W14-1P and W14-2P plaques in lieu of the W14-1 and W14-2 signs where traffic can proceed straight through the intersection into the dead end street. The FHWA agrees that this is necessary to adequately warn road users and includes this text as a separate paragraph in the STANDARD statement in this final rule.

70. In Section 2C.22 Low Clearance Signs (W12-2 and W12-2) (numbered Section 2C.20 in the NPA), the FHWA clarifies the STANDARD statement by removing the words "or minimum structure height." This change clarifies the proper application of Low Clearance signs. The FHWA received two comments from the NCUTCD and the City of Tucson, Arizona, in support of this change, and incorporates the change.

Additionally, the FHWA clarifies the GUIDANCE statement by changing the phrase "legal limit" to "legal maximum vehicle height" to reflect more precisely the proper dimension. The FHWA received two comments from the NCUTCD and the City of Tucson, Arizona, in support of this change, and one from the Virginia DOT opposed to it. The Virginia DOT stated that the text in this section differs from the text in Section 8B.17 Low Ground Clearance Highway-Rail Grade Crossing Sign (W10-13) (numbered Section 8B.16 in the NPA), where there is no mention of using distance plaques, and suggests that the text in both sections should be the same, and that the GUIDANCE statement in this section be changed to

¹⁶Information about this research is summarized on pages 235 and 236 of the "Highway Design Handbook for Older Drivers and Pedestrians," Report number FHWA-RD-01-103, published by the FHWA Office of Safety Research and Development, 2001. It is available for purchase from The National Technical Information Service, Springfield, Virginia 22161, (703) 605-6000, and at the following URL: <http://www.ntis.gov>.

an OPTION. The FHWA disagrees with downgrading this paragraph to an OPTION because drivers of high profile vehicles need this information where they can still execute a turning maneuver and an OPTION would not be appropriate. However, in response to this comment, the FHWA adds a distance plaque to the list of sign types in Section 8B.17.

71. In Section 2C.23 BUMP and DIP Signs (W8-1, W8-2) (numbered Section 2C.21 in the NPA), the FHWA modifies the second GUIDANCE statement to indicate that a short stretch of depressed alignment that might momentarily hide a vehicle should be treated as a no-passing zone when centerline striping is provided on a two-lane or three-lane road. The change replaces the word "may" with "might" to avoid possible confusion of this GUIDANCE statement as an OPTION statement, and clarifies that the use of a no-passing zone in this situation only applies when centerline striping is provided on the road. The FHWA received two comments from the NCUTCD and the City of Tucson, Arizona, in support of this change, and adopts this change.

72. In Section 2C.24 SPEED HUMP Sign (W17-1) (numbered Section 2C.22 in the NPA), the FHWA adds a sentence to the OPTION statement to allow the use of the legend SPEED BUMP instead of the legend SPEED HUMP on the W17-1 sign. This provides additional flexibility to jurisdictions and reduces sign inventory. The FHWA received two comments from the City of Tucson, Arizona, and a traffic engineering consultant in support of this change, and one comment from the NCUTCD opposed to it. The NCUTCD stated that speed humps and speed bumps are not the same and are designed and applied differently, and therefore should be signed accordingly. While the FHWA agrees that speed humps and speed bumps are different, the FHWA believes that the general public does not readily perceive the difference in terminology or design between speed humps and speed bumps. To allow jurisdictions to use the terminology that will be best understood locally and to minimize maintenance issues, the FHWA adopts the OPTION statement as proposed in the NPA in this final rule. To clarify the intent, the FHWA adds a new SUPPORT statement immediately following the OPTION that describes speed humps and speed bumps and that, because the terminology is not well known by the public, for signing purposes the terms are interchangeable.

73. In Section 2C.26 SHOULDER Signs (W8-4, W8-9, and W8-9a) (numbered and titled "Section 2C.24

SHOULDER and UNEVEN LANES Signs (W8-4, W8-9, W8-9a, and W8-11)" in the NPA), the FHWA removes the UNEVEN LANES (W8-11) sign from the title and section text, as well as the first SUPPORT and STANDARD statements to move temporary traffic control applications signs out of Chapter 2C to respond to comments from the NCUTCD and the Washington DOT.

In the NPA, the FHWA proposed to add a STANDARD statement just before the GUIDANCE statement requiring the use of the SHOULDER DROP OFF (W8-9a) sign when a shoulder drop-off, adjacent to the travel lane, exceeds 75 mm (3 in) in depth and is not delineated by portable barriers. The FHWA received two comments from the City of Tucson, Arizona, and the Motorcycle Safety Foundation in support of this new STANDARD, and three comments from the Illinois and Minnesota DOTs opposed to it. Those opposed expressed that the text should remain a GUIDANCE because requiring the use of SHOULDER DROP OFF signs at all locations that meet the criteria would be a considerable hardship on agencies to properly identify all locations and sign them at all times. The opposing commenters also stated that the public does not fully understand the differences between the LOW SHOULDER and SHOULDER DROP OFF signs, and suggested that the LOW SHOULDER sign be omitted. The FHWA believes that jurisdictions need the proper warning signs to sign accurately for conditions where the drop off is greater than 75 mm (3 inches) and has not yet been repaired. Accordingly, the FHWA restores this statement to a GUIDANCE and clarifies the use of the SHOULDER DROP OFF sign.

74. The FHWA adds a new section numbered and titled, "Section 2C.28 BRIDGE ICES BEFORE ROAD Sign (W8-13)." (This section was numbered Section 2C.52 in the NPA.) This new section includes an OPTION statement on the use of the BRIDGE ICES BEFORE ROAD sign, which states that the sign may be used in advance of bridges to advise road users as they approach and traverse the bridge during winter weather conditions. The FHWA received four comments from the NCUTCD, ATSSA, and the City of Tucson, Arizona, in support of this change, and three comments from the Kansas and Wisconsin DOTs as well as the City of Plano, Texas, opposed to it. The opposing commenters indicated that the sign either served no purpose, or that as an OPTION statement, States may still choose to use different wording for the sign. The FHWA believes that States should not use a

different wording for a standardized warning sign legend because that decreases uniformity. The FHWA adopts this new section in this final rule, but modifies the proposed GUIDANCE to OPTION because there is no research indicating that display of this sign message during warm weather causes any safety or operational problem. However, some agencies feel it is good practice to cover or not display the message when it is not appropriate. The FHWA also moves this section to follow Section 2C.25 SLIPPERY WHEN WET because this follows a more logical order within the chapter.

75. In Section 2C.29 Advance Traffic Control Signs (W3-1, W3-2, W3-3, W3-4) (numbered Section 2C.26 in the NPA), the FHWA received several informational and editorial comments from State DOTs regarding the text in the OPTION statement about the use of the BE PREPARED TO STOP sign. One comment from the Oregon DOT suggested that other legends be used for signs at intersection traffic control in order to preserve the BE PREPARED TO STOP signs for flagger applications. The FHWA believes that although the BE PREPARED TO STOP sign is mentioned in Section 6F.29 Flagger Sign (W20-7a, W20-7) in conjunction with the Flagger sign, it is not intended to be used only for flagger applications. Because this is an OPTION statement, States are not required to use the BE PREPARED TO STOP sign for non-flagger situations.

The FHWA also received two comments from private citizens suggesting shortening the message on the sign to PREPARE TO STOP for conciseness and to allow use of a larger text font. The FHWA disagrees because PREPARE TO STOP would imply that the condition that must be stopped for is always present.

The FHWA also clarifies that the reference to a beacon in the second OPTION statement and the second GUIDANCE statement is a reference to a warning beacon. This clarification is necessary to be consistent with prescribed use of warning beacons in Part 4 of the MUTCD. The FHWA received one comment from the City of Tucson, Arizona, in support of these changes, and the FHWA incorporates these changes.

76. The FHWA adds a new section numbered and titled, "Section 2C.30 Speed Reduction Signs (W3-5, W3-5a)." (This Section was numbered Section 2C.51 in the NPA.) This new section includes a GUIDANCE statement, which recommends using the Speed Reduction signs to inform road users of a reduced speed zone when engineering judgment indicates the need

for advance notice to comply with the posted speed limit ahead. These new warning signs replace the R2-5a, b, and c signs because the intended message is more properly categorized as a warning message rather than regulatory message. The FHWA received five comments from ATSSA, the City of Tucson, Arizona, and a private citizen in support of this change, and fourteen comments from several State and local DOTs opposed to the change. Those who opposed the change indicated that the existing signs are more recognized by drivers, and therefore have the desired effect of reducing speeds where needed. Although some of the opposing commenters, such as the NCUTCD and the Washington DOT, agreed that the sign should be classified as a warning rather than a regulatory sign, many still favored use of the existing signs for economic reasons or indicated disagreement with the design of the proposed signs.

The FHWA disagrees with the use of an advisory speed plaque with a word message "Reduced Speed Ahead" sign as was suggested by some commenters. This is an inappropriate use of an advisory speed plaque and would only serve to further confuse the motoring public about what the difference is between a (regulatory) speed limit and a (non-enforceable) advisory speed. The sign proposed in the NPA is the most logical and the one that best serves the public because it is consistent with other advance warning signs that warn of a specific regulation ahead, such as the symbolic Stop Ahead and Yield Ahead signs. The Canadian MUTCD¹⁷ has incorporated a similar concept of speed reduction signs for several decades. The NCUTCD and the Missouri DOT felt that the proposed sign would be a maintenance burden on jurisdictions due to having to stock and carry on sign maintenance vehicles multiple versions of the Speed Reduction sign with different numerical speed values. In view of Canada's long-standing use of this concept of speed reduction sign, the FHWA believes that this has not proven to be an unreasonable maintenance burden in Canada, nor has it been an unreasonable problem for jurisdictions in the U.S. with other standard signs in the MUTCD that provide for multiple speed values or distance values, such as the R2-1 Speed Limit sign, the W12-2 Low Clearance warning sign, the W13-1

Advisory Speed Plaque, or the W13-2 and W13-3 Exit and Ramp Speed advisory signs. Clear and unambiguous advance warning of a reduced regulatory speed limit ahead is an extremely important message that warrants the use of the sign as proposed in the NPA. The FHWA adopts the language for this section, as proposed in the NPA.

To respond to comments regarding the costs associated with this change, the FHWA revises the phase-in target compliance date to 15 years from the effective date of this final rule for existing R2-5 signs in good condition to be changed to W3-5 or W3-5a signs, to minimize any impact on State or local governments.

The FHWA received several comments from the Arizona DOT and private citizens suggesting revisions to the design of the W3-5 and W3-5a signs to make them more legible from longer distances. To address these comments, the FHWA makes minor refinements to the English unit version of the W3-5 symbol sign to make the numerals 9 inches high for the 36" x 36" sign and 12 inches high for the 48" x 48" sign, and adjusts the layout slightly. The FHWA also deletes the metric alternate of the W3-5 symbol sign because the numerals on it would be too small. The only allowable metric version of the Speed Reduction Warning sign is to be the metric word message W3-5a sign.

Additionally, the FHWA includes a STANDARD statement, which requires that a Speed Reduction Warning sign be followed by a Speed Limit (R2-1) sign installed at the beginning of the zone where the speed limit applies and that the speed limit displayed on the Speed Reduction sign shall be identical to the speed limit displayed on the subsequent Speed Limit sign. This is needed to provide for uniform application of these signs. The Minnesota DOT opposed this new paragraph, indicating that Section 2B.13 Speed Limit Sign (R2-1) already states that an R2-1 sign is required. The FHWA disagrees because Section 2B.13 does not require that statutory speed limits be posted, and this new paragraph is needed because it correctly limits the use of the Speed Reduction signs to only locations that are prior to "posted" speed limits. The FHWA adopts this paragraph in this final rule.

77. In Section 2C.31 Merge Signs (W4-1, W4-5) (numbered Section 2C.28 in the NPA), the FHWA includes the addition of the new Entering Roadway Merge (W4-5) sign in the title (referred to as W4-1a in the NPA). In addition to the title change, the FHWA adds a recommendation to the GUIDANCE statement, which states that when a

Merge sign is to be installed on an entering roadway that curves before merging with the major roadway, the Entering Roadway Merge (W4-5) sign should be used. This sign is recommended for this condition because it better portrays the actual geometric conditions to road users on the entering roadway. The FHWA received three comments from the NCUTCD, ATSSA, and the City of Tucson, Arizona, in support of this change, and one comment from the Minnesota DOT opposing it. The Minnesota DOT indicated that drivers will not understand the sign, and suggested changing the W4-5 sign to an "ENTERING MERGE AREA" word sign. The FHWA disagrees and believes that this symbol sign would more accurately inform the drivers on the ramp that they must merge and adopts the change as proposed in the NPA. The FHWA establishes a phase-in target compliance date of 10 years from the effective date of this final rule for existing signs in good condition to minimize any impact on State or local governments.

78. In Section 2C.32 Added Lane Signs (W4-3, W4-6) (numbered Section 2C.29 in the NPA), the FHWA changes the title to reflect the addition of the new Entering Roadway Added Lane (W4-6) sign (referred to as W4-3a in the NPA). In addition to the title change, the FHWA adds to the GUIDANCE statement, that 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 should be used. This sign is recommended for this condition because it better portrays the actual geometric conditions to road users on the entering roadway. The FHWA received three comments from the NCUTCD, ATSSA, and the City of Tucson, Arizona, in support of this change, and one comment from the Minnesota DOT opposing it. The Minnesota DOT stated that drivers would not understand the sign. The FHWA disagrees because the orientation of the symbol on the sign will better convey to drivers on the ramp that they are about to flow into an added lane. Also, the FHWA notes that this sign has been used in the State of Washington for the intended geometric conditions. The FHWA adopts the change, as proposed in the NPA, in this final rule. The FHWA establishes a phase-in target compliance date of 10 years from the effective date of this final rule for existing signs in good condition to

¹⁷ Manual on Uniform Traffic Control Devices for Canada", 1998, and a December 2002 update, are available for purchase from the Transportation Association of Canada, at the following URL: <https://mediant.magma.ca/tacatc/bookstore/bookstore.cfm> click on "Traffic Control".

minimize any impact on State or local governments.

79. In Section 2C.33 Lane Ends Signs (W4-2, W9-1, W9-2) (numbered Section 2C.30 in the NPA), the FHWA changes the title of the section to reflect the addition of the Lane Ends (W4-2) sign (referred to as the Lane Reduction sign in the NPA.) This symbol sign was included in the 1988 edition of the MUTCD but in the 2000 Edition of the MUTCD it was deleted from Part 2 due to poor comprehension of the 1988 symbol by road users. However, in Part 6 of the 2000 MUTCD this symbol sign continued to be shown in many of the figures, particularly for the Typical Applications in Chapter 6H, and therefore this symbol sign has continued to be widely used by State and local highway agencies.

The FHWA believes that a symbolic sign for the Lane Ends message continues to be needed and in the NPA the FHWA proposed changes the design of the Lane Ends (W4-2) symbol sign to improve comprehension by road users. The FHWA received nine comments from the NCUTCD, the Minnesota DOT, and private citizens opposed to the new sign design and five comments from the Oregon, Virginia and Wisconsin DOTs as well as private citizens in support of the new sign design.

The opposing commenters suggested that the new design would not be understood and also stated that there was not sufficient research to support the new design. An FHWA human factors research project¹⁸ has found that road users very poorly comprehend the meaning of the previous design of the W4-2 sign. The research found that the old design is commonly misinterpreted to mean "merge ahead" or "road narrows" and does not adequately convey the intended message of a lane ending (reduction in the number of lanes.) This research also evaluated an alternative design similar to the design used in Canada but with more graphic elements (bent arrows.) This study found that comprehension of the tested alternative symbol was much better than the old W4-2 design, but because of the complexity of the added graphical elements (arrows) the legibility distance was less than that of the old W4-2 design. The FHWA adopts a revised design for the W4-2 sign that is identical to the design used in Canada

for several decades. A study in Canada¹⁹ found the Canadian symbol sign to be legible in the range of 70 to 200 meters, which is better legibility than most symbols. The FHWA adopts this design in this final rule because the long-standing Canadian use of this sign indicates it is successful and because having a uniform design between the U.S. and Canada will benefit cross-border travelers. Several State DOTs suggested that the OPTION allowing jurisdictions to modify the Lane Ends sign to represent the actual road lane configuration be removed. The FHWA agrees and eliminates the OPTION allowing the sign to be modified. The adopted sign design conveys that the number of lanes is being reduced by one, regardless of how many total lanes are on the roadway. The FHWA establishes a phase-in target compliance date of 10 years from the effective date of this final rule for existing signs in good condition to minimize any impact on State or local governments.

Additionally, the FHWA adds the Lane Ends (W4-2) symbol sign to the first and second GUIDANCE statements and to the OPTION statement, indicating that the W4-2 symbol sign is an alternative to the LANE ENDS MERGE LEFT (RIGHT) (W9-2) word sign. This will provide additional flexibility to jurisdictions. The FHWA received one comment from Caltrans opposed to this change, stating that allowing the option to use word or symbol signs will lead to motorist confusion. The FHWA disagrees because there are many examples in the MUTCD where jurisdictions may choose between symbol signs and word message signs and there is no data indicating this causes confusion. Also, this provides jurisdictions with more flexibility. The FHWA adopts this change, as proposed in the NPA, in this final rule.

80. In Section 2C.34 Two-Way Traffic Sign (W6-3) (numbered Section 2C.31 in the NPA), the FHWA adds to the GUIDANCE statement that a Two-Way Traffic sign with an AHEAD (W16-9P) plaque should be used to warn road users of a transition from a one-way street to a two-lane, two-way section of roadway. The FHWA makes this addition in response to three comments received from private citizens regarding this section and a figure in Section 2B.37 ONE WAY Signs (R6-1, R6-2) (numbered 2B.32 in the NPA), where

use of the sign is also illustrated, indicating that this revision should be made to clarify the text. The most common use of the W6-3 sign is along sections of two-lane, two-way roadways. In the specific case that is illustrated in Section 2B.37, the W6-3 sign is posted on the one-way street, in advance of where it changes to a two-way road. Therefore, the use of an AHEAD plaque with the W6-3 sign is recommended to enhance safety by minimizing possible misinterpretation of the meaning of the sign in that particular application. The FHWA establishes a phase-in target compliance date of five years from the effective date of this final rule for existing signs in good condition to minimize any impact on State or local governments.

81. In Section 2C.36 Advisory Exit, Ramp, and Curve Speed Signs (W13-2, W13-3, W13-5) (numbered Section 2C.33 in the NPA), the FHWA changes the design of the metric exit speed, ramp speed, and curve speed signs, and advisory speed signs/plaques so that the metric speed value is within a black circle with "km/h" below. This new design better differentiates between warning signs and plaques with metric units for speed from those using English units for speed. The FHWA received two comments from ATSSA and the City of Tucson, Arizona, in overall support of changes in this section. Three commenters representing the Minnesota and Ohio DOTs and a private citizen opposed the design of the metric exit speed sign, stating that this non-standard sign may not be recognized and understood by motorists. The FHWA disagrees and, consistent with decisions regarding the R2-1 sign in Chapter 2B, the FHWA adopts the metric exit speed sign as proposed in the NPA.

The FHWA received one comment from the Oregon DOT opposed to the first STANDARD statement regarding the use of the RAMP SPEED sign in addition to the EXIT SPEED sign, stating that the added signs clutter the sign environment and that the warning can more easily be handled with proper curvature signs with advisory speed plaques. The commenter suggested that the RAMP SPEED signs be an OPTION rather than a STANDARD. While the FHWA does not agree with removing the RAMP SPEED sign from the STANDARD, the FHWA adds a new OPTION paragraph stating that a Curve or Turn sign with Advisory Speed 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. The NCUTCD suggested that all of the references to curves and

¹⁸ "Evaluation of Selected Potential MUTCD Signs," by Alicandri and Wochinger, 2000, Federal Highway Administration (FHWA) report number FHWA-RD-00-053, is available from FHWA Turner-Fairbank Highway Research Center, 6300 Georgetown Pike, McLean, Virginia 22101, or through their web site at the following URL: <http://www.fhrc.gov>.

¹⁹ "Age Differences in the Legibility of Symbol Highway signs," by Frank Schieber and Donald Kline, 1994, is available for downloading at the University of South Dakota's Web site at the following URL: <http://www.usd.edu/~schieber/pdf/signs.pdf>.

Curve Speed signs be removed from the STANDARD and OPTION statements. The FHWA disagrees because this is a helpful sign to remind drivers of the advisory speed. Most curves are very well outlined with delineators or chevron signs. Because crashes are still occurring on curves, the FHWA believes that there is a need to remind drivers of the recommended reduction in speed as they proceed along the curve or ramp. The FHWA includes this statement, as well as other references to the Curve Speed sign, in this final rule.

The FHWA also adds a new paragraph to the OPTION stating that, based on engineering judgment, the Curve Speed sign may be installed on the inside or the outside of the curve to enhance its visibility. The FHWA incorporates this new paragraph in this final rule to be consistent with changes elsewhere in Part 2 of the MUTCD.

The FHWA also adds a new figure numbered and titled "Figure 2C-7 Example of Advisory Speed Signing for an Exit Ramp." This figure illustrates the use of the Exit Speed sign along the deceleration lane and the use of the Ramp Speed signs along the actual ramp. The figure clarifies application of these signs to jurisdictions. Based on editorial comments suggesting additional clarity to this figure, the FHWA adopts this new figure, with revisions, in this final rule.

Additionally, the FHWA adds to the OPTION statement at the end of the section, that the advisory speed may be the 85th percentile speed of free-flowing traffic, the speed corresponding to a 16-degree ball-bank indicator reading,²⁰ or the speed otherwise determined by an engineering study due to unusual circumstances. The wording of this paragraph in this final rule incorporates comments received from the NCUTCD, the Kansas DOT, a traffic engineering consultant and private citizens on the proposed wording in the NPA, specifically the ball-bank test. The FHWA includes this OPTION criteria to enhance the uniformity of determining the recommended advisory speed and to provide additional warning to motorists, because highway curves have a crash rate about three times the rate for highway tangent segments and a run-off-the-road crash rate about four times the tangent segment rate. The FHWA also adds a new SUPPORT statement that further describes the ball-bank indicator reading and its correlation with the 85th percentile speed, based on research

conducted for the Maryland Department of Transportation.²¹

82. In Section 2C.37 Intersection Warning Signs (W2-1 through W2-6) (numbered Section 2C.34 in the NPA), the FHWA changes the design of the CIRCULAR INTERSECTION (W2-6) sign to a symbol sign with three rotating arrows to better portray the operations at circular intersections. The FHWA received eight comments from ATSSA, the City of Tucson, Arizona, traffic engineering consultants, and private citizens in support of the new sign design and six comments from the Kansas, Virginia, and Wisconsin DOTs as well as the City of Lenexa, Kansas, opposing it. The commenters who opposed suggested that road users may not understand the new sign and offered new designs, or stated that the sign in the 2000 MUTCD should be restored. The FHWA adopts the three-arrow sign as proposed in the NPA because it is consistent with the international symbol for a roundabout intersection and with FHWA roundabout design guidance²² and has significantly longer recognition distance than the previous sign. The FHWA establishes a phase-in target compliance date of 10 years from the effective date of this final rule for existing signs in good condition to minimize any impact on State or local governments.

In order to educate road users, the FHWA clarifies the first paragraph of the OPTION statement to include that a TRAFFIC CIRCLE word message plaque may accompany the Circular Intersection (W2-6) sign installed in advance of a circular intersection.

Additionally, the FHWA modifies the GUIDANCE statement to clarify that the Intersection Warning signs, other than the Circular Intersection Warning symbol (W2-6) sign and the T-intersection symbol (W2-4) sign, should not be used on approaches controlled by STOP signs, YIELD signs, or signals. This change, which was suggested by the NCUTCD, allows the W2-4 sign to be used on the stem of a T-intersection, regardless of how the intersection is controlled, to provide additional warning information to road users.

83. The FHWA adds a new section numbered and titled, "Section 2C.39 Traffic Signal Signs (W25-1, W25-2)." (This section was numbered Section

2C.53 in the NPA.) This new section includes a STANDARD statement on the use of the ONCOMING TRAFFIC HAS EXTENDED GREEN (W25-1) and ONCOMING TRAFFIC MAY HAVE EXTENDED GREEN (W25-2) traffic signal signs. The STANDARD statement requires that, unless a separate left-turn signal face is provided and is operated as described in Section 4D.06 Application of Steady Signal Indications for Left Turns, if the possibility exists that a CIRCULAR YELLOW signal indication could be displayed to an approach from which drivers are turning left permissively without the simultaneous display of a CIRCULAR YELLOW signal indication to the opposing approach (see Section 4D.05), either a W25-1 or a W25-2 sign be installed near the left-most signal head. The FHWA adds this new section because these signs are adopted in Chapter 4D as one of several ways to eliminate or reduce safety issues associated with the "yellow trap" (as described in the discussion of Section 4D.05) in some traffic signal phasing sequences. The FHWA received three comments from ATSSA, the City of Tucson, Arizona, and a traffic engineering consultant in support of this new section and associated signs, and many comments from the NCUTCD, State and local DOTs, and private citizens opposed to it. The proposed wording of the signs in the NPA, CAUTION ONCOMING GREEN EXTENDED (W25-1) and CAUTION ONCOMING GREEN MAY BE EXTENDED (W25-2), stimulated many comments from the NCUTCD, the Arizona DOT, Pierce County, Washington; the City of Plano, Texas; and the City of Los Angeles, California, regarding the use of the word "Caution," stating that the warning sign colors should communicate to the driver that caution is needed, rather than explicit use of the word. Many of these same commenters suggested that the public would not understand the signs, and some jurisdictions are opposed to allowing any situations in which the "yellow trap" can occur. The FHWA recognizes that there are some locations where no other signal sequence other than a yellow trap is reasonably feasible due to unique combinations of intersection geometrics, traffic volumes, and the like. The FHWA believes that these signs will serve a useful purpose, and revises the text of the signs to remove the word "Caution" and to clarify their meaning.

84. In Section 2C.40 Vehicular Traffic Signs (W8-6, W11-1, W11-5, W11-5a, W11-8, W11-10, W11-11, W11-12p,

²¹ "Advisory Speeds on Maryland Highways—Technical Report", August 1999, by Brudis and Associates, Inc., is available from Brudis and Associates, 9220 Rumsey Road; Suite 110, Columbia, Maryland 21045, Phone (410) 884-3607.

²² "Roundabouts: An Informational Guide," FHWA, 2000. Report Number: FHWA-RD-00-067 is available at the following URL: www.fhrc.gov/safety/00068.htm.

²⁰ The ball bank indicator reading is a measure of the overturning force (side friction), measured in degrees, on a vehicle negotiating a horizontal curve.

W11-14) (numbered and titled "Section 2C.36 Motorized Traffic Signs (W8-6, W11-5, W11-5a, W11-8, W11-10, W11-10a, W11-12)" in the NPA), the FHWA changes the title to be consistent with the changes in Section 2C.41 and to reflect the addition and deletion of some signs from this section.

The FHWA received several comments from the NCUTCD, ATSSA, State DOTs, traffic engineering consultants, and private citizens regarding specific signs listed in the first OPTION statement, as well as the signs shown in Figure 2C-9 (numbered Figure 2C-10 in the NPA). The Ohio DOT suggested that bicycles be included in the list of vehicles in this statement and removed from the first paragraph of Section 2C.41 because bicycles are vehicles. The FHWA agrees and, in addition to adding bicycles and the W11-1 sign to this section, the FHWA adds the W11-11 Golf Cart and W11-14 Horse-Drawn Vehicle signs.

The FHWA adds a sentence in this OPTION that the TRUCK CROSSING (W8-6) word message sign may be used as an alternate to the Truck Crossing symbol sign, to provide additional flexibility. The FHWA received one comment from the City of Tucson, Arizona, supporting this change, and incorporates this change. The FHWA establishes a 10-year phase-in target compliance date from the effective date of this final rule for the new symbol signs W11-1, W11-5, W11-5a, W11-11, and the W11-14 signs, for existing signs in good conditions, to minimize any impacts on State and local governments.

The FHWA received several comments regarding the sign images in Figure 2C-9 (numbered Figure 2C-10 in the NPA). The NCUTCD, the Illinois DOT, and private citizens opposed the W11-5a tractor sign, and the Virginia DOT supported the sign. Many of the commenters who opposed the new sign suggested that the existing W11-5 sign is sufficient, and road users will not distinguish the differences between the two signs. The W11-5a sign was actually adopted in a 1997 final rule,²³ and inadvertently omitted from the 2000 MUTCD. Accordingly, the FHWA adopts the W11-5a sign in this final rule.

Four commenters representing State and local DOTs and private citizens also opposed the new W11-10a truck sign, again stating that existing W11-10 sign is sufficient, and road users will not

distinguish the differences between the two signs. The FHWA agrees and removes the W11-10a sign from the MUTCD in this final rule. In addition, based on a comment from the Ohio DOT, the FHWA separates Figure 2C-9 into two figures titled "Figure 2C-9 Vehicular Traffic Signs" and "Figure 2C-10 Nonvehicular Traffic Signs." On the figure titled "Nonvehicular Traffic Signs," the FHWA adds sign images of the W11-7 Equestrian and W11-9 Handicapped signs. Based on the comments from the NCUTCD and a private citizen, the FHWA removes the W11-4a Horse-and-Buggy, W11-15 Waterfowl, and the W11-10a construction dump truck signs from Figure 2C-9 as well as the section text. The FHWA believes that only one sign depicting a horse and buggy and one sign depicting a truck is necessary. *See also* the discussion that follows regarding the Waterfowl Sign.

In the second OPTION statement, the FHWA adds that a supplemental plaque with the legend SHARE THE ROAD may be mounted below Vehicular Traffic warning signs. The purpose of this addition is to allow the use of this sign to provide additional warning to road users. The NCUTCD suggested that the SHARE THE ROAD plaque be moved to Figure 2C-11 and removed from this section. The FHWA adds the SHARE THE ROAD plaque to Figure 2C-11.

85. In Section 2C.41 Nonvehicular Signs (W11-2, W11-3, W11-4, W11-6, W11-7, W11-9) (numbered Section 2C.37 in the NPA), the FHWA changes the title to reflect that this section pertains to nonvehicular signs, not just Crossing signs. The FHWA moves the Bicycle (W11-1), Golf Cart (W11-11) and Horse-Drawn Vehicle (W11-14) symbol signs from this section to Section 2C.40 because they represent vehicular signs. This responds to several comments from State DOTs and traffic engineering consultants. The FHWA adds the Equestrian (W11-7) symbol sign, which had been adopted previously as a standard symbol in an amendment to the 1988 MUTCD but which had been inadvertently omitted from the figure illustrating Nonvehicular Signs in the 2000 MUTCD. Based on comments from the NCUTCD, State and local DOTs, and private citizens opposed to the Waterfowl Crossing sign that was proposed in the NPA because of lack of research showing effectiveness of the symbol, the FHWA withdraws that sign from the figure and the text of this final rule. Future research may develop an improved symbol for this message.

The FHWA also revises the second OPTION statement to clarify that the

supplemental plaques such as AHEAD or XX METERS may be used with the Nonvehicular warning signs, when used in advance of a crossing. These plaques are specifically intended to provide advance notice to road users of crossing activity. The FHWA received no comments regarding this change, and adopts this change.

Additionally, the FHWA modifies the STANDARD statement to specify that when Nonvehicular warning signs are used at a crossing, the signs shall be supplemented with a diagonal downward pointing arrow (W16-7p) plaque showing the location of the crossing. This reflects the fact that Nonvehicular warning signs can be used either in advance of or at the crossing, and is consistent with the practice of using the diagonal downward pointing arrow with other similar signs located at a crossing. The FHWA received one comment from the Kansas DOT in support of this change, and one comment from the Oregon DOT opposed to it, stating that the requirement to use the arrow plaque at all signed crossings adds excessive signing without much benefit. The Oregon DOT suggested that use of the arrow plaque remain an option for supplementing any crossing sign, but not be required. The FHWA notes that the required use of the plaque was established in the 2000 MUTCD, and at that time the FHWA established a January 17, 2011 phase-in target compliance date. The revisions to this STANDARD statement in the 2003 MUTCD merely add clarity. Consistent use of the arrow plaque at crossings is needed to educate the public regarding the meaning of the plaque.

Additionally, the FHWA adds to the third OPTION statement to state that Pedestrian, Bicycle, School Advance Crossing, and School Crossing signs and their related supplemental plaques may have a fluorescent yellow-green background with a black legend and border. This change reflects the common practice for supplemental plaques to be of the same color as the signs they supplement. The FHWA received one comment from ATSSA in support of this change and adopts this change.

86. In Section 2C.46 Advisory Speed Plaque (W13-1) (numbered Section 2C.42 in the NPA), the FHWA adds to the first OPTION statement to permit the use of an Advisory Speed (W13-1) plaque to supplement any warning sign to indicate the advisory speed for a condition. The FHWA received one comment from Pierce County, Washington, suggesting that the 2000 MUTCD wording be retained, stating that the proposed revision may

²³ Final rule on FHWA Docket 95-7, published in the Federal Register on January 9, 1997, at 62 FR 1363, amended the 1988 MUTCD to include the ruling on Official Request for Change number II-228 (C) to add an alternative symbol sign W11-5a for farm machinery.

encourage widespread and ineffective use of the W13-1 plaque. The FHWA disagrees and adopts the revision in this final rule, changing the proposed phrase "recommended speed" to "advisory speed" in this statement, as well as the STANDARD, GUIDANCE, and OPTION statements for consistency.

In the STANDARD statement, the FHWA requires the use of the Advisory Speed plaque where an engineering study indicates a need to inform road users of the advisory speed for a condition and, if they are used, the speed shown shall be a multiple of 10 km/h or 5 mph. This change clarifies which sign should be used when an engineering study indicates the need to advise road users of the advisory speed and how to determine what the recommended speed is for the condition. The FHWA received two comments from the Oregon and Kansas DOTs stating that an engineering study is an unnecessary expense, and recommended that the statement be changed to engineering judgment. The OPTION statement gives the flexibility to use the Advisory Speed plaque where only engineering judgment has been applied and no study has been performed. The STANDARD only requires the use of an Advisory Speed plaque where an engineering study has been performed and shows a need for the plaque. Because there is no requirement for an engineering study, the FHWA adopts the change, as proposed in the NPA, in this final rule.

In the NPA, the FHWA proposed to add an OPTION statement at the end of the section indicating how to determine the advisory speed along a ramp or curve. The FHWA received several comments from the NCUTCD, Yakima and Pierce Counties in Washington State, and a traffic engineering consultant opposed to the language in the NPA. As a result, the FHWA replaces the proposed language with the language adopted in Section 2C.36 Advisory Exit, Ramp, and Curve Speed Signs (W13-2, W13-3, W13-5). In concert with the changes in Section 2C.36, the FHWA also repeats the SUPPORT statement that further describes the ball-bank indicator reading and its correlation with the 85th-percentile speed in this section. (See also the discussion in Section 2C.36 regarding the ball-bank indicator reading and its correlation with the 85th percentile speed.)

87. In Section 2C.47 Supplemental Arrow Plaques (W16-5p, W16-6p, W16-7p) (numbered Section 2C.43 in the NPA), the FHWA changes the title to reflect the existence of the diagonally pointing down arrow plaque and

includes the designation in the section text. The FHWA received one comment from the City of Tucson, Arizona, in support of this change and adopts this change. The FHWA also received another editorial comment from a traffic engineering consultant suggesting that all plaques be assigned a "p" designation to distinguish them as plaques. The FHWA agrees that this change will provide additional clarity and consistency and will perform a comprehensive review of the MUTCD to achieve consistency in this designation in the future. The FHWA will consider including this in a future rulemaking.

88. The FHWA removes Section 2C.46 DEAD END/NO OUTLET Plaques (W14-1P, W14-2P), as numbered in the NPA, from the MUTCD. The FHWA changes the designation of these plaques to signs because they are permitted to be used alone, and moves the appropriate information to Section 2C.21 DEAD END/NO OUTLET Signs (W14-1, W14-1a, W14-2, W14-2a) in this final rule.

89. In Section 2C.50 CROSS TRAFFIC DOES NOT STOP Plaque (W4-4p) (numbered Section 2C.27 in the NPA), the FHWA replaces the entire section (of the 2000 MUTCD) with new OPTION and STANDARD statements. The OPTION statement specifies that the CROSS TRAFFIC DOES NOT STOP (W4-4p) plaque 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 a multi-way stop condition. The STANDARD statement specifies that if the W4-4p plaque is used, it shall be installed below the STOP sign. The new text for this section is necessary to provide for more uniform application of this plaque. The FHWA received two comments from the Cities of Plano, Texas, and Tucson, Arizona, in support of these changes and one editorial comment from the NCUTCD, which the FHWA incorporates in this final rule. The FHWA also changes the sign designation in the title to "W4-4p" and changes corresponding text throughout the section. In response to two comments from private citizens, the FHWA adds to the OPTION statement that the W4-4p plaque may use alternate messages such as TRAFFIC FROM LEFT (RIGHT) DOES NOT STOP or ONCOMING TRAFFIC DOES NOT STOP when such messages more accurately describe the traffic controls established at the intersection.

Additionally, the FHWA removes the arrow from the design of the plaque to reduce potential confusion and misunderstanding as to whether the arrow denotes the direction cross traffic

is flowing or the direction toward which the driver is to look for cross traffic. The FHWA received four comments from the Cities of Plano, Texas, and Tucson, Arizona, and private citizens in support of this change. The FHWA received one comment from the Minnesota DOT opposed to it, citing concerns that removal of the arrow would increase the confusion. The FHWA believes that the arrow is the source of the confusion and therefore removes the arrow from the design of the plaque.

90. The FHWA adds a new section numbered and titled, "Section 2C.52 High Occupancy Vehicle (HOV) Plaque (W16-11)." (This section was numbered Section 2C.48 in the NPA.) This new section includes an OPTION statement on the use of the High Occupancy Vehicle (HOV) Plaque. Specifically, an HOV (W16-11) plaque may be used to warn drivers in an HOV lane of a specific condition and to differentiate a warning sign specific for HOV lanes when the sign is also visible to traffic on the adjoining general purpose roadway. Additionally the diamond symbol may be used instead of the word message HOV and, when appropriate, the words LANE or ONLY may be used. This will enhance road user understanding of which signs apply to which lanes. The FHWA received three comments from the NCUTCD, ATSSA, and the City of Tucson, Arizona, in support of this new section, and adopts this new section, with minor changes to Figure 2C-11.

91. The FHWA adds a new section numbered and titled, "Section 2C.53 PHOTO ENFORCED Plaque (W16-10)." (This section was numbered Section 2C.49 in the NPA.) This new section includes an OPTION statement on the use of the PHOTO ENFORCED plaque in advance of locations of photo enforcement of traffic laws, thereby alerting motorists of the use of cameras as an enforcement tool. This section facilitates consistency with the PHOTO ENFORCED plaque for use with regulatory signs, as described in Section 2B.46 Photo Enforcement Signs (R10-18, R10-19).

Additionally, the FHWA adds a STANDARD statement to require that, if used below a warning sign, the PHOTO ENFORCED plaque be a rectangle with a black legend and border on a yellow background. This STANDARD makes the color of the plaque consistent with the color of the warning sign it supplements.

The FHWA received three comments from the NCUTCD, ATSSA, and the City of Tucson, Arizona, in support of this new section, and adopts this section. The Wisconsin DOT stated that some States have statutes that do not allow

photo enforcement of traffic regulations, and therefore those States will not allow the use of these signs. Because this is an optional plaque used to indicate an optional application, States are not required to use this plaque.

The FHWA establishes a phase-in target compliance date of 10 years from the effective date of this final rule for the PHOTO ENFORCED plaque, for existing signs in good condition to minimize any impact on State or local governments.

92. In Section 2D.03 Color, Retroreflection, and Illumination, the FHWA makes revisions to provide for enhanced uniformity of design and application of color-coding of destinations in guide signs. The FHWA adds a SUPPORT statement following the first STANDARD statement, which states that color coding is sometimes used to help road users distinguish between multiple potentially confusing destinations. The SUPPORT statement gives examples of valuable uses of color coding including 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. The FHWA received three comments from the NCUTCD, the City of Tucson, Arizona, and a traffic engineering consultant supporting this change, and adopts this change.

The FHWA adds a second STANDARD statement that prohibits the use of different color sign backgrounds to provide color-coding of destinations and requires that the color-coding shall be accomplished by the use of different colored square or rectangular panels on the face of the guide signs. The FHWA received three comments from the NCUTCD, ATSSA, and the City of Tucson, Arizona, supporting this change, and adopts this change.

The FHWA also adds an OPTION statement, which states that the different colored 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. The FHWA received two comments from the NCUTCD and the City of Tucson, Arizona, supporting this change, and adopts this change.

Additionally, the FHWA adds a SUPPORT statement, which states that two examples of color-coded guide sign assemblies are shown in Figure 2D-1. Figure 2D-1 is a new figure titled "Examples of Color-Coded Destination Guide Signs" and illustrates two overhead guide signs examples of color-

coded airport terminal destination guide signs and an example of a color-coded community destination guide sign. The FHWA received three comments from the NCUTCD, ATSSA, and a private citizen supporting this new figure, as well as suggesting editorial changes to the figure, which the FHWA incorporates in this final rule. The FHWA received one comment from a representative of an airport suggesting a separate standard for on-roadway signing at major international airports. This goes beyond the scope of the NPA, and will have to be addressed in a future rulemaking.

93. In Section 2D.04 Size of Signs, the FHWA rephrases the first OPTION statement to clarify that reduced letter height, reduced interline spacing, and reduced edge spacing may be used on guide signs if the sign size is limited by factors such as lane width, and vertical and lateral clearance. The FHWA received two comments from the NCUTCD and the City of Tucson, Arizona, in support of this change, and one from a private citizen opposed to it. The opposing commenter stated that allowing the reduction of guide sign dimensions may lead to substandard sign dimensions being used in situations where it would otherwise be possible to remove the constraint, and suggests that an engineering study be performed before substandard guide signs are used. The FHWA disagrees and believes that, because agencies install guide signs to provide drivers with needed information, they will not intentionally and repeatedly use smaller signs based on the revisions to this OPTION. The FHWA adopts this change, as proposed in the NPA, in this final rule.

In the NPA, the FHWA proposed to add a STANDARD statement that prohibits the use of reduced spacing between the letters or words of the legend as a means of reducing the overall size of a guide sign, to provide for enhanced legibility of guide signs, especially for older road users.

The FHWA received one comment from ATSSA supporting this STANDARD. Four commenters from State DOTs opposed this language as a STANDARD, and suggested that it be GUIDANCE to provide necessary flexibility to deal with unusual situations. The FHWA agrees that this flexibility is needed in some cases, and adopts this language, with additional clarifying information, as a GUIDANCE statement in this final rule.

94. In Section 2D.05 Lettering Style, the FHWA revises the second paragraph of the STANDARD to specify that the lettering for place names and

destinations for conventional road guide signs shall be in capital letters or combination lower-case letters with initial upper-case letters and that all other lettering for conventional road guide signs shall be in capital lettering. To respond to a comment from a private citizen suggesting complete consistency between the "Standard Highway Signs" book and the MUTCD, the FHWA revises the text slightly from that proposed in the NPA.

95. In Section 2D.06 Size of Lettering, the FHWA removes the last paragraph in the STANDARD statement (from the 2000 MUTCD), which required sign panels to be large enough to accommodate the legend without crowding. The FHWA modifies that information and includes it in Section 2D.04 Size of Signs, where it is more appropriately located. The FHWA received two comments from the NCUTCD and the City of Tucson, Arizona, in support of this change, and adopts this change.

One comment from a private citizen suggested that language in this section be added expressly forbidding the use of mixed case lettering on conventional road guide signs unless it is Series E Modified/Lowercase. The FHWA disagrees because street name signs are guide signs and they can use mixed case lettering other than E Modified.

96. In Section 2D.08 Arrows, the FHWA received one comment from a private citizen stating that the first paragraph of the STANDARD statement indicating that down arrows shall be used only on overhead guide signs that restrict use of specific lanes to traffic bound for the destination(s) and/or route(s) indicated by the arrows, is in conflict with the optional signs that have down arrows in Figures 2E-35, 2E-36, and 2E-37. The FHWA agrees that some of the optional signs depicted in Figures 2E-35, 2E-36, and 2E-37 are in error. The FHWA revises Figures 2E-35, 2E-36, and 2E-37 by removing the optional signs as appropriate.

97. In Section 2D.11 Design of Route Signs, the FHWA revises the first paragraph of the fourth STANDARD statement by removing the reference to the publication "A Proposal for Uniform County Route Marker Program on a National Scale" for design and use of County road identification signs because this publication is no longer available from the National Association of Counties or any other source. However, because the pertinent requirements of that document are still valid, the FHWA incorporates applicable text from that document into the STANDARD statement. No new requirements are imposed by this change, because the

previously referenced document had been incorporated by reference into the 2000 MUTCD as well as previous editions.

98. In Section 2D.17 ALTERNATE Auxiliary Signs (M4-1, M4-1a), the FHWA adds the qualifiers of time or distance to the word "shorter" in the GUIDANCE statement. This addition clarifies that the shorter (time or distance) or better-constructed route should retain the regular route number. The ability to define the shorter route in terms of either time or distance provides additional flexibility. The FHWA received one comment from the City of Tucson, Arizona, in support of this change, and adopts this change.

99. In Section 2D.23 TEMPORARY Auxiliary Signs (M4-7, M4-7a), the FHWA changes the title to reflect the addition of the new TEMP (M4-7a) sign and adds the TEMP (M4-7a) sign to the OPTION and STANDARD statements. The FHWA received three comments from the NCUTCD, ATSSA, and the City of Tucson, Arizona, in support of this change, and adopts this change.

100. In Section 2D.26 Directional Arrow Auxiliary Signs (M6 Series), the FHWA removes the M6-8 and M6-9 multiple direction advance arrow auxiliary signs. These specific arrow signs are not consistent in design concept with the other Directional Arrow Auxiliary Signs. The M6-6 and M6-4 signs or separate assemblies for each route direction should be used instead to provide enhanced clarity to road users. The FHWA received three comments from the NCUTCD, a State DOT, and the City of Tucson, Arizona, in support of this change, and adopts this change.

101. In Section 2D.27 Route Sign Assemblies, the FHWA rennumbers Figure 2D-2 of the 2000 MUTCD to Figure 2D-6 and modifies all three sheets of the figure to make the sign assemblies illustrated in the figure consistent with requirements in Section 2D.15 Cardinal Direction Auxiliary Signs (M3-1 through M3-4) regarding the size of the initial letter of the Cardinal Direction Auxiliary Signs, and to illustrate directional assemblies that reflect the most recent practice. The FHWA received comments from the NCUTCD and the City of Tucson, Arizona, in support of these changes, and a few editorial changes. In this final rule, the FHWA revises the numbers of the U.S. routes on all three sheets to conform to the convention of odd numbers for north-south routes and even numbers for east-west routes. The FHWA also revises the numbers for all the State routes on these three sheets, even though not all States adopt the

U.S. route numbering convention for their State routes.

102. In Section 2D.31 Confirming or Reassurance Assemblies, the FHWA removes from the STANDARD statement the requirement that, if used, the Confirming Assembly be installed just beyond intersections of numbered routes.

Additionally, in the first GUIDANCE statement, the FHWA recommends that a Confirming assembly should be installed just beyond intersections of numbered routes.

The FHWA also adds a SUPPORT statement that states that Confirming and Reassurance Assemblies are Directional Assemblies.

These changes are adopted because use of the Confirming assembly beyond intersections with numbered routes should be a recommended practice rather than completely optional. Confirming assemblies are an important safety and operational feature that lets the road user know that he/she is on the correct route just beyond the decision point. The Confirming assembly provides highly desirable information to road users. These changes allow flexibility in installing the signs to adjust to roadside conditions. The FHWA received one comment from the City of Tucson, Arizona, in support of the changes to this section, and adopts these changes.

103. In Section 2D.34 Destination Signs (D1 Series), the FHWA changes the title to add sign number designations and changes the section text to clarify which signs are applicable to the material in the section. The FHWA received one comment from the City of Tucson, Arizona, in overall support to the changes in this section.

In the NPA, the FHWA proposed moving material concerning the use of a sloping arrow at an irregular intersection from the second GUIDANCE statement (of the 2000 MUTCD) to a new second OPTION statement. The FHWA received one comment from the Illinois DOT opposed to this change, suggesting that the term "irregular" is not appropriate. The FHWA agrees and, to address this issue, the FHWA combines the preceding GUIDANCE and the OPTION into one GUIDANCE statement that reads, "Unless a sloping arrow will convey a clearer indication of the direction to be followed, the directional arrows should be horizontal or vertical."

104. In Section 2D.36 Distance Signs (D2 Series), the FHWA changes the title to add sign number designations. The FHWA also changes the section text to clarify which signs are applicable to the material in the section, and adds the

D2-3 (three destination distance sign), to reflect all the signs included in the series.

In the NPA, the FHWA proposed adding a recommendation in the first GUIDANCE statement that the distance shown on the sign be the distance to the center of the central business district, or to the point where the major north/south and east/west routes serving the city intersect, or to some point near the center of the city. While two commenters representing the NCUTCD and the City of Tucson, Arizona, supported this change, commenters from the Illinois and Kansas DOTs opposed the wording. The Kansas DOT suggested that the distance on the sign should be to a point where the city limits either cross or abut the route. The FHWA disagrees because many cities have city limits that now encompass large geographic areas or the entire county, and using the city limit as a basis for distance would give misleading information to the driver. The Illinois DOT suggested that the distance be determined on a community-by-community basis, and that the layout of the community be considered in relation to the highway being signed. The FHWA agrees with this suggestion and revises the GUIDANCE accordingly because the FHWA believes it provides the flexibility to determine distances that will be better understood and accepted by road users.

105. In Section 2D.38 Street Name Sign (D3-1), the FHWA changes the title to reflect the appropriate sign designation. In the first GUIDANCE statement the FHWA adds a recommendation that on multi-lane streets with speed limits of 60 km/h (40 mph) or more the minimum letter size should be 200 mm (8 in). Larger letter sizes are needed to improve sign legibility and safety for older road users. In this same GUIDANCE statement, the FHWA deletes the recommendation that larger letter heights be used for Street Name signs mounted overhead because more specific guidance is added elsewhere in this section. The FHWA received comments from ATSSA and the Virginia DOT in support of these changes, while the NCUTCD suggested even larger letter sizes for lettering on multilane higher-speed streets.

The Oregon and Wisconsin DOTs, the Cities of Tucson, Arizona; and Plano, Texas; and Pierce County, Washington, opposed the change. The opposing commenters primarily indicated that this change creates a financial impact on agencies, and that the larger letter heights will create longer street name signs that cannot be mounted and maintained using post top mounts.

Several commenters suggested that this be an OPTION, rather than GUIDANCE. The FHWA disagrees. The use of larger letter sizes is not precluded in the 2000 MUTCD, so it is already an option. Fewer agencies will convert their street name signs to the larger letter sizes if the GUIDANCE is reduced to an OPTION. The larger signs will be beneficial to all road users on higher-speed multi-lane streets, especially older road users. Also, many jurisdictions use post-top mountings of longer street name signs with larger letters, taking advantage of appropriately designed attachment hardware. Because this is GUIDANCE, rather than a STANDARD, jurisdictions can be used in special circumstances if determined necessary by the engineer. To mitigate the financial impact on State or local governments, the FHWA establishes a phase-in target compliance date of 15 years from the effective date of this final rule for existing signs in good condition. The phase-in target compliance date for symbol sizes and 6" letter sizes for lettering on ground-mounted Street Name signs on roads that are not multi-lane streets with speed limits greater than 60 km/h (40 mph) remains unchanged from that previously established, and is still January 9, 2012.

The FHWA also adds a clarification to the first OPTION statement. The OPTION statement in the 2000 MUTCD generally states that a symbol or letter designation may be used to identify the government jurisdiction. The FHWA revises the paragraph to provide more specificity by stating that a symbol or letter designation may be used on a Street Name sign to identify the governmental jurisdiction, area of jurisdiction, or other government-approved institution. This change provides additional flexibility for jurisdictions that install Street Name signs, allowing them to identify areas of the city, neighborhoods, and the like. The FHWA received no comments regarding this change, and adopts this change.

The FHWA adds to the first STANDARD statement that if a symbol or letter designation is used, the height and width of the symbol or letter designation shall not exceed the letter height of the sign. This provides for more uniform Street Name sign design and assures that the name of the street will have more prominence on the sign than the jurisdictional symbol or letter designation. The FHWA received one comment from ATSSA supporting this change, and one editorial comment, which the FHWA adopts in this final rule.

In the NPA, the FHWA proposed two changes in the second OPTION statement. First, the FHWA proposed eliminating midblock locations from the provision concerning locations where Street Name signs may be installed because Street Name signs are not appropriate at non-intersection locations. The FHWA received two comments from the NCUTCD and a local DOT opposed to this revision because there are locations other than intersections where Street Name signs are appropriate. The FHWA agrees and withdraws this proposal. Second, the FHWA eliminates the provision allowing the installation of a supplemental Street Name sign separately or below an intersection-related warning sign on intersection approaches because this is an inappropriate use of the sign. Instead, the Advance Street Name plaque, as described in Section 2C.49 Advance Street Name Plaque (W16-8, W16-8a), is appropriate for this purpose. The FHWA received no comments regarding this change, and adopts this change.

The FHWA adopts several changes to the fourth GUIDANCE statement. First, the FHWA eliminates the recommendation on the color of the supplemental Street Name sign when it is combined with a warning sign because this is now termed an Advance Street Name plaque and is discussed in Section 2C.49.

Second, the FHWA recommends that in urban and suburban areas, especially where Advance Street Name signs are not used, overhead-mounted street name signs be considered. 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) lower-case letters. The FHWA received two comments from ATSSA and the U.S. Access Board in support of this change, and five from the NCUTCD and State and local DOTs opposed to it. Those who opposed this change felt that the signs would be too large, that the size of the sign may not properly fit on traffic signal mast arms, that wind loading may also be an issue on mast arms, and that financial impacts would be high. The FHWA adopts this change in this final rule because 300 mm (12 in) letters are superior to 250 mm (10 in) letters in terms of legibility distance for older drivers as well as all drivers. Lettering on overhead signs need to be larger than roadside mounted signs to achieve adequate visibility. The 300 mm (12 in) size is a GUIDANCE, not a STANDARD, so smaller letters can be used if determined necessary by the engineer. To mitigate economic impacts,

the FHWA establishes a 15-year phase-in target compliance date from the effective date of this final rule (rather than January 9, 2012, as proposed in the NPA) for this paragraph, for existing signs in good condition.

Additionally, the FHWA adds a SUPPORT statement at the end of the section referencing Section 2C.49 for information regarding the use of street name signs as supplemental plaques for use with intersection-related warning signs. The FHWA received one editorial comment, which it incorporates in this final rule.

106. The FHWA adds a new section, numbered and titled "Section 2D.39 Advance Street Name Signs (D3-2)" that describes the uses, placement, legend, and lettering sizes for Advance Street Name signs. The FHWA received two comments from the City of Tucson, Arizona, and a traffic control device manufacturer supporting this new section, and several editorial comments that the FHWA adopts in this final rule.

The GUIDANCE includes two separate paragraphs regarding placement of Advance Street Name signs on arterial highways in rural areas and in urban areas. The FHWA received four comments from the NCUTCD and the Virginia, Minnesota, and Kansas DOTs opposing the language that Advance Street Name signs be used in advance of all intersections with exclusive turn lanes in rural areas. The Virginia DOT felt that this could have a major cost impact. The Kansas DOT felt that Advance Street Name signs could contribute to sign clutter along major arterials, and suggested that their use in urban areas be based on an engineering study. The FHWA disagrees and adopts the language, with minor modifications, in this final rule. The FHWA strongly encourages the use of these signs in rural and urban areas as specified in the MUTCD. These signs, especially in rural areas, are one of the most important things that can be done to improve older driver safety and convenience, and they also benefit other drivers. To mitigate economic impacts, the FHWA establishes a 15-year phase-in target compliance date from the effective date of this final rule (rather than January 9, 2012, as proposed in the NPA) for existing signs in good condition.

To respond to a comment by the NCUTCD suggesting that the paragraph is redundant, the FHWA withdraws the second OPTION statement that was proposed in the NPA because this information is contained in the first OPTION statement in this final rule.

To preserve consistency of letter sizes, the FHWA withdraws two paragraphs from the STANDARD statement that

were proposed in the NPA, and creates a new GUIDANCE that references the letter sizes given in Section 2D.38 Street Name Sign (D3-1).

To clarify the intent and recognize common practices regarding the use of directional arrows on these signs, the FHWA adds a new paragraph to the last OPTION statement that provides information regarding the placement of directional arrows.

The FHWA renumbers the following sections accordingly.

107. In Section 2D.45 General Service Signs (D9 Series) (numbered Section 2D.44 in the 2000 MUTCD), the FHWA adds Electric Vehicle Charging to the list of services, one or more of which General Services signs must carry, in accordance with the second STANDARD statement. The FHWA received one comment from the City of Tucson, Arizona, in support of this change, and adopts this change. The FHWA also adds an illustration of the Electric Vehicle Charging sign (D9-11b) to Figure 2D-11.

The FHWA changes the words "CB Monitoring" in the fourth OPTION statement to "Channel 9 Monitored" and makes a corresponding change in item C of the fourth GUIDANCE statement. These changes reflect current practice and terminology. The FHWA received one comment in support of these changes from the City of Tucson, Arizona, and adopts these changes. The FHWA establishes a phase-in target compliance date of 10 years from the effective date of this final rule for existing signs in good condition to minimize any impact on State or local governments.

Additionally, the FHWA removes references in the fourth OPTION statement to the Road Conditions Dial 511 (D12-5) sign and adds new OPTION, STANDARD, and GUIDANCE statements regarding the use and design of the redesigned TRAVEL INFO CALL 511 (D12-5) sign. These changes reflect the assignment of 511 as the nationwide traveler information telephone number. The FHWA received one comment from ATSSA in support of these changes. The Virginia DOT suggested that the sign legend be "TRAVEL INFO DIAL 511." The FHWA agrees to change "TRAVELER" to "TRAVEL" in this final rule, however does not agree to use the word "DIAL" because it is antiquated terminology. The NCUTCD and Minnesota suggested that allowing the logo of a transportation agency or traveler information service to be two times the letter height used in the legend of the sign, as proposed in the GUIDANCE, was too large. The FHWA disagrees because some large traveler

information agency logos are more recognizable than the sign text and this instant recognition is valuable to the traveler.

108. In Section 2D.46 Reference Location Signs (D10-1 through 10-3) and Intermediate Reference Location Signs (D10-1a through D10-3a) (numbered and titled "Section 2D.45 Reference Posts (D10-1 through D10-3)" in the 2000 MUTCD), the FHWA changes the title and the term "reference posts" to "reference location signs" throughout the section to correspond to terminology used throughout the MUTCD. The FHWA received several comments from the NCUTCD, Caltrans, the Kentucky, Wisconsin, and Kansas DOTs, Pierce County, Washington, and private citizens regarding proposed changes to this section as well as to Section 2E.54 Reference Location Signs and Enhanced Reference Location Signs (D10-4, D10-5) in the NPA. The FHWA revises both of these sections in this final rule. The following paragraphs describe this final rule, specifically differences between this final rule and the 2000 MUTCD. Where applicable, notations are included to detail where the language for this final rule reflects comments received.

The FHWA adds a SUPPORT statement at the beginning of the section to identify two types of reference location signs and their sign designations: Reference Location signs (D10-1, 2, 3) and Intermediate Reference Location signs (D10-1a, 2a, 3a).

The FHWA also adds to the first OPTION statement a description of Intermediate Reference Location signs.

In the first STANDARD statement, the FHWA adds a paragraph indicating that when Intermediate Reference Location signs are used to augment the reference location sign system, the Reference Location sign at the even kilometer (mile) shall display a decimal point and zero numeral. The FHWA also distinguishes between use on conventional roads and freeways. The design of reference location signs used on conventional roads is the same as currently listed in the STANDARD, and the FHWA includes a minimum sign size of 250 mm (10 in) wide vertical panel. If reference location signs are used on freeways or expressways, the FHWA requires that the Reference Location signs contain 250 mm (10 in) white numerals on 300 mm (12 in) wide vertical green panels with a white border. The FHWA received several comments from State DOTs suggesting that blue panels be used, or at least included as an option. Although a blue background has been used by some

States in FHWA-approved experimentations,²⁴ the FHWA believes that the standard green background of the 30-year old "mile marker" system should be used. These signs fit into the category of guidance signs much more than they do into the category of motorist information signs. The FHWA does allow the use of blue backgrounds for the Enhanced Reference Location signs, as described in Section 2E.54. The FHWA also includes panel heights for one, two, and three digit signs.

The FHWA also includes a paragraph in the first STANDARD indicating how to determine reference location sign distance numbering for routes within a State, with and without overlaps with other routes. The FHWA also requires the installation of reference location signs on the right side of the roadway, except as provided in the OPTION statement. One commenter suggested that reference location markers be installed in the median because they are less of a maintenance issue when placed in the median. The FHWA disagrees because road users generally expect signs to be mounted on the right side of the roadway.

The FHWA adds an OPTION statement indicating that Reference Location signs may be installed in the median where conditions limit or restrict installation on the right side of the roadway. The FHWA further expands the OPTION, based on comments, to indicate that on two-lane conventional roadways, Reference Location signs may be installed on one side of the road only and that they may be installed back-to-back. The OPTION also states that Reference Location signs may be placed up to 9 m (30 ft) from the edge of the pavement.

The FHWA also revises the first STANDARD statement to clarify that the minimum mounting height of reference location signs shall be 4 feet to the bottom of the sign, to be consistent with the mounting height for delineators.

To mitigate economic impacts, the FHWA establishes a 10-year phase-in target compliance date from the effective date of this final rule for the location and spacing of Reference Location Signs and design of Intermediate Reference Location Signs, for existing signs in good condition.

²⁴ Information on the various designs and colors used for these experimentations is included in "Location Marker Signs for Incident Management," September 2001, a report by Didier M. Valdes, *et al.*, of the University of Puerto Rico at Mayagüez, for the Federal Highway Administration under contract number DTFH61-00-X-00091-F. This document is available from the Department of Civil Engineering and Surveying, University of Puerto Rico, Mayagüez, Puerto Rico, 00681-9041.

The FHWA removes the last OPTION statement from the 2000 MUTCD in this final rule because the signs that the statement refer to are now called Intermediate Reference Location signs, and are described in more detail in Section 2E.54.

109. In Section 2D.48 General Information Signs (I Series) (numbered Section 2D.47 in the 2000 MUTCD), the FHWA removes all references concerning Adopt-A-Highway signs from the MUTCD. Current State and local practices pertaining to Adopt-A-Highway signs vary widely and, in some cases, include the use of commercial logos for indicating Adopt-A-Highway sponsors. The use of logos has raised deeper policy issues regarding Federal and State laws concerning advertising along the right-of-way, general commercialization of the right-of-way, the safety of motorists and workers, and the ability to raise revenues for activities such as litter removal. Recent discussions of the signing criteria in the MUTCD, along with dialogue of several American Association of State Highway and Transportation Officials (AASHTO) subcommittees, have highlighted that these issues go beyond the current standards included in the MUTCD. For example, the AASHTO Subcommittee on Maintenance has argued that several States have existing contracts that allow a commercial entity to exchange maintenance and litter pickup services for signs acknowledging the commercial sponsors who pay for the services. These contracts supplement scarce maintenance resources for these States. The Subcommittee also noted that the use of more experienced crews in such arrangements is safer than using volunteers.

The AASHTO Subcommittee on Traffic Engineering, on the other hand, has argued that these acknowledgements of the commercial sponsors is an opening for other types of advertising (including electronic advertising on overhead dynamic message signs along freeways and at signalized intersections) and raise serious concerns over driver distraction, confusion, and crash potential and liability. At the request of the Subcommittee on Maintenance, the AASHTO Standing Committee on Highways has established a task force to consider commercialization within the right-of-way, including, but not limited to, signage for the Adopt-A-Highway program.

An FHWA policy memorandum dated November 9, 2001²⁵ indicated that

these signs are acknowledgement signs, not advertisements. However, until the AASHTO study is completed, the FHWA removes all references to Adopt-A-Highway signs in the MUTCD. The FHWA received two comments from the NCUTCD and Caltrans in support of this position, and two from ATSSA and the Connecticut DOT opposed to it.

In the NPA, the FHWA proposed adding new OPTION, GUIDANCE, and STANDARD statements regarding the use of signs to display safety or transportation-related messages. These messages, such as "SEAT BELTS BUCKLED?" and "DON'T DRINK AND DRIVE," are in common and widespread use in many jurisdictions and they provide valuable reminders to road users of important laws. The additions to this section were proposed in order to provide for consistency in application of these types of messages on General Information signs and to reduce the possibility of such signs being misused. The FHWA received four comments from the NCUTCD, Caltrans, the Minnesota DOT, and a private citizen opposed to these new statements, stating that they do not regulate, warn or guide motorists, and should not be encouraged. The FHWA disagrees with these comments. However, because these statements are duplicative of statements already contained in Chapter 2A, the FHWA withdraws these statements from Section 2D.48 in this final rule.

Finally, the FHWA revises the third STANDARD statement replacing the words "jurisdiction logos" with "boundary" to provide additional flexibility to highway agencies to use different colors for political boundary signs. The FHWA received no comments regarding this change, and adopts this change.

110. In Section 2D.49 Signing of Named Highways (numbered Section 2D.48 in the 2000 MUTCD), in the first STANDARD statement the FHWA adds additional requirements for installing memorial signs on the mainline. These requirements prohibit the use of memorial names on the directional guide signs, interference with necessary highway signing, and placement which compromises the safety or efficiency of traffic flow. The STANDARD statement is identical to the STANDARD statement in Section 2E.08 Memorial Highway Signing. The FHWA adds this for consistency and to clarify the acceptable locations to install memorial signs. The FHWA received two comments from the NCUTCD and the

City of Tucson, Arizona, supporting this change, and adopts this change.

111. The FHWA adds a new section, numbered and titled "Section 2D.52 National Scenic Byways Sign (D6-4, D6-4a)." This section includes SUPPORT, OPTION, and STANDARD statements that describe the National Scenic Byways program and the signs that may be placed on roads designated as National Scenic Byways or All-American Roads by the U.S. Secretary of Transportation. This new section provides for uniformity of design and application of markers on designated National Scenic Byways. The FHWA received three comments in support of the new section and the D6-4 signs. The FHWA incorporates several suggested clarifications to the proposed language in this final rule, including revising the SUPPORT statement to remove unnecessary information. In addition, the FHWA includes the proper color illustration of the D6-4 and D6-4a signs, which features a blue flag and border, red text, and white background. The black and white version was inadvertently published in the NPA. The FHWA also adds an illustration of a half-size D6-4 sign in response to comments.

112. In Section 2E.01 Scope of Freeway and Expressway Guide Sign Standards, the FHWA adds to the SUPPORT to clarify that guide signs for freeways and expressways are primarily identified by sign name and not necessarily by a standard sign number. The FHWA incorporates this additional minor editorial information in this final rule to clarify the intent of the section.

113. In Section 2E.10 Number of Signs at an Overhead Installation and Sign Spreading, the FHWA expands the title and relocates the SUPPORT and GUIDANCE statements related to sign spreading from Section 2E.11 Pull-Through Signs to this section because they are more appropriately associated with sign location installation. The FHWA received two comments from the NCUTCD and the City of Tucson, Arizona, supporting this change, and adopts this change.

114. In Section 2E.11 Pull-Through Signs, the FHWA shortens the title to reflect the relocation of the SUPPORT and GUIDANCE statements that deal with "sign spreading" to Section 2E.10 Number of Signs at an Overhead Installation and Sign Spreading.

In the first sentence in the GUIDANCE statement, the FHWA replaces the words "only when" with "where" to broaden the use of Pull-Through signs. The FHWA adopts this change to recognize that Pull-Through signs can be beneficial in congested traffic for

²⁵ Policy memorandum is available for downloading from the following URL: http://mutcd.fhwa.dot.gov/res-memorandum_adopt-a-highway_110901.htm.

road users, especially older drivers, at many locations. The FHWA also recommends that Pull-Through signs with down arrows be used where 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. The FHWA received three comments from the NCUTCD, the City of Tucson, Arizona, and a private citizen supporting the proposed changes to the text and one comment from a private citizen opposed to it. The opposing commenter suggested the wording be revised to clarify that Pull-Through signs be used where there is a reduction in the number of through lanes because it is not appropriate to recommend Pull-Through signs at all multi-lane exits. The FHWA agrees and modifies the text to clarify the use of Pull-Through signs with down arrows at multi-lane exits where there is a reduction in the number of through lanes.

115. In Section 2E.13 Size and Style of Letters and Signs, in Table 2E-3, the FHWA adds dimensions for the "Action Message Word" row and adds a row with dimensions for the sizes of "Numerals and Letter" for Gore signs. The FHWA received one comment from the NCUTCD in support of the changes to this table. Based on an editorial comment, the FHWA revises the dimensions for the Action Message Word under "category a" for major interchanges to make this entry consistent with all of the other entries on this table.

In Table 2E-4, under item H, Rest Area and Scenic Area Signs, the FHWA changes the values for Distance Fraction to 250 mm (10 in), and the values for Distance Word to 300 mm (12 in) to correct an error in the 2000 MUTCD. A commenter from the Oregon DOT noted this inadvertent transposition of values and the FHWA agrees with this correction.

116. In Section 2E.19 Diagrammatic Signs, the FHWA proposed in the NPA to add to item A of the first STANDARD statement the option of showing each individual lane arrangement, based on research related to the needs of older road users.²⁶ The FHWA also proposed adding a second illustration to Figure

2E-3 Diagrammatic Sign for a Single-Lane Left Exit to show two diagrammatic arrows instead of just one. The FHWA received comments from the NCUTCD, the Kansas DOT, and a private citizen opposing the new sign design, stating that the size of the sign would be increased, the message difficult to read, and that additional guidance should be provided so that readers know how to design the signs. The FHWA agrees that additional research and study is needed to refine the design of the individual lane arrangement style of the diagrammatic sign. Therefore, the FHWA withdraws this proposal to include the option of showing each individual lane arrangement, as well as the proposal to add an illustration within Figure 2E-3.

The FHWA adopts additional editorial changes to improve the graphic representations in Figures 2E-3 through 2E-7 to be consistent with the text.

117. In Section 2E.23 Lateral Offset (titled "Lateral Clearance" in the 2000 MUTCD and the NPA), the FHWA changes the title to be consistent with changes in terminology as discussed in Section 2A.19 Lateral Offset.

118. In Section 2E.28 Interchange Exit Numbering, the FHWA revises the first STANDARD statement to require that a space be included between the suffix letter and the exit number on an exit number plaque for multi-exit interchanges. The FHWA received one comment from Caltrans opposed to this change, suggesting that the FHWA change this to a GUIDANCE because total width is an issue on signs, especially in retrofitting signs. The FHWA disagrees and adopts this change because the space between the exit number and suffix letter is important for adequate legibility. The FHWA also adds to this STANDARD that exit numbers shall not include the cardinal initials corresponding to the directions of the cross route. This sentence is moved from Section 2E.42 Cloverleaf Interchange because it is more appropriate in this section.

The FHWA relocates the second OPTION statement (of the 2000 MUTCD) to the first GUIDANCE statement. Because road users might not expect a left exit and have difficulty in maneuvering to the left, the FHWA recommends that the word "LEFT" be added to the exit number plaque. The FHWA received one comment from a private citizen in support of this change, and six comments from the NCUTCD, and the Minnesota, Kansas, and Wisconsin DOTs opposed to it. Most of the commenters in opposition felt the addition of the word "LEFT" to the exit number plaque should be an OPTION,

rather than GUIDANCE. The FHWA disagrees and adopts this change as a GUIDANCE because of numerous complaints of the difficulty that road users have in knowing when an exit is on the left. Very few road users know that when the exit plaque is installed on the top left edge of the sign, it means the exit is on the left.

The FHWA also adds additional text that, for exits that are not numbered (no exit plaque), a LEFT plaque should be added to the top left edge of the sign for a left exit. The FHWA adopts this text to address a comment from a private citizen suggesting that non-numbered exits needed to be addressed in a manner that is consistent with the way numbered left exits are signed, to provide for adequate safety at these locations. The FHWA establishes a phase-in target compliance date of 15 years from the effective date of this final rule for the new GUIDANCE for existing signs in good condition to minimize any impact on State or local governments.

The FHWA adds an OPTION statement following the first GUIDANCE statement, stating that the portion of the exit number plaque containing the word "LEFT" may have a black legend and border on a yellow background. This OPTION statement mirrors other similar uses of the black on yellow color pattern for signs and panels associated with left exits in the MUTCD. The FHWA received three comments from the NCUTCD, the Minnesota DOT, and a private citizen opposed to this new statement, but these commenters provided no reasoning for their opposition. The FHWA adopts the OPTION in this final rule because it is consistent with the EXIT ONLY and LEFT EXIT color scheme, it further increases conspicuity of the infrequent left exit, and it is an optional treatment that jurisdictions may use but is not required.

Additionally, the FHWA removes the EXIT 13 plaque from Figure 2E-3 to reflect the changes in Section 2E.28. The FHWA makes additional editorial modifications to the figures to correspond with the text and correct minor errors.

119. In Section 2E.30 Advance Guide Signs, the FHWA modifies the first GUIDANCE statement to provide necessary clarification for placement of advance guide signs. This change responds to a comment from Caltrans stating that clarification on advance sign placement is necessary to address situations where it is not practical to use three Advance Guide signs because of very close spacing between interchanges. This minor change does not add any new requirements and

²⁶ Information about this research is summarized on pages 190 and 191 of the "Highway Design Handbook for Older Drivers and Pedestrians," Report number FHWA-RD-01-103, published by the FHWA Office of Safety Research and Development, 2001. It is available for purchase from The National Technical Information Service, Springfield, Virginia 22161, (703) 605-6000, or at their Web site at the following URL: <http://www.ntis.gov>.

provides additional flexibility to jurisdictions to address unique situations.

In the STANDARD, the FHWA removes the requirement to use the specific distance message for the 2 km (1 mi) and 4 km (2 mi) Advance Guide signs, to respond to a question from Caltrans as to why the 1 km (0.5 mile) sign was not included. All Advance Guide signs shall contain the appropriate distance message.

120. In Section 2E.34 Exit Gore Signs, the FHWA revises the STANDARD statement so that it is worded in a manner consistent with the rest of the MUTCD. The STANDARD statement in this final rule includes a definition of "gore" and indicates that the Exit Gore sign shall be located in the gore.

The FHWA adds an OPTION statement to allow mounting a panel indicating the advisory speed for the ramp below the Exit sign, to supplement and not replace the exit or ramp advisory speed warning sign where extra emphasis of an especially low advisory ramp speed is needed. The FHWA received one comment from the NCUTCD in support of the new OPTION statement as proposed in the NPA, one comment from Caltrans requesting additional information, and two comments from Minnesota and Kansas DOTs opposed to the change, stating that more information was needed. The FHWA adopts the new OPTION statement with additional language to clarify the usage of the advisory speed panel and to emphasize that the supplemental advisory speed panel is not intended to replace the exit or ramp speed warning sign. This option provides jurisdictions additional flexibility for reminding road users of the recommended speed for an especially low-speed exit ramp.

121. In Section 2E.36 Distance Signs, the FHWA adds a SUPPORT statement after the first STANDARD statement that the minimum size of route shields identifying a significant destination point appear in Tables 2E-1 through 2E-4. The FHWA received a comment from Caltrans that route shields are more commonly used on Distance Signs than text identification of route numbers. The FHWA agrees with this comment and believes that route shields are more quickly identifiable by road users than words. Accordingly, the FHWA revises Figure 2E-22 to show a U.S. 38 route shield rather than a text identification of the route, and adds an OPTION that the text identification of a route may be shown instead of a route shield.

122. In Section 2E.42 Cloverleaf Interchange, the FHWA relocates the

last sentence of the STANDARD statement regarding exit numbers to Section 2E.28 Interchange Exit Numbering because that section deals with overall interchange exit numbering, and the statement is applicable to all interchanges, not just cloverleaf interchanges. Although this change was not included in the NPA, the FHWA includes this minor editorial change in this final rule to clarify the intent based on a comment from Caltrans questioning whether the information regarding exit numbers was applicable only to cloverleaf interchanges. The FHWA also changes the OPTION to a second GUIDANCE statement to be consistent with similar GUIDANCE in Section 2E.44 Partial Cloverleaf Interchange.

123. In Section 2E.43 Cloverleaf Interchange with Collector-Distributor Roadways, the FHWA adds a new Figure 2E-29 and a SUPPORT statement referencing Figure 2E-29 for examples of guide signs for full cloverleaf interchanges with collector-distributor roadways. The FHWA rennumbers subsequent figures accordingly. A figure very similar to new Figure 2E-29 was in the 1988 MUTCD, but was inadvertently left out of the 2000 MUTCD. Several commenters pointed out this error and the FHWA corrects it in this final rule.

124. In Section 2E.49 Signing of Approaches and Connecting Roadways, the FHWA removes the entire text of the section (from the 2000 MUTCD) and adds new SUPPORT, GUIDANCE, STANDARD, and OPTION statements, as well as five new figures (Figures 2E-34 through 2E-38). The new statements address sign sequences and sign design for conventional roads with one lane and multi-lane traffic approaching an interchange. The new statements also clarify the use of signs for approaches and connecting roadways in order to better convey to road users the ramp configuration and the maneuver that a road user would have to make to get on the desired ramp or connecting roadway. The FHWA adopts the statements proposed in the NPA, with editorial modifications to the text and figures to respond to comments and maintain consistency with changes in other sections. The FHWA also removes from Figures 2E-28 through 2E-33 the depiction of signing on the roads approaching the freeway and adds a note cross-referencing to the appropriate Figure 2E-34 through 2E-38.

125. In Section 2E.51 General Service Signs, the FHWA changes from three to two the number of meals per day for which a food establishment should have a continuous operation to serve in item B.2 in the first GUIDANCE statement.

The FHWA received two comments from the NCUTCD and the Wisconsin DOT supporting this change, and three comments from the Minnesota and Connecticut DOTs and a private citizen opposed to it. The opposing commenters indicated that restaurants that serve less than three meals a day are not adequately serving the motoring public, and that the more stringent criteria should remain, in order to reduce sign clutter and better serve motorists. The FHWA disagrees because many restaurants of interest to travelers serve only two meals per day. In addition, this is consistent with changes made in Section 2F.01 Eligibility regarding eligibility of businesses for Specific Service Signs. The FHWA adopts the change, as proposed in the NPA.

126. In Section 2E.54, the FHWA changes the title from "Reference Posts" to "Reference Location Signs and Enhanced Reference Location Signs (D10-4, D10-5)" to reflect the new Enhanced Reference Location sign and to be consistent with changes in other chapters of Part 2 of the MUTCD. The FHWA received comments from the City of Tucson, Arizona, in support of these changes. Caltrans and a private citizen suggested that the abbreviation of kilometer be corrected. The same private citizen opposed the green color of the signs, stating that a blue background is used by some States, and opposed the FHWA's proposal to include the decimal point to indicate the fractional character of the mile or kilometer in both this section and Section 2D.46 Reference Location Signs (D10-1 through D10-3) and Intermediate Reference Location Signs (D10-1a through D10-3a). The FHWA revises both of these sections to address comments as appropriate, and to provide consistency with Section 2D.46. The FHWA also adds Figure 2E-45 illustrating the sign images. The FHWA adopts the decimal point for intermediate signs because the FHWA believes that this will make it clearer to road users that it denotes a portion of a mile or kilometer.

To mitigate economic impacts, the FHWA establishes a phase-in target compliance date of 10 years from the effective date of this final rule for the design of Enhanced Reference Location signs and Intermediate Enhanced Reference Location Signs as specified in the second STANDARD statement, for existing signs in good condition.

127. In Section 2E.56 Radio Information Signing, the FHWA adds a SUPPORT statement at the end of the section with a cross-reference to Section 2D.45 General Service Signs (D9 Series),

for information about the use and design of a TRAVEL INFO CALL 511 (D12-5) sign. In the NPA, the FHWA proposed the addition of OPTION and STANDARD statements mirroring text in Section 2D.45, however, the FHWA believes that a cross-reference to Section 2D.45 is sufficient in this section.

128. In Section 2E.57 Carpool and Ridesharing Signing (titled "Carpool Information Signing" in the NPA), the FHWA adds to the OPTION statement that Carpool Information signs may include Internet addresses or telephone numbers within the legend. This exception to a general prohibition against Internet addresses or telephone numbers with more than four characters in Section 2A.06 Design of Signs, reflects long-standing and common current practice and provides for additional information to road users. The FHWA received two comments from the Virginia DOT and the City of Tucson, Arizona, in support of this change, and one from the NCUTCD opposed to it, stating the inconsistency with Section 2A.06. The FHWA adopts this change, as proposed in the NPA. Section 2A.06 allows the use of telephone numbers and Internet addresses when specifically authorized for certain signs in the MUTCD. A specific exemption is intended to be authorized by Section 2E.57 for carpool signs. However, to encourage use of shorter numbers, the FHWA changes the illustration of the Carpool sign (D12-2) in Figure 2D-12 to show "*CAR" rather than a 10-digit number.

Additionally, the FHWA changes the size of the maximum vertical dimension of the logo or symbol in the STANDARD statement from 900 mm (36 in) to 450 mm (18 in) to enhance the legibility of the primary message. The FHWA received no comments regarding this change, and adopts it in this final rule.

129. The FHWA adds a new section numbered and titled "Section 2E.59 Preferential Only Lane Signs." This section was titled "High-Occupancy Vehicle (HOV) Signs" in the NPA. In the NPA, the FHWA proposed to include STANDARD, GUIDANCE, OPTION, and SUPPORT statements regarding the use and placement of signs for HOV lanes and facilities and five figures illustrating examples of HOV signing applications. The FHWA received several comments from Caltrans, the Minnesota DOT, and private citizens regarding this new section, ranging from editorial comments to opposition regarding specific statements, to a suggestion not to include the new section or figures until the section is reviewed in more detail by the Guide and Motorist Information Sign Technical Committee

of the NCUTCD. The FHWA disagrees with the commenter suggesting that additional time is needed for review. There was ample time for individuals to review and provide comments on this proposed section. Also, prior to preparing the NPA, the FHWA considered available information about the state of the practice of HOV signing. The FHWA reviewed the docket comments and conducted a thorough revision of the proposed language to address comments, remove inconsistencies, and clarify the text as it relates to signing for specific situations for barrier-separated, buffer-separated, concurrent flow, and direct access ramps.

One of the private citizens suggested that the section provide guidance that differentiates between an HOV lane physically ending and an HOV lane designation ending with the lane continuing as a mixed-flow lane. The FHWA agrees and clarifies the text and figures to provide examples of these conditions and guidance for proper signing.

Caltrans suggested that additional information and examples be provided regarding the use of changeable message signs (CMS), so that States do not inadvertently implement CMS signs for static, rather than dynamic signing purposes. The FHWA agrees and includes references to new Sections 2B.26 Preferential Only Lane Signs and 2B.28 Preferential Only Lane Sign Application and Placement (numbered Sections 2B.48 and 2B.50 in the 2000 MUTCD) at the beginning of this section and repeats pertinent information regarding the use of CMS signs in this section.

Caltrans also suggested that the proposed size of ground mounted/barrier mounted HOV signs was too small to contain all of the necessary information at the appropriate text size. The FHWA agrees and, in concert with Section 2B.26, the FHWA modifies the size and layout of the text that appears in the legend of the R3-10 through R3-14 signs to be consistent with the other sections in Part 2 regarding size of text associated with the type of facility.

The FHWA also received several comments from a private citizen regarding the use of the diamond symbol on the HOV signs. In some cases, the diamond was inadvertently shown incorrectly and/or inappropriately on signs in the figures in the NPA. The FHWA clarifies the use of the diamond symbol and the word "HOV" on signs to correspond with the option that agencies have to use either the diamond symbol or "HOV" that is included in Sections 2B.26 and 2B.28.

The FHWA clarifies the use of the diamond symbol and includes a diamond in the top left corner of the legend of the guide sign for all guide signs that appear in the gore areas for exits onto HOV lanes. These guide signs in gore areas appear in the figures for this section to respond to comments from a private citizen suggesting additional information on the gore signs.

The FHWA establishes a phase-in target compliance date of 10 years from the effective date of this final rule for this new section, for existing signs in good condition.

130. In Section 2F.01 Eligibility, the FHWA changes from three to two the number of meals per day for which a food establishment should have a continuous operation to serve in item B.2 of the fourth GUIDANCE statement to be consistent with changes in Section 2E.51 General Service Signs. (See also the discussion in Section 2E.51.)

131. In Section 2F.04 Number and Size of Logos and Signs, the FHWA changes the second STANDARD statement to require that a logo panel on signs for conventional roads and ramps not exceed 750 mm (30 in) in width instead of 600 mm (24 in) to be consistent with the proportions of panels for freeways and expressways. The FHWA received three comments from the NCUTCD, ATSSA and the City of Tucson, Arizona, in support of this change, and adopts this change.

132. In Section 2F.08 Double-Exit Interchanges, the FHWA adds to the OPTION statement that at a double-exit interchange where there are four logo panels displayed for one of the exits and one or two panels to be displayed for the other exit, the logo panels may be arranged in three rows with two panels per row, to make the layout of the sign more logical. The FHWA received two comments from the NCUTCD and the City of Tucson, Arizona, in support of this change, and one from the Minnesota DOT opposed to it. The opposing commenter suggested that the signing concept would confuse motorists. The FHWA believes that the commenter was confused as to what the sign would look like. Therefore the FHWA adds an illustration in Figure 2F-1 and believes that there should be no reason for drivers to be confused with this arrangement. The FHWA adopts the change.

133. In Chapter 2G TOURIST-ORIENTED DIRECTIONAL SIGNS, the FHWA changes "Typical" to "Examples of" in the titles of Figures 2G-1 and 2G-2 because the information shown is only an example of many acceptable arrangements of signs. The FHWA

received no comments regarding these changes, and adopts these changes.

134. In Section 2G.01 Purpose and Application, in the second STANDARD statement, the FHWA adds language prohibiting the placement of tourist-oriented directional signs on conventional roads in urban areas. This clarifies and strengthens the current requirement that such signs shall only be used on rural conventional roads.

Also, the FHWA relocates the current first paragraph of the GUIDANCE statement to become a new second paragraph of the second STANDARD statement. This change requires, rather than recommends, that tourist-oriented directional signs incorporate information from and be used in place of Specific Service signs where both types of signs are needed at an intersection.

The FHWA received two comments from the NCUTCD and the City of Tucson, Arizona, in support of these changes, and adopts these changes.

135. In Section 2G.07 State Policy, the FHWA changes the phrase "State or Federal laws" to "State and Federal laws" in the STANDARD statement, to clarify that both types of laws must be heeded. The FHWA received two comments from the NCUTCD and the City of Tucson, Arizona, in support of this change, and adopts this change.

136. In Section 2H.08 Placement of Recreational and Cultural Interest Area Symbol Signs, the FHWA combines Figures 2H-5 and 2H-6 into a single figure titled "Figure 2H-5 Recreational and Cultural Interest Area Symbol Signs" illustrating all approved recreational and cultural interest symbol signs. The previous titles of Figures 2H-5 and 2H-6 were inaccurate, and the FHWA received a comment from the Arizona DOT recommending that all currently approved recreational and cultural interest symbols be shown in the figures of Chapter 2H. The FHWA agrees and adopts these minor changes for accuracy and consistency.

137. In Section 2H.09 Destination Guide Signs, the FHWA clarifies in the second STANDARD statement that linear parkway-type highways that primarily, rather than merely, 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. The FHWA adopts this change to improve uniformity of guide signing on these important arterials. The FHWA received two comments from the NCUTCD and the City of Tucson, Arizona, in support of this change, and adopts this change.

In the NPA, the FHWA proposed adding illustrations of trapezoidal-shaped directional guide signs to Figure 2H-2 to correspond with the optional use of this shape for recreational or cultural interest area directional signing as provided for in this section. The FHWA received two comments from the NCUTCD and the Minnesota DOT opposed to adding these illustrations, suggesting that the trapezoidal shape not be included in the figure nor the section text. The trapezoidal shape was not illustrated in the 2000 MUTCD because it is not widely used, due to higher costs for sign blanks versus rectangular shaped blanks. However, some agencies do still use the trapezoidal shape, so it is inappropriate to remove this option from the text of the MUTCD without allowing public comment. Therefore, the FHWA includes illustrations of the trapezoidal shaped signs in Figure 2H-2 in this final rule with a note identifying them as optional.

138. In Section 2I.03 EVACUATION ROUTE Sign (EM-1), in the first STANDARD statement, the FHWA changes the design of the EVACUATION ROUTE (EM-1) sign to a rectangular sign with a blue circular symbol with a directional arrow and the legend EVACUATION ROUTE. This change reserves the circular shape sign exclusively for rail grade crossings and enhances the conspicuity and legibility of the EVACUATION ROUTE sign. The FHWA received three comments from the NCUTCD, ATSSA and the City of Tucson, Arizona, in support of this change, and three comments from the Florida and Oregon DOTs and a private citizen opposed to it. The Florida DOT feels that the change would have a large statewide impact to their hurricane evacuation signing program. The private citizen felt that the sign shape should remain circular so that it will continue to be recognized as a Civil Defense sign, and that changing the shape creates unnecessary work and expense for agencies. The Oregon DOT indicated their belief that the new design was too similar to the Trail Marker sign and, as a result, motorists may not recognize the Evacuation Route Markers with the appropriate amount of importance. The FHWA notes that the Emergency Evacuation Route Marker has not been changed; it has just been put onto a white rectangular background so that the circular shape can be reserved for another use. The FHWA adopts the change in this final rule. The FHWA revises the phase-in target compliance date to 15 years from the effective date of this final rule (the NPA proposed 10

years) for existing signs in good condition to minimize any impact on State or local governments.

In the NPA, the FHWA proposed to add a sentence in the first STANDARD stating that the minimum size for this sign is 600 x 600 mm (24 x 24 in) and the circular symbol diameter is 2.5 mm (1 in) smaller than the width of the sign. The FHWA received one comment from the Arizona DOT suggesting that increasing the minimum size of the EM-1 sign to be the same size as other standard route markers may distract drivers from other route markers that are far more important for everyday route guidance, and suggests that the 450 x 450 mm (18 x 18 in) size be left as an available option. The FHWA agrees and removes this sentence from the STANDARD statement and creates a new table in Chapter 2I listing sign sizes for the EM-1 through EM-7 signs for two categories "Conventional Roads" and "Minimum." For the EM-1 sign, the FHWA includes 600 x 600 mm (24 x 24 in) for conventional roads and 450 x 450 mm (18 x 18 in) as the minimum.

In the second STANDARD statement, the FHWA changes the detail regarding the colors to be used on the EVACUATION ROUTE (EM-1) sign to correspond with the design changes required by the first STANDARD statement. In the NPA, the FHWA proposed that at least the arrow, legend and corners of the sign shall be retroreflective. The FHWA received two comments from ATSSA and a traffic control device manufacturer opposed to this change, stating that the entire sign needs to be retroreflective because, in the event of a need to evacuate, power systems may not be available to externally illuminate these signs and weather conditions may be extremely poor for visibility. The FHWA agrees and requires that the entire sign be retroreflective.

The FHWA adds to the second OPTION statement that the legend on the EVACUATION ROUTE sign may be modified to describe the type of evacuation route, such as HURRICANE, to provide additional information to road users. The FHWA did not receive any comments regarding this change, and adopts this change.

Additionally, the FHWA adds to Figure 2I-1 illustrations of the HURRICANE EVACUATION ROUTE, AREA CLOSED, TRAFFIC CONTROL POINT, MEDICAL CENTER, and HURRICANE SHELTER signs and illustrations of six new directional signs for EMERGENCY SHELTER, FALLOUT SHELTER, CHEMICAL SHELTER, WELFARE CENTER, REGISTRATION CENTER, and DECONTAMINATION

CENTER signs. The FHWA removes all size notations from the signs in this figure, and lists the sign sizes under the "Conventional Roads" column in the new table in this chapter. The FHWA received two comments from Caltrans and the Arizona DOT questioning why the EM-1 sign in the illustration includes the word "HURRICANE." Because this is probably the most common type of evacuation route that is currently signed in the U.S., the FHWA uses the hurricane sign in the figure as an example. To address these comments in this final rule, the FHWA adds an asterisk to the EM-1 sign and a note stating that HURRICANE is an example of one type of evacuation route, and that the legend for other types may also be used, or this line of text may be omitted.

139. In Section 2I.08 Emergency Aid Center Signs (EM-6 Series), the FHWA adds to the STANDARD statement that the EM-6 series signs shall be a horizontal rectangle and that the identifying word and the word "CENTER", the directional arrow, and the border shall be black on a white background. Although this text was not included in the NPA, the FHWA adopts this change in this final rule to clarify the colors of these signs, consistent with longstanding requirements of the Standard Highway Signs book for the design of these signs. This does not impose any new requirements.

Discussion of Adopted Amendments to Part 3—Markings

140. In Section 3A.01 Functions and Limitations, based on a comment from the NCUTCD, the FHWA adds a list describing the hierarchy system for longitudinal lines in order to clarify the intended functions of various types of longitudinal lines, similar to text that was in Section 3A.06 of the 2000 MUTCD. This text is most appropriately located in Section 3A.01.

141. In Section 3A.03 Materials, the FHWA received one comment from the Motorcycle Safety Foundation requesting that motorcycles be considered when selecting pavement marking materials, especially longitudinal markings, because traction is important to motorcyclists. Because the FHWA did not propose changes to this section in the NPA, and a change to add "motorcycles" could have a significant impact on agencies, the FHWA declines incorporating any changes at this time. This goes beyond the scope of this rulemaking and would need to be addressed in a future rulemaking.

142. In Section 3A.04 Colors, the FHWA revises the STANDARD statement to clarify the use of black

markings. Black markings can be used in conjunction with any other color marking to add contrast to it. The FHWA removes the existing reference to object markers because it is not an appropriate reference. The FHWA received one comment from the City of Tucson, Arizona, supporting these changes to this section. A traffic control device manufacturer suggested adding a paragraph to denote that channelizing devices such as tubular markers and longitudinal channelizers are often used to reinforce white channelizing lines. The FHWA declines incorporating this comment because this topic is adequately covered in Section 3F.02 Channelizing Devices.

Additionally, the FHWA removes the section titled, "Section 3A.05 Colors of Pavement Markings" (as it appeared in the NPA) and moves this information to Section 3A.04. The FHWA rennumbers the remaining sections accordingly.

In response to comments from the NCUTCD and the Wisconsin DOT, the FHWA removes the reference to white and yellow raised pavement markers, because raised pavement markers are distinguished from others by their physical characteristics, rather than color. Raised pavement markers are described in detail in Section 3B.11 Raised Pavement Markers.

The Ohio DOT and a traffic engineering consultant suggested adding text in this section to acknowledge that blue raised pavement markers may be used as fire hydrant locators. The FHWA agrees with this addition in conjunction with the addition of blue raised pavement markers to Section 3B.11, and adds a sentence to the STANDARD statement in Section 3A.04.

143. In Section 3A.05 Widths and Patterns of Longitudinal Pavement Markings (referred to as Section 3A.06 in the NPA), the FHWA received two comments from the NCUTCD and the Ohio DOT opposed to proposed changes to the STANDARD statement to remove the descriptions of the functions of longitudinal pavement markings. The FHWA agrees with these comments and moves these items to Section 3A.01 Functions and Limitations.

Additionally, the FHWA moves the last item of the STANDARD, pertaining to lengths of broken and dotted lines, to Section 3B.11 Raised Pavement Markers and revises it to clarify that it pertains to the spacing of raised pavement markers.

The FHWA deleted "on rural highways" from the GUIDANCE statement to clarify that this guidance refers to all roadway types, not just rural highways. A private citizen expressed concern that this revision would imply

that the pavement marking section would be applicable to toll facilities as well. Due to the unique nature of toll plazas, the citizen suggested that uniformity of toll plaza marking be addressed before including toll facilities under the blanket of "all roadway types." While the FHWA realizes that toll plaza applications are not specifically discussed in the MUTCD, the FHWA plans to study toll plaza applications and defers that discussion to a future rulemaking. The FHWA adopts the revision, as proposed in the NPA.

The FHWA received one comment from the Washington DOT supporting the FHWA's proposal to revise the OPTION statement to differentiate between the dimensions for dotted lines used for line extensions and lane drop/add markings and the proposed revisions to the dimensions for the line segments and gaps to be consistent with other sections in Part 3. The Wisconsin DOT opposed this revision, stating that they are using a higher gap ratio. The Ohio DOT felt that this should be a GUIDANCE statement. Because changing this to a GUIDANCE may have cost impacts to agencies, the FHWA adopts the language as proposed in the NPA as an OPTION, but the FHWA may consider changing it to a GUIDANCE in a future rulemaking.

144. In Section 3B.01 Yellow Centerline Pavement Markings and Warrants, the FHWA changes the title "Yellow Centerline and Left Edge Line Pavement Markings and Warrants" to "Yellow Centerline Pavement Markings and Warrants." The FHWA also moves the fourth STANDARD statement of Section 3B.01 to Section 3B.06 Edge Line Pavement Markings because edge lines are appropriately covered in Section 3B.06. The FHWA received one comment from the City of Tucson, Arizona, in support of these changes, and the FHWA adopts these changes.

A traffic engineering consultant suggested that the term "traffic lane" be clarified to specify whether parking lanes and bicycle lanes were included. The FHWA agrees with this suggestion, and replaces the phrase "traffic lane" with "lanes for moving motor vehicle traffic" where appropriate in this section. The FHWA received a comment from a private citizen in Newton, Massachusetts stating that it is common practice in the northeast to paint a single yellow centerline stripe on narrow or low-volumes streets. The commenter suggests additional language explaining the use of single yellow centerlines be added to this section to account for the proposed changes to remove the descriptions of longitudinal

lines from Section 3A.05 Widths and Patterns of Longitudinal Pavement Markings. As a result of this and other comments received to the proposed change in Section 3A.05, the FHWA moves the descriptions of line types to Section 3A.01 Functions and Limitations in this final rule. Accordingly, the FHWA believes that the meaning of solid centerlines will be clear. Adding additional information regarding single yellow centerlines requires additional research in the future and goes beyond the scope of this rulemaking.

145. In Section 3B.02 No Passing Zone Pavement Markings and Warrants, the FHWA revises the second STANDARD statement to clarify that no-passing zone markings on approaches to highway-rail grade crossings shall conform with Section 8B.20 Pavement Markings, and eliminates the requirement that no passing zone markings be used at other appropriate locations, to be consistent with Part 8 Traffic Controls for Highway-Rail Grade Crossings, and eliminate overlap with more specific requirements for no passing zone markings elsewhere in Section 3B.02. One commenter from Pierce County, Washington, suggested clarification in this section, as well as in Part 8, that No Passing Zone striping is not required on roadways that otherwise have no centerline striping. The FHWA agrees with this comment and incorporates this clarification into this final rule.

Additionally, the FHWA revises the third STANDARD statement to clarify the dimensions of a no-passing buffer zone, and to eliminate the buffer zone dimensions specific to areas where no passing zones are required because of limited passing sight distance. There was one comment from the City of Tucson, Arizona, supporting this change.

146. In Section 3B.03 Other Yellow Longitudinal Pavement Markings, the FHWA revises the text in the first paragraph of the first STANDARD statement to substitute the phrase "normal double" for "two double" in the description of the pavement marking requirements for reversible lanes. In the third paragraph of the first STANDARD statement, the FHWA clarifies that the pavement marking requirements for a two-way left turn lane applies to such lanes that are never operated as a reversible lane. These changes improve the clarity of the requirements and provide consistency with requirements elsewhere in Chapters 3A and 3B. There was one comment from the City of Tucson, Arizona, in support of these changes.

The FHWA received comments from two traffic engineering consultants regarding Figure 3B-7, Example of Two-Way Left-Turn Marking Applications. One commenter suggested that the left turn arrow at the nose of the left turn bay at the major street be required, rather than optional. The FHWA believes that a possible upgrade from OPTION or SUPPORT to GUIDANCE is a significant change and would require discussion and comment in a future rulemaking. The commenter did not present sufficient justification for this requirement therefore the FHWA declines incorporating this comment. A traffic engineering consultant suggested that the FHWA establish a phase-in target compliance date for the spacing of two-way left turn lane pavement markings, which was changed in the 2000 MUTCD. The FHWA agrees and establishes a five-year phase-in target compliance date from the effective date of this final rule for markings in good condition.

147. The FHWA received one comment from the City of Tucson, Arizona, in support of the proposal to change the title of Section 3B.04 from "Edge Line Pavement Markings and Warrants" to "White Lane Line Pavement Markings and Warrants," and to move the fourth STANDARD statement of Section 3B.04 to Section 3B.06 Edge Line Pavement Markings, because edge lines are appropriately covered in Section 3B.06. The FHWA adopts these changes.

148. In Section 3B.05 Other White Longitudinal Pavement Markings, the FHWA changes the gap length for lane drop markings from 3.6 m (12 ft) gaps to 2.7 m (9 ft) gaps in the third OPTION statement to be consistent with the ratio of other marking gaps. While the City of Tucson, Arizona, supported this change, the Wisconsin DOT opposed this revision because they are using a higher gap ratio. The FHWA changed the gap spacing in the final rule for the 2000 MUTCD, however there were inconsistencies between the text in Section 3B.05 and Figure 3B-10 of the 2000 MUTCD. The intent of the proposed change was merely to correct this inconsistency, and therefore the FHWA adopts the wording as proposed in the NPA.

149. In Section 3B.06 Edge Line Pavement Markings, the FHWA adds to the STANDARD statement text pertaining to left and right edge lines that is being moved from Sections 3B.01 Yellow Centerline Pavement Markings and Warrants and 3B.04 White Lane Line Pavement Markings and Warrants. These changes result in all edge line pavement marking information being

contained within one section. ATSSA opposed the reference to "normal" lines in these two paragraphs, because "normal" lines are defined in Section 3A.05 Widths and Patterns of Longitudinal Pavement Markings as 4 inches to 6 inches in width. ATSSA suggests that FHWA require 6-inch lines on all Federal-aid projects, based on a recent study by the Texas Transportation Institute²⁷ that 29 States are using 6-inch or wider longitudinal lines on the roadway in at least some applications. However, this study did not indicate that 6-inch lines would improve safety or have better visibility than 4-inch lines. Four-inch lines are adequate. This is a topic for further study and possibly a future rulemaking. Accordingly, the FHWA adopts the changes to this section as proposed in the NPA.

To respond to a suggestion from a traffic engineering consultant, the FHWA changes the STANDARD statement to include major driveways in the locations where edge line markings shall not be continued and to include major driveways as locations where dotted edge lines extensions may be used. The addition of "major driveways" will clarify the intent of this section.

The FHWA also adds an OPTION statement, which states that wide solid edge line markings may be used for greater emphasis. Wide edge lines can sometimes be useful in reducing run-off-the-road crashes at curves and this option will provide additional flexibility for jurisdictions to use these markings where needed.

Additionally, in the GUIDANCE statement, the FHWA clarifies that edge line markings should not be broken for minor driveways, to be consistent with other areas of the MUTCD.

The FHWA received a comment from the City of Tucson, Arizona, supporting the changes to this section.

150. In Section 3B.08 Extensions Through Intersections or Interchanges, the FHWA received two comments from the Wisconsin DOT and a traffic engineering consultant regarding the proposed addition to the GUIDANCE statement on the placement and dimensions of pavement markings that are continued through intersections and interchanges. The traffic engineering consultant opposed the proposal that edge lines not be extended into or continued through intersections or

²⁷ "The Use of Wider Longitudinal Pavement Markings," Texas Transportation Institute (TTI) Research Report 0024-1, Timothy J. Gates and H. Gene Hawkins, 2002. This report is available at the following URL: <http://ted.tamu.edu/Documents/02-0024-1.pdf>.

interchanges. Accordingly, the FHWA adds an OPTION statement after the STANDARD statement to indicate that a normal line may be used to extend a wide line through an intersection. In addition, the FHWA adds an OPTION statement after the first GUIDANCE to clarify that dotted extensions of edge lines may be used as line extensions. The FHWA received two comments from the NCUTCD and the City of Tucson, Arizona, supporting these changes.

The FHWA clarifies the first paragraph of the second GUIDANCE statement by including "major driveways" to be consistent with other changes made in this chapter.

151. In Figure 3B-11, Examples of Extensions through Intersections or Interchanges, the FHWA deletes "Interchanges" from the title, because this figure does not include interchanges, and makes other modifications to the graphic and legend for clarity.

152. In Figure 3B-12, Examples of Lane Reduction Markings, the FHWA adds a graphic "c", which was contained in the 2000 MUTCD and incorporates modifications in the graphic to be consistent with changes in the MUTCD in order to address two comments; one from the NCUTCD and the other from the Wisconsin DOT suggesting that graphic "c" be added.

153. In Section 3B.10 Approach Markings for Obstructions, the FHWA revises the first STANDARD and GUIDANCE statements to change "diagonal" to "tapered" where it refers to the line type. This change is as a result of the decision made by the FHWA in Official Interpretation #3-156²⁸ to correct an error in word usage and clarify the text. The FHWA received no comments regarding this change.

154. In Section 3B.11 Raised Pavement Markers, the FHWA changes the first SUPPORT statement to a STANDARD because this is a definition and all definitions are standards. Because there were several comments from the NCUTCD, Caltrans, and a traffic control device manufacturer opposed to specifying 10 mm (0.4 in) as the height of the retroreflective surface, the FHWA withdraws this proposal due to lack of research to support a specific height of retroreflective surface and restores the language to that used in the 2000 MUTCD, indicating that the height of the device is at least 10 mm (0.4 in).

The FHWA adds an OPTION statement after the STANDARD statement, which states that blue raised pavement markers may be used to mark the positions of fire hydrants. This is common practice in many jurisdictions.

The FHWA adds a second STANDARD statement describing the spacing for raised pavement markers. This statement is moved from Section 3A.05 Widths and Patterns of Longitudinal Pavement Markings (Section 3A.06 in the NPA).

The FHWA also adds a SUPPORT statement at the end of this section that references the Institute of Transportation Engineers 2001 "Traffic Control Devices Handbook"²⁹ for more information regarding the spacing of raised pavement markings.

155. In Section 3B.12 Raised Pavement Markers as Vehicle Positioning Guides with Other Longitudinal Markings, the FHWA received one comment from the City of Tucson, Arizona, supporting the changes and comments from the NCUTCD and the Ohio DOT suggesting clarifications and reversion back to some of the 2000 MUTCD text. Accordingly, the FHWA withdraws this proposal to indicate that raised pavement markers as positioning guides should be spaced "no greater than 3N" and retains the 2000 MUTCD language of the SUPPORT, indicating that typical spacing for raised pavement markers as positioning guides is "2N". The FHWA also revises the second OPTION statement to the language of the 2000 MUTCD for consistency.

To address the Ohio DOT comment and provide agencies with flexibility in raised pavement marker spacing, the FHWA adds an OPTION statement to indicate that a spacing of 3N may be used for some applications on freeways and expressways. A 1997 study by the Ohio Department of Transportation³⁰ found that 120 foot spacing (3N) spacing is adequate in providing guidance to the wet-night driver on freeways in some, but not all, circumstances.

156. In Section 3B.13 Raised Pavement Markers Supplementing Other Markings, the FHWA's proposal to revise item B1 of the GUIDANCE statement to indicate that raised pavement markers should not

supplement right edge line markings unless they are spaced closely enough (no greater than 3 m (10 ft) apart) to approximate the appearance of a solid line received several opposing comments from the Metropolitan Planning Organization of Cincinnati, Ohio, the City of Phoenix, Arizona, traffic engineering consultants, and private citizens. In particular opposition, the bicycle community stated that raised pavement markers cause steering difficulties for bicyclists. The NCUTCD and the City of Tucson, Arizona, supported the proposed changes, however these commenters expressed that more information was needed on the proper spacing of raised pavement markers. Accordingly, the FHWA does not adopt the proposed revision to Item B1 of the GUIDANCE statement. In the future, the FHWA may engage in rulemaking to address the use of raised pavement markers on edge lines in locations where bicycles are not permitted.

In item B.2 of the GUIDANCE statement, the FHWA revises the recommended spacing to be used between raised pavement markers supplementing broken line markings from 2N to "no greater than 3N" because this is an acceptable spacing for most applications. There were no comments regarding this change. (See also the discussion in Section 3B.12 Raised Pavement Markers as Vehicle Positioning Guides with Other Longitudinal Markings regarding Ohio's testing of raised pavement marker spacing.)

Additionally, in item B.5 of the GUIDANCE statement, the FHWA revises the recommended spacing to be used between raised pavement markers that supplement edge line extensions through freeway interchanges from N/2 to "no greater than N" because this is an acceptable spacing for most applications. There were no comments regarding this change.

157. In Section 3B.14 Raised Pavement Markers Substituting for Pavement Markings, there were several comments from the Washington and Ohio DOTs and the City of Plano, Texas, opposing the FHWA's proposal to revise the required spacing between raised pavement markers, while the NCUTCD supported the proposed change. The FHWA modifies the first paragraph of the STANDARD statement to clarify raised pavement marker spacing when used to substitute for broken line markings. The FHWA adds language to clarify spacing for 4 and 5 marker installations, as well as to clarify placement of retroreflective or internally illuminated markers. The FHWA

²⁸ A copy of the FHWA's Official interpretation #3-156 is available for downloading from the American Traffic Safety Services Association the following URL: <http://www.atsssa.com/pubinfo/downloads/10-16-02a.pdf>.

²⁹ Traffic Control Devices Handbook," Institute of Transportation Engineers (ITE), 2001 is available for purchase from the ITE Bookstore at the following URL: <http://www.ite.org/bookstore/index.asp>.

³⁰ "A Field Demonstration and Accident Study of 120-Foot Spacing of Raised Pavement Markers on Ohio Freeways," January 2, 1997, by Whit W. Wardell and Mohammad M. Khan, is available from the Ohio DOT Office of Traffic Engineering, 1980 West Broad Street, Columbus, Ohio 43223, telephone number (614) 466-3601.

eliminates the proposed 10-year phase-in target compliance date, because no new requirements are being imposed.

The FHWA proposed to revise the second STANDARD statement to change the spacing of raised pavement markers substituting for dotted lines to N/4, rather than N/8. The NCUTCD agreed, but the City of Plano, Texas, opposed it, suggesting that the spacing be "no greater than N/4." The FHWA agrees with the City of Plano, because it would be consistent with the first STANDARD statement, and makes this change in this final rule.

158. In Section 3B.15 Transverse Markings, in the first STANDARD statement the FHWA adds "yield lines" and "speed hump" markings to the list of transverse markings required to be white markings.

The FHWA changes the second paragraph of the GUIDANCE statement to a STANDARD statement, which requires that pavement marking letters, numerals, and symbols be installed in accordance with the Pavement Markings chapter of "Standard Highway Signs book"³¹ to be consistent with requirements elsewhere in the MUTCD and to correct an oversight in the 2000 MUTCD.

There were two comments from the NCUTCD and the City of Tucson, Arizona, in support of the changes to Section 3B.15.

159. In Section 3B.16 Stop and Yield Lines, in the second paragraph of the first GUIDANCE statement, the FHWA clarifies that YIELD signs are an exception to the recommendations on the use of stop lines to be consistent with the intended use of yield lines. One traffic engineering consultant suggested that Stop lines should be an OPTION, because wide crosswalk lines work well. This goes beyond the scope of this rulemaking and would need to be addressed in a future rulemaking. The NCUTCD, City of Tucson, Arizona, and The Association of Pedestrian and Bicycle Professionals agreed with changes to this section. The FHWA adopts the text as proposed in the NPA.

The FHWA modifies the OPTION statement to clarify that yield lines may also be placed at locations where vehicles are to yield to pedestrians in

compliance with a YIELD HERE TO PEDESTRIANS (R1-5 or R1-5a) sign to correspond with the addition of this new sign to Chapter 2B Regulatory Signs. There were no comments on this change.

The FHWA revises and adds to the second GUIDANCE statement to enhance pedestrian safety by indicating the recommended placement of yield lines at unsignalized midblock crosswalks. One private citizen suggested that yield lines extend across both directions of travel, from sidewalk to sidewalk, on both sides of the crosswalk so that all motorists are aware of the pedestrian crossing. The FHWA disagrees with this comment because drivers are not approaching the crosswalk from the left side of the centerline, therefore it would not be appropriate to place a yield line all the way across the roadway on both sides of the crosswalk.

The FHWA also adds a new paragraph to the second GUIDANCE statement regarding placement of yield lines at midblock crosswalks. The Florida DOT suggested that "Yield to Pedestrians (R1-5 or R1-5a)" signs be used in the vicinity of transit stops. The FHWA disagrees with this comment because local agencies will likely take the location of transit stops into consideration when determining where midblock crosswalks will be installed.

The Oregon DOT requested that an OPTION be added to allow the use of a stop line with "Stop Here for Pedestrians" signs at crosswalks not controlled by a signal, stop sign, or yield sign. The FHWA disagrees with this comment, because research has not been conducted to determine if driver response and obedience to these signs would be adequate. Research that led to the proposal to add the "Yield Here to Pedestrians" sign and the yield line markings for midblock uncontrolled pedestrian crossings only evaluated driver response to the "Yield Here * * *" sign, and did not evaluate a "Stop Here * * *" sign.³² The FHWA adopts the text as proposed in the NPA.

The FHWA also adds a new figure numbered and titled "Figure 3B-15 Examples of Yield Lines at Unsignalized Midblock Crosswalks" relating to the new text, and rennumbers all of the following figures in the chapter accordingly.

Additionally, the FHWA adds a new SUPPORT statement at the end of the section to emphasize that drivers who yield too close to crosswalks on multi-lane approaches place pedestrians at risk by blocking other drivers' view of pedestrians. There were no comments regarding this change.

160. In Section 3B.17 Crosswalk Markings, the FHWA received several comments from the NCUTCD, Caltrans, the City of Plano, Texas, and traffic engineering consultants regarding proposed changes in the second GUIDANCE statement increasing the upper limit of the range for spacing diagonal or longitudinal crosswalk marking lines from 300 to 600 mm (12 to 24 in) to 300 to 1500 mm (12 to 60 in) and specifying the relationship between marking spacing and line width. The NCUTCD supported the proposed change, and the other comments suggested additional clarification. In response to these comments, the FHWA revises the first GUIDANCE statement to clarify the width of crosswalks (with transverse lines or with diagonal or longitudinal lines) and to indicate that the width is measured as the gap between the inside of the lines. The City of Plano, Texas, requested that options for different crosswalk patterns be included in the MUTCD. This goes beyond the scope of this rulemaking and will have to be addressed in a future rulemaking.

161. In Section 3B.19 Pavement Word and Symbol Markings, the FHWA changes the fourth paragraph of the first GUIDANCE statement to clarify that the longitudinal space between word or symbol message markings does not apply to the two opposing arrows of a two-way left-turn lane marking. This change is in response to a comment from Caltrans requesting clarification.

In addition, the FHWA modifies the third STANDARD statement to allow the use of STOP markings at the ends of aisles in parking lots even though there is no STOP sign. The NCUTCD opposed this additional language, and requested that the language from the 2000 MUTCD be retained until the broader issue of the MUTCD and private property is addressed. The FHWA adopts the changes, as proposed in the NPA, because the MUTCD is applicable to public and private parking lots in a growing number of States, and the change is very important for parking lot safety.

162. In Section 3B.21 Curb Markings, in the first paragraph of the STANDARD statement, the FHWA clarifies that the requirement for signs to be used with curb markings does not apply if the no parking zone is controlled by statute or

³¹ "Standard Highway Signs," FHWA, 2002 Edition is available for purchase from the U.S. Government Printing Office Bookstore, Superintendent of Documents, Room 118, Federal Building, 1000 Liberty Avenue, Pittsburgh, PA 15222. Internet Web site at <http://bookstore.gpo.gov>. It is also available on the FHWA's Web site at http://mutcd.fhwa.dot.gov/ser-shs_millennium.htm is available for inspection and copying at the FHWA Washington Headquarters and all FHWA Division Offices as prescribed at 49 CFR part 7.

³² "Advance Yield Markings Reduce Motor Vehicle/Pedestrian Conflicts at Multilane Crosswalks with an Uncontrolled Approach," by Van Houten, Malenfant, and Malenfant, and McCusker, 2001. It is available from the Center for Education and Research in Safety, at the following URL: "<http://www.cers-safety.com/advanceyieldmarkings.pdf>."

local ordinance, to minimize unnecessary sign clutter. The NCUTCD and the City of Tucson, Arizona, supported this change. In response to a comment from a private citizen, the FHWA adds additional clarity by inserting an OPTION statement indicating that curb markings without signs or word markings may be used to convey a general prohibition of parking within a specified distance of a stop sign, driveway, fire hydrant, or crosswalk.

163. In Section 3B.22 Preferential Lane Word and Symbol Markings, the FHWA adds to the second STANDARD statement that more than one symbol or word marking can be used to mark a preferential lane, that the word message "HOV" is acceptable as a preferential marking (relocating this from the OPTION statement), and that the "T" marking shall be the light rail transit preferential lane symbol. Additionally, in the same STANDARD statement, the FHWA requires that symbol or word markings for each preferential lane use be installed if two or more preferential lane uses are permitted in a single lane. These changes provide uniformity for marking of multi-use preferential lanes and provide a distinctive symbol for light rail transit. The NCUTCD and the Florida DOT supported this change. Caltrans opposed the "T" marking, stating that the "T" marking could be mistaken as the abbreviation for other uses (such as taxis, trams, and trains). The FHWA adopts the wording as proposed in the NPA. While possible future research may find that there is a better marking, there are currently very few applications of exclusive light rail transit lanes on street. If a better symbol is indicated by research in the future the FHWA will address this accordingly in a future rulemaking.

164. In Section 3B.24 Markings for Roundabout Intersections, the FHWA adds a new STANDARD statement, which prohibits marking bicycle lanes on roundabout intersections. Many comments, especially from the bicycling community, agreed with this statement.

As a result of a comment from the New York DOT, the FHWA changes Item C of the SUPPORT statement to clarify that the flare or widening for a roundabout intersection approach should allow for proper operation as needed. This is a critical characteristic of a modern roundabout intersection. In addition, the FHWA adds a paragraph to the last OPTION statement regarding the option of using yield lines in roundabout intersections. The FHWA also adds yield lines to the figures illustrating roundabout intersection markings to correct an omission noted

by a traffic engineering consultant, regarding yield lines in roundabout intersections. These minor changes to the SUPPORT, OPTION, and figures do not impose any new requirements and are considered editorial in nature.

165. In Section 3C.01 Object Marker Design and Placement Height, the FHWA adds to the text of the first STANDARD statement the sign numbers for Type 1 markers for clarity. The FHWA also adds text to reflect the FHWA's Official Interpretation #3-155(I)³³ to clarify the text for Type 2 markers. The FHWA inserts that the minimum width of both the yellow and black stripes on a Type 3 striped marker shall be 75 mm (3 in), to provide for uniformity of appearance of these markers. The FHWA establishes a 10-year phase-in target compliance date from the effective date of this final rule for existing markers in good condition.

One commenter suggested that there be a maximum width specified for the stripes. The FHWA has no information regarding a reasonable maximum width and therefore additional research is necessary. This issue may be the subject of a future rulemaking.

166. In Section 3D.01 Delineators, the FHWA changes the STANDARD statement indicating that delineators are considered guidance devices rather than warning devices to a SUPPORT statement to be consistent with other parts of the MUTCD. Two commenters from the NCUTCD and the City of Tucson, Arizona, supported this change.

167. In Section 3D.04 Delineator Placement and Spacing, in response to a comment from a traffic engineering consultant, the FHWA adds to the first GUIDANCE statement a description of the three ways that delineators can be mounted with guardrail. This text is needed for consistency with the notes in Figure 3D-1 and to reflect common practices.

168. In Section 3E.01 Colored Pavements, the FHWA makes several changes to reflect that red colored pavement is no longer being considered a traffic control device. The FHWA adds to the SUPPORT statement that colored pavement located between the crosswalk lines is not considered to be a traffic control device. The FHWA removes item A of the STANDARD statement concerning when the color red is used, and removes the second GUIDANCE statement concerning how the color red is used. The FHWA received several comments regarding

this change from the NCUTCD, traffic control device manufacturers, and State DOTs, many in favor and requesting that colored pavement for bicycle lanes also be included. One commenter from the Arizona DOT expressed concern that the use of colored pavement may be expanded and used inappropriately, in the absence of further direction. The FHWA adopts the language as proposed in the NPA. The use of colored pavement in bicycle lanes is currently under experimentation and may be appropriate for discussion in a future rulemaking.

Additionally, in the first GUIDANCE statement, the FHWA adopts text that recommends that colors that degrade the contrast of white crosswalk lines, or that might be mistaken by road users as a traffic control application, not be used for colored pavement located between crosswalk lines. Four commenters, representing associations for the blind, agreed with this statement.

Discussion of Adopted Amendments to Part 4—Highway Traffic Signals

169. In Section 4A.02 Definitions Relating to Highway Traffic Signals, the FHWA removes the definition of "Emergency Beacons", to correspond with FHWA's decision to remove the proposed section numbered and titled in the NPA "Section 4F.04 Emergency Beacon" from this final rule (see discussion of Section 4F.03 Operation of Emergency-Vehicle Traffic Control Signals).

The FHWA received three comments from the Missouri DOT and the cities of Tucson, Arizona, and Plano, Texas, opposed to the proposal to revise the definition of "Pedestrian Clearance Time" to correspond to proposed changes in the standards contained in Section 4E.10 Pedestrian Intervals and Signal Phases. The commenters stated that defining pedestrian clearance time as a standard eliminates the flexibility in calculating clearance time. The FHWA disagrees with the commenters because this definition must correspond to the text of Section 4E.10, and in that section, the FHWA adopts the provision to calculate pedestrian clearance time from curb to curb and not to allow clearance time to be calculated to the middle of the farthest lane. (See discussion of Section 4E.10.) The FHWA adopts the language as proposed in the NPA.

The FHWA also received two comments from the NCUTCD and the City of Plano, Texas, requesting that the new definitions for "Separate Left Turn Signal Face," and "Shared Left Turn Signal Face" be deleted, because these phrases are described in Section 4D.06

³³ A copy of the FHWA's Official Interpretation number 3-155(I) is available from the American Traffic Safety Services Association's web site at the following URL: <http://www.atssa.com/pubinfo/downloads/5-31-02b.pdf>.

Application of Steady Signal Indications for Left Turns, and the definitions are not completely consistent with practice in some areas of the country. The FHWA disagrees with these comments and adopts the language because different jurisdictions do have their own accepted definitions for these terms that are not necessarily consistent with the MUTCD, thus it is important to have the MUTCD definitions for these terms stated at the beginning of this part to avoid misunderstanding.

170. In Section 4B.02 Basis of Installation or Removal of Traffic Control Signals, the FHWA received one comment from Caltrans regarding the proposal to remove the maximum time limit of one year for signal poles and cables to remain in place after removal of the signal heads from item E of the OPTION statement. The commenter requested deleting this OPTION and not allowing poles to remain in place after removal of a signal, because the commenter believes that this practice could result in a potential safety hazard and maintenance responsibilities. The FHWA adopts the wording proposed in the NPA, because leaving the poles in place is only an option, and agencies can remove poles if they believe them to constitute a significant safety problem and/or if they are reasonably certain that the signal would never be placed back into service.

171. In Section 4B.03 Advantages and Disadvantages of Traffic Control Signals, the FHWA received four comments from the NCUTCD, local DOTs, and a private citizen regarding the proposal to revise item B of the second paragraph of the SUPPORT statement to suggest that signal timing review and updating be conducted if needed and that every two years is just one of several possible frequencies of review. The private citizen suggested that the timeframe reference be lengthened to "at least every five years" and strengthened to a STANDARD in order to encourage jurisdictions to maintain traffic signal timings. The NCUTCD and the cities of Tucson, Arizona, and Plano, Texas, opposed a reference to any specific time frame, and suggested that the timeframe be determined by engineering judgment. The FHWA agrees with the concept of these comments and revises the sentence to delete the timeframe reference and to include engineering judgment and significant traffic flow and/or land use changes in determining the frequency of the review of signal timing.

172. In Chapter 4C Traffic Control Signal Needs and Studies, the FHWA received one general comment from a traffic engineering consultant that

public transit interests be incorporated when determining the need for installing a traffic control signal. The commenter suggested that either a ninth warrant be added to recognize the special needs associated with bus operations, or one of the current eight warrants be modified to recognize public transit needs. This goes beyond the scope of this rulemaking. Research has just started regarding this issue,³⁴ and this topic may be suitable for a future rulemaking action.

173. In Section 4C.01 Studies and Factors for Justifying Traffic Control Signals, the FHWA received two comments from Caltrans and the Minnesota DOT opposed to the recommendation in the GUIDANCE statement, which states that a traffic control signal installed under projected conditions should be studied again within one year after placing it in stop-and-go operation to determine if it is still justified and, if it is not justified, it should be taken out of stop-and-go operation or removed. Both commenters stated that conducting these follow-up studies would take additional manpower and could be politically sensitive. Additionally, the Minnesota DOT suggested that Section 4B.02 Basis of Installation or Removal of Traffic Control Signals already contains information related to removing traffic control signals. The Minnesota DOT also noted that the one-year requirement would conflict with Warrant 8, which states that one can use projected volumes five years out. The FHWA revises the language to add, "Except for locations where the engineering study uses the satisfaction of Warrant 8 to justify a signal" at the beginning of the second sentence, in order to correct the stated conflict of the proposed language with Warrant 8. In terms of the additional manpower that could potentially be required to conduct studies, the FHWA believes that the number of follow-up studies that would need to be conducted would be few and that, in many cases, the jurisdiction could require the studies to be completed by the developer's traffic engineer. The FHWA adopts the language as proposed in the NPA with the above-mentioned modification to avoid conflict with Warrant 8.

³⁴ "Improving Pedestrian Safety at Unsignalized Roadway Crossings" is a research study that is currently in progress. This is a joint effort between the National Cooperative Highway Research Program (NCHRP) and the Transportation Cooperative Research Program (TCRP). The study is numbered NCHRP Project 3-71 and TCRP D-08. Information is available at the following URL: <http://rip.trb.org>.

The FHWA received one comment from Caltrans opposed to the proposal to allow the OPTION of using the left-turn volume on the major-street as the minor-street volume and the corresponding single direction of opposing traffic as the major street volume. The commenter felt that this would allow signals to be installed at non-intersection locations. The FHWA disagrees with the commenter because this is an OPTION statement and need not be applied. There are many locations, such as left turns onto freeway ramps, where the left turn versus opposing through movement conflict creates the need for a signal. The FHWA adopts the language as proposed in the NPA.

The FHWA received four comments from Caltrans, the Kansas DOT, the Association of Pedestrian and Bicycle Professionals, and a traffic engineering consultant in general agreement with adding item H to the OPTION statement, which indicates that bicyclists may be counted as either vehicles or pedestrians when studying the need for a traffic control signal. To add clarity and consistency for how this is applied, as suggested by the Kansas DOT, the FHWA revises this section and includes this information as a new paragraph within the OPTION and adds a new SUPPORT statement indicating that bicyclists are usually considered as vehicles when they are riding in the street, and as pedestrians when they are clearly using pedestrian facilities.

174. In Section 4C.02 Warrant 1, Eight-Hour Vehicular Volume, the FHWA received several comments regarding the proposal to add a new OPTION statement to explain the use of 56 percent traffic volumes under certain conditions and modify Table 4C-1 to include additional criteria for a combination of Conditions A and B as reflected in the text. Three commenters, including the NCUTCD, the Ohio DOT, and the City of Tucson, Arizona, agreed with the use of the 56 percent traffic volumes. However, six commenters, including Caltrans, the Kansas and North Carolina DOTs, the City of Kennewick, Washington, and a private citizen, were opposed to the use of the 56 percent volumes, stating that the reduced volume allows signals to be installed at locations with low volumes. The FHWA believes that the use of the 56 percent volumes has been successfully applied in the past by many jurisdictions and should be allowed. Because it is an OPTION, jurisdictions have the ability to decide whether or not this option will be used. The FHWA adopts the 56 percent column in the table as proposed.

175. In Section 4C.05 Warrant 4, Pedestrian Volume, based on a comment from the NCUTCD, the FHWA removes the second sentence under item A of the GUIDANCE statement. The NCUTCD suggested that it is not necessary to describe the type of actuated operation that should be used at a traffic control signal, if this warrant is met. The FHWA agrees that the sentence is unnecessary and duplicative of the first sentence and makes this minor editorial change to remove this sentence in this final rule.

176. In Section 4C.06 Warrant 5, School Crossing, based on a comment from the NCUTCD similar to its comment on Section 4C.05 suggesting that it is not necessary to describe the type of actuated operation that should be used at a traffic control signal, if this warrant is met, the FHWA removes the second sentence under item A of the GUIDANCE statement.

177. In Section 4C.08 Warrant 7, Crash Experience, the FHWA received several comments from the NCUTCD, Caltrans, the City of Kennewick, Washington, and a private citizen regarding the proposed OPTION explaining the use of 56 percent traffic volumes. The comments were similar to those received regarding similar proposed wording in Section 4C.02 Warrant 1, Eight-Hour Vehicular Volume. The FHWA adopts the 56 percent column in the table as discussed in Section 4C.02.

178. In Section 4D.01 General, the FHWA removes from the STANDARD statement the requirement that a traffic control signal be operated in either a steady (stop-and-go) mode or a flashing mode at all times. That former requirement was in conflict with other STANDARD statements in Chapter 4E that require flashing indications (flashing UPRAISED HAND pedestrian signal indications) to be displayed during an otherwise steady mode of traffic control signal operation. This change allows practitioners the flexibility to use flashing indications along with steady indications where appropriate in a signal sequence to improve the efficiency or safety of the intersection. The FHWA received comments from the NCUTCD and the U.S. Access Board supporting the removal of this requirement, and the FHWA adopts it.

The FHWA received two comments from the NCUTCD and the Wisconsin DOT opposed to the removal of "within or" from item B of the STANDARD statement describing exceptions to locations where STOP signs shall not be placed in conjunction with any traffic control signal operation. The FHWA agrees with the commenters who

suggested that these words need to be retained to cover situations where minor driveways or extremely low-volume roadways intersect within the controlled area. The FHWA withdraws this proposal and retains the existing language in the 2000 MUTCD.

The FHWA adds a STANDARD statement prior to the GUIDANCE reiterating text that also appears in Chapter 4C Traffic Control Signal Needs Studies, that restricts signalization of midblock crosswalks if they are located within 90 m (300 ft) from the nearest traffic control signal, unless the proposed traffic control signal will not restrict the progressive movement of traffic. The FHWA believes that repeating the STANDARD found elsewhere in Part 4 will improve the chances of readers properly applying this restriction. The FHWA adds this statement based on a comment received from the NCUTCD recommending this change.

The FHWA also received three comments regarding the GUIDANCE statement that the location of signalized midblock crosswalks should be at least 30 m (100 ft) away from adjacent stop or yield controlled driveways or streets. The NCUTCD suggested revised wording to clarify that midblock crosswalks should not be signalized if they are located within 30 m (100 ft) from adjacent stop or yield controlled driveways or streets. The FHWA agrees with this recommendation and adopts this in this final rule. One commenter from the City of Tucson, Arizona, suggested that there are some situations where a signalized midblock crossing would be less than 30 m (100 ft), and therefore the wording should be changed to allow flexibility. The FHWA disagrees with the commenter because the suggested wording will diminish the text to the point where it is meaningless. Because this is a GUIDANCE, conditions where there is a good engineering reason to deviate would still be able to be accommodated without violating the MUTCD. A traffic engineering consultant questioned the five-year phase-in target compliance date, stating that it would be a burden for jurisdictions to address existing locations where signalized midblock crosswalks did not meet the new criteria within a five-year timeframe. Accordingly, the FHWA changes the phase-in target compliance date from five years to 10 years from the effective date of this final rule.

However, the FHWA clarifies that the December 31, 1996, compliance date established in Official Ruling IV-8 (Sg-

44)³⁵ issued in 1987 is not affected by this "new" 10-year phase-in target compliance date. The 1987 ruling was that all "half-signals" (signalized pedestrian crossings where only the major street and the pedestrian crosswalk are provided with signal indications, and the minor street is stop-sign controlled) located "at" intersections had to be either relocated to a midblock location or modified to include signalization of the minor street approaches by December 31, 1996. That date still applies to such non-conforming signals that were in place as of the 1987 ruling. (Some of the "half-signals" still have not been relocated or modified.) The new 10-year date is intended to apply only to "half-signals" installed after 1987 that may not be immediately at the intersection but are within 100 feet of a side street or driveway controlled by stop or yield signs.

179. In Section 4D.03 Provisions for Pedestrians, the FHWA received one comment from a traffic engineering consultant suggesting that consideration of accessible pedestrian signals be an OPTION, rather than GUIDANCE. The FHWA strongly disagrees because this GUIDANCE merely recommends accessible pedestrian signals "where appropriate" and refers to Sections 4E.06 Accessible Pedestrian Signals and 4E.09 Accessible Pedestrian Signal Detectors. In those sections, there is guidance on what conditions should prompt a study and what factors should be considered, but the decision to use the device is optional. The FHWA strongly supports provisions in the MUTCD that provide accommodations for all pedestrians and road users. In addition, the FHWA feels that by including this as a GUIDANCE, it will encourage more traffic engineers to consider issues involving pedestrians with disabilities. The FHWA adopts the changes to this section as proposed in the NPA.

180. In Section 4D.04 Meaning of Vehicular Signal Indications, the FHWA received several comments from the NCUTCD, State DOTs, and a private citizen regarding the proposal to remove the phrase "unless otherwise determined by law" from the beginning of the STANDARD statement. While the NCUTCD and a private citizen were in favor of the change, the Ohio, North Carolina, Florida, and Oregon DOTs were opposed to it. Those opposed were concerned that the removal of the

³⁵ Official Ruling IV-8 (Sg.-44) is described on page OR-IV-4 of the 1988 edition of the MUTCD. This ruling was published in a final rule in 1987 in the **Federal Register** at 52 FR 7126.

phrase would cause legal issues within their respective States. The FHWA adopts the changes as specified in the NPA, because the intent of this change is to enhance traffic safety by encouraging national uniformity between States in the meaning of traffic signal indications.

The FHWA received several comments from Caltrans, the Minnesota DOT, the U.S. Access Board and the Association of Pedestrian and Bicycle Professionals regarding the addition to item A.3 that the pedestrian does not automatically have the right of way when starting to cross at the time that a green signal is first shown. The commenters generally opposed this addition, thinking that it was actually in conflict with State laws that require vehicles to yield to pedestrians. Some slower drivers who enter the intersection during the last moments of the yellow change interval or red clearance interval may not clear the intersection before the start of the next movement's green interval. Pedestrians should have a legal requirement to let this traffic exit the intersection before stepping into the path of an oncoming vehicle. The FHWA adopts the text as proposed in the NPA, which corresponds to recent changes in the Uniform Vehicle Code.³⁶

The FHWA received one comment from the North Carolina DOT opposing the addition to item C.2 that a turn on a RED ARROW signal indication after stopping is allowed only when a sign is in place permitting the turn on red arrow (to conform to the Uniform Vehicle Code) and the corresponding removal of the existing OPTION statement at the end of the section dealing with right-turn on a red arrow. The commenter felt that the meaning and application of red signal indications should be the same for red balls and arrows. FHWA disagrees because it believes that national uniformity and traffic safety will be best served by the text as proposed in the NPA. The FHWA adopts the proposed text.

181. In Section 4D.05 Application of Steady Signal Indications, the FHWA received several comments from the NCUTCD, State and local DOTs, regarding additions and revisions to item B.4 of the STANDARD statement. This item lists conditions under which

a steady circular yellow signal indication may be displayed to an approach from which drivers are turning left. The commenters were particularly concerned with signal displays that result in what is referred to as the "yellow trap." A "yellow trap" occurs when drivers in the opposing direction are not simultaneously being shown a circular yellow indication. This can lead to drivers who are attempting to make a permissive left turn falsely thinking that the opposing traffic is coming to a stop. The Minnesota and Oregon DOTs are opposed to allowing any situations in which the "yellow trap" can occur. The FHWA recognizes that there are some locations where no other signal sequence other than one that includes a yellow trap is reasonably feasible due to unique combinations of intersection geometrics and traffic volumes. Accordingly, the FHWA revises item B.4(c) to account for such conditions. Additionally, based on changes in Section 2C.39 Traffic Signal Signs, the FHWA revises the legend of the W25-1 and W25-2 signs item B.4(c) and (d) to clarify their message, and to be consistent with Section 2C.39.

The FHWA received comments from the NCUTCD, Caltrans, the North Carolina DOT, and the City of Kennewick, Washington, opposed to adding to item F.2 of the STANDARD statement that would require the use of a "U Turn Yield to Right Turn" sign when U-turns on a green arrow signal conflict with right turns on a green arrow signal. While the North Carolina DOT agreed with the proposed change to advise U-turn motorists to yield, the remaining commenters felt that drivers would not understand the proposed wording on the sign and that additional research is necessary. The FHWA concurs and, because there is no data to support or refute those concerns, the FHWA changes this to an OPTION statement, allowing the use of the sign but not requiring it. This OPTION statement is located at the end of the section. The FHWA also modifies Section 2B.45 Traffic Signal Signs accordingly.

182. In Section 4D.06 Application of Steady Signal Indications for Left Turns, the FHWA received several comments from the NCUTCD, Caltrans, and the Oregon and Minnesota DOTs suggesting clarifying language to item A in the STANDARD statement that provides for the use of separate or shared left turn signal faces and separate signal face sequences for "permissive only" mode of operation. The FHWA agrees and includes additional clarifying language in this final rule.

183. In Section 4D.09 Unexpected Conflicts During Green or Yellow Intervals, the FHWA received comments from the NCUTCD and the City of Tucson, Arizona, regarding the revision to item A of the STANDARD statement. These commenters were concerned about the proposal to add an exception for the situation regarding U-turns as described in item F.2 of Section 4D.05 Application of Steady Signal Indications to the prohibition of displaying a steady GREEN ARROW or YELLOW ARROW signal indication to vehicular movements that conflict with other vehicles moving on a green or yellow signal indication. (See the discussion regarding Section 4D.05) Accordingly, the FHWA revises item A to be consistent with the changes in Section 4D.05 that change the text to an OPTION.

184. In Section 4D.10 Yellow Change and Red Clearance Intervals, the FHWA received several comments from Caltrans, AAA, and a private citizen proposing changes to how the yellow change interval and the red clearance interval are calculated. These comments go beyond the scope of this rulemaking, and would need to be addressed in a future rulemaking.

185. In Section 4D.12 Flashing Operation of Traffic Control Signals, the FHWA received two comments from the cities of Tucson, Arizona, and Kennewick, Washington, in agreement and two comments from Caltrans and the Wisconsin DOT opposed to revising the GUIDANCE statement to eliminate the word "maximum" in describing the duration of six seconds for a steady red clearance interval in the change from red-red flashing mode to steady (stop and go) mode. Caltrans felt that the time duration should not be fixed at a specific number of seconds because of difficulties in timing the interval exactly. The FHWA disagrees with the opposing comments because less than six seconds is not enough time to recognize that the signal has stopped flashing, and more than six seconds is too long, creating unnecessary congestion at the intersection. Also, modern traffic signal control equipment provides accurate digital timing of an interval such as this. The FHWA adopts the language as proposed in the NPA.

186. In Section 4D.15 Size, Number, and Location of Signal Faces by Approach, the FHWA received two comments from AAA and Caltrans suggesting stronger language to require the use of 300 mm (12 inch) signal heads, rather than 200 mm (8 inch) signal heads in order to improve visibility and safety. Because there were no changes to this wording proposed in

³⁶ The "Uniform Vehicle Code and Model Traffic Ordinance," 2000 edition, is published by the National Committee on Uniform Traffic Laws and Ordinances (NCUTLO), 107 S. West Street, #110, Alexandria, Virginia 22314. It is available for inspection at the FHWA Office of Transportation Operations, 400 7th Street, SW., Room 3408, Washington, DC 20590, as prescribed at 49 CFR part 7. Purchase information is available on the Web site for NCUTLO at <http://www.ncutlo.org>.

the NPA, such a change is outside the scope of this rulemaking and would need to be addressed in a future rulemaking.

The FHWA received eleven comments from the NCUTCD, State and local DOTs and a private citizen regarding the proposal to increase the maximum allowable distance for 300 mm (12 inch) far side signal heads (without a supplemental near-side signal head) from the stop line to 55 m (180 ft) based on local engineering judgment. Eight commenters, representing the North Carolina DOT, Palm Beach, Pinellas, Miami-Dade, Sarasota, and Broward counties in Florida, the City of Boca Raton, Florida, and a private citizen strongly supported the change. Three commenters from the NCUTCD, the Minnesota DOT, and the City of Plano, Texas, were opposed to it, stating concerns about older drivers, poor weather conditions, and need for additional research data. The FHWA disagrees with those opposed because experience has shown that 12 inch signals are adequately visible from 180 feet away in most circumstances, and this change will provide considerable cost savings for State and local agencies. If an agency does not want to place signal heads more than the previous 150-foot distance, they are not required to do so. The FHWA adopts the language as proposed in the NPA.

187. In Section 4D.18 Design, Illumination, and Color of Signal Sections, the FHWA removes the GUIDANCE statement concerning the color of signal housings because there is no consensus that yellow signal housings are universally best in all of the various environments. In actual practice, far fewer than 50 percent of the signal heads in the United States are highway yellow. California, New York, and many other very large jurisdictions require signal heads to be other colors, such as green, black, gray, or brown. Some states require the front surfaces of the housings to be black while painting the back surfaces of the housing yellow. The FHWA received one comment from the City of Tucson, Arizona, supporting the removal of this GUIDANCE. The FHWA adopts the removal in the final rule.

188. In Section 4E.02 Meaning of Pedestrian Signal Head Indications, the FHWA received several comments from the U.S. Access Board and organizations representing the blind community opposed to the revision of item A of the STANDARD statement to indicate that a pedestrian does not automatically have the right of way when starting to cross when a WALK signal is first shown. These comments were identical to those

received for Section 4D.04 Meaning of Vehicular Signal Indications suggesting that the change was in conflict with State laws that require vehicles to yield to pedestrians. Some slower drivers who enter the intersection during the last moments of the yellow change interval or red clearance interval may not clear the intersection before the start of the next movement's green interval. Pedestrians should let this traffic exit the intersection before stepping into the path of an oncoming vehicle. The FHWA received one comment from the City of Tucson, Arizona, in support of the proposed change. The FHWA adopts the text as proposed in the NPA, which corresponds with recent changes in the Uniform Vehicle Code.

189. In Section 4E.03 Application of Pedestrian Signal Heads, the FHWA received one comment from Caltrans opposing the proposal to delete item D of the STANDARD statement. The commenter cited potential safety reasons for objecting to the change in this section. The FHWA agrees and revises the statement to clarify that that pedestrian signal heads are required at locations where engineering judgment determines that multiphase signal indications would confuse pedestrians using a crosswalk guided only by vehicular signal indications. The language in the 2000 MUTCD implied that all multiphase signals needed pedestrian signals, even in the absence of any pedestrian activity.

190. In Section 4E.04 Size, Design, and Illumination of Pedestrian Signal Head Indications, the FHWA received several comments from NCUTCD, organizations representing the blind community as well as State and local DOTs regarding the proposal in the first paragraph of the STANDARD statement that symbolized messages for pedestrian signal heads are required to be solid and not allowing the use of "outline style" symbols. Five commenters representing NCUTCD and organizations associated with the blind were in favor of the proposed language, while four commenters representing the New York DOT, the cities of Kennewick, Washington, Salt Lake City, Utah, and Tucson, Arizona, and a private citizen opposed the language. Those opposed to the language expressed concern that countdown style pedestrian signals would not be permitted, because many of those that are currently available commercially are of the outline style, and that new light emitting diode (LED) style outline symbol pedestrian signal heads that have recently been installed in cities such as Salt Lake City, Utah have been favorably received. To address these comments, the FHWA

revises the language to state that all new pedestrian signal head installations shall consist of solid symbolized messages and that existing pedestrian signal head indications with lettered or outline style symbol messages may be retained for the remainder of their useful service life.

The FHWA received several comments from representatives of the blind community requesting the addition of a new statement indicating that the intensity of LED pedestrian signal indications should respond to ambient light. The concern is that during daytime conditions, persons with low vision benefit from pedestrian signal indications displayed at their maximum intensity, and at night signals at maximum intensity create glare conditions for people with low vision, making it difficult for them to see crosswalk lines and other features that aid crossing. The addition of a statement regarding ambient light could have potentially significant impacts on agencies and thus must be addressed in a future rulemaking. This would require inclusion in a future NPA for public review and comment. Accordingly, the FHWA declines to address this comment at this time.

The FHWA adds a seventh paragraph to the STANDARD statement to specify the flash rate for the flashing upraised hand pedestrian signal head indication to be consistent with flash rates specified in other sections of Part 4. There were no comments on this change and the FHWA adopts this change.

Additionally, the FHWA adds an OPTION statement and a STANDARD statement at the end of the section to allow and describe the use of an animated eyes symbol on pedestrian signal heads. Three commenters from the Kansas and Minnesota DOTs opposed these additions, stating that the animated eyes might be confusing to pedestrians and questioning their effectiveness. The FHWA disagrees with the comments because research^{37, 38} has documented benefits to alerting pedestrians to look both ways for approaching vehicles. Because use of these symbols in an option, jurisdictions can decide not to use this device.

³⁷ *Use of Animation in LED Pedestrian Signals to Improve Pedestrian Safety*, Ron VanHouten, et al., ITE Journal, February 1999. This issue of ITE Journal is available for purchase from the Institute of Transportation Engineers at <http://www.ite.org> and click on "Bookstore".

³⁸ *Use of Animated LED 'Eyes' Pedestrian Signals to Improve Pedestrian Safety*, Florida Department of Transportation, January 2000. It is available at the following URL: http://www11.myflorida.com/safety/ped_bike/handbooks_and_research/research/led_eyes.pdf.

191. In Section 4E.06 Accessible Pedestrian Signals, there were several comments from the Minnesota DOT and representatives of the blind community regarding the proposed addition to the second paragraph of the fourth GUIDANCE statement on how sound pressure levels of the accessible walk signal tone should be measured. Based on those comments, the FHWA revises the statement to indicate that the sound pressure level should conform to the requirements of ISO 1996-1:1982 and ISO 1996-2:1987,³⁹ rather than explicitly stating the method to be used when measuring sound pressure levels.

192. The FHWA received several comments from NCUTCD, State and local DOTs, representatives of the blind community and private citizens regarding the proposal to add a new section numbered and titled "Section 4E.07 Countdown Pedestrian Signals" containing OPTION, STANDARD, and GUIDANCE statements on the design, use, and operation of countdown pedestrian signals. Countdown pedestrian signals have been shown by research and experimentation in a variety of cities, such as San Jose, California,⁴⁰ to be beneficial to pedestrians by providing additional information to help pedestrians judge the time remaining to cross the street. Uniformity in the design and operation of countdown pedestrian signals is needed to minimize pedestrian confusion. Many commenters, including the NCUTCD, the City of Tucson, Arizona, Lake County, Illinois, and the Association of Pedestrian and Bicycle Professionals were in agreement with adding the new section, and the NCUTCD had comments and suggestions regarding the specific wording. Based on the comments received, the FHWA clarifies the OPTION statement to indicate that the countdown display informs pedestrians of the number of seconds remaining in the pedestrian change interval (rather than the number of seconds remaining to cross the street, as proposed in the NPA). Additionally, the FHWA clarifies the second STANDARD statement to reflect that after the countdown displays zero, the display shall remain dark until

the beginning of the next countdown. The FHWA also clarifies the third STANDARD statement to indicate that countdown displays shall not be used during the walk interval nor during the yellow change interval of a concurrent vehicular phase.

The FHWA clarifies the first GUIDANCE statement to reflect the way that the countdown timing is controlled as compared to the timing of the flashing DON'T WALK interval. Most countdown devices manufactured today contain timers external to the signal controller and they "learn" how long the flashing DON'T WALK is and adjust themselves to time out so that the zero will be reached at the end of the flashing DON'T WALK. This creates a logistical problem for signalized midblock crosswalks or exclusive "scramble" pedestrian phases. The countdown timer of most existing devices will not be able to make the zero occur four seconds prior to the end of flashing DON'T WALK, which is timed by the controller. The solution for the midblock pedestrian signal situation is to set the flashing DON'T WALK interval to be 4 seconds less than the calculated required "pedestrian crossing time" and to also include a 4 second "red clearance" interval for the controller phase that times the pedestrian WALK—DON'T WALK. During the red clearance interval, a steady DON'T WALK is displayed to the crosswalk while vehicular traffic continues to have red signals. The pedestrian clearance time is thus the sum of the flashing DON'T WALK time plus the 4 second red clearance. This method will produce a display for the pedestrian that is identical to what he/she would see with a countdown at a crosswalk that has concurrent vehicular movements. Accordingly, the FHWA clarifies the GUIDANCE statement to read:

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 four seconds less than the required pedestrian crossing time (see Section 4E.10) and an additional clearance interval (during which steady UPRAISED HAND is displayed) should be provided prior to the start of the conflicting vehicular phase. In this case, the countdown 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 steady UPRAISED HAND, and be dark during the additional clearance interval prior to the conflicting vehicular phase.

The FHWA adopts this new Section 4E.07 with changes and rennumbers the

remaining sections in Chapter 4E accordingly. To minimize any impact on State or local governments, the FHWA establishes phase-in target compliance dates of 10 years for the hardware and three years for the operational requirements (sequence of display, timing, etc.) for existing countdown pedestrian signals in good condition.

193. In Section 4E.08 Pedestrian Detectors, (numbered as Section 4E.07 in the 2000 MUTCD), the FHWA removes from the last STANDARD statement the sentence that instructional signs are not required if special purpose pushbuttons are used. The current design of special purpose pushbuttons does not require a sign to make users aware of their intended purpose. Additionally, the FHWA adds to the third GUIDANCE statement comparable text that the special purpose pushbuttons do not need an instructional sign. One commenter from the City of Tucson, Arizona, was in support of all proposed changes to the section.

The FHWA received several comments from the U.S. Access Board and from organizations representing the blind community regarding the proposal to add an OPTION statement at the end of the section to allow the use of special pedestrian detectors to provide additional crossing time for pedestrians with special needs. Those comments indicated that an extended pushbutton press is the preferred method of calling for extra pedestrian time. Based on the comments, the FHWA revises the wording to state, "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."

194. In Section 4E.09 Accessible Pedestrian Signal Detectors, (numbered as Section 4E.08 in the 2000 MUTCD), the FHWA changes the SUPPORT statement to a STANDARD statement for consistency because other definitions in the MUTCD are standards. Additionally, the FHWA relocates the existing first STANDARD statement to become part of the new first STANDARD statement at the beginning of the section. There were no comments on these changes, and the FHWA adopts these changes.

The FHWA received several comments from organizations representing the blind community opposed to the proposal to retitle Figure 4E-2 from "Recommended Pushbutton Locations for Accessible Pedestrian Signals" to "Typical Locations for Accessible Pedestrian Signals," because these locations for accessible pedestrian

³⁹ These standards are available from the International Organization for Standardization web site at the following URL: <http://www.iso.ch/iso/en/CatalogueListPage.CatalogueList>.

⁴⁰ Pedestrian Countdown Signals: An Experimental Evaluation, Volume 1, by Jan L. Botha, Aleksander A. Zabyshy, and Jennifer E. Day—San Jose State University, Department of Civil and Environmental Engineering, and by Ron L. Northhouse, Jaime O. Rodriguez, and Tamara L. Nix—City of San Jose Department of Transportation, May, 2002. A copy is available on the docket.

signals are not common or typical at this point in time. The FHWA agrees with these comments and withdraws this proposal. Because the figure illustrates how to apply the GUIDANCE, the title of "Recommended * * *" is more accurate than "Typical * * *". Three commenters from associations representing the blind community commented that the FHWA's arrows symbolizing push buttons in Figure 4E-2 were incorrectly revised in the NPA. The pushbuttons and arrows are shown correctly on this figure in the NPA. They were shown incorrectly in the 2000 MUTCD. The FHWA adopts this change as shown in the NPA.

195. In Section 4E.10 Pedestrian Intervals and Signal Phases, (numbered as Section 4E.09 in the 2000 MUTCD), the FHWA removes from the first OPTION statement the desire to favor the length of an opposing signal phase as a condition for using walk intervals as short as 4 seconds. Three commenters representing associations for the blind community agreed, and the FHWA adopts this revision.

The FHWA received over 15 comments from State and local DOTs, the U.S. Access Board, and private citizens regarding the proposal to increase the pedestrian clearance time so that it is sufficient to allow the pedestrian to clear the full width of the traveled portion of the roadway in the second GUIDANCE statement. Six commenters, representing the U.S. Access Board and associations for pedestrians, bicyclists, and the blind, were in agreement with the change.

Eight commenters, representing Caltrans, the North Carolina, Oregon, and Missouri DOTs, the Cities of Campbell, California, and Dallas, Texas, and a traffic engineering consultant opposed the change, stating cost of retiming, lack of need, increased cycle lengths, and difficulty with signal progression as the basis for their opposition. While the FHWA realizes that this is an issue for which there is significant interest and diverging opinions, the FHWA adopts the language as proposed in the NPA. Despite some potential impacts on agencies, the FHWA believes that it is appropriate to better address pedestrian timing needs and requiring calculation to the far side of the traveled portion of the roadway is now appropriate for adequate pedestrian safety. With the increases in the number of coordinated signal systems, with platoons of vehicles potentially arriving at the intersection at the start of the green indication, and with more prevalent aggressive driving behavior, it is a significant safety concern for

pedestrians to be given only enough clearance time that they are in the middle of a travel lane when the platoon arrives at the start of green. This change will result in only a very small increase in the pedestrian clearance time but will significantly enhance pedestrian safety. The FHWA establishes a phase-in target compliance date of five years for this GUIDANCE, for existing traffic control signals in good condition to minimize any impact on State or local governments.

Additionally, the FHWA adds to the first paragraph of the last OPTION statement the option of containing the pedestrian clearance time within the vehicular green and yellow change intervals. The North Carolina DOT agreed with this change. The FHWA adopts this change as proposed in the NPA. However in a directly related issue, the NCUTCD commented that, in the second paragraph of the STANDARD statement, revisions should be made to prohibit the flashing of the UPRAISED HAND (symbolizing DON'T WALK) indication during the yellow change or red clearance intervals of the concurrent vehicular phase. The NCUTCD stated that this would give pedestrians approximately 4 to 5 seconds of extra time to get to the curb or edge of traveled way prior to the release of opposing traffic, similar to the red clearance interval to which drivers have become accustomed. The FHWA disagrees with this comment because to make the prohibition of flashing UPRAISED HAND extending into the yellow interval apply to all locations without the countdowns would require the opportunity for additional public notice and comment in a future rulemaking action due to the potentially large cost impacts to some jurisdictions that currently have all their controllers set up to display flashing UPRAISED HAND through the yellow interval. However, because of the need for consistency, safety, and uniformity of operation of all countdown pedestrian signal displays, the FHWA adds a new STANDARD statement in this section stating: "If countdown pedestrian signals are used, a steady UPRAISED HAND (symbolizing DON'T 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)." This is for consistency with requirements for countdown pedestrian signal displays adopted in Section 4E.07.

196. In Section 4F.01 Applications of Emergency-Vehicle Traffic Control Signals, the FHWA proposed adding to the OPTION statement the choice of

installing an Emergency Beacon instead of an emergency vehicle traffic control signal. This corresponded to the proposed new Section 4F.04 in the NPA that proposed adding Emergency Beacons as an alternative to Emergency Vehicle Traffic Control Signals. Based on comments on Section 4F.04, the FHWA is not adopting that section. (See also the discussion of Section 4F.04). Therefore, the FHWA withdraws the proposed addition to the OPTION statement in Section 4F.01.

Additionally, the FHWA revises the GUIDANCE statement to recommend following the provisions of Chapter 4D Traffic Control Signal Features not only if a numerical signal warrant is met, but also if a decision is made to install a signal after an engineering study, for consistency with Chapter 4C Traffic Control Signal Needs Study. There was one comment from the City of Tucson, Arizona, in support of this change, and the FHWA adopts this change.

197. In Section 4F.02 Design of Emergency-Vehicle Traffic Control Signals, the FHWA revises the GUIDANCE statement to indicate that two signal faces are required for each major street approach, and that at least one of those two signal faces should be located over the roadway. This change is for consistency with Chapter 4D Traffic Control Signal Features. There was one comment from the City of Tucson, Arizona, in support of this change. The FHWA adopts this change.

198. The NPA included a proposal by the FHWA to add a new section following Section 4F.03 Operation of Emergency-Vehicle Traffic Control Signals. This proposed new section was numbered and titled "Section 4F.04 Emergency Beacon" and contained STANDARDS, SUPPORT, GUIDANCE, and OPTIONS concerning the design, use, and application of Emergency Beacons. Five public agencies, the Caltrans and the Minnesota, North Carolina, Oregon, and Wisconsin DOTs, commented in opposition to the addition of this section, citing many concerns with the Emergency Beacon. Most commenters stated that the proposed new section included non-standard operations and signal displays that are in conflict with driver expectation. Concerns expressed included:

(1) The proposed arrangement of colors of indications within the signal face for an Emergency Beacon is different from all other signal faces. People with red/green color blindness may perceive it to be flashing red and green alternately based on indication location within the signal face;

(2) Under normal traffic signal operation, signal faces must always have at least one indication illuminated while the proposed language requires the signal face to be dark;

(3) Because this is a traffic control signal requiring the motorist to stop, the requirement for two signal faces per approach should still hold. A car driving behind a truck may not be able to see the single indication; and

(4) It is better to keep the operation of this type of a signal uniform with other traffic control signals.

The public agencies also cited concerns about the validity of the studies⁴¹ that were conducted to show that it was a good device. There was only one comment in favor of the Emergency Beacon and that was from a traffic control device manufacturer. Due to overwhelming opposition and valid concerns, the FHWA withdraws this section from this final rule. While the manufacturer of the device has indicated some potential benefits to public agencies, including cost savings compared to a normal Emergency Vehicle Traffic Signal, the serious issues raised by the commenting public agencies indicate that further research is needed before the Emergency Beacon could be considered again in the future.

199. In Section 4G.02 Design of Traffic Control Signals for One-Lane, Two-Way Facilities, the FHWA changes the GUIDANCE statement, concerning the applicability of provisions of Chapter 4D Traffic Control Signal Features to traffic control signals for one-lane two-way facilities and exceptions to these provisions, to a STANDARD statement. One commenter from the City of Tucson, Arizona, agreed with this change. The FHWA adopts this change.

200. In Section 4L.02 Design and Location of Movable Bridge Signals and Gates, the FHWA removes from item A of the STANDARD statement the explanation that three-section signal faces with red, yellow and green signal lenses are generally used if movable bridge operation is quite frequent. In the NPA, the FHWA also proposed adding comparable text in a proposed SUPPORT statement, which would follow the third paragraph of the STANDARD statement. The FHWA received one comment on this change from the NCUTCD, recommending that the proposed SUPPORT be changed to GUIDANCE, to make it more in line with the intent of the previous text in

the 2000 MUTCD and to clarify the language. The FHWA incorporates the NCUTCD's recommended changes in this final rule. In the 2000 MUTCD, the applicable text was in a STANDARD, so it is inappropriate to change it to SUPPORT. A recommendation to consider the use of three-section signal faces when moveable bridge operation is frequent is appropriate, for safety reasons.

Additionally, the FHWA removes the phrase "on long bridges or causeways" from the last paragraph of the second STANDARD statement because two sets of gates may be used on bridges or causeways of any length and what constitutes a long bridge or causeway is not and cannot be readily defined. There were no comments on this change. The FHWA adopts this change.

201. In Section 4J.03 Design of Lane-Use Control Signals, the FHWA adds to the OPTION statement to allow the use of smaller size lane-use control signal faces for one-way and two-way left turn arrows in areas with minimal visual clutter and low speeds. The FHWA changes the definition of low speeds from "70 km/h (45 mph) or less" to "less than 70 km/h or less than 40 mph" to be consistent with similar criteria regarding signal lens sizes in Chapter 4D Traffic Control Signal Features. There were two comments from the NCUTCD and the City of Tucson, Arizona, in support of this change. The FHWA adopts this change with minor editorial revisions in this final rule.

202. In Section 4K.04 Speed Limit Sign Beacon, the FHWA adds to the STANDARD statement a requirement that a Speed Limit Beacon be used only to supplement a Speed Limit sign. One commenter from the City of Tucson, Arizona, agreed with this change. The FHWA adopts this change.

203. In Section 4L.01 Application of In-Roadway Lights, the FHWA revises the SUPPORT statement to include marked crosswalks in advance of roundabout intersections as additional situations for possible use of in-roadway lights. In the NPA, highway-rail grade crossings and highway-light transit rail grade crossings were also included in the statement, however the FHWA removes those elements due to opposition expressed by seven commenters from the NCUTCD, railroad agencies, associations representing railroads, the City of Tucson, Arizona, and a private citizen as well as the lack of sufficient research supporting its use. One commenter from the City of Plano, Texas, specifically agreed with adding the use of in-roadway lights at crosswalks in advance of roundabout intersections.

204. The FHWA received one general comment and two specific comments regarding Section 4L.02 In-Roadway Warning Lights at Crosswalks. A traffic engineering consultant suggested a SUPPORT statement be added to discuss possible trip and fall hazards of lights in crosswalk lines, because they are not readily detected by a blind person's cane. The U.S. Access Board made two suggestions regarding the flash rate for in-roadway warning lights and the use of audible and vibrotactile cues at crossings with in-roadway lights. These comments are beyond the scope of this rulemaking and may be addressed in a future rulemaking.

205. In the NPA, the FHWA proposed to add a new section following Section 4L.02 In-Roadway Warning Lights at Crosswalks. The proposed new section was numbered and titled "ion 4L.03 In-Roadway Lights at Highway-Rail Grade Crossings and Highway-Light Rail Grade Crossings" and contained STANDARD, GUIDANCE, and OPTION statements describing the design, application, and operation of in-roadway warning lights and in-roadway stop line lights at highway-rail and highway-light rail transit grade crossings. Based on the comments received from the NCUTCD, railroad owners, associations representing the railroad industry, the State DOTs of Wisconsin, Ohio, Nevada, and Oregon, the Cities of Plano, Texas, and Tucson, Arizona, the FHWA determines that the proposed addition of this section was premature. Although the concept of using in-roadway flashing lights at grade crossings logically makes sense as a means of increasing driver observance of the crossing, the details of colors, locations, and specific applications of in-roadway lights for grade crossings has not been sufficiently researched to draw supportable conclusions. Such research is underway in California and Michigan, but results will not be available for several years. The commenters in opposition to adding this section make strong arguments and cite some valid concerns. Therefore, the FHWA withdraws the proposed section in its entirety in this final rule and will await research results, prior to consideration of a possible rulemaking on this subject in the future.

Discussion of Adopted Amendments to Part 5—Traffic Control Devices for Low-Volume Roads

206. In Section 5A.03 Design, the FHWA revises the second paragraph of the STANDARD statement to refer to sign sizes on low speed, low volume roads by adding a sentence to this paragraph stating that the minimum

⁴¹ "Special Use Emergency Flashing signals Report", Archie Burnham & Associates, prepared for Richard D. Jones, Right-of-Way, Inc., 1995. This report is available on the docket.

sign sizes shall only be used on low-volume roads where the 85th percentile or posted speed is less than 60 km/h (35 mph). This additional text was recommended in comments received from the NCUTCD indicating that the FHWA should provide clarification about the use of minimum sign sizes on low-volume rural roads. The FHWA believes that it is necessary to clarify the intent of the minimum sign size, to provide adequate safety by preventing signs that are too small to be read at higher speeds from being used on higher speed, low-volume rural roads.

The FHWA received five comments from the NCUTCD, the Oregon and Minnesota DOTs, and a traffic engineering consultant regarding Table 5A-1 Sign Sizes on Low-Volume Roads (titled "Minimum Sign Sizes on Low-Volume Roads" in the NPA and 2000 MUTCD). The NCUTCD suggested a revised table that includes separate columns for Minimum, Typical, and Oversized sizes to provide more information to agencies. The FHWA agrees with this comment and incorporates this revised table into this final rule. The NPA included a proposal to reduce the minimum size of the W20-1, W20-7a, W20-7b, W21-1a, and W21-6 signs from 900 x 900 mm (36 x 36 in) to 600 x 600 mm (24 x 24 in) to be consistent with minimum sizes of other signs of comparable design. The Minnesota and Oregon DOTs opposed the reduction in these sign sizes on grounds of worker safety. The revised table in this final rule includes the 900 x 900 mm (36 x 36 in) as the typical size and 750 x 750 mm (30 x 30 in) as the minimum size for the W20-1, W3-4, W20-7b, and W21-1a signs, and shows 750 x 750 mm (30 x 30 in) as the typical size and 600 x 600 mm (24 x 24 in) as the minimum size for the W21-6 sign. Accordingly, this revised table addresses comments from the DOTs regarding specific sign sizes by providing three possible sizes, rather than just one size, for all of the signs. The FHWA also deletes the NO CENTER STRIPE (W8-12) sign from Table 5A-1 in this final rule, because this sign has little if any application to low volume roads, and adds the PASS WITH CARE (R4-2) and the Two-Direction Large Arrow (W1-7) signs.

207. In Section 5B.03 Speed Limit Signs (R2 Series), the FHWA received five comments from the NCUTCD, the Minnesota, Oregon, and Ohio DOTs, as well as the City of Tucson, Arizona, regarding the proposal to revise the illustration of the R2-1 metric speed limit sign in Figure 5B-1 Regulatory Signs on Low-Volume Roads to correspond to a similar proposed

revision in Chapter 2B Regulatory Signs. In the NPA, the proposed design of the metric speed limit sign included the metric speed value within a red circle with the legend "km/h" below it. Two commenters agreed with the proposal and three opposed it. See discussion regarding Chapter 2B Regulatory Signs where FHWA changes the color of the circle to black.

208. In Section 5B.04 Traffic Movement and Prohibition Signs (R3, R4, R5, R6, R9, R10, R11, R12, R13, and R14), the FHWA adds an illustration of the PASS WITH CARE, (R4-2), sign to accompany the DO NOT PASS (R4-1) sign in Figure 5B-1 Regulatory Signs on Low-Volume Roads because agencies commonly use this sign. The FHWA received one comment from the City of Tucson, Arizona, in support of this change.

209. In Section 5C.05, the FHWA retitles the section from "Narrow Bridge Sign (W5-2a)" to "NARROW BRIDGE Sign (W5-2)" because in Chapter 2C Warning Signs, the FHWA removes the symbol version of this sign and requires the use of only the word version of the sign. There were four comments from the NCUTCD, the Ohio DOT, and the City of Tucson, Arizona, in support of this change, and the FHWA adopts this change. Related to this, the FHWA adds a phase-in target compliance date of 10 years from the effective date of this final rule for the replacement of Narrow Bridge symbol signs, consistent with the phase-in target compliance date for Section 2C.16 NARROW BRIDGE Sign (W5-2).

210. In Section 5C.09 Vehicular Traffic and Nonvehicular Signs (W11 Series and W8-6), the FHWA received two comments from the Arizona and Ohio DOTs regarding the proposal in the NPA to change the section title to "Motorized Traffic and Nonvehicular Signs (W11 Series and W8-6)." The commenters suggested that the terms should be changed to better accommodate bicycles. The FHWA agrees and revises the title by changing "Motorized" to "Vehicular," consistent with changes made in Chapter 2C.

211. In Section 5C.10 Advisory Speed Plaque (W13-1), the FHWA revises the illustration of the metric advisory speed plaque to correspond to a similar revision in Chapter 2C. The design of the metric advisory speed plaque includes the metric speed value within a black circle with the legend "km/h" below it. The FHWA received two comments supporting the change, and two opposed to it. See discussion regarding Chapter 2C where FHWA adopts the use of the metric speed value within a black circle with the legend

"km/h" below it. That discussion also applies to this section.

212. In Section 5C.12 NO TRAFFIC SIGNS Sign (W18-1), the FHWA changes the sign number code in the title and elsewhere in this section and elsewhere in the MUTCD from "W16-2" to "W18-1". The W16-2 code is already assigned to the Distance Ahead Plaque, thus this duplication is corrected by reassigning the NO TRAFFIC SIGNS Sign code to W18-1.

213. In Section 5F.02 Highway-Rail Grade Crossing (Crossbuck) Sign (R15-1, R15-2), the FHWA revises the last paragraph of the STANDARD statement to create two new paragraphs, which are duplicates of text contained in the second standard statement in Section 8B.03 regarding the use of retroreflective strips. The FHWA incorporates this minor editorial change for consistency with other sections of the MUTCD.

214. In Section 5F.04, STOP and YIELD Signs, the FHWA removes the words "State or local" from the OPTION statement, to reflect that jurisdictions responsible for grade crossings may be any level of government or may be quasi-governmental or non-governmental. One commenter from the City of Tucson, Arizona, supported this change. However, another comment from the Wisconsin DOT suggested that if the words "State and local" are removed from this section that this section would then be inconsistent with Section 8B.08 STOP (R1-1) or YIELD (R1-2) Signs at Highway-Rail Grade Crossings, which still refers to State or local highway agencies. The commenter suggested that this section contain similar criteria and guidance to that contained in Section 8B.08. The FHWA agrees in principle; however, it is Sections 2B.04 to 2B.10 that contain the appropriate criteria that should be referenced. The FHWA adopts the changes as proposed in the NPA and includes a cross-reference to Sections 2B.04 to 2B.10.

215. In Section 5G.03 Channelization Devices, the FHWA replaces the second occurrence of the phrase "temporary traffic control zone" with "work space" in the OPTION statement to correspond with the appropriate terminology in Part 6 Temporary Traffic Control. There was one comment from the City of Tucson, Arizona, in support of this change, and the FHWA adopts this change.

216. In Section 5G.05 Other Traffic Control Devices, the FHWA adds a SUPPORT statement referring to Figure 5G-1 for some of the signs that might be applicable in a temporary traffic control zone on a low-volume road. There were two comments in support of this change from the NCUTCD and the City of

Tucson, Arizona, and the FHWA adopts this change.

The FHWA also revises Figure 5G–1 Temporary Traffic Control Signs on Low-Volume Roads, to change the W20–7a Flagger sign to conform with the correctly designed sign in Section 6F.29 Flagger Sign (W20–7a, W20–7). There was one comment from the NCUTCD in support of this change. The FHWA also changes the metric version of the W13–1 Advisory Speed Plaque to conform to the use of the black circle for metric speed values as adopted in Chapter 2C. Two commenters from the Minnesota and Ohio DOTs were opposed to this change, suggesting that the use of the color black and the circle symbol are non-standard, and motorists in the U.S. will not understand. Similar to previous discussions in Chapter 2C, the FHWA disagrees and adopts the change as proposed in the NPA. The NCUTCD suggested that the NO CENTER STRIPE (W8–12) sign be deleted from this figure. The FHWA agrees and deletes the NO CENTER STRIPE sign from the figure, as well as from Table 5A–1, because this sign has little if any application to low volume roads.

Discussion of Adopted Amendments to Part 6—Temporary Traffic Control

217. In the NPA, the FHWA proposed to add to a number of places in sections throughout Part 6, references to ensure that temporary traffic controls involving or affecting pedestrian walkways and paths account for the needs of pedestrians with disabilities. These proposed additions followed the accessibility requirements of the Americans with Disabilities Act of 1990 (ADA) (Pub. L. 101–336, 104 Stat. 327, July 26, 1990. 42 U.S.C. 12101–12213 (as amended)). While the U.S. Access Board, many private citizens and associations representing the blind generally agreed with including the accessibility requirements, there were many comments from private citizens and from the Ohio and Kansas DOTs suggesting that the multiple references were unnecessarily repetitive, and should be handled in a different manner in this final rule. In addition, the Virginia and Oregon DOTs suggested that requirements based on the proposed ADA Accessibility Guidelines for Buildings and Facilities (ADAAG)⁴²

rulings on accessibility of public rights-of-way should not be incorporated until the new guidelines are adopted by the U.S. Access Board. The FHWA notes that the requirements in the MUTCD are not based on the proposed ADAAG ruling, rather they are based on existing laws, such as the Americans with Disabilities Act (ADA).

Based on general comments and a suggestion by the NCUTCD, the FHWA places a common introductory STANDARD statement at the beginning of Sections 6A.01, 6B.01, 6C.01, 6D.01, 6F.01, 6G.01, 6H.01, and 6I.01 to emphasize accessibility provisions. The FHWA revises the reference as the “Americans with Disabilities Act of 1990 (ADA), title II, Paragraph 35.130” to provide a more specific legal reference.

The FHWA also adds a SUPPORT at the beginning of each chapter in Part 6 that the acronym “TTC” refers to “temporary traffic control” and replaces the words with the acronym in many places throughout Part 6. This is in response to a comment from a traffic engineering consultant suggesting that this acronym is well understood and would reduce unnecessary text.

Additionally, the FHWA received comments from the NCUTCD and the Ohio DOT suggesting that the parenthetical reference “(drivers, bicyclists, and pedestrians)” after “road users” be removed, because the term “road users” is already defined as including these entities. There were also arguments from the Florida DOT, the City and County of Denver, Colorado, and many private citizens to retain the text as proposed throughout Part 6 to remind readers of the importance of considering bicyclists and pedestrians. The FHWA includes the parenthetical reference the first time it appears in each chapter, and removes it from many of the remaining occurrences. The FHWA also revises the parenthetical reference to change “drivers” to “motorists” and to include pedestrians with disabilities, to reflect changes to the definition of “road user” that FHWA makes in Part 1 and elsewhere in the MUTCD. Additionally, the FHWA adds, in a number of sections in Part 6, references to the needs of bicyclists through temporary traffic control zones, as many temporary traffic control plans affect a substantial amount of bicycle activity. The FHWA received eight comments from private citizens in support of these changes, and adopts these changes.

218. In Section 6A.01 General, the FHWA received two comments from a traffic engineering consultant opposed to the existing second STANDARD

statement regarding the responsibility for temporary traffic control plans and devices as being that of the public body or official having jurisdiction for guiding road users. There were no significant changes to this statement proposed in the NPA, therefore these comments are outside the scope of this rulemaking.

Additionally, the FHWA adds to a number of places in this section and a number of sections in Part 6, statements that temporary traffic control principles are applicable to managing traffic incidents along the roadway because incidents are temporary road or lane closures and are one of the major causes of congestion. In this regard, the FHWA adds a new chapter titled “Chapter 6I Control of Traffic Through Traffic Incident Management Areas.” There were no specific comments regarding the inclusion of traffic incidents in Chapter 6A, and individual comments regarding Chapter 6I are addressed in the discussion for that chapter.

219. In Section 6B.01 Fundamental Principles of Temporary Traffic Control, the FHWA adds to a number of places in this section references about accounting for the needs of pedestrians with disabilities, bicyclists, and traffic incident management responders.

The FHWA received three comments from the NCUTCD, the City of Charlotte, North Carolina, and a private citizen suggesting that the last paragraph of the second SUPPORT be restored to contain the text in the 2000 MUTCD, which included the sentence, “While these principles provide guidance for good temporary traffic control for the practitioner, they do not establish standards and warrants.” The commenters felt that removing this sentence would change the emphasis of the section to mean that it contains STANDARDS. The FHWA disagrees and does not include this sentence because it is a generic statement in reference to fundamental principles. Only the second and last paragraphs of the section are STANDARDS, the rest are GUIDANCE and SUPPORT.

The FHWA withdraws the proposal to add to the first and second GUIDANCE statements that the needs of pedestrians with disabilities should be considered when planning, designing and establishing a temporary traffic control zone, because this information is now contained in a new STANDARD statement at the beginning of the section.

Additionally, the FHWA adds to the second GUIDANCE statement that the needs of commercial vehicle operators should be assessed and appropriate accommodations made when

⁴² “Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities,” as amended through January 1998, is published by the U.S. Architectural and Transportation Barriers Compliance Board (Access Board), 1331 F Street, NW., Suite 1000, Washington, DC 20004–1111. It may be obtained from the Access Board, or viewed electronically at the following URL: <http://www.access-board.gov/adaag/html/adaag.htm>.

developing a public relations plan for a temporary traffic control zone. The FHWA received two comments from the National Institute for Occupational Safety and Health (NIOSH) and a private citizen supporting this change, and the FHWA adopts this change.

220. In Section 6C.01 Temporary Traffic Control Plans, the FHWA adds to the first GUIDANCE statement that planning for all road users should be part of the planning and design of the temporary traffic control plan. The FHWA also adds a fourth paragraph to the first GUIDANCE statement that provisions for effective continuity of accessible circulation paths for pedestrians should be incorporated into the temporary traffic control process. Several commenters suggested editorial revisions for clarity, which the FHWA agrees with and adopts in this final rule.

221. In Section 6C.02 Temporary Traffic Control Zones, the FHWA proposed to add a sentence at the end of the SUPPORT statement that the incident area begins at the first warning sign or vehicle with a rotating/strobe light and extends to the last temporary traffic control device or to a point where road users are allowed to return to the original lane alignment. The FHWA received two comments from ATSSA and the City of Tucson, Arizona, in support of this change, and one comment from the National Institute for Occupational Safety & Health (NIOSH) suggesting that "warning sign or rotating strobe/lights" may be too specific because flares, cones, or other devices might also be used to warn of an incident ahead. The FHWA agrees that the first responder to an incident might appropriately use other devices, and revises the text in this final rule to indicate that the incident management area begins at the first warning device (such as a sign, light, or cone).

222. In Section 6C.03 Components of Temporary Traffic Control Zones, the FHWA received several comments from the NCUTCD, the City of Charlotte, North Carolina, the Illinois DOT, and a private citizen regarding proposed changes to Figure 6C-1 Component Parts of a Temporary Traffic Control Zone. The FHWA modifies the drawing to show a shoulder taper as one of the potential components of a temporary traffic control zone. The NCUTCD suggested that the shoulder taper should be removed because no other tapers are shown and a shoulder taper is not required in the situation pictured. The City of Charlotte, North Carolina, and a private citizen indicated that the advance warning area was referenced incorrectly to the beginning of the shoulder taper, rather than the

beginning of the merge taper. The FHWA believes that the intent of the figure is to show all of the potential components of a temporary traffic control zone, rather than a specific example, and the shoulder taper should be included in the figure. However, the FHWA revises the figure to more accurately show the shoulder taper in advance of the merge taper, and dimensions the Advance Warning Area to the start of the merge taper, as suggested by the two commenters. The FHWA also includes advance warning signs on both sides of the one-way roadway as suggested by the City of Charlotte, North Carolina, and a private citizen. The FHWA labels the area above the Work Space as a Buffer Space (longitudinal). The City of Charlotte, North Carolina, and a private citizen stated that this area is not considered a buffer space because it is downstream of the Work Space. The FHWA disagrees with the commenters because the OPTION statement in Section 6C.06 Activity Area indicates that buffer spaces may be positioned either longitudinally or laterally with respect to the direction of road user flow, and that the activity area may contain one or more lateral or longitudinal buffer spaces.

223. In Section 6C.04 Advance Warning Area, the FHWA received several comments from the City of Charlotte, North Carolina, and private citizens about the sign spacings shown in Table 6C-1 Suggested Advance Warning Sign Spacing. There were no changes proposed to this table in the NPA, therefore the comments regarding the distances shown in this table are outside the scope of this rulemaking and such changes would need to be addressed in a future rulemaking. The FHWA notes that these are suggested sign spacings and actual placement may be adjusted in order to improve sign visibility due to roadway geometry, intersections or driveways, or other factors, based on engineering judgment.

224. In Section 6C.06 Activity Area, the FHWA adds a new table numbered and titled "Table 6C-2 Stopping Sight Distance as a Function of Speed." This table is identical to Table 6E-1. The current Table 6C-2 is renumbered as Table 6C-3, Taper Length Criteria for Temporary Traffic Control Zones. The FHWA received two comments from the Wisconsin DOT and the City of Tucson, Arizona, in support of this new table, two comments from the City of Charlotte, North Carolina, and a private citizen suggesting that this table be titled "Guidelines for Longitudinal Buffer Lengths," and three comments from the City of Charlotte, North

Carolina, and private citizens opposed to the values in the new table. The commenters who opposed the values in the table suggested that the values from Table 6E-1 of the 2000 MUTCD should be used because they represent a buffer length based upon the braking distance that would provide adequate opportunity to stop before entering a workspace. These commenters also suggested that the proposed longer lengths would result in inordinately and unnecessarily long buffers, which will encourage misuse and potentially lack of use, particularly in urban areas. The FHWA disagrees because this table is referenced in an OPTION statement, and practitioners may use discretion in determining the lengths of longitudinal buffer spaces. The FHWA adopts the table, as proposed in the NPA.

The FHWA adds a reference to new Table 6C-2 to the second OPTION statement, as these distances may be used to determine the length of the longitudinal buffer space. The FHWA received two comments from the Illinois DOT and a private citizen suggesting this change, and the FHWA revises the statement slightly in this final rule to add clarity.

In the third SUPPORT statement, the FHWA proposed to remove the phrase "formidable device" as well as the reference to arrow panels as they relate to determining buffer spaces. The FHWA received one comment from a private citizen in support of this change, and three comments from the NCUTCD, the City of Charlotte, North Carolina, and a private citizen opposed it. Those commenters who opposed the change suggested restoring the 2000 MUTCD wording, or offered alternate wording. They also suggested that this SUPPORT statement be combined with the second SUPPORT statement. The FHWA agrees to reword the sentence in the SUPPORT statement to state, "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." The FHWA does not combine the second and third SUPPORT statements in this final rule.

In the last GUIDANCE statement, the FHWA adds that incident response storage areas should not extend into any portion of the buffer space. The FHWA received two comments from the City of Charlotte, North Carolina, and a private citizen suggesting that this GUIDANCE should be a STANDARD. The FHWA disagrees because of the flexibility that is needed to respond to unplanned

incidents therefore, this statement remains a GUIDANCE in this final rule.

225. In Section 6C.07 Termination Area, the FHWA clarifies the STANDARD statement to indicate that temporary traffic control devices other than END ROAD WORK signs can be used to signify the end of a termination area. The FHWA received one comment from the City of Tucson, Arizona, in support of this change, and one comment from a private citizen opposed to it. The opposing commenter suggested that the STANDARD statement be deleted or changed to an OPTION because the many work zones have no deviation from the normal path. The FHWA disagrees with changing the STANDARD statement because it is clear that if road users have not been diverted from their normal path, then a termination area would not be needed, and this section would not apply. The FHWA adopts the change as proposed in the NPA.

To provide flexibility to jurisdictions, the FHWA adds to the OPTION statement that a longitudinal buffer space may be used between the work space and the beginning of the downstream taper. The FHWA received one comment from the NCUTCD opposed to this change, stating that the paragraph should be deleted because the area between the work space and the beginning of the downstream taper is not a buffer space. The FHWA disagrees because such a buffer space could be used in a variety of locations, such as for a center lane closure on a multi-lane undivided highway or on a two-lane, one-way operation. The FHWA adopts this change as proposed in the NPA.

The FHWA also received two comments from the City of Charlotte, North Carolina, and a private citizen suggesting that an additional paragraph be added to the OPTION stating that the use of END ROAD WORK signs is optional for most daytime maintenance and utility operations. The FHWA disagrees that this sentence is needed because there are several terms within the section to indicate that use of an END ROAD WORK sign is not mandated for termination areas.

226. In Section 6C.08 Tapers, the FHWA revises the first GUIDANCE statement to indicate that the appropriate taper length should be determined using the criteria in Tables 6C-3 and 6C-4 to address a comment from a private citizen stating that the word "minimum" does not accurately describe the taper lengths in the table. The FHWA agrees that the change is needed to correct the error, and revises the GUIDANCE statement in this final rule. The same commenter suggested

that the FHWA also revise the second paragraph of the GUIDANCE statement, to remove the word "maximum" when referring to the distances between devices in a taper. The FHWA disagrees because it would not be acceptable to have longer spacing unless there is a good engineering reason to do so. The FHWA also inserts a new table numbered and titled, "Table 6C-4 Formulas for Determining Taper Lengths" immediately following Table 6C-3. This table contains the formulas that were included as notes to Table 6C-3 in the NPA, except that they are included in a tabular format for clarity. This table is also identical to Table 6H-4.

In the fifth GUIDANCE statement, the FHWA deletes the word "minimum" from the description of the length of a downstream taper in this final rule. The FHWA received two comments from the City of Charlotte, North Carolina, and a private citizen suggesting the word "minimum" be replaced with the word "maximum," however the FHWA disagrees. Criteria for downstream tapers, as shown in Table 6C-3 indicate a set distance, not a minimum or maximum length.

The FHWA received three comments from the Ohio DOT, the City of Charlotte, North Carolina, and a private citizen suggesting changes to the shifting and downstream taper entries in Table 6C-3. Because there were no changes proposed to this table (other than the table number), these comments are outside the scope of the NPA. Such changes would need to be proposed in a future rulemaking.

The FHWA revises Figure 6C-3 Example of a One-Lane, Two-Way Traffic Taper to illustrate a downstream longitudinal buffer space (between the work space and traffic from the open-lane approach); a downstream taper, noted "100 ft MAXIMUM;" shifts the flagger and warning sign symbols on the open-lane approach accordingly so that the flagger is stationed well beyond the last cone in the downstream taper; and on both approaches, shift the END ROAD WORK symbols so that they are opposite the last warning signs.

227. In Section 6C.10 One-Lane, Two-Way Traffic Control, the FHWA received two comments from the City of Charlotte, North Carolina, and a private citizen suggesting that an OPTION be added after the STANDARD statement to indicate that where traffic speeds and volumes are low, and where the work area is short and sight distance is good, vehicular traffic may be self-regulating. The FHWA disagrees with adding this language at this time because similar text is already included in the

SUPPORT statement. Changing that SUPPORT to an OPTION may be considered in a future rulemaking.

The FHWA received two comments from the same commenters suggesting that the last paragraph of the GUIDANCE be revised to delete pilot cars as one of the means for controlling opposing traffic flows on a one-lane roadway where affected traffic is not visible from one end to the other because a pilot car alone cannot coordinate traffic movements at both ends of the operation. The FHWA agrees with the commenter and, rather than deleting the option to use a pilot car, the FHWA clarifies that a pilot car uses a flagger as defined in Section 6F.54 PILOT CAR FOLLOW ME Sign (G20-4).

228. In Section 6D.01 Pedestrian Considerations, the FHWA proposed adding a new GUIDANCE statement at the beginning of the section to indicate that pedestrians of all ages and abilities should be provided a detectable and usable travel path. The FHWA received one comment from the NCUTCD opposed to the new GUIDANCE, suggesting that the text be reworded and classified as a SUPPORT statement. The FHWA disagrees and adds the introductory STANDARD statement at the beginning of this section to emphasize accessibility provisions, as discussed above at the start of the Part 6 discussion.

In the NPA, the FHWA proposed modifying the second SUPPORT statement to include information on other publications that can provide useful data for assisting the planning for, and the design of, pedestrian facilities. The FHWA received one comment from the NCUTCD opposing this language and suggesting that a new Section 6D.02 Accessibility Considerations be added. The FHWA also received three comments from commenters representing the visually disabled community suggesting additional wording to clarify that speech messages provided by an audible information device are more helpful to pedestrians with disabilities than Braille and raised character signs. The FHWA agrees with the commenters and withdraws the proposed language. In this final rule, the FHWA adds Section 6D.02 Accessibility Considerations and revises Section 6D.01 by adding two paragraphs to the SUPPORT with more detailed information describing how to provide information to pedestrians with visual disabilities via audible messages, and adds a GUIDANCE statement recommending locator tones be used with pushbuttons, to be consistent with Part 4 of the MUTCD.

Additionally, the FHWA proposed adding to the second STANDARD statement that in addition to visual signage, equivalent information in alternate formats for pedestrians who have visual disabilities shall be provided so that they are not trapped on a closed facility. The FHWA received four comments from the NCUTCD, the Wisconsin DOT, the City of Charlotte, North Carolina, and a private citizen opposed to the new text, stating that it is an unreasonable requirement for all sidewalks, or that it should be a GUIDANCE, rather than a STANDARD. The NCUTCD, the City of Charlotte, North Carolina, and a private citizen suggested that the text be revised to explicitly state that where pedestrians with visual disabilities normally use the closed crosswalk, a barrier 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 crosswalk. The FHWA agrees with the suggested text and adopts that text in this final rule. The FHWA also received two comments from the City of Charlotte, North Carolina, and a private citizen suggesting that the existing first sentence, requiring advance notification of sidewalk closures by the entity conducting the work was vague. The FHWA agrees and expands the sentence in this final rule to indicate that advance notification of sidewalk closures shall be provided to the maintaining agency.

The FHWA adds to the second SUPPORT statement that pedestrians are reluctant to add distance or out-of-the-way travel to a destination. The NCUTCD opposed this new text and three commenters representing associations for the blind community suggested including additional text regarding the types of barriers that are detectable by a person with visual disability. The additional information regarding barrier types goes beyond the scope of this rulemaking and the FHWA adopts the changes as proposed in the NPA.

In the second GUIDANCE, the FHWA proposed adding information about the general needs of pedestrians with disabilities. The NCUTCD opposed the additional information, the City of Charlotte, North Carolina, and a private citizen requested more information, and three commenters representing associations for the blind community opposed the text as written in the NPA, but suggested new text. The FHWA agrees with the suggested text from the associations for the blind community, which provides additional information regarding how to communicate with pedestrians with visual disabilities in

order to alert them to blocked routes, alternate crossings, and sign and signal information. The FHWA adopts this text in this final rule.

The FHWA proposed to revise item C of the second GUIDANCE statement to include accessible paths as well as provisions for pedestrians who have visual disabilities in planning for pedestrians in temporary traffic control zones. The NCUTCD opposed the revision, suggesting that this information be included in a new Section 6D.02 Accessibility Considerations. The City of Charlotte, North Carolina, and a private citizen requested additional information regarding how to provide audible warnings, and three commenters representing associations for the blind community suggested new wording to incorporate the need to provide pedestrians with visual disabilities with instructions, as well as a reference to accessible pedestrian signals. The FHWA agrees with the suggested text from associations representing the blind community, and adopts the revised language with the additional information in this final rule.

The FHWA also adds to the second GUIDANCE statement that a pedestrian route should not be severed and/or moved for nonconstruction activities such as parking for vehicles and equipment. The FHWA received one comment from the Florida DOT in support of this change, and one comment from the NCUTCD opposed, stating redundancy. The FHWA adopts the change as proposed in the NPA.

The FHWA proposed expanding the third GUIDANCE statement to include additional information regarding how to delineate a pedestrian footpath through or around a work site. The NCUTCD opposed the revision, suggesting a new Section 6D.02 Accessibility Considerations be added. A commenter from the City of Charlotte, North Carolina, and a private citizen requested additional clarification, and three commenters representing associations for the blind community suggested rewording to reference Section 6F.65 Temporary Traffic Barriers as Channelizing Devices for a description of detectable barriers. To address the comments, the FHWA clarifies the wording to indicate that if the previous pedestrian facility was accessible to pedestrians with disabilities, then the footpath provided during temporary traffic control should also be accessible, and to denote additional information regarding grades and use of barriers and channelizing devices.

The FHWA also adds an OPTION statement that wherever it is feasible,

closing off the work site from pedestrian intrusion may be preferable to channelizing pedestrian traffic along the site with temporary traffic control devices.

The FHWA adds a new SUPPORT statement following the third GUIDANCE to provide information on how to communicate pedestrian routes to pedestrians with disabilities. The FHWA received one comment from the NCUTCD opposed to this new statement, two comments from the City of Charlotte, North Carolina, and a private citizen requesting additional clarification and three comments from associations representing the blind community suggesting rewording of the statement to clarify the use of audible instructions, which the FHWA adopts in this final rule.

In the NPA, the FHWA proposed to expand the third GUIDANCE statement to indicate that fencing should be continuous and detectable. The FHWA withdraws this proposal because this information is included in new Section 6D.02 Accessibility Considerations in this final rule.

In the NPA, the FHWA proposed to expand the first paragraph of the fourth GUIDANCE statement to indicate that ballast and other elements should not intrude into the accessible passage. The FHWA withdraws this proposal, because this information is included in new Section 6D.02 Accessibility Considerations in this final rule.

The FHWA expands the last paragraph of the fifth GUIDANCE statement to clarify that access to work space by equipment as well as workers across pedestrian walkways should be minimized. The FHWA received one comment from the NCUTCD opposed to this change, citing disagreement with the wording regarding accessibility. The FHWA disagrees with the commenter and adopts the change in this final rule.

In the NPA, the FHWA proposed to expand the third paragraph of the fifth GUIDANCE statement to include information about pedestrian accessibility and to add a paragraph at the end of the fifth GUIDANCE statement to indicate that audible information be provided at locations where a temporary pedestrian crossing is implemented. The FHWA received one comment from the NCUTCD opposed to these changes, suggesting that this information is repetitive. The FHWA withdraws these proposals, because this information is included in new Section 6D.02 Accessibility Considerations in this final rule.

The FHWA removes the second sentence from the sixth SUPPORT statement regarding the use of tape,

rope, and other devices along a designated pathway. The FHWA received two comments from the City of Charlotte, North Carolina, and a private citizen opposed to the removal of the sentence. The commenters did not provide a justification for their opposition, and the FHWA removes the sentence in this final rule, because these devices should not be used where persons with visual disabilities are expected and because use of these devices is strongly discouraged in any case.

In the NPA, the FHWA proposed to add a paragraph at the beginning of the last GUIDANCE statement to indicate that tape, rope, and other devices are not detectable and should not be used as a control for pedestrian movements. The FHWA received one comment from the NCUTCD opposed to this change. The FHWA believes that this information is important to provide safe passage for persons with visual disabilities and adopts this text, as proposed in the NPA, in this final rule. The FHWA also expands the (new) second paragraph of this GUIDANCE to emphasize that pedestrian routes should be preserved in urban and commercial suburban areas and that alternate routing should be discouraged. The FHWA received one comment from the NCUTCD opposed to this language; however, to emphasize the importance of pedestrian routes in these areas, the FHWA adopts this language in this final rule.

In the NPA, the FHWA proposed to add a SUPPORT statement at the end of Section 6D.01 to state that the absence of a continuous passage, including accessible features, might preclude the use of the facility by pedestrians with disabilities. The FHWA received one comment from the NCUTCD opposed to this new paragraph, and the FHWA withdraws this proposal, because this information is included in new Section 6D.02 Accessibility Considerations in this final rule.

The FHWA establishes a phase-in target compliance date of five years from the effective date of this final rule for the changes in this section, which in turn affects many other sections in Part 6. However, this does not affect the obligations placed on governments by the ADA laws and regulations.

229. The FHWA adds a new section numbered and titled, "Section 6D.02 Accessibility Considerations." This new section contains SUPPORT, GUIDANCE, and STANDARD statements specific to pedestrian accessibility, including pedestrians with visual disabilities, in temporary traffic control zones. The FHWA received several comments

suggesting that the accessibility information that was repeated throughout Part 6 in the NPA should be consolidated into one location. While the FHWA includes some accessibility information in each chapter of Part 6 in this final rule, the FHWA includes this new section to provide all of the necessary information in one place. The dual provisions provide the practitioner with the necessary emphasis to ensure that there is consideration of the accessibility needs for persons with disabilities in the planning, design, implementation and operation of temporary traffic control zones. The FHWA strongly supports provisions in the MUTCD that provide accommodations for all pedestrians and road users. The FHWA establishes a five year phase-in target compliance date from the effective date of this final rule for accessibility considerations in temporary traffic control zones, which in turn affects many other sections in Part 6.

230. In Section 6D.03 Worker Safety Considerations (numbered and titled Section 6D.02 Worker Considerations in the NPA), the FHWA changes the title as suggested by NIOSH, because the first SUPPORT statement in this section rightly indicates that worker safety is equally as important as road user safety. The FHWA also adds to the SUPPORT statement information on the need to separate workers on foot from moving construction vehicles. The FHWA received one comment from the NCUTCD opposed to this new language, suggesting that the issues covered in the new text are covered by the Occupational Safety and Health Administration (OSHA) regulations and should not be included in the MUTCD. The Laborers' Health and Safety Fund of North America and NIOSH expressed support for the new language, stating that including this language in the MUTCD is very important, because it emphasizes the hazards to workers on foot created by moving construction vehicles and equipment within the work zone. Comments from the Kansas DOT and NIOSH suggested editorial revisions, which the FHWA adopts in this final rule.

In the NPA, the FHWA proposed adding to the GUIDANCE statement that workers exposed to the risks of moving roadway traffic or construction equipment should wear high visibility apparel meeting the requirements of the American National Standard for High Visibility Safety Apparel⁴³ and labeled

as meeting ANSI 107-1999 Standard Performance for Class 1, 2, or 3 risk exposure. The FHWA received seven comments from the North American Association of Transportation Safety and Health Officials (NAATHSO), ATSSA, the Virginia DOT, Caltrans, the Laborers' Health and Safety Fund of North America, NIOSH, and a traffic control device manufacturer in support of this change, three of which suggested stronger language to change this to a STANDARD. The FHWA received thirteen comments from the NCUTCD, contractors, and State and local highway agencies opposed to the proposed safety apparel recommendations. The FHWA adopts the wording, as proposed in the NPA, but makes changes in Section 6E.02 High Visibility Safety Apparel to address issues regarding high-visibility flagger safety apparel.

While NIOSH supported the proposed wording that a "competent person" be responsible for the worker safety plan within the activity area, several commenters representing State and local highway agencies and contractors opposed the language, stating that the phrase was vague. The FHWA believes that this language is not vague and that it is specific enough to be reasonably applied by jurisdictions. The FHWA adopts the text as proposed in the NPA.

In the NPA, the FHWA proposed a phase-in target compliance date of five years from the effective date of this final rule for this change. The FHWA received comment from the International Safety Equipment Association (ISEA) and the Laborers' Health and Safety Fund of North America, indicating that worker clothing is an expendable item that wears out quickly and must be replaced much sooner than five years and therefore no special phase-in target compliance date is needed. Other commenters suggested that a shorter phase-in target compliance date is advisable because of the important safety benefits of high visibility safety apparel. The FHWA believes that high-visibility safety apparel for all workers, including supervisors, is very important for safety in temporary traffic control areas. Not all worker clothing wears out and is replaced quickly, especially the safety apparel worn on the job site by supervisors and managers. To provide for a reasonably rapid implementation of this important change while

purchase from ISEA—The Safety Equipment Association, by telephone (703) 525-1695, facsimile (703) 528-2148, mail ISEA, 1901 North Moore Street, Suite 808, Arlington, VA 22209. Also, a summary of information about the three classes of apparel in the standard is available at the following URL: <http://www.safetysystem.org/hivisstd.htm>.

⁴³ "American National Standard for High Visibility Safety Apparel," ANSI/ISEA 107-1999, 1999 Edition, or equivalent revision, is available for

minimizing impacts on State and local governments, the FHWA establishes a three-year phase-in target compliance date from the effective date of this final rule for the changes regarding worker safety apparel.

Additionally, in the same GUIDANCE statement, the FHWA adds "Activity Area" to the list of key elements of worker safety and temporary traffic control management that should be considered to improve worker safety. The FHWA received two comments from Laborers' Health and Safety Fund of North America and NIOSH in support of this new text, and one comment from the NCUTCD opposed to it. The NCUTCD suggested that this text is already covered in Chapter 6B. The FHWA disagrees because worker safety is very important and early planning is where many significant worker safety improvements can be made. The FHWA adopts the new text in this final rule, with minor editorial changes.

The FHWA includes "Worker Safety Planning" to the list of key elements of worker safety and temporary traffic control management that should be considered to improve worker safety. The worker safety plan should be in accordance with the Occupational Safety and Health Act of 1970, "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 in accordance with the Occupational Safety and Health Administration (OSHA) Regulations as found in 29 CFR 1926.20(b)(2). While NIOSH supported this new language, there were comments from the NCUTCD, the Virginia, Kansas, California, and North Carolina DOTs, the City of Charlotte, North Carolina, and a private citizen opposed to it. The opposing commenters suggested that the information in this paragraph is beyond what would be typical MUTCD material. The FHWA disagrees with the opposing commenters because this is GUIDANCE rather than a STANDARD, and the FHWA adopts this text to emphasize the importance of worker safety and to assure that the applicable laws and regulations are referenced.

The FHWA adds a new SUPPORT statement at the end of the section that contains information previously included in item E of the GUIDANCE statement regarding the judicious use of special devices to maintain their effectiveness. The FHWA received one comment from NIOSH opposing this change, stating that the statement merits continued emphasis in order to prevent misuse. The FHWA disagrees because

the original placement of this statement in item E made it erroneously appear to be an OPTION, when in fact it was a SUPPORT. The FHWA adopts the change as proposed in the NPA.

231. In Section 6E.01 Qualifications for Flaggers, the FHWA rewrites the GUIDANCE statement in its entirety to describe in terms more appropriate to a temporary traffic control zone environment the recommended skills and abilities for a flagger. This change reflects the state of the practice in flagger selection and training. The FHWA received no comments regarding this change, and adopts this change.

232. In Section 6E.02 High-Visibility Safety Apparel (titled High-Visibility Clothing in the NPA), the FHWA proposed to add to the first STANDARD statement the requirement that flaggers wear safety apparel meeting the requirements of the American National Standard for High Visibility Apparel and labeled as meeting ANSI 107–1999 Standard Performance for Class 3 risk exposure, to improve worker visibility to approaching road users. While the FHWA received six comments from ATSSA, the Virginia DOT, the City of Tucson, Arizona, the International Safety Equipment Association, the Laborers' Health and Safety Fund of North America, and NIOSH in support of using Class 3 high visibility safety apparel for flaggers under all conditions, there were sixteen comments from the NCUTCD, ATSSA, NAATSHO, the South Carolina, North Carolina, Wisconsin, and Oregon DOTs, contractors, and a private citizen opposed to it, at least for daytime activity. Several commenters stated that with the extreme heat conditions in the South, Midwest, and Western States that their workers endure in the summer, wearing the required uniform jacket and pants or jumpsuit would create more health problems. Based on all of the docket comments, the FHWA agrees that Class 3 high visibility safety apparel for flagger activity should not be a requirement. Instead, the FHWA establishes that, for both day and night time activity, Class 2 high visibility safety apparel shall be required. The FHWA also concludes that for nighttime flagger activity, Class 3 high visibility safety apparel should be considered for flagger wear rather than Class 2. Even with the requirements for flagger stations to be illuminated for night activity that the FHWA establishes in Section 6E.05 Flagger Stations, Class 3 safety apparel should at least be considered for nighttime flagger wear because of its increased retroreflective surface area. The FHWA revises the

STANDARD statement and adds a GUIDANCE statement accordingly.

In the NPA, the FHWA proposed a phase-in target compliance date of five years for this change. The FHWA received comments from ATSSA and the Virginia DOT indicating that flagger clothing is considered expendable because it wears out and must be replaced much sooner than five years and therefore no special phase-in target compliance date is needed. Other commenters suggested that a shorter phase-in target compliance date is advisable because of the important safety benefits of high visibility safety apparel. The FHWA believes that high-visibility safety apparel for all flaggers, including supervisors who sometimes perform this duty, is very important for safety in temporary traffic control areas. Not all worker clothing wears out and is replaced quickly, especially the safety apparel worn on the job site by supervisors and managers. To provide for a reasonably rapid implementation of this important change while minimizing impacts on State and local governments, the FHWA establishes a three-year phase-in target compliance date from the effective date of this final rule for the changes regarding flagger safety apparel.

233. In Section 6E.03 Hand-Signaling Devices, the FHWA proposed in the NPA to add to the OPTION statement other design configurations for adding white lights to the STOP/SLOW paddle to improve visibility and conspicuity. The FHWA received two comments from the City of Tucson, Arizona, and the Laborers' Health and Safety Fund of North America in support of the proposed changes and nine comments from NCUTCD, the Arizona DOT, Caltrans, private citizens, and traffic control device manufacturers opposed to it. The opposing commenters suggested that red and yellow lights should also be permitted, and that the information regarding the design configurations needed more detail. The FHWA agrees that these other colors of lights will be helpful to road users at night, as determined by a New York State study.⁴⁴ Therefore, the FHWA revises the OPTION statement in this final rule to include the use of red and yellow lights, as appropriate. The FHWA also adds two new paragraphs to the following STANDARD statement to provide appropriate restrictions on the mixing of colors of lights on the STOP

⁴⁴ A copy of "Effectiveness of STOP/SLOW Paddles Equipped With Flashing Red and Flashing Yellow Lights," Experiment VI–117(E) STOP SLOW PADDLE, by Daniel Paddick, P.E., New York State Department of Transportation, is available on the docket.

and SLOW paddles, and well as additional information regarding the arrangement of lights on the paddles.

The FHWA adds to the second STANDARD statement requirements for the performance of flashing lights that are used on the STOP/SLOW paddle. These flashing rate values are identical to the flashing rate used in other parts of the MUTCD. Five commenters representing the New York State Assembly, traffic control device manufacturers, and a private citizen suggest that "triple" flash modes be allowed; however, the FHWA disagrees because such high flash rates would appear more like a flicker than a flash and those rates would be close to the flash rates that may cause epileptic seizures.⁴⁵ The FHWA adopts the change, as proposed in the NPA.

234. In Section 6E.05 Flagger Stations, the FHWA revises the first STANDARD statement to indicate that flagger stations shall be located such that approaching road users will have sufficient distance to stop at an intended stopping point. The FHWA received one comment from the City of Tucson, Arizona, in support of this change, and two comments from the City of Charlotte, North Carolina, and a private citizen opposed to it. Those who opposed the change suggested that it should be changed to a GUIDANCE. The FHWA disagrees because it is important that flagger stations be located where approaching road users can safely stop, and adopts the change in this final rule.

To enhance worker safety, the FHWA adds a GUIDANCE statement following the first OPTION statement to indicate that flagger stations should be located so that an errant vehicle has space to stop without entering the work space. The FHWA received one comment from the Laborers' Health and Safety Fund of North America specifically in support of this new statement. In the NPA, the FHWA proposed that this statement appear after the first STANDARD statement; however, a commenter from the City of Charlotte, North Carolina, and a private citizen suggested moving it further back in the section to tie in better with the adjacent statements. The FHWA agrees and adopts this new GUIDANCE statement in this final rule.

In the NPA, the FHWA proposed changing the first SUPPORT statement to indicate that the Table 6E-1 provides information regarding the stopping sight distance as a function of speed. The FHWA received one comment from the Illinois DOT opposed to this change, stating that the use of Table 6E-1 is currently clear in the text and title of the table in the 2000 MUTCD. The FHWA disagrees because the revised SUPPORT statement matches the new title of the table, which provides the stopping sight distances for various speeds. The FHWA adopts the change; however, the FHWA incorporates the text into the following OPTION statement in this final rule.

The FHWA revises the first OPTION statement to indicate that the distances shown in Table 6E-1 may be used for the location of a flagger station. The FHWA received one comment from NIOSH in support of this change; however, two commenters from Caltrans and the City of Charlotte, North Carolina, and a private citizen opposed to it. The opposing commenters suggested that the FHWA retain the language from the 2000 MUTCD indicating that the distances may be increased for downgrades and other conditions that affect stopping distance. The FHWA agrees and modifies the OPTION statement to include this additional information in this final rule.

The FHWA changes the title of Table 6E-1 from "Distance of Flagger Stations in Advance of the Work Space" to "Stopping Sight Distance as a Function of Speed" and changes the distance values to be in agreement with AASHTO's "A Policy on Geometric Design of Highways and Streets."⁴⁶ The FHWA received three comments from the Laborers' Health and Safety Fund of North America, NIOSH, and the City of Tucson, Arizona, in support of this change, and adopts this change.

Additionally, the FHWA changes the GUIDANCE statement (in the 2000 MUTCD) to a STANDARD statement to indicate that, except in emergency situations, flagger stations shall be preceded by an advance warning sign or signs and that, except in emergency situations, flagger stations shall be

illuminated at night. The FHWA believes that anytime a flagger is active at night, illumination of the flagger station is important to make the flagger more visible to approaching road users. The FHWA received one comment from a private citizen suggesting that more detail be provided to specify the meaning of "illumination," and five comments from the Kansas and Wisconsin DOTs, the City of Charlotte, North Carolina, and a private citizen suggesting that this statement remain a GUIDANCE because during emergencies, where flagging is needed at night, portable lighting units are not always available. The FHWA agrees that lighting and/or advance warning signs are not always available for emergency situations, and revises the STANDARD statement to exclude emergency situations.

235. In Section 6F.01 Types of Devices, the FHWA adds a SUPPORT at the beginning of this chapter defining the acronym "TTC" as discussed above at the start of the Part 6 discussion. The FHWA also adds a new SUPPORT statement that includes a reference to the FHWA's policy⁴⁷ requiring that all roadside appurtenances on the National Highway System meet crashworthy performance criteria and referring to and repeating the definition of crashworthy as stated in Section 1A.13 Definitions of Words and Phrases in this Manual. The FHWA adds these statements to consolidate information, to emphasize FHWA policies regarding accessibility and crashworthiness, and to be consistent with crashworthiness provisions in Section 6F.03, 6F.58, 6F.53, 6F.66, and 6F.82.

The FHWA also relocates the final OPTION and SUPPORT statements from this section, and places them in Section 6F.02 General Characteristics of Signs, because this information regarding sign colors is more appropriate in that section. The FHWA makes this minor editorial change to move these statements for clarity and consolidation with other text regarding sign colors.

236. In Section 6F.02 General Characteristics of Signs, following the first STANDARD statement, the FHWA inserts OPTION and SUPPORT statements regarding the color of warning signs in temporary traffic control zones. These statements were in Section 6F.01 in the NPA and 2000 MUTCD, however the FHWA moves them to this section in this final rule where they are more appropriate.

⁴⁵ The website of the National Society for Epilepsy, a professional society in the United Kingdom that specializes in epilepsy, states that a flash rate of 5 to 30 hertz (flashes per second) can cause seizures in some people. This information is available at the following URL: <http://www.epilepsynse.org.uk/pages/info/leaflets/photo.cfm>. A variety of websites of U.S. organizations also refer to the problem of photosensitivity (triggering of seizures by flickering lights) among epileptic persons.

⁴⁶ "A Policy on Geometric Design of Highways and Streets," 4th Edition, 2001, in both hardcopy and CD-ROM, is available from the American Association of State Highway and Transportation Officials (AASHTO) by telephone (800) 231-3475, facsimile (800) 525-5562, mail AASHTO, P.O. Box 96716, Washington, DC 20090-6716, or at its Web site <http://www.transportation.org> and click on Bookstore. This document is a guide, based on established practices and supplemented by research, to provide guidance to the highway designer to provide for the needs of highway users while maintaining the integrity of the environment. It is incorporated by reference into the CFR at 23 CFR 625.4.

⁴⁷ Information on the FHWA policy is available at the following URL: http://safety.fhwa.dot.gov/programs/roadside_hardware.htm

The FHWA adds to the second OPTION statement that warning and guide signs used for temporary traffic control of incident management situations may have a black legend and border on a fluorescent pink (referred to as coral in the NPA) background. The FHWA received one comment from the Virginia DOT in support of this change, and one from a traffic control device manufacturer opposed to it. The opposing commenter, representing the sign manufacturing industry, suggested that stronger language changing this to a GUIDANCE would help define the use of the color for this application and reduce confusion, resulting in increased recognition and association with incidents on the part of the road user. The FHWA disagrees because of the unplanned nature of incidents and the varied agencies and capabilities of first responders, agencies should have the ability to continue to use orange signs in incident management situations. Use and experience with the fluorescent pink color over time will increase awareness. The FHWA adopts the optional color fluorescent pink in this final rule.

The FHWA adds a new table, numbered and titled, "Table 6F-1 Sizes of Temporary Traffic Control Signs" showing the sizes of temporary traffic control warning signs to facilitate the proper use of signs in temporary traffic control zones. This table contains the sizes that were illustrated with the individual signs in the figures in Chapter 6F in the NPA. This table consolidates the information in one location for clarity and easy reference. The FHWA references this table in the second STANDARD statement. The FHWA also revises the third OPTION statement to indicate that the dimensions of signs shown in Table 6F-1 may be increased wherever necessary for greater legibility or emphasis. The FHWA adds this table and makes these changes to respond to a comment from Caltrans suggesting that a table of sign sizes in Part 6 would better serve users than having the information spread throughout the part, and to clarify dimensions related to the class of highway on which the various sizes are recommended. The FHWA also removes sign sizes from the pages of sign images throughout this chapter, because this table consolidates all information regarding sign sizes in one location.

The FHWA revises the wording and changes the last SUPPORT statement, regarding external sign illumination, to a STANDARD because of the need for consistency with requirements throughout other areas of the MUTCD. The FHWA received two comments

from the City of Charlotte, North Carolina, and a private citizen noting this inconsistency and suggesting that it be corrected, and the FHWA agrees that it is important to be consistent.

237. In Section 6F.03 Sign Placement, in the first STANDARD statement, the FHWA adds "bicycle movements" to the list of reasons why in urban areas 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), to enhance safety for bicyclists. The FHWA received seven comments from the City and County of Denver and private citizens in support of this change, and two comments from the Ohio DOT and a private citizen opposed to it. The Ohio DOT questioned the relationship between the presence of a bicycle and sign height. The FHWA believes that because bicyclists do ride on sidewalks in urban areas, they will have an effect on signs, especially when riding in a standing position, thus higher mounting heights are needed. A private citizen felt that this should not be a STANDARD statement if obvious exceptions exist, unless they are specifically listed. The FHWA believes that this STANDARD is consistent with the first paragraph of Section 2A.18 Mounting Height, which is also a STANDARD. The FHWA adds a new SUPPORT statement (consistent with Section 2A.18) that the mounting heights apply except as otherwise provided elsewhere in the MUTCD.

Additionally, the FHWA adds language to the STANDARD requiring signs to be mounted and placed in accordance with Section 4.4 of the "Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG)."⁴⁸ The FHWA received three comments from the City of Tucson, Arizona, and associations representing the blind community in support of this new text, and comments from the NCUTCD, the Ohio DOT, and Lake County, Illinois, opposed to it. The opposing commenters stated several reasons, including that this statement is repetitive throughout Part 6, that agencies need the flexibility to use engineering judgment on a case-by-case basis to determine the appropriate measures in a temporary traffic control plan, and that the guidelines should be specifically stated in the MUTCD, rather

than referenced. The FHWA disagrees because the ADAAG guidelines are too voluminous to include directly in the MUTCD and because ADAAG provides flexibility to determine the need for accommodation of pedestrians with disabilities and the actual applications that will be used when necessary. The FHWA adopts the text, as proposed in the NPA with a modification to address the issue of need for accommodation. Repetition is important to elevate the practitioners' awareness on the accommodation of pedestrians with disabilities and there are specific details in this and other sections of Part 6 on the installation of devices to satisfy accommodation.

Additionally, the FHWA adds to the second GUIDANCE statement that signs mounted lower than 2.1 m (7 ft) should not project more than 100 mm (4 in) into pedestrian facilities. This is in accordance with the "Americans With Disabilities Act Accessibility Guidelines For Buildings And Facilities (ADAAG)."⁴⁹ The FHWA received two comments from associations representing the blind community supporting this change, and comments from the NCUTCD and a traffic engineering consultant opposed to it. The NCUTCD felt that this information was repetitive and the traffic engineering consultant suggested that "sidewalk" be removed from the GUIDANCE statement to better accommodate urban settings where paved sidewalks extend from the curb face to the building line. The FHWA disagrees and adopts the text as proposed in the NPA.

In the NPA, the FHWA proposed adding a SUPPORT statement indicating that the design and placement of work zone signs is described elsewhere in Chapter 6F of the Manual. The FHWA received one comment from the NCUTCD opposed this, suggesting that this statement is not necessary. The FHWA agrees and deletes this statement from this final rule.

Additionally, in the 2000 MUTCD, the FHWA established a new requirement in this section that sign supports for temporary traffic control devices shall be crashworthy, but no special phase-in target compliance date was established at that time. Based on comments that agencies are encountering difficulties and economic impacts given the extensive testing of devices that has to occur in accordance with NCHRP Report 350⁴⁹ in order to determine and

⁴⁸ "Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG)," as amended through January 1998, is published by the U.S. Architectural and Transportation Barriers Compliance Board (Access Board), 1331 F Street, NW., Suite 1000, Washington, DC 2004-111. It may be obtained from the Access Board, or viewed electronically at the following URL: <http://www.access-board.gov/adaag/html/adaag.htm>.

⁴⁹ NCHRP Report 350, "Recommended Procedures for the Safety Performance Evaluation of Highway Features," 1993, is available for downloading from the Transportation Research Board at the following URL: http://gulliver.trb.org/publications/nchrp/nchrp_rpt_350-a.pdf.

certify crashworthiness, the FHWA determines that a special phase-in target compliance date is required for the crashworthiness provision in this section. In this final rule, the FHWA establishes a phase-in target compliance date of January 17, 2005 for sign supports for temporary traffic control devices to be crashworthy. This is consistent with guidance previously communicated informally to jurisdictions in training and presentations by the FHWA Office of Safety regarding roadside safety and countermeasures for run-off-the-road crashes, and is a reasonable phase-in target date for achieving compliance.

Additionally, the FHWA adds a GUIDANCE statement regarding the type of sign post to be used in the clear zone. The FHWA received three comments from the NCUTCD, the City of Charlotte, North Carolina, and a private citizen opposed to the new GUIDANCE. The City of Charlotte, North Carolina, and a private citizen suggested that the statement be strengthened to a STANDARD, in order to require that sign posts placed in the clear zone be yielding or breakaway. The FHWA disagrees that this should be a STANDARD because jurisdictions need the flexibility to address unusual situations, but the FHWA revises the wording of the GUIDANCE in this final rule to be consistent with other references.

The FHWA also adds a SUPPORT statement regarding crashworthiness of sign supports. The FHWA received three comments from the NCUTCD, the City of Charlotte, North Carolina, and a private citizen suggesting that this statement is not necessary. The FHWA disagrees because this statement conveys important information about crashworthiness of sign supports. The FHWA revises the statement slightly in this final rule to clarify the language and add a reference to NCHRP Report 350.

In the NPA, the FHWA proposed adding OPTION, GUIDANCE, and OPTION statements at the end of the section regarding sign supports for long-term and short-term use. Based on comments, the FHWA removes these statements from this final rule, because this information is contained in Section 6F.01 Types of Devices and it is not necessary to repeat it in this section.

In Figure 6F-2, the FHWA adds the phrase, "above the traveled way," to the mounting height notes in the figure to be consistent with the corresponding standard statements in this section.

238. In Section 6F.06 Regulatory Sign Design, the FHWA changes the first sentence of the SUPPORT statement (in the 2000 MUTCD) to become a new

STANDARD statement at the beginning of the section, stating that temporary traffic control regulatory signs shall conform to the standards for regulatory signs presented in Part 2 and in the FHWA's "Standard Highway Signs" book. In the 2000 MUTCD, this sentence contains the word "shall" but was inadvertently included in the SUPPORT statement. This will make this statement consistent with the remainder of the MUTCD. The remainder of the SUPPORT statement remains a SUPPORT statement. The FHWA received two comments from ATSSA and the City of Tucson, Arizona, in support of this change, and incorporates this change in this final rule.

Additionally, the FHWA identifies the three page images of regulatory signs that follow page 6F-7 (as numbered in the 2000 MUTCD) as "Figure 6F-3 Regulatory Signs in Temporary Traffic Control Zones," and numbers them Sheets 1 and 2. In the NPA, the FHWA proposed that each page of sign images have a distinct figure number and title; however, several commenters suggested that the various titles were confusing. Additionally the FHWA removes all of the sign sizes from the pages of sign images, because sign sizes are now included in Table 6F-1.

In the NPA, the FHWA proposed increasing the size of the following signs in Table 6F-1: PEDESTRIAN CROSSWALK, SIDEWALK CLOSED, SIDEWALK CLOSED USE OTHER SIDE, SIDEWALK CLOSED CROSS HERE, and SIDEWALK CLOSED AHEAD CROSS HERE to make it easier for a pedestrian to read these signs from across a wide street. The FHWA received comments from the NCUTCD, the City of Charlotte, North Carolina, and a private citizen opposed to the larger sign sizes, and one comment from the Connecticut DOT questioning why the larger signs were needed. The reason for increasing the size of the signs was to make them more readable from across the street, and to make them more readable by pedestrians with visual disabilities. Based on the comments, and FHWA's judgment that 48-inch-wide signs would be too wide, thus in some cases blocking the sidewalk, the FHWA restores the size of these signs to 600 x 300 mm (24 x 12 in) in this final rule. Jurisdictions may use larger sizes when needed and where feasible.

239. In Section 6F.12 PEDESTRIAN CROSSWALK Sign (R9-8), the FHWA adds a STANDARD statement following the OPTION statement that if a temporary crosswalk is established, it shall be accessible to pedestrians with disabilities. The FHWA received eight comments from the City of Tucson,

Arizona, the City and County of Denver, and private citizens in support of this new statement, and one from the NCUTCD opposed to it. The NCUTCD indicated that the statement was repetitious. The FHWA agrees; however, repetition is necessary in this case to elevate awareness, and the FHWA adopts the statement, with an added reference to the new Section 6D.02 Accessibility Considerations, which provides additional information about pedestrian accessibility.

240. In Section 6F.13, SIDEWALK CLOSED Signs (R9-9, R9-10, R9-11, R9-11a), to provide adequate route guidance information to pedestrians, the FHWA proposed to add to the first GUIDANCE statement that Bicycle/ Pedestrian Detour (M4-9a) or Pedestrian Detour (M4-9b) signs should be used where pedestrian flow is rerouted. The FHWA received one comment from the NCUTCD opposed to this new text, suggesting that reference to these signs is not necessary in this section. The FHWA disagrees and adopts the references to the M4-9a and M4-9b signs in this final rule. The SIDEWALK CLOSED signs are used in situations where the normal pedestrian traffic is rerouted.

Additionally, the FHWA adds to the SUPPORT statement that printed signs are not useful to pedestrians with visual disabilities. In the NPA, the FHWA proposed to add that accessible pedestrian signals can provide audible information about closures and alternate routes. The FHWA received one comment from the NCUTCD opposed to this additional text, stating that it was repetitive. The FHWA received three comments from associations representing the blind community suggesting that the statement be expanded to provide more useful information about how to communicate sidewalk closure information to pedestrians with visual disabilities. The FHWA agrees and incorporates additional information regarding the use of barriers, detectable barricades, accessible signage, and audible information.

241. In Section 6F.14 Special Regulatory Signs, the FHWA adds a SUPPORT statement referencing Section 2B.17 FINES HIGHER PLAQUE for information regarding the use of the FINES HIGHER sign, because this sign can be useful in enhancing speed enforcement in temporary traffic control zones. The FHWA received three comments from ATSSA, the City of Tucson, Arizona, and the Associated General Contractors of America in support of this new statement, and one from the NCUTCD opposed to it. The

NCUTCD suggested that reference to this sign is not necessary in this section. The FHWA disagrees and adopts this new statement in this final rule.

Practitioners may not otherwise find that such a sign exists without the reference in Part 6 where they would typically look for temporary traffic control signs and the related text.

242. In Section 6F.15 Warning Sign Function, Design, and Application, the FHWA adds to the first OPTION statement that warning signs used for temporary traffic control incident management situations may have a black legend and border on a fluorescent pink (referred to as coral in the NPA) background, as an alternative to black on orange. This is consistent with changes in Section 6F.02 General Characteristics of Signs and the new Chapter 6I. The FHWA received one comment from Lake County, Illinois, opposed to the use of fluorescent pink, suggesting that highway incident management signing needs to be consistent with emergency management signing. The FHWA disagrees because these are two different situations and there is no reason why these signs need to be the same color. The FHWA adopts the change as proposed in the NPA.

Additionally, in the NPA, the FHWA proposed to add to the GUIDANCE statement that where road users include pedestrians, the provision of supplemental audible or tactile warning information should be considered for people with visual disabilities. The FHWA received one comment from the City of Tucson, Arizona, in support of this statement, and four from associations representing the blind community opposed to it. The NCUTCD suggested that this statement is repetitive. Three comments from associations representing the blind community suggested that the statement be revised to provide for supplemental audible information or detectable barriers or barricades, rather than tactile information, for pedestrians with visual disabilities. The FHWA agrees and incorporates these revisions in this final rule. The FHWA also inserts a SUPPORT statement following the GUIDANCE to clarify how detectable barriers and barricades assist pedestrians with visual disabilities.

Additionally, the FHWA identifies the six page images of warning signs that follow page 6F-13 (as numbered in the 2000 MUTCD) as "Figure 6F-4 Warning Signs in Temporary Traffic Control Zones," and numbers them Sheets 1 through 4. In the NPA, the FHWA proposed that each page of sign images have a distinct figure number, however in this final rule the FHWA numbers

these pages similar to the illustrations of regulatory signs. The FHWA identifies the following page of sign images "Figure 6F-5 Exit Open and Closed and Detour Signs."

Similar to comments in Section 2C.30 Speed Reduction Signs, the FHWA received two comments from the Missouri DOT and Lake County, Illinois, opposed to changing the Reduced Speed Ahead sign from a regulatory sign to a warning sign. Consistent with the decision in Part 2, the FHWA changes the Reduced Speed Ahead sign to a warning sign with sign designations W3-5 and W3-5a.

The FHWA received three comments from the Ohio DOT, the City of Charlotte, North Carolina, and a private citizen suggesting additional information regarding the use of the new dump truck symbol warning sign (W11-10a) to clarify where the sign should be used. Consistent with Chapter 2C, the FHWA withdraws the proposed new dump truck symbol warning sign (W11-10a) and instead illustrates the W11-10 truck warning symbol sign. The FHWA also adds a new section numbered and titled, "Section 6F.34 Motorized Traffic Signs (W8-6, W11-10)," to clarify sign use.

The FHWA received two comments from the Ohio DOT regarding the NO CENTER STRIPE (W8-12) sign. First, the Ohio DOT suggested that a sign be added to address the situation when the edge line has been obliterated. The FHWA believes that this is not usually a situation that requires warning, because there are many roads that do not have edge lines, however there is nothing that would prohibit an agency from developing a special word message warning sign with the legend NO EDGE LINE that would be similar to the W8-12 sign. Second, the Ohio DOT opposed the NO CENTER STRIPE sign, suggesting that the legend should read NO CENTER LINE. The FHWA disagrees because "centerline" is a single word, and to be technically correct would need to be on the same line. The FHWA believes that the public understands both "centerline" and "center stripe" equally well, so it adopts the NO CENTER STRIPE legend on the W8-12 sign in this final rule.

The FHWA received two comments from the City of Charlotte, North Carolina, and a private citizen regarding the BE PREPARED TO STOP (designated W20-7b in the NPA) sign. Both commenters suggested that a larger size be used. The FHWA revises the designation for this sign to be W3-4 throughout Part 6 to maintain consistency with Chapter 2C. The W3 Series in Chapter 2C has a conventional

size of 900 x 900 mm (36 x 36 in), however agencies may choose to use larger sizes where they feel it is appropriate.

A traffic engineering consultant suggested that the FHWA add a new section to allow for Special Warning Signs similar to the provision for Special Regulatory Signs in 6F.14. The FHWA agrees and has included a new Section 6F.47 Special Warning Signs.

243. In Section 6F.17 ROAD (STREET) WORK Sign (W20-1), in the NPA, the FHWA proposed adding an OPTION statement indicating that, where traffic can enter a temporary traffic control zone from a crossroad or a major (high volume) driveway, an advance warning sign may be used on the crossroad or major driveway to alert road users. The FHWA received comments from ATSSA, the City of Tucson, Arizona, and a private citizen in support of this change, and one comment from the NCUTCD suggesting that this statement be strengthened to a GUIDANCE. The FHWA agrees that use of the sign on the crossroad is important for safety and changes this statement to a GUIDANCE in this final rule.

244. In Section 6F.24 the FHWA changes the title of the section from "Lane Reduction Sign (W4-2)" to "Lane Ends Sign (W4-2)" to reflect the sign's name change and to be consistent with Part 2. The FHWA received one comment from the City of Tucson, Arizona, in support of this change, and adopts this change. The FHWA received three comments from the Minnesota DOT, the City of Charlotte, North Carolina, and a private citizen opposed to the new sign design for the W4-2 sign, which depicts a lane ending. Please refer to the discussion regarding this sign in Section 2C.33 Lane Ends Signs (W4-2, W9-1, W9-2) above.

245. In Section 6F.27 SLOW TRAFFIC AHEAD Sign (W23-1), the FHWA proposed changing the sign shape from a rectangle to a diamond. The FHWA received two comments from the City of Charlotte, North Carolina, and a private citizen opposed to it to the change in sign shape, stating that the rectangular sign fits better than a diamond sign on the back of a moving truck, which is where this sign is primarily used. The FHWA agrees and illustrates a rectangular shaped W23-1 sign in Figure 6F-4.

246. In Section 6F.28 EXIT OPEN, EXIT CLOSED, EXIT ONLY Signs (E5-2, E5-2a, E5-3) (titled EXIT OPEN, EXIT CLOSED Signs (E5-2, E5-2a) in the NPA), the FHWA adds a GUIDANCE statement indicating that when an exit ramp is closed, a black on orange EXIT CLOSED panel should be placed

diagonally across the interchange/intersection guide signs to enhance the information provided to road users. The FHWA received one comment from the City of Tucson, Arizona, in support of this new GUIDANCE statement, and five comments from the NCUTCD, the Wisconsin DOT, Caltrans, the City of Charlotte, North Carolina, and a private citizen opposed to it. The NCUTCD suggested that the GUIDANCE be changed to an OPTION, because ramp closures may occur for only a short period of time, and installing EXIT CLOSED panels on freeway guide signs involves significant effort.

Caltrans and the Wisconsin DOT suggested that the diagonal orientation of the sign would be especially confusing on guide signs with more than one exit, because a portion of the street name would be covered and unreadable for road users desiring to use the exit that is open. The City of Charlotte, North Carolina, and a private citizen suggested that the size of the panel be changed to better cover the sign. The FHWA disagrees with the opposing comments because it is very important, particularly for unfamiliar road users, to know that an exit is closed, and covering only a portion of the message by using the diagonal placement of the sign gives road users a visual clue as to what exit is closed. Because this sign may be used for other applications, the sign size, as proposed in the NPA, is appropriate.

The FHWA adds the EXIT ONLY sign (E5-3) to Figure 6F-5, and changes the title of the figure to "Exit Open and Closed and Detour Signs." The EXIT ONLY sign has been in the "Standard Highway Signs" book for many years and is used in some applications, so the FHWA determines that it is to be included in this section to correct an earlier omission.

247. The FHWA adds a new section numbered and titled, "Section 6F.34 Motorized Traffic Signs (W8-6, W11-10)." The FHWA adds this section in this final rule for consistency with Section 2C.36 Motorized Traffic Signs (W8-6, W11-10) and to address comments received in Section 6F.15 Warning Sign Function, Design, and Application. This new section mirrors text in Section 2C.36 Motorized Traffic Signs (W8-6, W11-10) and includes OPTION and SUPPORT statements clarifying the use of the Motorized Traffic (W8-6, W11-10) signs to alert road users to locations where unexpected use of the roadway by construction vehicles might occur. The FHWA rennumbers the subsequent sections accordingly.

248. In Section 6F.38 Signs for Blasting Areas (numbered Section 6F.37 in the NPA), the FHWA removes the GUIDANCE statement from this section. The GUIDANCE statement included a minimum safe distance of 300 m (1000 ft) for placing warning signs, however this information is stated as a STANDARD in Sections 6F.40 and 6F.41 (numbered 6F.38 to 6F.40 in the NPA). The FHWA received comments from the City of Charlotte, North Carolina, and a private citizen requesting that this inconsistency be resolved. The FHWA agrees that the STANDARD should take precedence and removes the GUIDANCE from Section 6F.38.

249. In Section 6F.40 TURN OFF 2-WAY RADIO AND CELL PHONE Sign (W22-2) (numbered Section 6F.39 in the NPA), the FHWA received two comments from the City of Charlotte, North Carolina, and a private citizen opposed to adding the word "CELL" to the legend of the W22-2a sign. The commenters suggested that other mobile phones have the same risk of causing premature firing of detonators. These commenters also suggested that the sign needed to be more readable with larger letter sizes and only three lines of text. The FHWA believes that the sign, as proposed in the NPA with the word "CELL", is appropriate. The Temporary Traffic Controls Committee of the NCUTCD supported the sign proposed in the NPA based on information received from representatives of the blasting industry and the Federal Communication Commission. Even though there are some other types of mobile phones and radios that can potentially cause premature firing of detonators, two-way radios and cell phones constitute the bulk of the devices in use in vehicles today, and the FHWA believes the terminology is best understood by the public. The FHWA changes the sign designation from W22-2a to W22-2 in this final rule, because there is no sign currently designated W22-2.

250. In the NPA, the FHWA proposed combining Sections 6F.41 and 6F.42 (as numbered in the 2000 MUTCD) into one section numbered and titled, "Section 6F.41 Shoulder and UNEVEN LANES Signs (W8-4, W8-9, W8-9a, and W8-11)." Although the FHWA received comments from a private citizen and the Motorcycle Safety Foundation in support of combining these sections, the NCUTCD suggested that these two sections should not be combined because they each describe unique applications and having two separate sections enhances practitioners' understanding. The FHWA agrees and

separates these sections in this final rule into Section 6F.42 Shoulder Signs (W8-4, W8-9, W8-9a) and Section 6F.43 UNEVEN LANES Sign (W8-11).

In Section 6F.42 Shoulder Signs (W8-4, W8-9, W8-9a), the FHWA includes an OPTION statement to allow the use of the SOFT SHOULDER sign to warn of a soft shoulder condition and the LOW SHOULDER sign 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. The FHWA received two comments in support of these changes from a private citizen and the Motorcycle Safety Foundation, and adopts these changes.

The FHWA received two comments from the Illinois DOT and a traffic engineering consultant opposed to mandating the use of SHOULDER DROP OFF signs. Those opposed expressed that the text should be a GUIDANCE, because requiring the use of SHOULDER DROP OFF signs at all locations that meet the criteria would be a considerable hardship on agencies to properly identify all locations and sign them at all times. The FHWA agrees and revises this as to a GUIDANCE and adds clarifying text consistent with Chapter 2C in this final rule.

In Section 6F.43 UNEVEN LANES Sign (W8-11) (numbered Section 6F.42 in the 2000 MUTCD), the FHWA maintains the GUIDANCE statement from the 2000 MUTCD text, and adds the phrase "that are open to travel" at the end of the sentence to address a comment received in Section 2C.26 Shoulder Signs suggesting additional information be included regarding the use of the UNEVEN LANES sign. In the NPA, the FHWA proposed including the word "substantial" in the description of the difference in elevation between adjacent lanes. The FHWA received four comments from the NCUTCD, the Illinois DOT, the City of Charlotte, North Carolina, and a private citizen suggesting that the word "substantial" be removed, because it is vague. The FHWA agrees and adopts the GUIDANCE with modifications in this final rule.

251. The FHWA adds a new section numbered and titled, "Section 6F.45 Double Reverse Curve Signs (W24 Series)." (This section was numbered Section 6F.43 in the NPA.) This section contains an OPTION statement regarding the use of the Double Reverse Curve sign when the tangent distance between two reverse curves is insufficient for a second Reverse Curve sign to be placed between the curves. The FHWA received two comments from ATSSA and the City of Tucson,

Arizona, in support of this new statement, and one from the NCUTCD suggesting that the word "insufficient" be defined as "less than 180 m (600 feet)." The FHWA agrees and clarifies the OPTION statement in this final rule.

This section also contains a STANDARD statement that 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. The FHWA received two comments from ATSSA and the City of Tucson, Arizona, in support of this new statement, and three comments from Caltrans, the City of Charlotte, North Carolina, and a private citizen suggesting that illustrating the number of lanes on the sign may be complex for multi-lane applications. The FHWA adopts the text in this final rule, because it is important to convey to road users that all of the lanes continue. Two commenters from City of Charlotte, North Carolina, and a private citizen suggested that the size of the W24 series signs be 1200 x 1200 mm (48 x 48 in). The FHWA believes that for one and two lane Double Reverse Curve signs, the 900 x 900 mm (36 x 36 in) signs as proposed in the NPA are appropriate, but that for three or more lanes, larger sizes may be desirable, and there is nothing preventing agencies from using larger sign sizes.

252. In Section 6F.46 Other Warning Signs (numbered 6F.44 in the NPA), the FHWA revises the STANDARD statement to reference Section 6F.02 for exceptions to using black legends and borders on orange backgrounds for warning signs. The FHWA includes this change in this final rule because it is necessary to be consistent with other sections of the MUTCD.

253. The FHWA adds a new section numbered and titled, "Section 6F.47 Special Warning signs." This section contains OPTION and GUIDANCE statements with information regarding the design of special warning signs. The FHWA adds this section to this final rule to remind readers that special word message warning signs may be used. This section parallels a similar section in Part 2 that allows the use of special word signs, and adding the section to Part 6 is necessary for consistency.

254. In Section 6F.48 Advisory Speed Plaque (W13-1) (numbered Section 6F.45 in the NPA), the FHWA received comments from the Ohio DOT opposed to the design of the sign—both the black circle around the numerals on the metric sign and the use of periods between the letters for the acronym "M.P.H." on the English-units sign. The

FHWA disagrees that the black circle around the numerals is confusing, because it is necessary that this sign look different from the English-unit sign in order to avoid confusion. The FHWA adopts the black circle on the sign in this final rule. The FHWA agrees that periods are not necessary in the acronym MPH and removes the periods from the sign images and from the listing in Table 1A-1, to reflect common practice.

255. In Section 6F.50 Guide Signs (numbered Section 6F.47 in the NPA), the FHWA adds to the OPTION statement that guide signs used for temporary traffic control incident management situations may have a black legend and border on a fluorescent pink (referred to as coral in the NPA) background as an alternative to black on orange, to correspond with the change in Section 6F.02 General Characteristics of Signs. The FHWA received one comment from the City of Tucson, Arizona, in support of this change, and three comments from the City of Charlotte, North Carolina, a private citizen, and a traffic engineering consultant suggesting that wording of the STANDARD and the GUIDANCE relating to the color of additional guide signs in temporary traffic control zones was inconsistent and confusing. To clarify, the FHWA revises the STANDARD statement in this final rule to specify that if additional temporary guide signs are used in temporary traffic control zones, they shall have a black legend and border on an orange background. The FHWA also adds a paragraph to the OPTION stating that when permanent directional or street name signs are used with detour signing, they may have a white legend on a green background. This will clarify that street name signs do not need to be on an orange background.

256. In Section 6F.52 END ROAD WORK Sign (G20-2) (numbered Section 6F.49 in the NPA), the FHWA changes the GUIDANCE statement to indicate that the END ROAD WORK sign should be placed near the end of the termination area, rather than specify a distance beyond the end of the temporary traffic control zone as in the 2000 MUTCD. The FHWA received two comments from the NCUTCD and the Wisconsin DOT opposed to this change. The NCUTCD suggested that the wording be changed to indicate that this sign is not always necessary, and the Wisconsin DOT suggested that a placement distance be included. The FHWA agrees with the NCUTCD and adds the phrase "when used" at the start of the GUIDANCE. Rather than specifying a distance, the FHWA further

clarifies that the END ROAD WORK sign should be placed near the end of the termination area, as determined by engineering judgment.

257. In Section 6F.53 Detour Signs and Markers (M4-8, M4-8a, M4-8b, M4-9, M4-9a, M4-9b, M4-9c, and M4-10) (numbered Section 6F.50 in the NPA), the FHWA changes the title to include signs specifically for detouring pedestrians and bicyclists.

Additionally, the FHWA adds to the first OPTION statement that signs used for temporary traffic control of incident management situations may have a black legend and border on a fluorescent pink (referred to as coral in the NPA) background, as an alternative to black on orange, to correspond to changes in Section 6F.02 General Characteristics of Signs. The FHWA received one comment from the City of Tucson, Arizona, supporting this change, and incorporates this change.

Additionally, at the end of the second GUIDANCE statement, the FHWA adds that the Pedestrian/Bicycle Detour (M4-9a) sign should be used where a pedestrian/bicycle detour route has been established because of the closing of a pedestrian/bicycle facility to through traffic. In the NPA, the FHWA proposed that this be a STANDARD, rather than GUIDANCE; however, the FHWA believes that GUIDANCE is more appropriate and is consistent with Section 6F.13 Sidewalk Closed Signs. The FHWA adds a STANDARD statement that if used, the Pedestrian/Bicycle Detour sign shall have an arrow pointing in the appropriate direction.

Additionally, the FHWA adds an OPTION statement at the end of the section that an arrow may be on the sign face or on a supplemental plaque. The Pedestrian/Bicycle Detour (M4-9a) sign or Bicycle Detour (M4-9c) sign may be used where a pedestrian or bicycle detour route (not both) has been established because of the closing of that particular facility to through traffic.

The FHWA received eleven comments from the Florida DOT, the City and County of Denver, Colorado, the City of Tucson, Arizona, the Association of Pedestrian and Bicycle Professionals, and private citizens in support of the changes to include signs specifically for detouring pedestrians and bicyclists.

258. In Section 6F.55 Portable Changeable Message Signs (numbered Section 6F.52 in the NPA), the FHWA adds a sentence at the end of the first STANDARD statement that each character module shall use at least a five wide and seven high pixel matrix, based on research regarding visibility and

legibility of changeable message signs.⁵⁰ The FHWA received one comment from the NCUTCD opposing this change, stating that other units are in use. The FHWA believes that this is a minimum requirement, and the FHWA includes this sentence in this final rule.

Additionally, the FHWA adds to the first GUIDANCE statement that for a trailer or large truck mounted sign, the letter height should be a minimum of 450 mm (18 in). For a service patrol truck mounted sign, the letter height should be a minimum of 250 mm (10 in). 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 prior to work starting, or the anticipated operating speed. Because the FHWA is retaining the current guidance that road users should be able to read the entire message twice, there may be a need in some temporary traffic control zones to use more than one Portable Changeable Message sign. The FHWA incorporates these changes in response to research addressing the needs of older road users.⁵¹

The FHWA received one opposing comment from a traffic engineering consultant suggesting that legibility depends on several factors and that, at a minimum, letter heights on trailer or large truck mounted signs and changeable message signs mounted on service patrol trucks should be the same, at 450 mm (18 in). The Virginia DOT agreed with allowing smaller letter heights for service patrol trucks and also suggested that letter heights for signs used on work vehicles in moving operations could also be smaller. The FHWA received one opposing comment from a traffic control device manufacturer suggesting that letter heights for changeable message signs should be consistent with the size of lettering on static signs. The FHWA disagrees because the sign types are entirely different and need to be treated

separately. The FHWA adopts the letter heights as proposed in the NPA.

The FHWA received one comment from the NCUTCD opposed to the minimum three second per phase recommendation for the adjustable display rates, stating that there was no documentation indicating that three seconds was appropriate. The FHWA disagrees because a minimum display time needs to be specified for each message phase to give road users a reasonable chance to read the message before it goes away and, based on the previously-cited research addressing the needs of older drivers, believes three seconds is sufficient.

Additionally, for clarity, the FHWA moves the GUIDANCE information regarding the factors that agencies should take into account when designing changeable messages from the end of the section to the end of the first GUIDANCE statement.

Additionally, the FHWA changes and relocates from the first GUIDANCE statement to the following OPTION statement (based on the 2000 MUTCD) that smaller letter sizes may be used on a sign mounted on a trailer or large truck provided that the message is legible from a minimum distance of 200 m (650 ft), or a sign mounted on a service patrol truck provided that the message is legible from a minimum distance of 100 m (330 ft). The FHWA received one comment from the NCUTCD opposed to this paragraph, stating that there is not sufficient documentation to justify smaller letter sizes. The FHWA adopts the OPTION as proposed in the NPA, because service patrol trucks are typically small pick-up trucks on which it is not practical to mount large signs.

Additionally, the FHWA adds a fourth paragraph to the second STANDARD statement to clarify that 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 shall be a minimum of 2.1 m (7 ft) above the roadway in urban areas and 1.5 m (5 ft) in rural areas when it is in the operating mode, to correspond with mounting heights for ground-mounted signs. The FHWA received one comment from a traffic engineering consultant opposed to these mounting heights, stating that it is sometimes not practical or necessary to mount the large, heavy signs this high. The commenter suggested that this be changed to a GUIDANCE to give more flexibility. The FHWA retains this as a STANDARD, because the only change from the 2000 MUTCD is to add that these signs may be mounted lower in rural areas, thereby giving agencies

additional flexibility. Any further changes would require notice and public comment in a future rulemaking.

The FHWA also consolidates all of the SUPPORT statements in this section under one heading at the beginning of the section. The FHWA makes this minor editorial change to better organize the section, based on a suggestion from a traffic engineering consultant.

259. In Section 6F.56 Arrow Panels (numbered Section 6F.53 in the NPA), the FHWA adds to the first GUIDANCE statement that an arrow panel in the arrow mode should be used to advise approaching road users 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. The FHWA received one comment from the City of Tucson, Arizona, in support of this change. The NCUTCD opposed this change suggesting that "Sequential Chevron mode" be added, because chevron mode is also permitted for arrow panels in this case. The FHWA agrees and incorporates this change.

The FHWA also revises the last paragraph of this GUIDANCE statement to clarify that if it is not removed, an arrow panel within the clear zone should be delineated with retroreflective temporary traffic control devices if it is not feasible to shield it with a barrier or crash cushion when it is not in use. The FHWA received one comment from a private citizen opposed to this change, stating that shielding the arrow panel with a barrier or crash cushion is impractical. The FHWA notes that the change proposed in the NPA actually clarified that the shielding only pertains to arrow panels not in use, and that retroreflective delineation is acceptable. The FHWA adopts the change as proposed in the NPA.

The FHWA revises the last paragraph of the sixth STANDARD statement to clarify the language. The FHWA received no comments regarding this change, and adopts this change. However, the FHWA received two comments from the City of Charlotte, North Carolina, and a private citizen regarding the fifth GUIDANCE statement and the last paragraph of the last STANDARD statement concerning the use of the word "shift" as it relates to moving traffic over laterally. Because the intent throughout the MUTCD is that arrow panels are to be used only in merging operations, not to shift traffic laterally, the FHWA revises these statements accordingly. The FHWA makes these changes in the final rule,

⁵⁰ "Changeable Message Sign Visibility," Federal Highway Administration publication number FHWA-RD-94-077, by P.M. Garvey and D.J. Mace, 1994, is available from FHWA, Turner-Fairbank Highway Research Center, 6300 Georgetown Pike, McLean, Virginia 22101. It is also available for purchase from The National Technical Information Service, Springfield, Virginia 22161, (703) 605-6000. Internet Web site address at <http://www.ntis.gov>.

⁵¹ Information about this research is summarized on pages 253-263 of the "Highway Design Handbook for Older Drivers and Pedestrians," Report number FHWA-RD-01-103, published by the FHWA Office of Safety Research and Development, 2001. It is available for purchase from The National Technical Information Service, Springfield, Virginia 22161, (703) 605-6000. Internet Web site address at <http://www.ntis.gov>.

due to the comments received and the need to clarify the proper use of arrow panels.

The FHWA also adds an OPTION at the end of the section to indicate that a portable changeable message sign may be used to simulate an arrow panel display. The FHWA received one comment from the Illinois DOT opposed to this new OPTION, stating that it should be deleted because portable changeable message signs are not nearly as conspicuous as arrow panels. The FHWA disagrees because portable changeable message signs are often used as a supplement to arrow panels well in advance of the arrow panels where long queues are expected. The FHWA adopts this new OPTION in this final rule.

260. In Section 6F.58 Channelizing Devices (numbered Section 6F.55 in the NPA), following the first SUPPORT statement, the FHWA proposed adding a STANDARD statement, GUIDANCE statement, and another STANDARD statement defining the use of channelizing devices to channelize pedestrians and that they need to be detectable to users of long canes. While there were eight comments from the City and County of Denver, Colorado, and private citizens in support of these new statements, the City of Charlotte, North Carolina, and a private citizen suggested that use of these devices should only be necessary at locations that are likely to be used by pedestrians with visual disabilities. Lake County, Illinois, opposed this change, stating that the individual highway agencies should have more flexibility in meeting the ADA Guidelines. Several representatives of the blind community recommended rewording to include that the devices should be detectable not only to users of long canes, but also visible to persons having low vision, because many persons who are severely visually impaired do not travel with the aid of a long cane or a guide dog, but rely on their diminished vision for travel information. Channelizing devices that are made highly visible by strong contrast are accessible to pedestrians with low vision. The FHWA agrees and revises the STANDARD statement accordingly. The FHWA changes the proposed GUIDANCE to an OPTION, because it was inadvertently classified as a GUIDANCE in the NPA. The FHWA also modifies this statement, increasing the maximum gap size between the bottom rail and the ground to 150 mm (6 in) (proposed as 38 mm, 1.5 inches in the NPA) to facilitate drainage.

The FHWA revises the first GUIDANCE statement by removing the phrase "in the immediate area" from the

last sentence regarding fragments or other debris from channelizing devices or ballast. The NCUTCD disagreed with removing this phrase, but did not cite a reason. The FHWA adopts the sentence as proposed in the NPA because debris and fragments pose a hazard to road users and workers, even if not in the immediate area. The City of Charlotte, North Carolina, and a private citizen suggested that this statement should be a STANDARD and that all channelizing devices shall be crashworthy. The FHWA disagrees because not every channelizing device is required to be crashworthy. The FHWA adopts the language of this statement as proposed in the NPA.

Additionally, the FHWA adds a note to Figure 6F-7 (numbered 6F-14 in the NPA), (Sheet 1 of 2) that 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 915 mm (36 in) to be detectable to users of long canes. The FHWA received three comments from the NCUTCD, the City of Charlotte, North Carolina, and a private citizen opposed to this new note, suggesting that it be revised to indicate that criteria apply only at locations where the presence of disabled pedestrians is likely. The FHWA addresses this comment by beginning this note with "if" rather than "when" in this final rule.

Additionally, the FHWA adds a note to Figure 6F-7 (numbered 6F-14 in the NPA), (Sheet 2 of 2) that if 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 915 mm (36 in) above the ground surface. The FHWA received three comments from the NCUTCD, the City of Charlotte, North Carolina, and a private citizen opposed to this new note, suggesting that it be revised to indicate that criteria apply only at locations where the presence of disabled pedestrians is likely. The FHWA addresses this comment by beginning this note with "if" rather than "when" in this final rule.

The FHWA received comments from the NCUTCD, the City of Charlotte, North Carolina, and a private citizen suggesting that the footnote regarding nominal lumber dimensions on each of the figures not be removed as was

proposed in the NPA. The FHWA removes this footnote because devices constructed of lumber have not passed NCHRP 350 crashworthy criteria.

Additionally, in the 2000 MUTCD a new recommendation was established in this section that channelizing devices in temporary traffic control zones should be crashworthy. No special phase-in target compliance date was established at that time. Based on comments that agencies are encountering difficulties and economic impacts given the extensive testing of devices that has to occur in accordance with NCHRP Report 350⁵² in order to determine and certify crashworthiness, the FHWA determines that a special phase-in target compliance date is required for the crashworthiness provision in this section. Therefore, in this final rule, the FHWA establishes a special phase-in target compliance date of January 17, 2005, for when channelizing devices in temporary traffic control zones should be crashworthy. The FHWA believes this target date of four years from the effective date of the 2000 MUTCD provides agencies with a reasonable period in which to phase in the use of compliant channelizing devices in temporary traffic control zones.

In the NPA, the FHWA proposed a phase-in target compliance date of five years from the effective date of this final rule for the changes in this section regarding pedestrian accessibility (detectability by users of long canes). Because a five year phase-in target compliance date has been established for Sections 6D.01 Pedestrian Considerations and 6D.02 Accessibility Considerations, which in turn affect many other sections throughout Part 6, a special phase-in target compliance date just for Section 6F.58 is not necessary. Accordingly, the FHWA withdraws the proposed five-year phase-in target compliance date for accessibility requirements of this section.

261. In Section 6F.59 Cones (numbered Section 6F.56 in the NPA), the FHWA adds to the STANDARD statement that 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

⁵² NCHRP Report 350, "Recommended Procedures for the Safety Performance Evaluation of Highway Features," 1993, is available for downloading from the Transportation Research Board at the following URL: http://gulliver.trb.org/publications/nchrp/nchrp_rpt_350-a.pdf.

top stripe being orange. Any non-retroreflective spaces between the orange and white stripes shall not exceed 75 mm (3 in) in width. The FHWA also adds an illustration of a cone more than 900 mm (36 in) in height to Figure 6F-7 (Sheet 1 of 2). These changes will enhance the visibility of cones at night and improve safety in temporary traffic control zones. The FHWA received three comments from the Ohio DOT, the City of Tucson, Arizona, and the Association of Pedestrian and Bicycle Professionals in support of this new paragraph, and adopts it in this final rule. The FHWA also adds an illustration of a cone that is more than 900 mm (36 in) in height to Figure 6F-7 (sheet 1 of 2), to aid in user understanding. The FHWA establishes a phase-in target compliance date of five years from the effective date of this final rule for these changes in order to minimize any impact on State or local governments.

Additionally, in the first GUIDANCE statement the FHWA adds that cones should not be used for pedestrian channelization or as pedestrian barriers in temporary traffic control zones on or along sidewalks unless they are continuous between individual devices and detectable to users of long canes. Non-continuous, non-detectable series of cones have been found to be safety problems for pedestrians with visual disabilities. The FHWA received one comment from the NCUTCD opposed to this new paragraph, suggesting that it is repetitive because accessibility is addressed elsewhere. The FHWA agrees that it is repetitive but believes that, in this instance, the repetition is necessary and the FHWA adopts this paragraph in this final rule.

262. In Section 6F.60 Tubular Markers (numbered Section 6F.57 in the NPA), the FHWA adds to the GUIDANCE statement that tubular markers should not be used for pedestrian channelization or as pedestrian barriers in temporary traffic control zones on or along sidewalks unless they are continuous between individual devices and detectable to users of long canes. Non-continuous, non-detectable series of tubular marker have been found to be safety problems for pedestrians with visual disabilities. The FHWA received comments from the Cities of Tucson, Arizona, and Charlotte, North Carolina, the Association of Pedestrian and Bicycle Professionals, and a private citizen in support of this new paragraph. The NCUTCD opposed it, suggesting that it is repetitive because accessibility is addressed elsewhere. The FHWA agrees that it is repetitive but believes that, in this instance, the

repetition is necessary and the FHWA adopts this paragraph in this final rule, with minor editorial changes.

263. In Section 6F.61 Vertical Panels (numbered Section 6F.58 in the NPA), the FHWA proposed to include in the first STANDARD statement that vertical panels shall be mounted a minimum of 1050 mm (42 in) above the pedestrian travel way, so as not to interfere with pedestrians, and that vertical panels shall be mounted with the bottom no greater than 300 mm (12 in) above the ground. The FHWA received two comments from the City of Tucson, Arizona, and the Association of Pedestrian and Bicycle Professionals in support of the changes. The NCUTCD, the City of Charlotte, North Carolina, and a private citizen opposed this change stating that the text should be revised so that the requirements pertained only to those areas where disabled pedestrians were likely to be present. Because this information regarding pedestrian accessibility is now included elsewhere in Part 6 in this final rule, the FHWA withdraws this proposal and retains the text in the 2000 MUTCD.

264. In Section 6F.62 Drums (numbered Section 6F.59 in the NPA), the FHWA adds to the GUIDANCE statement that drums should not be used for pedestrian channelization or as pedestrian barriers in temporary traffic control zones on or along sidewalks unless they are continuous between individual devices and detectable to users of long canes. Non-continuous, non-detectable series of drums have been found to be safety problems for pedestrians with visual disabilities. The FHWA received two comments from the City of Tucson, Arizona, and the Association of Pedestrian and Bicycle Professionals in support of the changes. The NCUTCD opposed this change stating that the text regarding accessibility issues is repetitive. The FHWA disagrees and adopts these changes in this final rule.

The FHWA received two comments from the City of Charlotte, North Carolina, and a private citizen suggesting that the last paragraph of the GUIDANCE statement describing the weighting of drums and need for drain holes be changed to a STANDARD. This is a topic that is outside the scope of this rulemaking and may be a subject for further discussion in a future rulemaking.

265. In Section 6F.63 Type I, II, or III Barricades (numbered Section 6F.60 in the NPA), the FHWA proposed adding a STANDARD statement following the first GUIDANCE statement that barricade supports shall not project into

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)." Additionally, supports shall not narrow the pedestrian facility to less than 1200 mm (48 in) in width, with a 1500 × 1500 mm (60 × 60 in) passing space at least every 60 m (200 ft), as described in Section 4.3.4 of ADAAG. The FHWA received three comments from the Ohio DOT, the City of Tucson, Arizona, and the Association of Pedestrian and Bicycle Professionals in support of this new STANDARD, and four comments from the NCUTCD, the Connecticut DOT, the City of Charlotte, North Carolina, and a private citizen opposed to it. The City of Charlotte, North Carolina, and a private citizen suggested that the wording be revised so that these requirements are necessary only in locations where pedestrians with disabilities are likely to be present. The Connecticut DOT suggested that this STANDARD conflicts with other sections of the MUTCD. In response to these comments, the FHWA replaces the proposed STANDARD with a two-paragraph GUIDANCE statement containing additional information regarding the width of pedestrian pathways and the mounting heights of signs in temporary facilities.

In concert with the changes outlined above, the FHWA also changes the last sentence of the following STANDARD to a GUIDANCE because it also contains information about the width of accessible passages when ballast is used. In the NPA, the FHWA proposed this sentence as a STANDARD. The change to GUIDANCE is necessary for consistency with the other GUIDANCE in this section.

Additionally, in the 2000 MUTCD the FHWA established a new recommendation in this section that barricades in temporary traffic control zones should be crashworthy. No special phase-in target compliance date was established at that time. Based on comments that agencies are encountering difficulties and economic impacts given the extensive testing of devices that has to occur in accordance with NCHRP Report 350⁵³ in order to determine and certify crashworthiness, the FHWA determines that a special phase-in target compliance date is required for the crashworthiness

⁵³ NCHRP Report 350, "Recommended Procedures for the Safety Performance Evaluation of Highway Features," 1993, is available for downloading from the Transportation Research Board at the following URL: http://guilliver.trb.org/publications/nchrp/nchrp_rpt_350-a.pdf.

provision in this section. In this final rule, the FHWA establishes a special phase-in target compliance date of January 17, 2005, for when barricades in temporary traffic control zones should be crashworthy. The FHWA believes this target date of four years from the effective date of the 2000 MUTCD provides agencies with a reasonable period in which to phase in the use of compliant barricades in temporary traffic control zones.

In the NPA, the FHWA proposed a phase-in target compliance date of five years from the effective date of this final rule for the changes in this section regarding pedestrian accessibility. Because a five year phase-in target compliance date has been established for Sections 6D.01 Pedestrian Considerations and 6D.02 Accessibility Considerations, which in turn affect many other sections throughout Part 6, a special phase-in target compliance date just for Section 6F.63 is not necessary. Accordingly, the FHWA withdraws the proposed five-year phase-in target compliance date for accessibility requirements of this section.

266. In Section 6F.64 Direction Indicator Barricades (numbered Section 6F.61 in the NPA), the FHWA makes editorial revisions in the STANDARD statement to properly describe the direction indicator barricade. The FHWA incorporates this change in this final rule to address comments that the term arrow panel in this section was incorrectly used in the NPA to describe what should be correctly called a One-Direction Large Arrow (W1-6) sign.

267. In Section 6F.65 Temporary Traffic Barriers as Channelizing Devices (numbered Section 6F.62 in the NPA), the FHWA adds SUPPORT and STANDARD statements related to the use of temporary traffic barriers as traffic control devices. These statements are relocated from Section 6G.04 Modifications to Fulfill Special Needs, as they are more appropriate in this section. The FHWA received two comments from the City of Tucson, Arizona, and the Association of Pedestrian and Bicycle Professionals in support of these changes, and adopts these changes. The FHWA received several editorial comments regarding the second paragraph of the first STANDARD statement, and incorporates these changes in this final rule to be consistent with other areas of the MUTCD.

268. The FHWA adds a new section, numbered and titled, Section 6F.66 Longitudinal Channelizing Barricades. (This section was numbered Section 6F.53 in the NPA.) This section consists

of GUIDANCE, OPTION, and SUPPORT statements relating to the use of longitudinal channelizing barricades that are lightweight, deformable devices that can be used singly as Type I, II, or III barricades. The FHWA received two comments from the City of Tucson, Arizona, and the Association of Pedestrian and Bicycle Professionals in overall support of the text contained within this new section. The FHWA also received several comments from equipment suppliers suggesting additional uses for longitudinal channelizing barricades or modified applications from the proposed text in the NPA. The FHWA is not implementing these suggestions at this time because these are beyond the scope of this rulemaking.

The FHWA received one comment from the NCUTCD opposing the last sentence of the first SUPPORT, stating that the text was not necessary. The FHWA agrees and removes the sentence in this final rule.

The FHWA received one comment from the NCUTCD suggesting that an additional GUIDANCE statement be added between the first SUPPORT and OPTION statements to list the characteristics of a barricade. The FHWA agrees and, for consistency with other sections in Part 6, adds this new GUIDANCE statement in this final rule.

The FHWA received several comments regarding the last GUIDANCE statement as it relates to crashworthiness of longitudinal channelizing barricades. While the NCUTCD was opposed to the first paragraph, stating that it was not necessary, the City of Charlotte, North Carolina, and a private citizen felt that the GUIDANCE should be changed to a STANDARD in order to require that longitudinal channelizing barricades be crashworthy. The FHWA adopts the wording as proposed in the NPA because the information regarding crashworthiness is important and readers should understand that these barricades should not be used to shield pedestrians, including workers, from vehicle impacts or obstacles. Strengthening this statement to a STANDARD would require discussion and comment in a future rulemaking. However, for consistency with the special phase-in target compliance date that the FHWA established for crashworthiness provisions of other sections in Part 6, the FHWA establishes a phase-in target compliance date of January 17, 2005, for crashworthiness of longitudinal channelizing barricades in temporary traffic control zones. The FHWA believes this target date of four years from the effective date of the 2000

MUTCD provides agencies with a reasonable period in which to phase in the use of compliant longitudinal channelizing barricades in temporary traffic control zones.

269. The FHWA adds a new section numbered and titled, Section 6F.67 Other Channelizing Devices. This section was numbered Section 6F.64 in the NPA, and consists of an OPTION statement and a GUIDANCE statement that there may be channelizing devices other than those already described in Part 6 that may be used in special situations based on an engineering study. If used, these other channelizing devices should conform to the general size, color stripe pattern, retroreflectivity, and placement characteristics established for the devices described in Chapter 6F. This use of other channelizing devices was included in revision number 3 of the 1988 edition of the MUTCD (Section 6F-1 of that edition) but was inadvertently omitted from the 2000 MUTCD. The FHWA received one comment from the Association of Pedestrian and Bicycle Professionals in support of this new section, and adopts this new section in this final rule.

270. The FHWA adds a new section numbered and titled, "Section 6F.68 Detectable Edging for Pedestrians." This section contains SUPPORT and GUIDANCE statements with information and examples regarding the use of detectable edging along the length of a facility when needed. The FHWA includes this new section in this final rule to respond to comments throughout Part 6 requesting additional information on detectable edging that is consistent with information available from the U.S. Access Board, and to consolidate the information on detectable edging into a single section for clarity.

271. In Section 6F.69 Temporary Raised Islands (numbered Section 6F.65 in the NPA), the FHWA adds a STANDARD statement at the end of the section that 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 pedestrians. This change is to comply with the ADA requirements and to provide for all pedestrians, including disabled pedestrians, a clear and useable facility. The FHWA received one comment from the NCUTCD opposed to this new statement, indicating that it was repetitive, and that accessibility is covered elsewhere. The FHWA disagrees because this is important information regarding the design of temporary raised islands and adopts the STANDARD as proposed in the NPA.

In the NPA, the FHWA proposed a phase-in target compliance date of five years from the effective date of this final rule for the changes in Section 6F.69 regarding pedestrian accessibility. Because a five-year phase-in target compliance date has been established for Sections 6D.01 Pedestrian Considerations and 6D.02 Accessibility Considerations, which in turn affect many other sections throughout Part 6, a special phase-in target compliance date just for Section 6F.69 is not necessary. Accordingly, the FHWA withdraws the proposed five-year phase-in target compliance date for accessibility requirements of this section.

272. In Section 6F.70 Opposing Traffic Lane Divider (numbered Section 6F.66 in the NPA), the FHWA adds to the STANDARD statement that opposing traffic lane dividers shall not be placed across pedestrian crossings, to assure that pedestrians have a clear and useable facility. The FHWA received one comment from the City of Tucson, Arizona, in support of this change, and adopts this change.

273. In Section 6F.71 Pavement Markings (numbered Section 6F.67 in the NPA), the FHWA proposed to add to the STANDARD statement that to require that delineation and channelizing devices for use by pedestrians shall be accessible and detectable to pedestrians who have disabilities and shall be continuous throughout the temporary traffic control zone. The FHWA received comments from the NCUTCD, the City of Charlotte, North Carolina, and a private citizen opposed to this new language. The City of Tucson, Arizona, expressed support if the text was reworded to apply only at locations where persons with disabilities are likely to pass. The FHWA withdraws this proposal because accessibility information is included in other sections of Part 6 and does not need to be repeated here.

In the NPA, the FHWA proposed revising the last OPTION statement to specify the amount of time that removable, nonreflective, performed tape may be used to temporarily cover markings. The FHWA received five comments from the NCUTCD, the Wisconsin DOT, the City of Charlotte, North Carolina, a private citizen, and a traffic control device manufacturer opposing this change, stating that there is not sufficient documentation to support the notion that temporary tape becomes ineffective after two weeks. The FHWA agrees and withdraws this proposal.

Additionally, in the NPA the FHWA proposed adding a SUPPORT statement

at the end of the section that pavement markings alone are generally not sufficient for use by pedestrians who have visual disabilities. Tactile warnings on the roadway surface or audible devices are usually more helpful to these pedestrians. The FHWA received four comments from the NCUTCD and associations representing the blind community opposed to this new SUPPORT statement. Representatives of the blind community stated that there are currently no consistently understood tactile markings for roadway surfaces. The FHWA agrees with the commenters and withdraws this proposal.

274. In Section 6F.72 Temporary Pavement Markings (numbered Section 6F.68 in the NPA), the FHWA modifies the OPTION statement and the second GUIDANCE statement to indicate the use of DO NOT PASS and PASS WITH CARE signs is acceptable for temporary situations rather than pavement markings. In the NPA, the FHWA proposed deleting the use of the NO PASSING ZONE sign. While the FHWA received one comment from the City of Tucson, Arizona, in support of the changes, the NCUTCD was opposed to removing the NO PASSING ZONE sign because it felt that use of the sign should remain an option. The FHWA agrees and restores the use of the NO PASSING ZONE sign and includes a reference to Section 2C.35 for use of the NO PASSING ZONE sign in this final rule.

275. In Section 6F.75 Lighting Devices (numbered Section 6F.71 in the NPA), the FHWA adds to the GUIDANCE statement that the maximum spacing for warning lights should be identical to the channelizing device space requirements. The FHWA received one comment from the NCUTCD opposed to this change, suggesting that the proposed wording may cause practitioners to think that warning lights are needed on all channelizing devices. The City of Charlotte, North Carolina, and a private citizen suggested rewording the text to clarify that the statement applies only when warning lights are used to supplement channelization. The FHWA adopts the change, with editorial changes to indicate that the requirements apply when warning lights are used to supplement channelization.

Additionally, the FHWA changes the second SUPPORT statement (in the 2000 MUTCD) to an OPTION statement to more accurately reflect the uses of lighting devices. The FHWA received one comment from a traffic engineering consultant opposed to this change, suggesting that, because this sentence refers specifically to warning beacons, it

belongs in another section. The FHWA disagrees because this statement is generic and is most appropriate in this section.

In the NPA, the FHWA proposed adding an OPTION statement at the end of this section stating that vehicle hazard warning signals may only supplement the rotating lights or strobe lights. The FHWA received three comments from the NCUTCD, the City of Charlotte, North Carolina, and a private citizen opposed to this statement, suggesting that the statement was repetitive because this information is contained in the previous STANDARD. The FHWA agrees and withdraws this proposal, and removes this OPTION from this final rule.

276. In Section 6F.76 Floodlights (numbered Section 6F.72 in the NPA), the FHWA revises the first GUIDANCE statement by removing "flagger stations" from the text and adds a new STANDARD statement, following the GUIDANCE, to indicate that, except in emergency situations, flagger stations shall be illuminated at night. The FHWA incorporates this change in this final rule to retain consistency with other sections of the MUTCD, such as in Section 6E.05 Flagger Stations, and to improve flagger visibility during nighttime operations.

The FHWA also adds to the existing STANDARD statement that floodlighting shall not produce a disabling glare condition for approaching road users, flaggers, or workers. The FHWA adds flaggers and workers to the statement based on comments from the City of Charlotte, North Carolina, and a private citizen expressing concerns about safety of flaggers and workers. The FHWA believes that it is important and necessary to protect flaggers and workers, as well as road users, from disabling floodlight glare.

In the NPA, the FHWA proposed adding a SUPPORT statement at the end of the section, that based on research,⁵⁴ 50 lux (5 foot candles) is a desirable nighttime illumination level where workers are active. The FHWA received one comment from the Laborers' Health and Safety Fund of North America in support of this new statement. The NCUTCD, the City of Charlotte, North Carolina, a private citizen, and NIOSH suggested that additional information

⁵⁴ Information on "Illumination Guidelines for Nighttime Highway Work", NCHRP Project 5-13, 1993, is summarized in NCHRP research Results Digest Number 216, December, 1996, which is available for purchase from the Transportation Research Board's bookstore, at the following URL: http://64.118.69.9/acb1/showdet1.cfm?&DID=92&Product_ID=2048&CATID=1&series=7.

should be included regarding illumination levels for other than general activities. The FHWA agrees and includes information on illumination levels for general activities and for tasks requiring high levels of precision and extreme care.

277. In Section 6F.78 Warning Lights (numbered Section 6F.74 in the NPA), the FHWA adds Type D 360-degree warning lights, as appropriate, throughout the section to provide more flexibility in the use of lighting devices. The FHWA received one comment from ATSSA in support of these changes, and adopts these changes.

The FHWA also changes the first paragraph of the first STANDARD statement to a SUPPORT statement because it describes what warning lights are, rather than providing requirements on their use. The FHWA incorporates this minor editorial change in this final rule because the language of this statement is more appropriate as a SUPPORT, rather than a STANDARD.

278. In Section 6F.80 Temporary Traffic Control Signals (numbered Section 6F.76 in the NPA), to enhance consideration of pedestrian needs in temporary traffic control zones, the FHWA adds to the first GUIDANCE statement that, where pedestrian traffic is detoured to a temporary traffic control signal, agencies should use engineering judgment to determine if pedestrian signals or accessible pedestrian signals are needed. The FHWA received one comment from the NCUTCD opposed to this change, stating that the wording is repetitive because accessibility is already addressed elsewhere. The FHWA disagrees and includes this paragraph in this final rule.

Additionally, the FHWA proposed in the NPA to add a new STANDARD statement that indicates that the supports for temporary traffic control signals shall not encroach into a minimum required pedestrian pathway width of 1500 mm (60 in), to assure a clear pathway for all pedestrians, including disabled pedestrians. The FHWA received comments from the NCUTCD, the Cities of Tucson, Arizona, and Charlotte, North Carolina, and a private citizen opposed to this change. The NCUTCD stated that the wording is repetitive because accessibility is already addressed elsewhere. The Cities of Tucson, Arizona, and Charlotte, North Carolina, and the private citizen suggested that the text be reworded to apply only to those locations where pedestrians with disabilities are likely to be present. The FHWA agrees and revises this paragraph to state that the supports shall not encroach into the minimum width of a "pedestrian access

route" (1200 mm/48 in) or an "alternate circulation path" (900 mm/36 in) to be consistent with the various requirements elsewhere in Part 6.

The FHWA also adds to the second SUPPORT statement a new item "M. The nature of adjacent land uses (such as residential or commercial)" to the list of factors related to the design and application of temporary traffic control signals. The FHWA received one comment from a private citizen in support of this change, and adopts this change and re-letters the remaining items.

279. In Section 6F.81 Temporary Traffic Barriers (numbered Section 6F.77 in the NPA), the FHWA modifies the first SUPPORT statement to more clearly describe the four primary functions of temporary traffic barriers, by deleting the last two sentences related to the functions of temporary traffic barriers and adding a portion of text from Section 6G.11 Work Within the Traveled Way of Urban Streets. The FHWA received one comment from the City of Tucson, Arizona, in support of the changes to this section, and adopts these changes.

280. In Section 6F.82 Crash Cushions (numbered Section 6F.78 in the NPA), the FHWA adds to the STANDARD statement that damaged crash cushions shall be promptly repaired or replaced to maintain their crashworthiness. The FHWA received one comment from the City of Tucson, Arizona, in support of this change, and adopts this change.

Additionally, in the 2000 MUTCD a new requirement was established in this section that crash cushions in temporary traffic control zones shall be crashworthy. No special phase-in target compliance date was established at that time. Based on comments that agencies are encountering difficulties and economic impacts given the extensive testing of devices that has to occur in accordance with NCHRP Report 350⁵⁵ in order to determine and certify crashworthiness, the FHWA believes that a special phase-in target compliance date is required for the crashworthiness provision in this section. Therefore, in this final rule, the FHWA establishes a special phase-in target compliance date of January 17, 2005, for crash cushions in temporary traffic control zones to be crashworthy. The FHWA believes this target date of four years from the effective date of the 2000 MUTCD provides agencies with a

reasonable period in which to phase in the use of compliant crash cushions in temporary traffic control zones.

281. In Section 6F.84 Rumble Strips (numbered Section 6F.80 in the NPA), to clarify which applications are used for travel lanes and which ones are used on the shoulder, the FHWA adds to the SUPPORT statement a description of longitudinal rumble strips, and clarifies throughout the section which statements refer specifically to longitudinal rumble strips and which statements refer specifically to transverse rumble strips. The FHWA received one comment from the City of Tucson, Arizona, in support of these changes to this section, and adopts these changes.

Additionally, the FHWA adds a STANDARD statement following the SUPPORT statement that, 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 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. These changes are needed to conform to general principles for colors of pavement markings. The FHWA received two comments from the NCUTCD and the Virginia DOT opposed to this new STANDARD statement suggesting that some jurisdictions have used other colors, such as yellow and orange. The FHWA believes that white has been the traditional color used for transverse rumble strips and adopts this statement in this final rule. The use of other colors would need further research and may be considered for future rulemaking.

The FHWA also adds to the GUIDANCE statement that transverse rumble strips should not be placed through pedestrian crossings or on bicycle routes; 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; and that 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. These changes will minimize interference caused by rumble strips to bicyclists using the roadway or shoulder. The FHWA received one comment from the Association of Pedestrian and Bicycle Professionals in support of these changes. The Wisconsin DOT opposed them, suggesting that additional text is needed to define the clear path at the

⁵⁵ NCHRP Report 350, "Recommended Procedures for the Safety Performance Evaluation on Highway Features," 1993, is available for downloading from the Transportation Research Board at the following URL: http://gulliver.trb.org/publications/nchrp/nchrp_rpt_350-a.pdf.

edge of the roadway. The FHWA addresses this comment by providing additional language in this final rule that references the AASHTO Guide to the Development of Bicycle Facilities, which is listed in Section 1A.11 Relation to Other Publications.

282. In Section 6G.01 Typical Applications, in the NPA the FHWA proposed adding two SUPPORT statements indicating that temporary traffic control zones are subject to all accessibility requirements for use by all types of pedestrians. The FHWA received five comments from the NCUTCD, the Ohio DOT, the Cities of Tucson, Arizona, and Charlotte, North Carolina, and a private citizen opposed to the wording of these statements suggesting that it is repetitive because accessibility issues are already covered elsewhere. To address these comments, while also stressing the importance of accessibility, the FHWA adds a new STANDARD statement to the beginning of this section emphasizing accessibility provisions as required by the Americans with Disabilities Act.

Additionally, in the NPA the FHWA proposed to add a GUIDANCE statement following the second SUPPORT statement that bicyclists and pedestrians should not be exposed to unprotected excavations, open utility access, overhanging equipment, or other hazards. The Association of Pedestrian and Bicycle Professionals supported this new statement. For enhanced clarity, the FHWA removes this paragraph from this section and moves it, with minor editorial changes, to a new section numbered and titled, "Section 6G.05 Work Affecting Pedestrian and Bicycle Facilities."

283. In Section 6G.02 Work Duration, the FHWA adds to the SUPPORT statement in this section (and in all other sections in Chapter 6G except 6G.01, 6G.05, and 6G.14 through 6G.19), providing references to other chapters and sections of Part 6 of the MUTCD for additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite. Also, the FHWA modifies item C in the first STANDARD to clarify that short-term stationary work is defined as daytime work of more than one hour within a single daylight period. The FHWA received two comments from commenters who did not understand why the change was necessary. The change is necessary because the single period of daylight in the summertime can last more than 12 hours. The FHWA adopts the change as proposed in the NPA.

284. In Section 6G.04 Modifications to Fulfill Special Needs, the FHWA adds

throughout the GUIDANCE statement additional information related to the need to take into account pedestrian and bicycle usage. The FHWA received several editorial comments suggesting changes to the wording proposed in the NPA. The FHWA incorporates many of these changes and includes additional references to other areas of the MUTCD.

Additionally, the FHWA moves the SUPPORT and STANDARD statements at the end of the section (in the 2000 MUTCD) to Section 6F.65 Temporary Traffic Barriers as Channelizing Devices because this text outlining temporary traffic barriers is more appropriately located in this section. The FHWA received two comments from the City of Charlotte, North Carolina, and a private citizen opposed to removing these statements from this section, stating that these statements are important in this section of modifying the typical applications to fulfill special needs. The FHWA disagrees and believes that this information is best covered elsewhere, and does not need to be included in this section.

285. The FHWA adds a new section numbered and titled, Section 6G.05 Work Affecting Pedestrian and Bicycle Facilities. This new section contains SUPPORT, GUIDANCE, and STANDARD statements with provisions for maintaining accessibility for pedestrians as well as bicyclists in temporary traffic control zones. The information in this section was proposed elsewhere in the NPA. However, based on comments, the FHWA believes that this information is best consolidated into one section, rather than spread throughout all of the sections of Chapter 6G. The FHWA rennumbers the remaining sections accordingly.

286. In Section 6G.06 Work Outside of Shoulder (numbered 6G.05 in the NPA), the FHWA proposed adding to the first GUIDANCE statement that pedestrians should be separated from the worksite by appropriate barriers that maintain accessibility and detectability for pedestrians with disabilities. Although one commenter from the City of Tucson, Arizona, supported this new text, the NCUTCD suggested that it was repetitive. The FHWA disagrees that it is repetitive, but removes this paragraph from this section and places it in the new section numbered and titled, "Section 6G.05 Work Affecting Pedestrian and Bicycle Facilities."

287. In Section 6G.07 Work on the Shoulder with No Encroachment (numbered Section 6G.06 in the NPA), the FHWA proposed adding to the first STANDARD statement that, where pedestrian routes are closed, alternate

pedestrian routes shall be provided. A private citizen supported this new text. The NCUTCD suggested that the STANDARD be changed to GUIDANCE because this section involves work on the shoulder with no encroachment, and alternate pedestrian routes will not be necessary in all locations. The FHWA disagrees with changing this to a GUIDANCE, but removes this paragraph from this section and places it in the new section numbered and titled, "Section 6G.05 Work Affecting Pedestrian and Bicycle Facilities."

Additionally, the FHWA proposed adding a sentence to the GUIDANCE statement that, where feasible, signs should be placed so they do not narrow any existing pedestrian passage to less than 1500 mm (60 in). The FHWA received two comments from the NCUTCD and the City of Tucson, Arizona, opposed to this new sentence. The NCUTCD stated that it was repetitive, and the City of Tucson, Arizona, suggested a narrower passage be permitted. The FHWA removes the entire paragraph from this section and places it in the new section numbered and titled, "Section 6G.05 Work Affecting Pedestrian and Bicycle Facilities." Based on comments and to be consistent with other sections in Part 6, the FHWA revises the last sentence of this paragraph to permit existing pedestrian passages to be narrowed to 1200 mm (48 in) rather than 1500 mm (60 in). In addition, this is consistent with the ADAAG.

288. In Section 6G.08 Work on the Shoulder with Minor Encroachment (numbered 6G.07 in the NPA), the FHWA proposed adding to the GUIDANCE statement that, where feasible, pedestrian routes should be protected or alternate accessible and detectable routes should be provided. Although the City of Tucson, Arizona, supported this new text, the NCUTCD suggested that it was repetitive. The FHWA removes this paragraph from this section, rewords it and classifies it as a STANDARD to be consistent with ADA requirements and places it in the new section numbered and titled, "Section 6G.05 Work Affecting Pedestrian and Bicycle Facilities."

289. In Section 6G.10 Work Within the Traveled Way of Two-Lane Highways (numbered Section 6G.09 in the NPA), the FHWA proposed adding to the GUIDANCE statement that pedestrian detours should be avoided because pedestrians rarely observe them and the cost of providing accessibility and detectability might outweigh the cost of maintaining a continuous route. Also, whenever possible, work should be done in a manner that does not create

a need to detour pedestrians from existing routes or crossings. Although the City of Tucson, Arizona, supported this new text, the NCUTCD suggested that it was repetitive. The FHWA disagrees that it is repetitive, but removes this paragraph from this section, and places it in the new section numbered and titled, "Section 6G.05 Work Affecting Pedestrian and Bicycle Facilities."

290. In Section 6G.11 Work Within the Traveled Way of Urban Streets (numbered 6G.10 in the NPA), the FHWA adds to the first STANDARD statement that, if the temporary traffic control zone affects an accessible and detectable pedestrian facility, the accessibility and detectability along the alternate pedestrian route shall be maintained. The FHWA received one comment from a private citizen in support of this change, and four comments from the NCUTCD, the City of Tucson, Arizona, and traffic engineering consultants opposed to it. Most of the opposing commenters suggested that this statement should be a GUIDANCE, rather than STANDARD. The FHWA disagrees because this is an existing ADA requirement. Therefore, the FHWA adopts the text as proposed in the NPA. Based on a comment from the Florida DOT and for consistency with the new Section 6D.02 Accessibility Considerations, the FHWA adds another paragraph to the STANDARD that where transit stops are affected or relocated because of work activity, agencies shall provide access to temporary transit stops.

Additionally, the FHWA adds to the GUIDANCE statement that work sites within the intersection should be protected against inadvertent pedestrian incursion by providing detectable channelizing devices. The FHWA received one comment from the NCUTCD opposed to this new paragraph, stating that it is repetitive. The FHWA disagrees and adopts the text with an editorial change.

291. In Section 6G.12 Work Within the Traveled Way of Multi-lane, Nonaccess Controlled Highways (numbered Section 6G.11 in the NPA), the FHWA proposed adding to the first SUPPORT statement that Chapter 6D contains information regarding the steps to follow when pedestrian facilities are affected by the worksite. Although the City of Tucson, Arizona, supported this new text, the NCUTCD suggested that it was repetitive. The FHWA rewords this paragraph to match the same paragraph that the FHWA places in most of the other sections within Chapter 6G and places it at the beginning of the first SUPPORT statement.

Additionally, the FHWA moves the information in the second SUPPORT statement related to the four primary functions of temporary traffic barriers to Section 6F.81 Traffic Barriers (numbered Section 6F.75 in the NPA) as they more properly belong in that section.

292. In Section 6G.13 Work Within the Traveled Way at an Intersection (numbered Section 6G.12 in the NPA), to reinforce proper contact procedures, the FHWA proposed adding language to the first STANDARD statement and to the second GUIDANCE statement regarding contact with the highway agency having jurisdiction at intersections where pedestrian accessibility problems are anticipated. The FHWA received several primarily editorial comments regarding these changes. The NCUTCD suggested that the references to accessibility were repetitive. Based on a comment from a private citizen, the FHWA changes the language in the GUIDANCE to a STANDARD to provide greater consistency by requiring rather than recommending that the entity conducting the work contact the highway agency having jurisdiction when working near any (signalized or unsignalized) intersection where operational, capacity, or pedestrian accessibility problems are anticipated. If these types of problems are anticipated, it is important that the highway agency having jurisdiction be contacted even if it does not involve a signalized intersection.

The FHWA proposed adding a STANDARD statement after the second GUIDANCE statement that pedestrian crossings shall be protected with a pedestrian barrier detectable to pedestrians with visual disabilities. The FHWA received three comments from the NCUTCD, the City of Charlotte, North Carolina, and a private citizen opposed to this change suggesting that this should only be necessary if the crossing is an accessible pedestrian crossing. The FHWA agrees and revises the statement and classifies it as a GUIDANCE rather than a STANDARD to be consistent with new Section 6G.05 Work Affecting Pedestrian and Bicycle Facilities.

Additionally, the FHWA modifies item B of the third OPTION statement to indicate that uniformed law enforcement officers, as well as flaggers, may be used to direct road users when work is within an intersection. The FHWA received two comments from the Laborers' Health and Safety Fund of North America and a private citizen in support of this change and adopts this change.

293. In Section 6G.14 Work Within the Traveled Way of Freeways and Expressways (numbered Section 6G.13 in the NPA), the FHWA revises the first SUPPORT statement to include bicycles in the listing of road vehicle mix. The FHWA received one comment from the Kansas DOT opposed to this change, suggesting that bicycles should not be allowed on freeways. The FHWA adopts this change, with an editorial change to clarify that bicycles are included in the vehicle mix only if they are permitted. In some areas of the country, Interstate Routes or other freeways offer the only access for recreational bicyclists to get between destinations, and therefore bicycles are permitted. This is a safety issue that has traditionally been left to the States to decide.

294. In Section 6G.19 Work in the Vicinity of Highway-Rail Grade Crossings (numbered Section 6G.18 in the NPA), the FHWA clarifies the second sentence of the STANDARD statement by adding the word "uniformed" to describe a law enforcement officer. The FHWA makes this clarification in this final rule for consistency with other requirements elsewhere in the MUTCD.

295. The FHWA moves all of the information from Section 6G.19 Control of Traffic Through Traffic Incident Management Areas, as numbered and titled in the 2000 MUTCD, to a new chapter numbered and titled "Chapter 6I Control of Traffic Through Traffic Incident Management Areas." In its place, the FHWA adds a new section numbered and titled, "Section 6G.20 Temporary Traffic Control During Nighttime Hours." (This section was numbered Section 6G.19 in the NPA.) This new section contains SUPPORT, GUIDANCE, OPTION, and STANDARD statements regarding the temporary traffic control measures appropriate during nighttime hours. The FHWA received comments from the City of Tucson, Arizona, the Laborers' Health and Safety Fund of North America, and NIOSH in support of the new section. Many expressed that a new section devoted to temporary traffic control during nighttime hours is needed. Several commenters suggested that more information was needed to strengthen the section, and some suggested rewording and additional text. The NCUTCD favored replacing the proposed text with modified language developed by the NCUTCD Temporary Traffic Control Technical Committee. The FHWA agrees that additional information is necessary and believes the NCUTCD's rewording will clarify the section. Accordingly, the FHWA revises the text to incorporate and be

consistent with changes made in other areas of the MUTCD in this final rule, including the requirement for illuminating flagger stations, except in emergencies, consistent with Section 6E.05 Flagger Stations, and additional information on illumination for work areas in general.

296. In Section 6H.01 Typical Applications, the FHWA changes the Typical Applications figures and their accompanying notes to add more provisions to accommodate persons with disabilities and pedestrians, and to correct inadvertent minor errors in the 2000 MUTCD and in the NPA. These changes reflect the changes to all parts of the MUTCD with particular reference to Part 6 changes and they make the drawings and text consistent with other parts of the MUTCD and elsewhere in Part 6.

Additionally, in Table 6H-1 and in the corresponding Typical Applications, the FHWA changes the titles of Figure 6H-11 from "Lane Closure on Low-Volume Two-Lane Road" to "Lane Closure on Two-Lane Road with Low Traffic Volumes," Figure 6H-15 from "Work in Center of Low-Volume Road" to "Work in Center of Road with Low Traffic Volumes," and Figure 6H-16 from "Surveying Along Centerline of Low-Volume Road" to "Surveying Along Centerline of Road with Low Traffic Volumes." These changes will avoid confusion with material in Part 5 Traffic Control Devices for Low-Volume Roads. Low-volume roads, as covered in Part 5, are specifically defined in Section 5A.01 Function as, among other criteria, being outside a built-up area and having a traffic volume of less than 400 Annual Average Daily Traffic. The Typical Applications in Part 6 that refer to low volume roads are not intended to be limited only to roads meeting the limited definition of Part 5.

The FHWA inserts Table 6H-4 Formulas for Determining Taper Lengths. This information is the same information as was proposed in the NPA, except that it is included in a tabular format for clarity.

Additionally, the FHWA includes the following changes to the notes to the figures of typical applications:

a. *Notes for Figure 6H-1:* The FHWA replaces item 5 in the STANDARD statement (of the 2000 MUTCD) with a new item 5 in the OPTION statement, stating that vehicle hazard warning signals may be used to supplement high intensity rotating, flashing, oscillating, or strobe lights, and a new item 6 in the STANDARD statement, which states that vehicle hazard warning signals shall not be used instead of the vehicle's high intensity rotating, flashing,

oscillating, or strobe lights. The FHWA received no comments regarding these changes. These same changes have been made in the notes for other figures in Chapter 6H as applicable and as noted below in the discussions of such figures. The FHWA did receive two comments from the City of Charlotte, North Carolina, and a private citizen suggesting that item 1 in the GUIDANCE statement be revised. The suggested change would imply that a single sign is used, whereas this statement calls for an additional sign to be used. Because operation of the work vehicles may involve crossing from the median to the shoulder, all traffic must be warned of such conditions, and thus a sign on the median lane side and on the shoulder should be used. Accordingly, the FHWA disagrees with the commenters and adopts the text as proposed in the NPA.

b. *Notes for Figure 6H-2:* The FHWA received two comments from the City of Charlotte, North Carolina, and a private citizen objecting to the terminology for devices to be turned off in blasting zones and the letter sizes for the W22-2 sign. See discussion of this issue in Section 6F.40 TURN OFF 2-WAY RADIO AND CELL PHONE Sign (W22-2).

c. *Notes for Figure 6H-3:* See discussion of items regarding vehicle hazard warning signals in paragraph a above. That discussion applies to Figure 6H-3 also. Additionally, the FHWA adds a new item 7 to the STANDARD statement at the end of the Notes that 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. The FHWA received no comments regarding these changes, and adopts these changes.

d. *Notes for Figure 6H-4:* See discussion of items regarding vehicle hazard warning signals in paragraph a above. That discussion applies to Figure 6H-4 also.

e. *Notes for Figure 6H-5:* The FHWA revises item 4 from a GUIDANCE statement to a STANDARD statement to clarify that the ends of the barrier shall be treated in accordance with Section 6F.81 Temporary Traffic Barriers. The FHWA also removes the word "(optional)" following "crash cushion" in Figure 6H-5. The FHWA makes these changes to address two comments from the City of Charlotte, North Carolina, and a private citizen suggesting that item 4 as a GUIDANCE statement is misleading and it needs to be changed

to a STANDARD to be consistent with mandatory safety requirements of Section 6F.81 Temporary Traffic Barriers (numbered as 6F.77 in the NPA). The FHWA agrees that this change is necessary for consistency, and revises item 4 to a STANDARD statement, with some text changes to correspond with Section 6F.81.

f. *Notes for Figure 6H-6:* See discussion of items regarding vehicle hazard warning signals in paragraph a above. That discussion also applies to Figure 6H-6.

g. *Notes for Figure 6H-7:* The FHWA changes item 1 to a SUPPORT statement. It was inadvertently given a STANDARD heading in the 2000 MUTCD and the NPA, even though it contains no mandatory language. The FHWA rennumbers the remaining items accordingly. The FHWA revises items 5 and 6 (numbered items 4 and 6 in the NPA) to match the notes with the figure, which illustrates a double reverse curve situation. The FHWA makes these minor editorial changes to address two comments from the City of Charlotte, North Carolina, and a private citizen suggesting that the notes did not match the new double reverse curve illustration. The FHWA agrees and makes the changes for consistency.

h. *Notes for Figure 6H-8:* The FHWA combines items 2 and 3, as numbered in the NPA, into a single item 2 in the OPTION statement for clarity and rennumbers the following items. The FHWA also adds a new item 5 to the OPTION statement that cardinal direction plaques may be used with route signs. The FHWA makes these minor changes to address two comments from the City of Charlotte, North Carolina, and a private citizen suggesting these changes, to be consistent with other sections in Part 6.

i. *Notes for Figure 6H-9:* The purpose of Figure 6H-9 is to show signing for overlapping routes with a detour. The configuration of the actual work space raised comments from the City of Charlotte, North Carolina, and a private citizen as to what is intended by the associated signing and barricades. To avoid any confusion, the FHWA eliminates any reference to an allowance for local traffic and shows the space as a full road closure between the two intersecting routes. The FHWA adjusts the barricades and ROAD CLOSED signing accordingly. The FHWA also changes the double yellow dashed pavement markings to a single yellow dash in response to a comment from a traffic engineering consultant that the double yellow dashes are incorrect. The FHWA notes that the

markings in this figure are shown for illustrative purposes only.

j. *Notes for Figure 6H-10:* The FHWA moves item 4 in the OPTION statement to become a new OPTION item 11, and renumbers the other items accordingly for improved clarity. The FHWA also replaces item 4 (item 5 in the NPA) with the note regarding buffer space that was added to the figure in the NPA. The FHWA believes that buffer space is an important application that is often ignored, and placing the note in the notes as well as on the figure is appropriate. The FHWA also changes item 5 (item 6 in the NPA) from a GUIDANCE to a STANDARD to be consistent with Section 6E.05 Flagger Stations, and rewords the statement accordingly. The flagger and advance sign series are all moved farther upstream in the figure. Additional space is needed beyond the work area to allow the traffic in the wrong lane to return to their proper lane without conflicting with stopped vehicles in the opposite direction. The FHWA makes these changes in this final rule to address comments from the City of Charlotte, North Carolina, and a private citizen suggesting these changes to be consistent with other areas of the MUTCD.

k. *Notes for Figure 6H-11:* The FHWA removes item 2 of the STANDARD statement (from the 2000 MUTCD) because this Typical Application specifically does not involve the use of flaggers. Typical Application 10 covers the temporary traffic control zone applicable to this STANDARD, using flaggers. The FHWA received no comments regarding this change, and adopts this change in this final rule. The FHWA received two comments from the City of Charlotte, North Carolina, and a private citizen suggesting that the Type B flashing warning lights referenced in the OPTION should be changed to Type A for night work. The FHWA disagrees because there is no change from the 2000 MUTCD language elsewhere in Part 6 that would justify changing this note for Figure 6H-11.

l. *Notes for Figure 6H-12:* The FHWA adds to item 2 of the STANDARD statement that durations of red clearance intervals shall be adequate to clear the one-lane section of conflicting vehicles. Additionally, the FHWA adds a new item 5 to the STANDARD statement that safeguards shall be incorporated to avoid the possibility of conflicting signal indications at each end of the temporary traffic control zone. The FHWA proposed slightly different wording for item 5 in the NPA, however the FHWA modifies the wording based on a comment from a

traffic control device manufacturer in order to maintain consistency with Section 6F.80 Temporary Traffic Control Signals of the MUTCD. The FHWA renumbers the remaining items.

m. *Notes for Figure 6H-13:* The FHWA modifies item 2 of the STANDARD statement to indicate that a flagger or uniformed law enforcement officer shall be used during a temporary road closure. Additionally, the FHWA removes item 3 of the OPTION statement (as numbered in the 2000 MUTCD) because it is not applicable. The FHWA also adds a new item 3 as a GUIDANCE statement, which states that the law enforcement officer, if used for this application, should follow the procedures of Sections 6E.04 Flagger Procedures and 6E.05 Regulatory Sign Authority. This is to encourage law enforcement officers to use proper flagging devices and procedures for a temporary road closure. The FHWA received editorial comments on these changes, which the FHWA incorporates as appropriate in this final rule.

n. *Notes for Figure 6H-14:* The FHWA adds a new item 6 under Flagging Method which states, "At night, flagger stations shall be illuminated, except in emergencies." In response to concerns about the orientation of the signal heads in the figure, the two overhead traffic signal heads in each direction have been relocated to show one post mounted head and one overhead mounted traffic signal head.

o. *Notes for Figure 6H-15:* The FHWA adds a new item 2 to the GUIDANCE statement that workers in the roadway should wear high-visibility safety apparel as described in Section 6D.03 Worker Safety Considerations. See discussion of items regarding vehicle hazard warning signals in paragraph a above. The FHWA received comments from ATSSA and the Virginia DOT suggesting that all workers exposed to traffic wear high visibility safety apparel, and the statement be strengthened to a STANDARD. The City of Charlotte, North Carolina, and a private citizen felt the new text is unnecessary because it is obvious that workers should wear high visibility safety apparel. The FHWA strengthens the existing GUIDANCE statement in 6D.03 to include that the high visibility safety apparel should meet the requirements of ISEA "American National Standard for High-Visibility Safety Apparel" (see Section 1A.11 Relation to Other Publications) and labeled as ANSI 107-1999 standard performance for Class 1, 2, or 3 risk exposure and that 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. While this is not a mandate as suggested in two of the docket comments, the emphasis is significantly heightened from the 2000 MUTCD and does allow employer flexibility on the use of the high visibility safety apparel to fit the conditions that exist. Accordingly, the FHWA adopts the text as proposed in the NPA.

p. *Notes for Figure 6H-17:* The FHWA adds a new item 3 to the STANDARD statement that if an arrow panel is used, it shall be used in the caution mode. The FHWA renumbers the remaining items. Additionally, the FHWA removes item 5 of the GUIDANCE statement (as numbered in the 2000 MUTCD) and moves it to the OPTION statement as part of item 9 that the use of a truck mounted attenuator is optional on either a shadow vehicle or a work vehicle. Several commenters suggested an optional truck mounted attenuator be retained on the work vehicle. The FHWA agrees and includes the optional attenuator in this final rule.

q. *Notes for Figure 6H-19:* The FHWA repeats the GUIDANCE items from the notes for Figure 6H-20 in the notes for Figure 6H-19 to address two comments from the City of Charlotte, North Carolina, and a private citizen suggesting that these items be added because they are applicable and necessary for proper use of the typical application. The FHWA agrees and makes the editorial change to add these notes in this final rule.

r. *Notes for Figure 6H-21:* (See discussion of items regarding vehicle hazard warning signals in paragraph a above.) The NCUTCD objected to the addition of "optional" to the flag tree in the figure, stating it should be guidance. Optional is consistent with the text in Section 6F.57 High-Level Warning Devices. Upgrading to a GUIDANCE condition goes beyond the scope of the NPA and would need to be addressed in a future rulemaking. Practitioners can choose to make its use recommended or mandatory in their jurisdictions if appropriate.

s. *Notes for Figure 6H-22:* In the NPA, the FHWA proposed removing item 5 (as numbered in the 2000 MUTCD) from the OPTION statement, regarding a right-turn island using channelizing devices. The FHWA received three comments from the NCUTCD, the City of Charlotte, North Carolina, and a private citizen opposed to this proposal, stating that the item provides useful information that is not evident from looking at the figure. The FHWA agrees and restores the text of the 2000

MUTCD, with editorial changes. The NCUTCD, the Kansas DOT, the City of Charlotte, North Carolina, and a private citizen objected to the removal of "optional" from the arrow panel in the figure. In Section 6F.56 Arrow Panels, the FHWA adds a new GUIDANCE statement on the use of arrow panels for certain conditions such as multi-lane, high speed, high volume, limited sight distance or unexpected locations which applies in this typical application. Accordingly, the FHWA adopts the change deleting "optional" from the arrow panel in this final rule.

t. *Notes for Figure 6H-24:* The NCUTCD objected to the addition of "optional" for the buffer space and the NCUTCD, the Wisconsin DOT, the City of Charlotte, North Carolina, and a private citizen objected to the deletion of "optional" from the arrow panel in the figure. The FHWA agrees with the docket comments and withdraws these proposed changes.

u. *Notes for Figure 6H-25:* The NCUTCD objected to the term "optional" for the flag tree, stating that for work in intersections the high-level warning device is very useful and it should not be labeled as optional. Optional is consistent with the text in Section 6F.57 High-Level Warning Devices. Upgrading to a GUIDANCE condition goes beyond the scope of the NPA, and would need to be addressed in a future rulemaking. Practitioners can choose to make its use recommended or mandatory in their jurisdictions, if appropriate. Based on additional comments from the City of Charlotte, North Carolina, and a private citizen, the FHWA relocates the southbound ROAD WORK AHEAD sign upstream and dimensions it with respect to the first channelizing device rather than the intersection.

v. *Notes for Figure 6H-26:* (See discussion of items regarding vehicle hazard warning signals in paragraph a above.) The NCUTCD objected to the term "optional" for the flag tree in the figure. Similar to figures 6H-21 and 24, "optional" is consistent with the text in Section 6F.57. Practitioners can choose to make its use recommended or mandatory in their jurisdictions, if appropriate.

w. *Notes for Figure 6H-27:* (See discussion of items regarding vehicle hazard warning signals in paragraph a above.) The NCUTCD objected to the term "optional" for the flag tree in the figure. Similar to Figures 6H-12, 24, and 26, "optional" is consistent with the text in Section 6F.57 High-Level Warning Devices (Flag Trees). Practitioners can choose to make its use recommended or mandatory in their

jurisdictions, if appropriate. In addition, consistent with Section 6E.05 Flagger Stations, the FHWA adds a new STANDARD statement which states, "At night, flagger stations shall be illuminated, except in emergencies."

x. *Notes for Figure 6H-28:* In the NPA, the FHWA proposed adding a new item 3 to the GUIDANCE statement that audible warnings should be considered where midblock closings and changed crosswalk areas cause inadequate communication to pedestrians who have visual disabilities. The FHWA received five comments, including comments from representatives of the blind community, opposing this new item, and suggesting rewording. The FHWA agrees and revises this item by changing the phrase "audible warning" to "audible information devices." Additionally, the FHWA adds the use of Type D 360-degree Steady-Burn warning lights to item 7 of the OPTION statement (as numbered in the NPA), to provide consistency with other sections in Part 6. There were no comments regarding this change, and the FHWA adopts this change. The FHWA received two comments from the NCUTCD and a traffic engineering consultant regarding item 1 in the STANDARD statement, suggesting that the wording be revised for clarity. The FHWA agrees and clarifies the statement in this final rule to indicate that when crosswalks or other pedestrian facilities are closed or relocated, the temporary facilities shall be detectable and shall include accessibility features consistent with features present in the existing pedestrian facility.

y. *Notes for Figure 6H-29:* (Refer to the discussion for Figure 6H-28 regarding item 3 of the GUIDANCE statement and item 1 of the STANDARD statement). The City of Charlotte, North Carolina, and a private citizen suggested that an additional advance pedestrian crossing sign is necessary for eastbound traffic on the east leg of the intersection. The FHWA agrees and changes the figure accordingly in this final rule.

z. *Notes for Figure 6H-30:* The FHWA received comments from the NCUTCD, the Wisconsin DOT, the City of Charlotte, North Carolina, and a private citizen objecting to the removal of the term "optional" for the arrow panels in the figure. The FHWA modifies the new GUIDANCE statement in Section 6F.56 Arrow Panels on the placement criteria for use of arrow panels which will allow optional use in some conditions. Accordingly, the FHWA withdraws this proposed deletion of "optional" from the figure for this Typical Application.

aa. *Notes for Figure 6H-31:* The FHWA received one comment from

Caltrans suggesting that the metric maximum spacing formula for channelizing markings, as stated in item 4 of the GUIDANCE, is not accurate, and needed to be revised to be accurate and to be consistent with Figure 6H-32. The FHWA agrees that this was a typographical error and revises this item in this final rule from "0.1 S km" to "0.1 S m." The FHWA also adds the text "in km/h (mph)" following "where S is the speed." The FHWA received three comments suggesting that items 7 and 9 be revised to better correlate with the illustration on Figure 6H-31. The FHWA agrees and revises the items accordingly in this final rule. In note 7, the words "Two Lane" are added before "Reverse Curve" in the first and second sentences of note 7. The FHWA deletes the first sentence in note 9. Similar to Figure 6H-30, the FHWA also received four docket comments objecting to the removal of the term "optional" for the arrow panels in the figure. For the reasons listed in paragraph z above, the FHWA withdraws the proposed deletion of "optional" from the Figure for this Typical Application.

bb. *Notes for Figure 6H-32:* In the NPA, the FHWA proposed adding a new item 2 to the STANDARD statement requiring at least one advance warning sign when paved shoulders having a width of 2.4 m (8 ft) or more are closed and that 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. The FHWA received comments from the City of Charlotte, North Carolina, and a private citizen opposed to this new statement, indicating that this statement better relates to work exclusively on the shoulder. The FHWA agrees and changes this statement to a GUIDANCE and clarifies the statement to indicate that channelizing devices (rather than signs) should be used to close the shoulder in advance of the merging taper for a lane closure, to direct vehicular traffic to remain within the traveled way. The FHWA also adds a new item 4 under GUIDANCE regarding use of Reverse Curve signs rather than a Double Reverse Curve sign under certain conditions for consistency with GUIDANCE elsewhere in Part 6. The FHWA rennumbers the remaining items. One docket comment from the City of Charlotte, North Carolina, suggested that item 6 be clarified with respect to the start of temporary traffic control near railroad grade crossings where queues may extend through the crossing. The FHWA agrees and revises "transition area" to "merging taper." The FHWA

also revises notes 8 and 9 (numbered 7 and 8 in 2000 MUTCD) in response to comments from the City of Charlotte, North Carolina, and a private citizen about coordination with railroads. The FHWA believes that additional emphasis is necessary and adds the text "When a highway-rail grade crossing exists within the activity area" to the beginning of notes 8 and 9. The FHWA received comments from the City of Charlotte, North Carolina, and a private citizen objecting to the removal of the term "optional" for the arrow panels in the Figure. The FHWA deletes the term optional from the arrow panels in the figure. Although the FHWA modifies the new GUIDANCE statement in Section 6F.56 Arrow Panels on the placement criteria for use of arrow panels which will allow optional use in some conditions, in this Typical Application, the GUIDANCE conditions prevail; *i.e.* high speed, multi-lane highway. The FHWA received comments from the City of Charlotte, North Carolina, and a private citizen indicating that the distances for the RIGHT LANE CLOSED signs in the figure are in error. The FHWA agrees and revises 1500 FT and 450 m to XX FT and XX m.

cc. *Notes for Figure 6H-33:* (Refer to discussion for Figure 6H-32 regarding the new item 3 that the FHWA had proposed to add as a STANDARD.) The FHWA proposed removing item 3 of the GUIDANCE statement (as numbered in the 2000 MUTCD) because it was not applicable to the application depicted. The FHWA received three comments from the NCUTCD, the City of Charlotte, North Carolina, and a private citizen suggesting that the item be retained as a SUPPORT rather than GUIDANCE because it contains useful information suggesting that vehicles, equipment, workers, and their activities be located on one side of the pavement. The FHWA agrees and restores this statement as a SUPPORT.

dd. *Notes for Figure 6H-34:* The FHWA adds a new item to the STANDARD statement that the information from this figure shall also be used when work is being performed in the lane adjacent to the median on a divided highway, and specifies which signs to use for the specific application in this figure. This is a repeat of an item in the STANDARD statement in the notes for Figure 6H-33. The FHWA makes this change to address two comments from the City of Charlotte, North Carolina, and a private citizen suggesting that this STANDARD in Figure 6H-33 is also applicable to Figure 6H-34. The FHWA agrees that this is needed for consistency with

requirements elsewhere in Part 6 and adopts this change in this final rule. The City of Charlotte, North Carolina, and a private citizen suggested that the term "temporary," used to describe an edge line in note 2, be labeled "interim" as temporary markings are to remain in place only two weeks. The FHWA disagrees because Sections 6F.71 Pavement Markings and 6F.72.

Temporary Pavement Markings provide adequate guidance for short and long term markings and there is no term "interim" used to describe markings. Additionally, the FHWA received two comments from the City of Charlotte, North Carolina, and a private citizen indicating that the notes for the crash cushion in the figure are redundant. The FHWA addresses the comments and provides necessary consistency with other sections of the MUTCD by revising the notes and the figure as follows: To maintain consistency with Figure 6H-5, the FHWA revises note 3 (note 2 in the 2000 MUTCD) by deleting the last sentence. The FHWA adds a new STANDARD item 4 to clarify that the ends of the barrier shall be treated in accordance with Section 6F.81 Temporary Traffic Barriers. The FHWA also removes the word (optional) following "crash cushion" in Figure 6H-34 and changes the Section reference from Section 6F.78 to Section 6F.82 Temporary Traffic Barriers. Additionally, the FHWA received comments from the City of Charlotte, North Carolina, and a private citizen stating that the END ROAD WORK sign in the southbound direction should be labeled as optional. The FHWA agrees because the ROAD WORK AHEAD sign is optional in the southbound direction and revises the figure accordingly.

ee. *Notes for Figure 6H-35:* In the NPA, the FHWA proposed modifying item 4 of the GUIDANCE statement to indicate that Shadow Vehicle 2 should be equipped with an arrow panel in a caution mode if on the shoulder. The FHWA received comments from the NCUTCD, the Wisconsin DOT, the City of Charlotte, North Carolina, and a private citizen suggesting that the arrow panel should continue to be used in the arrow mode rather than the caution mode because, for this mobile operation, the distance between Shadow Vehicles 2 and 1 simulates a merging taper. The FHWA agrees and restores the text from the 2000 MUTCD, removing the phrase "in caution mode if on the shoulder" from this final rule. The FHWA also received one comment from Caltrans that an optional truck mounted attenuator should be shown on the work vehicle to enhance road user and worker

safety. The FHWA agrees and adds an optional truck mounted attenuator in the figure in this final rule.

ff. *Notes for Figure 6H-36:* The FHWA revises item 11 of the OPTION statement to clarify that the signs to be used are "Three Lane Reverse Curve" signs, rather than "Triple Lane Shift" signs. The FHWA makes this change because it is needed for consistency and to properly identify the type of sign to be used. The FHWA also received several comments from the NCUTCD, the City of Charlotte, North Carolina, and a private citizen related to the temporary barrier and crash cushion in the figure. Consistent with Figures 6H-5 and 6H-34, the FHWA adds a new STANDARD item 4 to clarify that where installed, the ends of the barrier shall be treated in accordance with Section 6F.81 Temporary Traffic Barriers. The FHWA deletes the parenthetical phrase "(see Section 6F.77 for end treatments)" in item 13 as the new STANDARD item 4 covers this information.

gg. *Notes for Figure 6H-37:* The FHWA received two comments from the City of Charlotte, North Carolina, and a private citizen objecting to the deletion of the label "optional" from the arrow panels. The FHWA modifies the new GUIDANCE statement in Section 6F.56 Arrow Panels on the placement criteria for use of arrow panels which will allow optional use in some conditions. In this Typical Application, however, the GUIDANCE conditions prevail; *i.e.* high speed, multi-lane highway. Accordingly, the FHWA deletes the term "optional" from the arrow panels in the figure.

hh. *Notes for Figure 6H-39:* The FHWA received comments from Caltrans, the City of Charlotte, North Carolina, and a private citizen related to the position and dimensions of the advance sign series in the northbound direction. To clarify the figure and allow flexibility for the practitioner, the FHWA changes the distances on the signs from 1500 FT, ½ MILE, 1 MILE to XX FT, XX MILE and XX MILE. The metric equivalents are also changed accordingly to XX m, XX m and XX km. The FHWA received two comments from the City of Charlotte, North Carolina, and a private citizen objecting to the deletion of the label "optional" from the arrow panels. The FHWA deletes the "optional" label because of the modifications made to the new GUIDANCE statement in Section 6F.56 Arrow Panels on the placement criteria for use of arrow panels which will allow optional use in some conditions. In this Typical Application, however, the GUIDANCE conditions prevail; *i.e.* high speed, multi-lane highway.

ii. *Notes for Figure 6H-40:* The FHWA adds to item 3 that YIELD or STOP lines should be installed, if needed, across the ramp to indicate the point at which road users should YIELD or STOP. The FHWA received two comments from the City of Charlotte, North Carolina, and a private citizen suggesting additional information should be included in the GUIDANCE regarding the placement of YIELD or STOP lines. However, the FHWA does not add additional language in this final rule because such a change would require further study and public comment. Additionally, the FHWA adds a dimension of 7.5 m (25 ft) spacing between channelizing devices shown on Figure 6H-40. The FHWA includes this additional guidance, beyond the general guidance in Section 6F.58 Channelizing Devices about channelizing device spacing, to help improve channelization specifically in the median crossover by providing a recommended device spacing to minimize the tendency of vehicles to drive between devices. The FHWA received one comment from a private citizen in support of this change, and the FHWA adopts this change.

jj. *Figure 6H-41:* (See discussion regarding channelizing device spacing in paragraph ii above.)

kk. *Notes for Figure 6H-42:* The FHWA removes items 6 and 7 of the OPTION statement (as numbered in the 2000 MUTCD) because they are not applicable to the specific application depicted on Figure 6H-42. In the NPA, the FHWA proposed renumbering the remaining item. The FHWA received two comments from the City of Charlotte, North Carolina, and a private citizen suggesting that the remaining item, stating that a buffer may be used, was not clear without the two previous items, which had been removed. The FHWA agrees and deletes the remaining item (6) in this final rule because it is unlikely that a buffer will be used for this application, thus the note is not necessary. (See the discussion and comments for item gg above regarding the label "optional" for the arrow panels on the figure.)

ll. *Notes for Figure 6H-44:* The FHWA removes item 5 in the GUIDANCE statement (as numbered in the 2000 MUTCD) because it is too vague and there is no accepted practice to determine how traffic is stabilized. The FHWA renumbers the remaining items. The FHWA received no comments regarding this change. (See the discussion and comments for paragraph gg above regarding the label "optional" for the arrow panels on the figure.)

mm. *Notes for Figure 6H-45:* The FHWA adds a second sentence to items 2a and 2e to include changing the mode

of the second northbound and southbound arrow panels respectively from Caution to Right Arrow and from Right Arrow to Caution. The FHWA received comments suggesting that these changes are necessary for consistency with Chapter 6F of the MUTCD. The FHWA agrees and adopts these changes in this final rule.

nn. *Notes for Figure 6H-46:* The FHWA revises item 9 from GUIDANCE to a STANDARD consistent with Section 6E.05 Flagger Stations. The standard states, "At night, flagger stations shall be illuminated, except in emergencies." This change is necessary to be consistent with the new STANDARD in Section 6E.05 Flagger Stations.

297. The FHWA adds a new chapter, numbered and titled "Chapter 6I Control of Traffic Through Traffic Incident Management Areas." This new chapter contains text from Section 6G.19 Control of Traffic Through Incident Areas (as numbered in the 2000 MUTCD) in its entirety with several modifications and additional information on the use of temporary traffic control devices for traffic incident management zones. The new chapter contains a general section as well as sections on major, intermediate, and minor traffic incidents, and on use of emergency-vehicle lighting (flashing or rotating beacons or strobes). This Chapter is included to recognize the importance of safely and efficiently controlling traffic through traffic incident areas and the unique characteristics of incidents and the traffic controls that should be used.

In Section 6I.01 Control of Traffic Through Traffic Incident Management Areas, the FHWA received comments from Lake County, Illinois, and the Cities of Tucson, Arizona, and Charlotte, North Carolina, and a private citizen specifically in support of this new section, several informational and editorial comments, and some comments opposed to specific language within the section.

Based on a comment from NIOSH suggesting that a distinction be made between planned and unplanned events, the FHWA makes a distinction between planned and unplanned events and removes language in this section, as well as the entire chapter, referring to planned events. With pre-planning and coordination between law enforcement and transportation agencies, most special events, such as a sporting event or a scheduled visit by a dignitary, would not require the emergency measures described in this section. This section focuses on management of emergency and other unforeseen

incidents, including motor vehicle crashes, hazardous materials spills, and natural disasters. All references to special events are deleted from this chapter.

The FHWA also revises text within this section to be consistent with changes made in other areas of the MUTCD in this final rule. Such revisions include clarifying the limits of an incident management area and designating the color fluorescent pink as an optional background color for incident management signs. Some commenters felt that the special color for traffic incident management signing should be mandatory or recommended rather than an option. The FHWA agrees it would be desirable for all traffic incident management signs to be the special color but determines that this is not practical due to the unplanned nature of such incidents and the wide variety and capabilities of first responders. The reason that the FHWA establishes an optional distinctive color (fluorescent pink) for signing for incident management is to inform drivers that the temporary traffic controls have been set up for an emergency and therefore this is not a normal temporary traffic control zone. If incident management treatments, including the special sign color, are only used for unforeseen situations, drivers will realize that they need to be especially alert in incident management situations.

Consistent with Section 2C.33 of the MUTCD, the FHWA adopts the W4-2 Lane Ends symbol sign but revises its design to be consistent with the Canadian symbol. (Please refer to the discussion in Section 2C.33).

In response to comments from NIOSH, the City of Charlotte, North Carolina, and a private citizen, the FHWA also revises the third paragraph of the first GUIDANCE statement that "first responders" to the incident should assess the situation and set up temporary traffic control related to that assessment. First responders, however, will likely be too involved with other tasks related to the incident itself and accordingly the FHWA has deleted "first" from this statement. The statement now recognizes that other responders may perform this assessment and the associated tasks for temporary traffic control.

In Section 6I.02 Major Traffic Incidents, the FHWA received two comments from the City of Charlotte, North Carolina, and a private citizen opposed to the first GUIDANCE statement regarding the use of applicable procedures and devices for traffic incidents that are anticipated to

last more than 24 hours. The commenters stated that normal temporary traffic control procedures should be recommended for any incident lasting more than a few hours. The FHWA disagrees with these comments because incidents that are relatively severe can last for most of a day, and it is appropriate during these incidents to allow the use of incident management procedures and devices, rather than temporary traffic control procedures and devices.

Based on comments from NIOSH and the Iowa DOT, the FHWA revises the third paragraph of the second GUIDANCE statement to add uniformed law enforcement officers, for consistency with other sections in Part 6.

Based on comments from the NCUTCD, the City of Charlotte, North Carolina, and a private citizen, the FHWA revises the third GUIDANCE statement in this final rule to delete the recommendation that channelizing devices should be used whenever possible if a roadway is expected to be closed for more than three hours. That recommendation was inconsistent with the first GUIDANCE statement in this section, which states that other chapters of Part 6 should be used if the incident will last more than 24 hours. Finally, the FHWA revises the last paragraph of the GUIDANCE statement to address a comment from the NCUTCD suggesting that the reference to using flares for short-term temporary traffic control be deleted.

In Section 6I.03 Intermediate Traffic Incidents, the FHWA revises the SUPPORT statement to clarify the duration of intermediate traffic incidents, based on comments from the NCUTCD and to be consistent with Section 6I.01 General. The FHWA makes additional revisions to this section to be consistent with changes as discussed in Section 6I.02 Major Traffic Incidents.

In Section 6I.04 Minor Traffic Incidents, the FHWA revises the SUPPORT statement to clarify the duration of minor traffic incidents. The FHWA also removes the first paragraph of the GUIDANCE statement and adds that paragraph to Sections 6I.01, 6I.02, and 6I.03, as this recommendation for training of on-scene responders is generally applicable to all types of traffic incidents but especially major and intermediate ones.

In Section 6I.05 Use of Emergency-Vehicle Lighting, the FHWA received one comment from NIOSH opposed to the section, suggesting that the section does not provide clear, consistent advice on the use of emergency-vehicle

lighting. The FHWA disagrees because the first sentence of the first paragraph points out that emergency-vehicle lighting is essential prior to establishing good traffic control and the second and third paragraphs encourage emergency-vehicle lighting to be kept to a minimum after good traffic control has been established. The FHWA adopts this section with an additional GUIDANCE paragraph stating that 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.

Discussion of Adopted Amendments to Part 7—Traffic Controls for School Areas

298. In Section 7A.01 Need for Standards, the FHWA received one comment from Caltrans suggesting that the STANDARD, which states that the types of traffic control devices used in school areas shall be related to the volumes and speed of vehicular traffic, street width, and the number and age of the students using the crossing, is not practical because the type of traffic control devices cannot be related to all of the conditions listed. The FHWA agrees that GUIDANCE, to provide recommendations rather than a requirement, is appropriate and revises this statement in the final rule to a GUIDANCE. In addition, this is consistent with the rest of the GUIDANCE statement in Section 7A.01.

299. In Section 7A.04 Scope, the FHWA received four comments from the NCUTCD, the Kansas DOT, and the Minnesota DOT opposing the removal of the second paragraph of the STANDARD restricting the use of portable school signs. The FHWA disagrees with the commenters because Arizona has extensively used portable school signs, in accordance with Arizona State laws and Arizona DOT guidelines that have been in effect for several decades.⁵⁶ The FHWA believes that, when designed and placed

appropriately, portable school signs can be helpful in reducing speed, increasing road user awareness of the crossing, and enhancing school pedestrian safety. The FHWA believes that the use of these signs is a subset of overall “in-street” pedestrian devices that the FHWA adopts in Part 2. In addition, the State of Washington successfully experimented with in-roadway school warning signs,⁵⁷ as discussed below under Sections 7B.08 School Advance Warning Assembly (S1–1 with Supplemental Plaque) and 7B.09 School Crosswalk Warning Assembly (S1–1 with Diagonal Arrow). Accordingly, the FHWA adopts the removal of the text as specified in the NPA. For consistency with other parts of the MUTCD, the FHWA also adds an OPTION that in-roadway signs for school traffic control areas may be used consistent with the requirements of Sections 7B.08, 7B.09, and 2B.12 In-Street Pedestrian Crossing Signs.

300. In Section 7A.09 Unauthorized Devices and Messages, (titled Section 7A.09 Removal of Confusing Advertising in the 2000 MUTCD), the FHWA changes the title to provide consistency with other text in the MUTCD as well as to avoid conflicting statements to clarify the intent of this section. Two commenters from the Ohio DOT and Caltrans suggested that the title of the section be changed to clarify the intent of the section. The comment from the Ohio DOT also suggested that the SUPPORT statement be revised to reference Section 1A.01 Purpose of Traffic Control Devices in addition to Section 1A.08 Authority for Placement of Traffic Control Devices, which is already referenced. The FHWA agrees that these changes are necessary for consistency.

301. In Section 7B.01 Size of School Signs, the FHWA revises the STANDARD statement to indicate that the “Conventional Road” size sign shall be used on public roads, streets, and highways unless engineering judgment determines that a special sign size would be more appropriate, and that “oversized” sign sizes shall be used on expressways. The FHWA also revises the OPTION statement to indicate that “oversized” sign sizes may be used for application that require increased emphasis, improved recognition, or increased legibility.

⁵⁶ “Traffic Safety for School Areas Guidelines”, 30–012, Arizona Department of Transportation, June 2003, includes Arizona DOT guidelines for use of portable school signs and citations of applicable Arizona State laws. This document is available at the following URL: http://www.dot.state.az.us/ROADS/traffic/standards/School_Safety/Schoolsafety.pdf. The longstanding use and success of these signs in Arizona is reported in “School Zone Flashers—Do they Really Slow Traffic?” by Benjamin E. Burritt, Richard C. Buchanan, and Eric I. Kalivoda”, an article in ITE Journal, volume 60, number 1, January, 1990, pages 29–31. A copy of this article is available on the docket. Also, this issue of ITE Journal is available for purchase from the Institute of Transportation Engineers (ITE) at the following URL: <http://ite.org> and click on “Bookstore”.

⁵⁷ “School Zone ‘Delineator’ Project: Summary of Preliminary Analysis Data” was prepared in August 2003 by the Washington Traffic Safety Commission for the Washington State Department of Transportation, as a part of FHWA-approved experimentation number 7–16. This document is available on the docket.

The FHWA also revises the three size columns of Table 7B-1 to correspond with the text changes, so that the first column is labeled "Conventional Road", the second column is labeled "Minimum" and the third is labeled "Oversized". The FHWA proposed several changes to this table in the NPA to reflect additional new signs, changes in sign sizes, and deletion of signs. Based on comments from the NCUTCD, the Virginia and Oregon DOTs, Pierce County, Washington, and a traffic engineering consultant, the FHWA incorporates additional changes to these signs in this final rule. These changes in the table reflect changes throughout Part 7 and make the sizes of supplemental plaques correspond more closely with the sizes of the signs they supplement. The sign sizes in this table are also consistent with the sign sizes in Part 2.

302. In Section 7B.07 Sign Color for School Warning Signs, the FHWA changes item A in the OPTION statement to "School Advance Warning Sign" to be consistent with other changes in the MUTCD. The FHWA also changes item D in the OPTION statement to clarify that only the SCHOOL portion on the School Speed Limit (S5-1) sign may have a fluorescent yellow-green background. The SCHOOL portion of the sign is the warning message. The FHWA also adds item H in the OPTION statement to include the Reduced Speed School Zone Ahead (S4-5, S4-5a) sign in the list of signs that may have a fluorescent yellow-green background with a black legend and border.

303. In Section 7B.08 School Advance Warning Assembly (S1-1 with Supplemental Plaque), to respond to a comment from a traffic engineering consultant suggesting clarification, the FHWA adds to the GUIDANCE statement an exception that the School Advance Warning (S1-1) assembly does not need to be installed along a highway when a physical barrier, such as fencing, separates school children from the highway.

The FHWA also adds an OPTION statement at the end of the section to describe the use of the in-street reduced size School Advance Warning (S1-1) sign and reduced size AHEAD (W16-9p) plaque in advance of a school crossing. The Washington State DOT performed a before and after study to determine the effectiveness of this sign. Although a final report on the evaluation is not complete, a preliminary analysis of the data⁵⁸ shows that these signs can be

effective in reducing speeds in school zones. Based on this experience, the FHWA determines that this is an acceptable variation of the In-Street Pedestrian Crossing sign discussed in Section 7B.09 School Crosswalk Warning Assembly (S1-1 with Diagonal Arrow). This sign will provide an additional tool to increase the safety of school crossings by enhancing the conspicuity of advance warnings.

For easier reference, the FHWA assigns the page of sign images a number and title, "Figure 7B-1 School Area Signs".

Also, the FHWA adds a new figure numbered and titled, "Figure 7B-2 Examples of Signing for School Crosswalk Warning Assembly" to illustrate the placement of these assemblies as described in Section 7B.09.

Additionally, the FHWA rennumbers and retitles Figure 7B-1 (as numbered in the 2000 MUTCD) to "Figure 7B-3 Examples of Signing for School Area Traffic Control with School Speed Limits." The FHWA received a comment in agreement from NCUTCD and a comment in opposition from a traffic engineering consultant regarding this figure. The traffic engineering consultant questioned the need to have an "End SCHOOL ZONE" sign. This sign is discussed in Section 7B.13 END SCHOOL ZONE Sign (S5-2) and its use is appropriately shown in Figure 7B-3.

The FHWA adds a new figure numbered and titled, "Figure 7B-4 In-Street Signs in School Areas" to illustrate the placement of these signs as described in Sections 7B.08 and 7B.09. The FHWA adds this figure in this final rule to provide clarity and to assist users in understanding the sign placement.

304. In Section 7B.09 School Crosswalk Warning Assembly (S1-1 with Diagonal Arrow), the FHWA received several comments from the NCUTCD, State DOTs, a traffic control device manufacturer, and a private citizen regarding the proposal to insert an OPTION statement allowing the use of the In-Street Pedestrian Crossing (R1-6 or R1-6a) signs at unsignalized midblock crossings. The NCUTCD and the Minnesota DOT were opposed to allowing the use of the sign, suggesting that there was not sufficient research to support of the effectiveness of the sign. The Oregon DOT, a traffic control device manufacturer, and the private citizen suggested that use of the sign be permitted at all unsignalized school

crossings, not just midblock crossings. As discussed above in Section 7A.04, the FHWA believes that portable school signs, when designed and placed appropriately, can be helpful in reducing speed, enhancing road user awareness of the crossing, and enhancing school pedestrian safety. The use of these signs is a subset of overall "in-street" pedestrian devices that FHWA adopts in Section 2B.12 In-Street Pedestrian Crossing Signs (R1-6, R1-6a), and for consistency, the FHWA adopts their use in Section 7B.09. The FHWA deletes "midblock" from the OPTION in this section and adds language to the STANDARD statement regarding sign placement and breakaway requirements.

The FHWA adds to the OPTION statement to describe the use of the reduced size School Advance Warning (S1-1) sign at an unsignalized school crossing instead of the In-Street Pedestrian Crossing (R1-6 or R1-6a) sign and to describe the use of the reduced size Diagonal Arrow (W16-7p) plaque with the reduced size School Advance Warning (S1-1) sign. Based on successful experience with this in-street version of the School Crosswalk Warning Assembly in Washington State, as discussed above under Section 7B.08, the FHWA believes that this is an acceptable alternative to the In-Street Pedestrian Crossing (R1-6 or R1-6a) sign for use at a school crosswalk.

Additionally, the FHWA clarifies the STANDARD statement at the end of the section to describe the use of the In-street Pedestrian Crossing sign and the reduced-size in-street School Advance Warning (S1-1) assembly.

305. In Section 7B.11 School Speed Limit Assembly (S4-1, S4-2, S4-3, S4-4, S4-6, S5-1) (referred to as Section 7B.11 School Speed Limit Assembly (S4-1, S4-2, S4-3, S4-4, S5-1) in the NPA), the FHWA received three comments from the Ohio DOT and traffic engineering consultants regarding the location of the reduced speed zone in the vicinity of a school. While there were no proposed changes to this statement in the NPA, the FHWA changes the location of the speed zone in relation to the school property line from "90 m (300 ft)" to "30 m (100 ft)" to correct an error in the 2000 MUTCD and address the concerns of the commenters. The FHWA also changes the corresponding dimension shown in Figure 7B-3.

In the NPA, the FHWA proposed to add to the OPTION statement that changeable message signs should subscribe to the principles established in Section 2A.07 Changeable Message Signs and other sections of the MUTCD,

⁵⁸ "School Zone 'Delineator' Project: Summary of Preliminary Analysis Data" was prepared in August 2003 by the Washington Traffic Safety Commission

for the Washington State Department of Transportation, as a part of FHWA-approved experimentation number 7-16. This document is available on the docket.

for consistency with Section 6F.55 Portable Changeable Message Signs. The NCUTCD suggested eliminating redundant references to the changeable message signs. Based on this comment, the FHWA creates a new OPTION statement after the second STANDARD and moves what was previously the first paragraph of the OPTION statement to this new OPTION and revises the wording to include references to Section 2A.07 and 6F.55. The FHWA deletes the remaining repetitious wording from the second OPTION.

The FHWA adds new paragraphs to the last OPTION statement indicating that fluorescent yellow-green pixels may be used when school-related messages are shown on a changeable message sign and that changeable message signs that display the speed of approaching drivers may be used in a school speed zone. There were no comments on this change.

The FHWA also adds information on the use of the FINES HIGHER (R2-6) sign to advise road users when increased fines are imposed for traffic violations in school zones. One commenter from the Wisconsin DOT felt that this sign was not necessary because these laws are already in the State statutes and the State generally does not make it a practice to sign all statutory requirements. Because this is an OPTION statement, any State can decide whether or not to use this sign. The FHWA adopts the language as proposed in the NPA.

306. In Section 7B.12 Reduced Speed School Zone Ahead Sign (S4-5, S4-5a) (referred to as Section 7B.12 School Reduced Speed Ahead Sign (S4-5, S4-5a) in the NPA), the FHWA received several comments from the NCUTCD and State DOTs regarding the use of S4-5 and S4-5a signs. The Illinois, Oregon, and Wisconsin DOTs and the NCUTCD opposed the use of these signs in place of the rectangular "School/Reduced Speed Ahead" signs, stating that these signs are not needed and do not add much benefit for the impact they would have on the States. The State DOTs stated that the S4-5 and S4-5a warning signs may not be as effective as the rectangular signs.

The FHWA disagrees and adds the S4-5 and S4-5a signs in this final rule for Part 7 to avoid conflicting sign applications within the MUTCD. The FHWA establishes a phase-in target compliance date of 15 years from the effective date of this final rule for replacement of existing regulatory signs in good condition with these warning signs to minimize any impact on State or local governments.

This is consistent with the decisions in Chapter 2C to add the W3-5 Speed Reduced Ahead signs in symbol and legend designs for English units and the legend design for metric units. In response to the NCUTCD's suggestions to enhance the perception and legibility, the FHWA modifies the design of the W3-5 symbol sign to reduce the height of the legend "SPEED" and "LIMIT" while increasing the height of the numbers of the speed limit. This will provide enhanced perception and legibility distance.

307. In Section 7C.03 Crosswalk Markings, the FHWA adds a new SUPPORT statement at the beginning of the section to provide information on the use of crosswalk markings. The FHWA received one comment from the City of Tucson supporting all of the changes to this section as proposed in the NPA.

Additionally, the FHWA revises the second paragraph of the GUIDANCE statement to include extending crosswalk lines to the edge of the intersecting crosswalk to discourage diagonal walking between crosswalks. The FHWA adds this additional wording to be consistent with changes in Section 3B.17 Crosswalk Markings, and because school children are pedestrians. To be consistent with Section 3B.17, the FHWA also adds additional text at the end of the first GUIDANCE statement to indicate that crosswalks should not be used indiscriminately and that an engineering study should be performed before placing crosswalks at locations away from traffic control signals or STOP signs.

308. In Section 7C.04 Stop and Yield Lines, the FHWA revises the title from "Stop Line Markings" to "Stop and Yield Lines" and revises the entire section to appropriately mirror the STANDARD, GUIDANCE, OPTION, and SUPPORT statements contained in Part 3. The FHWA received one comment from the City of Tucson, Arizona, in support of all of the changes. The Oregon DOT suggested adding an OPTION to allow the use of a stop line with STOP HERE FOR PEDESTRIANS signs at both intersection and midblock locations at crosswalks not controlled by a signal, stop sign, or yield sign, in order to help enforce State law requiring drivers to stop. The FHWA disagrees because STOP HERE FOR PEDESTRIAN signs with stop lines are not adopted in Section 2B.11 Yield Here to Pedestrians Signs (R1-5, R1-5a) or Part 3 Markings.

309. In Section 7E.04 Uniform of Adult Crossing Guards and Student Patrols (referred to as Section 7E.04 Uniform of Adult Guards and Student

Patrols in the NPA), the FHWA adds a STANDARD statement that adult guards shall wear high-visibility safety apparel labeled as ANSI 107-1999 standard performance for Class 2, and that student patrols shall wear high-visibility safety apparel labeled as ANSI 107-1999 standard performance for Class 1. This safety apparel will make the guards and patrols (and the students they are managing) far more visible to approaching road users. The adopted language in this final rule includes a slight revision from the NPA that changes the phrase "high-visibility retroreflective clothing" to "high-visibility safety apparel." The FHWA incorporates this change in this final rule for consistency with terminology used in Part 6 and to avoid any possible misinterpretation that all clothing worn must meet the ANSI standard. The FHWA adopts a phase-in target compliance date for these changes of five years from the effective date of this final rule in order to minimize any impact on State or local agencies.

310. In Section 7E.05 Operating Procedures for Adult Crossing Guards (referred to as Section 7E.05 Operating Procedures for Adult Guards in the NPA), the FHWA received seven comments from the NCUTCD, State and local DOTs, traffic control device manufacturers, and private citizens regarding the proposal to add an OPTION statement at the end of the section to allow the STOP paddle to be modified to enhance the conspicuity of the paddle by adding white flashing lights. All of the commenters suggested that the use of red lights also be allowed. The FHWA agrees and adds the use of red lights to the OPTION.

The FHWA also adds item E to the OPTION statement to indicate that a series of white lights forming the shapes of the letters in the legend of a STOP paddle may be used. This is consistent with adopted changes to Parts 2 and 6 of the MUTCD.

Additionally, the FHWA adds a STANDARD statement following the new OPTION statement to define the acceptable flashing rate of the optional flashing lights on STOP paddles. This change is consistent with the flashing rate in other parts of the MUTCD. A traffic control device manufacturer and private citizen suggested increasing the flash rate to three times the normal rate. The FHWA disagrees with allowing an increased flash rate because such a flash rate would be close to the range of flash rates that may cause epileptic seizures.⁵⁹ The FHWA adopts the flash

⁵⁹ The website of the National Society for Epilepsy, a professional society in the United

rate of between 50 and 60 flashes per minute as proposed in the NPA.

Discussion of Adopted Amendments to Part 8—Traffic Controls for Highway-Rail Grade Crossings

311. In Section 8A.01 Introduction, the FHWA revises the definitions in the STANDARD statement for: “Advance Preemption and Advance Preemption Time” (change to “Advance Preemption” and “Advance Preemption Time”), “Clear Storage Distance,” “Dynamic Envelope Delineation” (change to “Dynamic Envelope”), “Maximum Highway Traffic Signal Preemption Time,” “Minimum Track Clearance Distance,” “Pre-signal,” and “Queue Clearance Time” to reflect accepted practice and terminologies. There were a few editorial comments regarding some of these definitions that have been incorporated in this final rule as appropriate.

The FHWA also adds definitions for the following because they are referred to later in the MUTCD: “Dynamic Exit Gate Operating Mode,” “Exit Gate Clearance Time,” “Exit Gate Operating Mode,” “Flashing-Light Signals,” “Timed Exit Gate Operating Mode,” “Wayside Equipment,” and “Vehicle Intrusion Detection Devices” to reflect accepted practice and terminologies. There were a few editorial comments regarding some of these definitions that have been incorporated in this final rule as appropriate.

Additionally, in response to a comment from Norfolk Southern Railroad, the FHWA removes the definition for “Monitored Interconnected Operation” because it is not used in the MUTCD. The FHWA rennumbers the remaining definitions accordingly.

312. In Section 8A.02 Use of Standard Devices, Systems, and Practices, the FHWA adds a GUIDANCE statement following the STANDARD statement. This GUIDANCE statement is identical to the second GUIDANCE statement in Section 10A.02 Use of Standard Devices, Systems, and Practices, and reinforces that Part 1 principles of design, placement, operation, maintenance, and uniformity of traffic control devices should be considered for both highway-rail and highway-light rail transit grade crossings. There was one

comment from the City of Tucson, Arizona, in support of this change. The Ohio DOT suggested editorial changes to reduce redundancy in listing types of traffic. The FHWA agrees and changes the phrase “drivers, pedestrians, and bicyclists” to “vehicle operators and pedestrians.” The Virginia DOT suggested that the GUIDANCE be changed to a STANDARD. The FHWA disagrees because this statement is not specific enough to be a STANDARD.

313. In Section 8A.03 Uniform Provisions, the FHWA changes the STANDARD statement to indicate that no sign or signal shall be located in the center of an undivided highway, except in a “raised island.” In the 2000 MUTCD, the text used the phrase “island with non-mountable curbs,” however a traffic engineering consultant suggested a change to clarify that the curb should not be mountable. The FHWA agrees and modifies the text, with slight editorial changes, to be consistent with the AASHTO Green Book.⁶⁰

314. In Section 8A.04 Highway-Rail Grade Crossing Elimination, the FHWA adds a GUIDANCE statement at the beginning of the section. This GUIDANCE statement is identical to the first GUIDANCE statement in Section 10A.04 Highway-Light Rail Transit Grade Crossing Elimination, and reinforces that both highway-rail and highway-light rail transit grade crossings are a potential source of congestion and agencies should conduct engineering studies to determine the cost and benefits of eliminating such crossings. The FHWA received one comment from the Wisconsin DOT suggesting that the statement also mention that crossings are a potential source of crashes. The FHWA agrees and adds the appropriate text in this final rule.

Additionally, the FHWA adds an OPTION statement at the end of the section. This OPTION statement is identical to the last OPTION statement in Section 10A.04 and reinforces that TRACKS OUT OF SERVICE (R8–9) signs may be temporarily installed at locations where both rail or light rail

transit is eliminated at a highway-rail or highway-light rail transit grade crossing until the tracks are removed or paved over. The FHWA received one comment from the New Jersey DOT suggesting that this new OPTION be made a STANDARD. The FHWA also received a comment from the U.S. Access Board suggesting that the preceding GUIDANCE, as it relates to paving over tracks where a railroad is eliminated at a highway-rail grade crossing, be strengthened by adding a time limit by which the tracks should be paved over. The FHWA revises the OPTION statement to indicate that based on engineering judgment, the TRACKS OUT OF SERVICE sign may be temporarily installed until the tracks are removed or paved over and that the length of time that the tracks will be out of service before they are removed or paved over may be considered in making the decision as to whether to install the sign.

315. In Section 8A.05 Temporary Traffic Control Zones, the FHWA adds a SUPPORT statement at the beginning of the section. This SUPPORT statement is identical to the SUPPORT statement in Section 10A.05 Temporary Traffic Control Zones and reinforces that temporary traffic control planning provides for continuity of operations when the normal function of a roadway at both a highway-rail and a highway-light rail transit grade crossing is suspended because of temporary traffic control operations. The FHWA received one comment from the City of Tucson, Arizona, in support of this change. The FHWA adopts this change.

316. The FHWA adds a new section numbered and titled, “Section 8B.02 Sizes of Grade Crossing Signs.” This new section contains a STANDARD and an OPTION statement regarding sign sizes for grade crossing signs, as well as a reference to a new table numbered and titled, “Table 8B–1 Sign Sizes for Grade Crossing Signs.” The FHWA adds this section and table to consolidate information previously contained elsewhere in the MUTCD, make the information more readily accessible to readers, and for consistency with changes made in Part 2. The FHWA rennumbers the remaining sections accordingly.

317. In Section 8B.03 Highway-Rail Grade Crossing (Crossbuck) Sign and Number of Tracks Sign (R15–2) (numbered and titled “Section 8B.02 Highway-Rail Grade Crossing (Crossbuck) Signs (R15–1, R15–2, R15–9)” in the NPA), the FHWA proposed to add an OPTION statement for the optional use of a new Crossbuck Shield sign. The FHWA received two

Kingdom that specializes in epilepsy, states that a flash rate of 5 to 30 hertz (flashes per second) can cause seizures in some people. This information is available at the following URL: <http://www.epilepsynse.org.uk/pages/info/leaflets/photo.cfm>. A variety of websites of U.S. organizations also refer to the problem of photosensitivity (triggering of seizures by flickering lights) among epileptic persons.

⁶⁰ “A Policy on Geometric Design of Highways and Streets,” 4th Edition, 2001, in both hardcopy and CD-ROM, is available from the American Association of State Highway and Transportation Officials (AASHTO) by telephone (800) 231-3475, facsimile (800) 525-5562, mail AASHTO, P.O. Box 96716, Washington, DC 20090-6716, or at its Web site <http://www.transportation.org> and click on Bookstore. This document is a guide, based on established practices and supplemented by research, to provide guidance to the highway designer to provide for the needs of highway users while maintaining the integrity of the environment. It is incorporated by reference into the CFR at 23 CFR 625.4.

comments from the City of Tucson, Arizona, and ATSSA in support of the Crossbuck Shield sign. Sixteen commenters representing the NCUTCD and its railroad technical committee, railroad owners and associations, State and local DOTs, and private citizens expressed opposition to the use of the Crossbuck Shield sign, suggesting that consideration of these proposed changes be deferred pending the NCUTCD's consideration of the recommendations of NCHRP Report 470⁶¹ regarding requiring the display of a YIELD sign or a STOP sign where appropriate, in conjunction with the Crossbuck sign. Given the strong response opposing the proposal, the FHWA believes that the proposal of the Crossbuck Shield was premature and removes all text and graphic references regarding the Crossbuck Shield sign from this final rule. States currently using the Crossbuck Shield sign under approved experimentations may request an extension in writing from the FHWA to continue experimental use.

Also, the FHWA revises the second STANDARD statement to clarify the placement of retroreflective white material on the front and back of the supports for highway-rail grade crossing Crossbuck signs, to within 0.6 m (2 ft) above the edge of the roadway, except on the side of those supports where a STOP or YIELD sign or flashing lights have been installed, or on the back side of supports for Crossbuck signs installed on one-way streets. In the NPA, the FHWA proposed a distance of 0.3 m (1 ft) from ground level, however the FHWA revises the wording in this final rule to reflect the many comments that FHWA received from the NCUTCD and its railroad technical committee, railroad owners and operators, State DOTs in regions where snowfall is common, and private citizens suggesting that 0.6 m (2 ft) was more appropriate due to potential maintenance problems in northern States associated with snow. In addition, the change from "near ground level" to "above the edge of the roadway" responds to many of the same commenters who suggested that referencing to the height of the edge of the roadway promotes a more uniform display and is more consistent with other sections of the MUTCD.

Additionally, the FHWA received one comment from the Connecticut DOT regarding the second paragraph of the GUIDANCE statement relating to

minimum lateral clearance for the nearest edge of the Crossbuck sign to the shoulder or the traveled way. The Connecticut DOT indicated that the 3.7 m (12 ft) requirement seemed excessive and could affect the motorist's sight to the sign due to physical limitations in rural areas. The NPA did not propose any significant changes to this statement, rather the NPA included editorial changes to add that this GUIDANCE refers to the "minimum" lateral clearance and to clarify that the greater of 1.8 m (6 feet) 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) should be used. Because this is a GUIDANCE, if there is a good engineering reason for placing the sign closer to the edge of the roadway, agencies may do so. The FHWA adopts the language as proposed in the NPA with one punctuation revision.

318. In Section 8B.04 Highway-Rail Grade Crossing Advance Warning Signs (W10 series) (numbered Section 8B.03 in the NPA), the FHWA revises the first STANDARD statement, item A, to better define where Highway-Rail Grade Crossing Advance Warning (W10-1) signs are not required on an approach to a crossing from a T-intersection with a parallel highway. Five commenters from the NCUTCD, the Utah Transit Authority, a traffic engineering consultant and private citizens opposed the revision, stating that the wording is repeated in the first paragraph of the second STANDARD statement. One commenter from the Nevada DOT supported the revisions. The FHWA declines deleting item A because it discusses a specific situation for which no W10-1 sign is required on an approach to a grade crossing. Item A refers only to "T-intersections" where W10-3 signs are used in both directions of the parallel highway. Item A covers approaches where all vehicles crossing the track have turned onto the approach from the parallel highway, whereas text in the second STANDARD statement covers all intersections including 4-way intersections and T-intersections where the track crosses the top of the intersection. The FHWA adopts the wording as proposed in the NPA.

Additionally, the FHWA revises the second STANDARD statement to clarify the proper use of the W10-2, W10-3, and W10-4 advance warning signs if the distance from the parallel highway to the railroad tracks is less than 30 m (100 feet). The FHWA received comments from the Kansas DOT and Yakima County, Washington, regarding these changes. The Kansas DOT suggested that these changes would result in the

addition of too many additional railroad signs at a high cost to local jurisdictions and limited benefit to the traveling public. The FHWA believes that if the crossing is within 100 feet of the parallel highway, it is important for adequate safety that turning drivers are warned that they will encounter a crossing soon after turning.

Yakima County, Washington, suggested that these signs are a combination of railroad crossing warning and intersection warning signs, and therefore should be placed in accordance with Chapter 2A and Table 2C-4. The FHWA agrees and revises the statement in this final rule to include placing the signs in accordance with the guidelines for Intersection Warning Signs in Table 2C-4.

319. In Section 8B.06 Turn Restrictions During Preemption (numbered Section 8B.05 in the NPA), the FHWA received several comments from members of the NCUTCD Railroad and Light Rail Transit Committee stating that the committee recommended deleting the track image that appears in the center of the R3-1a and R3-2a signs, and to call these signs R3-1 and R3-2, because they would become identical to the turn prohibition signs in Chapter 2B. The committee felt that track depiction is unnecessary and clutters the signs. The FHWA acknowledges that these symbol signs involving tracks may need to be re-designed to enhance clarity and legibility, but rather than to use the R3-1 and R3-2 signs, the FHWA withdraws the R3-1a and R3-2a signs (with tracks) as proposed in the NPA and reassigns these signs as word message signs "NO LEFT/RIGHT TURN ACROSS TRACKS" in this final rule. The FHWA believes that it is important to use signs that clearly convey that turning across the tracks is prohibited, not necessarily all turns at a location.

320. The FHWA adds a new section titled, "Section 8B.10 STOP HERE WHEN FLASHING Sign (R8-10)" (numbered Section 8B.09 in the NPA), which contains an OPTION statement describing the use of the STOP HERE WHEN FLASHING (R8-10) sign as it relates to highway-rail grade crossings. The FHWA received one comment from NCUTCD in support of the new section and one comment from the Ohio DOT suggesting that the FHWA revise the arrow on the STOP HERE WHEN FLASHING (R8-10) sign from a tapered shaft arrow to a straight shaft arrow. The FHWA agrees and adopts this change.

321. The FHWA adds a new section titled, "Section 8B.11 STOP HERE ON RED Sign (R10-6)" (numbered Section 8B.10 in the NPA), which contains SUPPORT, OPTION, and GUIDANCE

⁶¹ NCHRP Report 470, "Traffic Control Devices for Passive Railroad-Highway Grade Crossings", 2002, is available for downloading from the Transportation Research Board at the following URL: http://gulliver.trb.org/publications/nchrp/nchrp_rpt_470-a.pdf

statements describing the use of the STOP HERE ON RED (R10-6) sign at highway-rail grade crossings. The FHWA received comments from the Wisconsin and New Jersey DOTs suggesting that the SUPPORT statement be clarified to indicate that the STOP HERE ON RED sign be restricted to just those crossings where traffic control signals are used to control traffic, and not used at locations with flashing-light signals. The FHWA also received several comments from the NCUTCD, railroad operators, traffic engineering consultants, and private citizens suggesting that the FHWA remove the term "traffic gates" from the SUPPORT statement because the term is not common in the railroad industry. The FHWA agrees with both of these comments and incorporates these clarifications into this final rule. The FHWA rennumbers the remaining sections accordingly.

322. In Section 8B.15 NO SIGNAL Sign (W10-10) or NO GATES OR LIGHTS Sign (W10-13) (numbered and titled "Section 8B.12 NO SIGNAL Sign (W10-10)" in the 2000 MUTCD), the FHWA adds to the OPTION statement that the NO GATES OR LIGHTS (W10-13) sign may be used as an alternate to the NO SIGNAL (W10-10) sign. There was one comment from the New Jersey DOT opposing this change, stating that they are not in favor of using these signs at grade crossings. Because the use of these signs is optional, States can determine whether or not they use these signs. Some States are interested in using these signs, so the FHWA adopts this change as proposed in the NPA.

323. In Section 8B.16 LOOK Sign (R15-8), (numbered Section 8B.15 in the NPA), the FHWA modifies the OPTION statement by removing the phrase, "that do not have active warning devices" to clarify that the LOOK (R15-8) sign may be mounted at any highway-rail grade crossing. There was one comment from the City of Tucson, Arizona, in support of the change, and two commenters from the Minnesota DOT and a traffic engineering consultant opposed the change. The traffic engineering consultant suggested that the LOOK sign should be a warning sign, rather than a regulatory sign. Because most State laws require road users to look for trains at a grade crossing, as well as the fact that this sign regulates pedestrians, the FHWA declines incorporating this suggestion. The Minnesota DOT, who opposed the change, suggested that the LOOK sign should only apply to highway-rail grade crossings with active warning devices. Because this sign is optional and may be used in areas of significant pedestrian traffic, regardless

of traffic control devices at the crossing, the FHWA disagrees and adopts the changes as proposed in the NPA.

324. The FHWA adds a new section numbered and titled "Section 8B.19 Skewed Crossing Sign (W10-12)" (numbered Section 8B.18 in the NPA), which describes the use of the Skewed Crossing (W10-12) sign at highway-rail grade crossings when railroad tracks are not perpendicular to the highway. Four commenters, representing the NCUTCD, Caltrans, the New Jersey DOT, as well as the City of Tucson, Arizona, agreed with the changes as proposed, while two commenters from the Nevada DOT suggested that more research should be conducted regarding the effectiveness of this sign. The FHWA disagrees that any additional study is needed and adopts this section in this final rule. One commenter from the Virginia DOT suggested revisions to the GUIDANCE statement to provide more guidance on the sign design to appropriately depict the skewed crossing. The FHWA agrees with this comment and incorporates this modification into this final rule.

325. In Section 8B.20 Pavement Markings (numbered Section 8B.19 in the NPA), the FHWA revises the second paragraph of the STANDARD statement to clarify that a no-passing marking on two-lane highways is needed only in locations where centerline markings are used. The FHWA incorporates this change for consistency with changes made in Part 3 in this final rule.

326. In Section 8B.22 Dynamic Envelope Markings (numbered and titled Section 8B.18 Dynamic Envelope Delineation in the 2000 MUTCD), the FHWA retitles this section to clarify that the text refers to pavement markings.

Additionally, the FHWA adds a second paragraph to the OPTION statement to clarify that dynamic envelope markings may be installed at any highway-rail grade crossing unless a Four-Quadrant Gate system is used.

327. In Section 8C.01 Illumination of Highway-Rail Grade Crossings, the FHWA proposed to change the OPTION statement to a GUIDANCE statement to indicate that illumination should be installed at, and adjacent to, a highway-rail grade crossing when an engineering study determines such illumination is needed to improve grade crossing safety. One commenter from the City of Tucson, Arizona, agreed with the change, however seven commenters, representing the NCUTCD, State and local DOTs as well as private citizens, opposed changing the OPTION to a GUIDANCE, stating that this would be very expensive to implement and that the FHWA should consider the economic impact. The FHWA agrees

with the economic concerns and to address this situation the FHWA adds an OPTION statement before the GUIDANCE, stating that illumination may be installed at or adjacent to a highway-rail grade crossing. The FHWA adopts the change proposed in the NPA to change the OPTION statement to a GUIDANCE statement; however, this GUIDANCE follows the new OPTION statement.

328. In Section 8D.01 Introduction, the FHWA revises the first OPTION statement to clarify that flashing-light signals that are post-mounted or overhead-mounted may be used separately or in combination with each other and that flashing-light signals may be used without automatic gate assemblies as determined by an engineering study. The FHWA received one comment from the Nevada DOT opposing this change, stating that this language may enable third parties to apply pressure to local authorities that approve crossings not to install automatic gates. The FHWA feels that the decision for the crossing treatment should be determined by the agency maintaining the roadway after an engineering study and adopts the change as proposed in the NPA.

Additionally, in the NPA the FHWA proposed adding to the second OPTION statement information that In-Roadway Stop Line Lights and In-Roadway Warning Lights may be installed at highway-rail grade crossings that are controlled by active grade crossing warning systems, as discussed in Chapter 4L In Roadway Lights. Eleven commenters representing the NCUTCD, State and local DOTs, railroad operators and associations, and private citizens opposed this new text. In concert with determinations made in Chapter 4L, the FHWA withdraws this proposal and retains the language in the 2000 MUTCD.

329. In Section 8D.02 Flashing-Light Signals, Post-Mounted, the FHWA modifies the GUIDANCE statement to clarify the sizes of lenses for use in highway-rail grade crossing flashing-light signals and to provide guidance for choosing the size of the background behind the lenses. The FHWA received five comments from the NCUTCD, stating that the NCUTCD Railroad and Light Rail Transit Committee opposed the proposed clarification of lens sizes for use in highway-rail grade crossing flashing-light signals because lens sizes have been understood for many years in the rail industry. The FHWA disagrees because the clarifying reference in this section is to Section 4D.15 Size, Number and Location of Signal Faces by Approach, which contains good advice

regarding lens sizes that some agencies and other individuals involved with highway-rail grade crossings may not be aware of. The FHWA adopts this change as proposed in the NPA. The FHWA received four comments, primarily from railroad companies, opposing the guidance for choosing the size of the background behind the lenses because Part 4 does not contain specified background sizes for any traffic signal. The FHWA agrees and withdraws this proposal.

330. In Section 8D.04 Automatic Gates, the FHWA received a comment from a private citizen suggesting that the second paragraph of the STANDARD statement be revised to include consideration for the unique requirements associated with constant warning time and other advanced system devices. The FHWA believes that it is appropriate to make this change because the features of constant warning time and other advanced systems do not necessarily provide for an operation of the gates exactly as described in the paragraph. The FHWA believes that requiring constant warning time and other advanced systems to have gate operations exactly as described would be an unreasonable burden on jurisdictions and is not practical or necessary. Accordingly, the FHWA revises the second paragraph of the STANDARD statement to provide an exception to the requirements of this paragraph when a constant warning time or other advanced system requires otherwise.

331. In Section 8D.05 Four-Quadrant Gate Systems, the FHWA revises and adds to the GUIDANCE statement information to describe the various operating modes of exit gates and how they should be used. The FHWA received five comments suggesting terminology changes that the NCUTCD Railroad and Light-Rail Transit Committee endorsed. The FHWA agrees and includes those terminology changes in this final rule. The Committee also suggested that the GUIDANCE statement regarding placement of exit gates to provide a safe zone be deleted because this practice is seldom used. Because Four-Quadrant Gates are a relatively new concept to grade crossings, the FHWA believes that if space is available, the exit gates should be set back at least one design vehicle length from the nearest rail in order to reduce the chances of a vehicle becoming trapped on the tracks. The FHWA adopts the changes as proposed in the NPA.

Additionally, the FHWA revises the third paragraph of the STANDARD statement to accommodate constant

warning time or other advanced systems, for the same reasons as discussed above in Section 8D.04.

Based on a comment from a railroad company, the FHWA revises the third and fourth paragraphs of the GUIDANCE statement to include coordination with the affected railroad company when determining the operating mode of exit gates and the Exit Gate Clearance Time.

Additionally, the FHWA changes the title of Figure 8D-2 from "Typical Location Plan for Flashing-Light Signals and Four-Quadrant Gates" to "Example of Location Plan for Flashing-Light Signals and Four-Quadrant Gates." There were no comments regarding this change, and the FHWA adopts this change.

332. In Section 8D.07 Traffic Control Signals at or Near Highway-Rail Grade Crossings, the FHWA received comments from a private citizen regarding text in the first OPTION and STANDARD statements related to the use of traffic control signals instead of flashing-light signals at industrial highway-rail grade crossings and mainline highway-rail grade crossings. The commenter suggested that the text include additional language specifying train speeds as part of the criteria. These comments go beyond the scope of this rulemaking and would need to be addressed in a future rulemaking.

Following the second paragraph of the second STANDARD statement, the FHWA adds additional GUIDANCE, STANDARD, GUIDANCE, and OPTION statements to better describe the use of pre-signals to improve safety at highway-rail grade crossings at locations in proximity to intersections controlled by traffic control signals. The FHWA received one comment from the City of Tucson, Arizona, supporting the overall changes to this section. One comment from the Wisconsin DOT expressed general support for the new language for preemption, but expressed concerns regarding the use of pre-signals when the crossing is 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. This comment is unique to the State of Wisconsin because they use near-side signal displays at all intersections. The FHWA believes it is inappropriate to change the MUTCD in this case to accommodate the practices of one State.

Additionally, the FHWA adds to the last OPTION statement that at locations where a highway-rail grade crossing is located more than 15m (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. The FHWA feels that this addition may improve safety for this type of highway-rail grade crossing.

The FHWA establishes a phase-in target compliance date of 10 years for existing installations to minimize any impact on State or local governments.

Discussion of Adopted Amendments to Part 9—Traffic Controls for Bicycle Facilities

333. In Section 9A.03 Definitions Relating to Bicycles, the FHWA adds to the first STANDARD statement a definition for "Bicycle Facilities" because the term is frequently used in Part 9. The FHWA revises the definition slightly from that proposed in the NPA to respond to comments suggesting that "made by public agencies" be removed because there are bicycle facilities that are operated by non-governmental agencies. The FHWA also removes the definition for "Bicycle Path," and removes the remaining occurrences of "bicycle path" from the MUTCD because "shared use path" appropriately covers the term. The FHWA also revises the definition for "Shared Use Path" to clarify that it is outside the traveled way. The FHWA renumbers the remaining items accordingly.

334. In Section 9B.01 Application and Placement of Signs, the FHWA removes the first SUPPORT statement as it only references Figure 9B-1. The FHWA now references Figure 9B-1 in the first STANDARD statement because the sign installation standards shown in Figure 9B-1 are discussed in this STANDARD. The FHWA received two comments from the NCUTCD and the City of Tucson, Arizona, in support of the changes to this section.

Two commenters opposed the standards for sign size, mounting height and lateral clearance. The New York City DOT stated these standards are infeasible in dense urban areas, and a traffic engineering consultant stated that the minimum vertical clearance of 8 feet is less than the ITE Guidelines for Major Street Design,⁶² which specifies 8.2 feet. While the FHWA recognizes the importance of these two comments, these suggestions go beyond the scope of this rulemaking and would need to be addressed in a future rulemaking.

335. In Section 9B.02 Design of Bicycle Signs, the FHWA replaces the

⁶² "Guidelines for Urban Major Street Design", Institute of Transportation Engineers, 1984. It may be purchased from the Institute of Transportation Engineers bookstore at the Web site <http://www.ite.org>.

term “bicycle facilities” with the term “shared-use path” in the first sentence of the second paragraph of the STANDARD statement because this sentence relates only to shared-use paths and not to on-street bicycle lanes. Shared-use paths are for the use of pedestrians (with or without disabilities), skaters, joggers, and other non-motorized users in addition to bicyclists. There were comments from the NCUTCD, the Wisconsin DOT, and the City of Tucson, Arizona, in agreement with the changes. The NCUTCD suggested that the last sentence of the STANDARD should retain “shared use paths.” The FHWA disagrees because this sentence states that the minimum sign sizes for bicycle facilities shall not be used in locations that would apply to other vehicles, and because the minimum sign size would be too small.

Additionally, the FHWA changes the title of Table 9B–1 from “Sign Sizes for Shared-Use Paths” to “Minimum Sign Sizes for Bicycle Facilities” and separates the column headed “Minimum Sign Size” into two sub columns headed “Shared-Use Path” and “Roadway,” to better distinguish between the applications of signs on paths and roadways and to be consistent with sign sizes used on roadways as described in Part 2. The FHWA also revises Table 9B–1 by adding additional signs to reflect changes elsewhere in Part 9. There were several comments from the NCUTCD, local highway agencies, associations representing bicyclists, and private citizens in support of these changes. The FHWA received two editorial comments regarding the size of the R1–2 YIELD sign, and incorporates those changes in this final rule.

336. In Section 9B.03 STOP and YIELD Signs (R1–1, R1–2), the FHWA modifies the first GUIDANCE statement so that it applies to the installation of both STOP and YIELD signs, and not exclusively to STOP signs. The FHWA includes additional editorial changes in this final rule based on comments received requesting that the term “bicyclists” be changed to “path users” and “drivers” be changed to “road users.” These editorial changes provide for consistent terminology throughout the MUTCD. Several commenters were in favor of the overall changes to this section.

337. In Section 9B.04, the FHWA changes the title from “Bicycle Lane Signs (R3–16, R3–17)” to “Bicycle Lane Signs (R3–17, R3–17a, R3–17b)” to reflect the changes to the Bicycle Lane Signs.

Additionally, the FHWA removes existing text in this section in its entirety and replaces it with new text regarding the use of Bicycle Lane signs. This modification replaces the existing Bicycle LANE AHEAD (R3–16), Bicycle LANE ENDS (R3–16a), and RIGHT LANE Bicycle ONLY (R3–17) signs with a redesigned BIKE LANE (R3–17) sign to be used in conjunction with new supplemental AHEAD (R3–17a) and ENDS (R3–17b) plaques. These sign combinations will more clearly provide the information contained on the old R3–16, R3–16a, R3–17, and R3–17a signs, and will reduce road user confusion. The FHWA received five comments from the NCUTCD, ATSSA, Caltrans, the Metropolitan Planning Organization of Cincinnati, and the Association of Pedestrian and Bicycle Professionals supporting the changes, stating that the modifications and redesign of the R3–17 sign and the supplemental plaques will help reduce motorist confusion and HOV lane conflicts.

The Illinois DOT opposed the elimination of the existing R3–17a, however the NCUTCD recommended removal of the sign, stating that it was confusing to road users. Several citizens and local highway agencies sent letters supporting changes to Figure 9B–2 that include the new R3–17 BIKE LANE sign. The Association of Pedestrian and Bicycle Professionals, a traffic engineering consultant, and a private citizen expressed confusion between the text in this section and that in Section 9C.04 Markings for Bicycle Lanes regarding the use of bike lane signs in conjunction with a striped bike lane. As a result, the FHWA modifies text in Section 9C.04 to remove the discrepancy between these sections.

338. In Section 9B.05 BEGIN RIGHT TURN LANE YIELD TO BIKES Sign (R4–4), The FHWA received one comment from the NCUTCD supporting the minor changes to this section. Additionally, to respond to a comment from a private citizen suggesting clarification on the use of this sign, the FHWA adds a GUIDANCE statement to the end of the section to clarify that the R4–4 sign should not be used when bicyclists need to move left because of a right-turn lane drop situation. The FHWA believes that this GUIDANCE statement is necessary for clarity and for safety, to reinforce that when there is a right-turn lane drop, it is the bicyclists who should yield to motor vehicle traffic when moving to the left, thus the R4–4 sign should not be used in those situations.

339. The FHWA adds a new section following Section 9B.05 BEGIN RIGHT

TURN LANE YIELD TO BIKES Sign (R4–4). The new section is numbered and titled “Section 9B.06 Bicycle WRONG WAY Sign and RIDE WITH TRAFFIC Plaque (R5–1b, R9–3c)” and provides GUIDANCE and OPTIONS regarding the design and placement of Bicycle WRONG WAY Signs. The remaining sections are renumbered accordingly. Sixteen commenters, representing the NCUTCD, State and local highway agencies as well as private citizens, supported this new section. One commenter from the City of Tucson, Arizona, opposed it, stating that WRONG WAY signs are not necessary for informing users of the normal rules of the road. The FHWA disagrees because many signs inform drivers of the normal rules of the road, and the WRONG WAY sign can provide important additional information to bicyclists. The FHWA adopts the changes as proposed in the NPA, with a minor editorial change, as suggested in a comment from the City of New York, to clarify that the RIDE WITH TRAFFIC (R9–3c) sign is actually a plaque, because it cannot be installed alone.

340. In Section 9B.08 No Bicycles Sign (R5–6) (titled “Bicycle Prohibition Sign (R5–6)” in the NPA), the FHWA changes the sign name to be consistent with changes in Section 2B.31 SLOWER TRAFFIC KEEP RIGHT. The FHWA believes that this minor change is needed to maintain consistency with other sections of the MUTCD.

341. In Section 9B.09 No Parking Bike Lane Signs (R7–9, R7–9a) (referred to as Section 9B.08 No Parking Bicycle Lane Signs (R7–9, R7–9a) in the 2000 MUTCD), the FHWA changes the title and the first STANDARD statement to accurately reflect the name of the sign. Two commenters representing the NCUTCD and the City of Tucson, Arizona, expressed agreement with the changes in this section. One commenter from New York City expressed concerns that the R7–9 and R7–9a signs have limited use in a dense urban area because most bike lanes are along roadways where parking is allowed at the curb. While localities are seeking signs to prohibit parking in the bike lanes, R7–9 and R7–9a do not work in these instances. The use of R7–9a could be confusing to use if curbside parking is allowed. With the change in the bike lane sign, now R3–17, it further complicates the agency’s ability to regulate parking in bike lanes. The FHWA determines that the R7–9 and R7–9a signs are not appropriate if curbside parking is allowed. If a bike lane exists where curbside parking is allowed, pavement markings will have to be used to communicate which

portion of the pavement is for parking and which portion of the pavement is for bike use. In the NPA, the FHWA proposed removing the R3-17a sign that was available for this purpose. The NCUTCD recommended removing the R3-17a sign because the sign is even more confusing to road users. The FHWA adopts the changes as proposed in the NPA.

342. In Section 9B.10 Bicycle Regulatory Signs (R9-5, R9-6, R10-3) (titled Bicycle Regulatory Signs (R9-5, R9-6) in the NPA), the FHWA removes the first paragraph of the OPTION statement, and includes the R10-3 sign in the section title. Two commenters representing the NCUTCD and the City of Tucson, Arizona, expressed agreement with the minor changes in this section. The FHWA also received one comment from a private citizen suggesting that the first sentence of the OPTION statement (as proposed in the NPA) was not necessary, and could be potentially confusing when taken in context with the three paragraphs that follow it. The FHWA agrees and removes that sentence in this final rule. The FHWA also adds the R10-3 sign to the title because the sign's use is described in this section.

343. The FHWA adds a new section following existing Section 9B.10 (new Section 9B.11) Shared-Use Path Restriction Sign (R9-7). The new section is numbered and titled "Section 9B.12 Bicycle Signal Actuation Sign (R10-22)" and provides a new sign giving information to bicyclists on how to best situate themselves within the proposed new Bicycle Detector pavement marking symbol so that they can actuate the traffic signal. The remaining sections are renumbered accordingly. Fifteen commenters, representing the NCUTCD, State and local highway agencies, as well as private citizens, supported the new section. The FHWA adopts the changes as proposed in the NPA.

344. In Section 9B.16 (formerly Section 9B.14) Bicycle Surface Condition Warning Sign (W8-10), the FHWA revises the first OPTION statement to clarify that BUMP, DIP, PAVEMENT ENDS, and any other word message signs are not supplemental plaques used with the W8-10 sign, but are instead standard signs to be used independently. The NCUTCD supported this change. The FHWA adopts the changes as proposed in the NPA.

345. In Section 9B.17 Bicycle Warning Sign (W11-1) (referred to as Section 9B.17 Bicycle Crossing Warning Sign (W11-1) in the NPA), the FHWA received one comment from the NCUTCD in support of the changes to

the section, and two comments from traffic engineering consultants suggesting additional changes. The commenters stated that the sign has other uses besides warning of a crossing. The FHWA agrees that this clarifies the use of these signs and changes the title of the section as well as the sign name and deletes the word "Crossing."

346. In Section 9B.18 Other Bicycle Warning Signs, the FHWA received three comments suggesting that the Narrow Bridge symbol sign be kept in the MUTCD. (See the discussion regarding Part 2 where FHWA eliminates the Narrow Bridge symbol sign.) Accordingly, the FHWA adopts the changes to this section as proposed in the NPA.

347. In Section 9B.19 Bicycle Route Guide Signs (D11-1), the FHWA received several comments from the NCUTCD and private citizens supporting the figures and GUIDANCE changes as proposed in the NPA. Several commenters suggested editorial changes to the figures, which the FHWA incorporates in this final rule. One traffic engineering consultant suggested further revisions to clarify the use of stop and yield signs on paths in conjunction with crosswalk markings. The FHWA believes that this suggestion goes beyond the scope of this rulemaking and would need to be addressed in a future rulemaking.

348. In Section 9B.20 Bicycle Route Signs (M1-8, M1-9) (titled Bicycle Route Markers in the NPA), the FHWA changes "drivers" to "motorists" in response to an editorial comment. The FHWA received three comments from private citizens stating that the bike route signs shown in the MUTCD need improvement to meet the needs of bicyclists who commute in an urban environment, and to clearly show compass directions and route designations. This suggestion goes beyond the scope of this rulemaking. The FHWA adopts the text as described in the NPA.

349. In Section 9C.01 Functions of Markings, the FHWA modifies the SUPPORT statement to remove the first sentence because it only refers to roadways with a designated bicycle lane and is not broad enough to describe markings used for all types of bicycle facilities. There were two comments from NCUTCD and the City of Tucson, Arizona, supporting this change.

350. In Section 9C.02 General Principles, the FHWA adds a new STANDARD statement after the second GUIDANCE statement. This new STANDARD statement referring to the colors, widths of lines, and patterns of lines, and symbols used for bicycle

markings is being moved from Section 9C.03 Marking Patterns and Colors on Shared-Use Paths to Section 9C.02 because this text is applicable to all bicycle facilities, not just shared-use paths, and is more appropriate in this section than Section 9C.03. The FHWA received two comments from NCUTCD and the City of Tucson, Arizona, in support of this change. One traffic engineering consultant stated that the portion of the second GUIDANCE statement that refers to selecting pavement marking materials that minimize the loss of traction for bicycles under wet conditions should be a STANDARD. The FHWA disagrees and believes GUIDANCE is strong enough for this sentence because the traction characteristics of marking materials are not always known. The FHWA adopts this section, with minor editorial changes to Figure 9C-4.

351. In Section 9C.03 Marking Patterns and Colors on Shared-Use Paths, the FHWA moves the STANDARD statement to Section 9C.02 General Principles because this text is applicable to all bicycle facilities, not just shared-use paths and is more appropriate in that section than Section 9C.03. Two commenters from NCUTCD and the City of Tucson, Arizona, were in general support of the changes made to this section.

Additionally, the FHWA removes the SUPPORT statement because it discourages the use of centerlines. There were no specific comments regarding this change.

The FHWA adds to the GUIDANCE statement additional information on the marking of obstructions in a path.

The FHWA moves to the OPTION statement the second item of the OPTION statement currently in Section 9C.05 Bicycle Detector Symbol because letter, symbol, and arrow sizes to be used on shared-use paths represent markings rather than markers. The FHWA received comments in support of this change, thus the FHWA adopts this change as proposed in the NPA.

Finally, the FHWA moves the contents of existing Section 9C.06 in its entirety to Section 9C.03 because this information is more applicable in Section 9C.03 as it clarifies the design and placement of marking patterns and object markers on shared-use paths. Several commenters supported this change.

352. In Section 9C.04 Markings For Bicycle Lanes, the FHWA revises the first sentence of the STANDARD statement to remove the specific distance of "not closer than 20 m (65 ft) from the crossroad" from the requirement for placing bicycle lane

symbols, to provide jurisdictions with additional flexibility. The FHWA received three comments from the City of Tucson, Arizona, Caltrans, and the Association of Pedestrian and Bicycle Professionals in general agreement with changes to this section.

Additionally, the FHWA adds a new item to the STANDARD statement prohibiting the placement of bicycle lanes to the right of a right turn only lane. The FHWA received nineteen comments from the NCUTCD, State and local agencies, as well as from private citizens, in support of this new statement. One private citizen suggested that this statement be broadened to also restrict bike lanes from being positioned to the left of a left turn only lane. This goes beyond the scope of this rulemaking and would need to be addressed in a future rulemaking.

The FHWA also adds a new item to the STANDARD statement prohibiting the placement of bicycle lanes in the circular roadway of a roundabout intersection because such markings have been found to cause a false sense of security for bicyclists traveling through the roundabout with conflicting and turning traffic. This change is consistent with the state of the practice for roundabout intersection design and is consistent with changes to Section 3B.24 Markings for Roundabout Intersections. The FHWA received seventeen comments from the NCUTCD, State and local highway agencies, and private citizens in support of this change. The Oregon DOT agreed with the principle of discouraging the use of bicycle lanes in roundabouts, but suggested that the statement be a GUIDANCE, rather than a STANDARD, because it is difficult to foresee all possible circumstances. Given the strong support for the STANDARD statement, the FHWA adopts the language as a STANDARD.

The FHWA adds a new paragraph to the SUPPORT statement indicating that 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 expectation of right-turning motorists. The FHWA received one comment from the NCUTCD in support of this change.

The FHWA adds a new GUIDANCE statement to establish guidance for bicycle lane markings at locations where a right through lane becomes an exclusive right turn lane and at locations where there is a shared through and right turn lane next to a right turn only lane. Commenters were generally in agreement with this text; however, the Wisconsin DOT and a

private citizen suggested that the FHWA include a figure to illustrate the intent of the text. Such a figure would require discussion and comment, thus it is more appropriate for a future rulemaking. The Association of Pedestrian and Bicycle Professionals suggested that the GUIDANCE be changed to a STANDARD. The FHWA believes this should be addressed in a future rulemaking.

The FHWA also adds a GUIDANCE statement and a SUPPORT statement to provide guidance on not using posts or raised pavement markers to separate bicycle lanes from adjacent travel lanes because they can hinder maintenance of the bicycle lane and prevent proper vehicle merging. While a private citizen and a traffic engineering consultant supported the changes as proposed in the NPA, several commenters representing the NCUTCD, the Arizona DOT, the City of Downers Grove, Illinois, and the League of American Bicyclists, requested that "curbs or other physical barriers within the traveled way" be included as devices that should not be used to separate bicycle lanes from adjacent travel lanes. The SUPPORT item following this GUIDANCE addresses this issue in part. The additional text proposed by the commenters goes beyond the scope of this rulemaking. The FHWA received comments in agreement with the proposed SUPPORT statement, as well as requests for revising the language to reorder the text to prioritize the potential concerns regarding raised devices and bicycle lanes. The FHWA agrees and adopts the changes with minor revisions.

353. The FHWA removes Section 9C.05 Word Messages and Symbols Applied to the Pavement and Section 9C.06 Object Markers on Shared-Use Paths, in their entirety. The FHWA incorporates the information from these sections into Section 9C.03 Marking Patterns and Colors on Shared-Use Paths, as this more properly locates the information. The FHWA rennumbers the remainder of the sections accordingly.

354. The FHWA adds a new Section 9C.05 Bicycle Detector Symbol, containing an OPTION statement that defines a standard symbol for the marking of detector locations for traffic signals actuated by bicyclists. This symbol marking is shown in a new figure numbered and titled "Figure 9C-7 Example of Bicycle Detector Pavement Marking." The FHWA received sixteen comments from the NCUTCD, State and local DOTs and private citizens supporting the material in this new section. Three commenters from Caltrans and private citizens suggested

additional text be added regarding the optimum location for placement of detectors. The FHWA believes that detector placement is within the discretion of the agencies.

355. In Section 9C.06 Pavement Markings for Obstructions, the FHWA received one comment from the NCUTCD supporting the minor changes to this section and to Figure 9C-8. The FHWA also received two comments from private citizens who suggested that the entire text of this section and Figure 9C-8 be removed from the MUTCD because they believe it could be used by some jurisdictions to justify not fixing serious road defects. The FHWA disagrees and adopts this section and figure in the MUTCD; however, the FHWA revises the GUIDANCE as follows: "In roadway situations where it is not practical to eliminate a drain grate or other roadway obstruction that is inappropriate for bicycle travel" because it may not always be practical to fix the defect.

356. In Section 9D.02 Signal Operations for Bicycles, the FHWA revises the STANDARD statement to require that signal timing and actuation be reviewed and adjusted to consider the needs of bicyclists instead of simply requiring the consideration of bicyclists' needs when timing signals. Many commenters were in support of this change, and several requested that bicycle detectors be used on all roadways where bicycle travel is permitted. The FHWA doesn't believe it is necessary to require bicycle detectors be placed on all roadways where bicycle travel is permitted, but may address this issue in a future rulemaking.

Discussion of Adopted Amendments to Part 10—Traffic Controls for Highway-Light Rail Transit Grade Crossings

357. In Section 10A.01 Introduction, the FHWA adds a SUPPORT statement at the end of the section to reference Section 8A.01 Introduction for the definitions applicable to Part 10. There were no comments on this change and the FHWA adopts it.

358. In Section 10A.03 Uniform Provisions, the FHWA changes the STANDARD statement to indicate that no sign or signal shall be located in the center of an undivided highway, except in a "raised island". This change is necessary to be consistent with changes as discussed in Section 8A.03 Uniform Provisions.

Additionally, the FHWA adds a GUIDANCE statement at the end of the section to reinforce that where the distance between tracks exceeds 30 m (100 ft), additional signs or other appropriate traffic control devices

should be used. There were no comments on this change and the FHWA adopts it.

359. In Section 10A.04 Highway-Light Rail Transit Grade Crossing Elimination, the FHWA removes language from the second GUIDANCE statement and adds it to the STANDARD statement that 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 traffic control devices shall be relocated and/or modified. The FHWA also adds to the second GUIDANCE statement that when a roadway is removed from a highway-light rail transit grade crossing, appropriate signs should be placed at the end of roadway and other appropriate locations to alert road users that the road no longer crosses the light rail transit tracks. There were two comments supporting these proposed changes. The FHWA adopts these changes.

The FHWA adds to the OPTION statement at the end of the section so that it is identical to the last OPTION statement in Section 8A.04 Highway-Rail Grade Crossing Elimination, and incorporates the same revisions in this section. Accordingly, the FHWA adds to the OPTION statement to indicate that, based on engineering judgment, the TRACKS OUT OF SERVICE sign may be temporarily installed until the tracks are removed or paved over. Also, agencies may consider the length of time that the tracks will be out of service before they are removed or paved over in deciding whether to install the sign.

360. In Section 10A.05 Temporary Traffic Control Zones, the FHWA combines the two separate STANDARD statements into one STANDARD statement at the beginning of the section. The FHWA received one comment in support of this change, and adopts this change.

The FHWA received one comment from a private citizen suggesting that a new paragraph be added to the end of the GUIDANCE statement to mirror the GUIDANCE in Section 8A.05 that 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. The FHWA agrees with the comment and adds this language because this is necessary for consistency with Part 8 of the MUTCD and would make the temporary light rail crossing as safe as the existing conditions.

361. In Section 10C.01, the FHWA changes the title from "Introduction" to

"Purpose" to more accurately reflect the contents of the section and corrects the text in the STANDARD statement to properly indicate that the design and location of signs shall conform to all of Part 2. The FHWA received one comment in support of the changes, and adopts these changes.

362. The FHWA adds a new section numbered and titled "Section 10C.02 Highway-Rail Grade Crossing (Crossbuck) Sign (R15-1) and Number of Tracks Sign (R15-2) (titled "Highway-Rail Grade Crossing (Crossbuck) Signs (R15-1, R15-2, and R15-9) in the NPA), which provides information on the use of Crossbuck signs at highway-light rail grade crossings. In the NPA, the FHWA proposed that this section be identical to Section 8B.02 (as proposed in the NPA) because the use of Crossbuck signs and the proposed optional Crossbuck Shield signs are applicable to both highway-light rail transit and highway-rail grade crossings and it is important to have this information in both parts of the MUTCD. The FHWA received five comments from the NCUTCD and members of the Railroad-Light Rail Transit Technical Committee opposed to this section, stating that the use of these Crossbuck signs in mixed-use alignments where light rail transit operates in streets in urban areas is frequently impractical. The FHWA agrees, and clarifies the first STANDARD statement to indicate that the Crossbuck sign is mandatory for semiexclusive Light Rail Transit alignments, and creates a new OPTION statement following the second paragraph of the first STANDARD to indicate that use of the Crossbuck sign is optional for mixed-use alignments, either alone or in combination with other traffic control devices.

In the NPA, the FHWA proposed to add an OPTION statement for the optional use of a new Crossbuck Shield sign. See the discussion regarding the removal of all text and graphic references to the Crossbuck Shield sign in Section 8B.02. Accordingly, the FHWA withdraws all text and graphic references to the Crossbuck Shield sign in Section 10C.02.

The FHWA revises the third STANDARD statement to require the placement of retroreflective white material on the front and back of the supports for highway-light rail transit grade crossing Crossbuck signs to within 0.6 m (2 ft) above the edge of the roadway, except on the side of those supports where a STOP or YIELD sign or flashing lights have been installed, or on the back side of supports for Crossbuck signs installed on one-way

streets. This change is necessary for consistency with changes as discussed in Section 8B.02.

The FHWA rennumbers all remaining sections accordingly.

363. In Section 10C.04 STOP (R1-1) or YIELD (R1-2) Signs at Highway-Light Rail Transit Grade Crossings, (numbered and titled Section 10C.03 STOP or YIELD Signs (R1-1, R1-2, W3-1a, W3-2a) in the 2000 MUTCD), the FHWA rennumbers and retitles the section to more accurately reflect the content of the section.

The FHWA modifies the last sentence of the STANDARD statement to require agencies to install Stop Ahead (W3-1) and Yield Ahead (W3-2) Advance Warning Signs when the criteria listed in Section 2C.29 Advance Traffic Control Signs, is met.

The FHWA adds to the list of characteristics in the GUIDANCE statement to clarify when STOP or YIELD signs may be used at highway-light rail transit grade crossings. The FHWA adds characteristics such as traffic volume, light rail train speed, and the need to sound an audible signal as well as the location of light rail tracks in relation to the line of cars waiting to cross. The FHWA received one comment from the City of Tucson, Arizona, in support of these changes, and eight comments from the NCUTCD and members of the NCUTCD's Railroad-Light Rail Transit Technical Committee opposed to using the light rail transit speed as one of the characteristics, suggesting that this item be deleted from the list. The reason cited by those in opposition was that train speed alone is not a factor in the decision to install STOP or YIELD signs at light rail transit crossings, provided the other conditions listed exist. The FHWA disagrees with deleting this item at this time because FHWA believes research or documentation would be needed to justify not considering light rail transit speed. The FHWA adopts these changes as proposed in the NPA.

364. In Section 10C.05 DO NOT STOP ON TRACKS Sign (R8-8) (numbered Section 10C.04 in the 2000 MUTCD), the FHWA adds to the OPTION statement to clarify that DO NOT STOP ON TRACKS (R8-8) signs may be placed on both sides of the track, to enhance visibility of the signs for road users. The FHWA received two comments in support of this change and adopts this change.

365. The FHWA adds a new section numbered and titled "Section 10C.06 TRACKS OUT OF SERVICE Sign (R8-9)" describing the use of the TRACKS OUT OF SERVICE (R8-9) sign at highway-light rail transit grade

crossings. While this section is identical to Section 8B.09 TRACKS OUT OF SERVICE, the use of the TRACKS OUT OF SERVICE (R8–9) sign is applicable to both highway-light rail transit and highway-rail grade crossings so the FHWA believes that it is important to have this information in both parts of the MUTCD. The FHWA received one comment from the Ohio DOT in general support of this new section, and adopts this new section in this final rule. The FHWA rennumbers the remaining sections accordingly.

366. In Section 10C.07 STOP HERE ON RED Sign (R10–6) (numbered 10C.05 in the 2000 MUTCD), the FHWA clarifies this section to indicate that the STOP HERE ON RED sign be restricted to just those crossings where traffic control signals are used to control traffic, and not used at locations with flashing-light signals to be consistent with changes as discussed in Section 8B.10 STOP HERE WHEN FLASHING Sign (R10–8).

367. The FHWA adds a new section numbered and titled “Section 10C.08 STOP HERE WHEN FLASHING Sign (R8–10)” describing the use of the STOP HERE WHEN FLASHING (R8–10) sign at highway-light rail transit grade crossings. While this section is identical to Section 8B.10 STOP HERE WHEN FLASHING, the use of the STOP HERE WHEN FLASHING (R8–10) sign is applicable to both highway-light rail transit and highway-rail grade crossings so the FHWA believes that it is important to have this information in both parts of the MUTCD. The FHWA rennumbers the remaining sections accordingly.

368. In Section 10C.09 Light Rail Transit-Activated Blank-Out Turn Prohibition Signs (R3–1a, R3–2a) (numbered Section 10C.06 in the 2000 MUTCD), the FHWA adds a STANDARD statement at the end of the section. This STANDARD statement is identical to the STANDARD statement in Section 8B.06 Turn Restrictions During Preemption and reinforces that at both highway-rail and highway-light rail transit grade crossings turn prohibition signs that are associated with preemption shall be visible only when the grade crossing restriction is in effect in order not to cause confusion to road users. The FHWA received one comment from the City of Tucson, Arizona, in support of the changes to this section.

In concert with comments regarding Section 8B.06, the FHWA received several comments from members of the NCUTCD Railroad and Light Rail Transit Committee recommending deleting the track image that appears in

the center of the R3–1a and R3–2a signs and to call these signs R3–1 and R3–2, because they would become identical to the turn prohibition signs in Chapter 2B. See the discussion in Section 8B.06 as it applies to this section as well.

369. The FHWA adds a new section numbered and titled “Section 10C.10 EXEMPT Highway-Rail Grade Crossing Signs (R15–3, W10–1a)” describing the use of the supplemental EXEMPT Highway-Rail Grade Crossing (R15–3, W10–1a) signs at highway-light rail transit grade crossings. While this section is identical to Section 8B.05 EXEMPT Highway-Rail Grade Crossing Signs (R15–3, W10–1a), the use of these supplemental signs is applicable to both highway-light rail transit and highway-rail grade crossings, and the FHWA believes that it is important to have this information in both parts of the MUTCD. The FHWA received one comment in support of this new section and several comments from members of the NCUTCD Railroad and Light Rail Transit Committee recommending deleting this section and the associated sign, stating that this sign is not applicable to light rail transit situations. The FHWA adopts this section because there are cases where this sign may be appropriate. The FHWA adds to the OPTION statement that where neither the Crossbuck nor Advance Warning sign exist for a particular crossing, an EXEMPT (R15–3) sign with a white background may be placed on its own post on the near right side of the approach to the crossing. The FHWA rennumbers the remaining sections accordingly.

370. In Section 10C.13 Light Rail Transit Only Lane Signs (R15–4 Series) (numbered Section 10C.09 in the 2000 MUTCD), the FHWA titles the figure illustrating regulatory sign panels as “Figure 10C–2 Regulatory Signs” and adds to and revises the signs illustrated in the figure, to be consistent with Section 2B.26 Preferential Only Lane Signs, and to reflect changes elsewhere in Part 10. The FHWA received one comment from the City of Tucson, Arizona, in support of the changes to this section and two editorial comments, which the FHWA adopts in this final rule.

371. In Section 10C.15 Highway-Rail Grade Crossing Advance Warning Signs (W10 Series) (numbered Section 10C.11 in the 2000 MUTCD), the FHWA revises the entire section by replacing it with the STANDARD, OPTION, and GUIDANCE statements also contained in Section 8B.04 Highway-Rail Grade Crossing Advance Warning Signs, including the revisions as described in Part 8. The use of advance warning

signs is applicable to both highway-light rail transit and highway-rail grade crossings and the FHWA believes that it is important to have consistency in the use of these signs so this information is included in both parts of the MUTCD. Several members of the NCUTCD Railroad and Light Rail Transit Committee suggested that the title and text within the section should be “highway-rail,” rather than “highway-light rail transit” in several cases because this sign is not exclusive to light rail transit and this sign section should be identical to Section 8B.03 Highway-Rail Grade Crossing (Crossbuck) Sign (R15–1) and Number of Tracks Sign (R15–2). The FHWA agrees and revises the section title and appropriate text accordingly in this final rule.

In addition, many commenters suggested deleting item A of the first STANDARD regarding T-intersections, stating that the wording is repeated in the first paragraph of the second STANDARD statement. See the discussion of this issue under Section 8B.04 Highway-Rail Grade Crossing Advance Warning Signs (W10 Series). For these reasons, the FHWA adopts item A.

The FHWA received two comments from a railroad operator and a private citizen suggesting changes to item C of the first STANDARD statement to change “where active light rail transit grade crossing traffic controls are in use” to “controlled with traffic signals or stop signs.” The FHWA disagrees with the suggested change because it is necessary for this item to correspond to the text in Part 8. This may be a topic for a future rulemaking to consider changing the text in both parts. The FHWA adopts item C as proposed in the NPA.

The FHWA also titles the figure illustrating predominantly warning sign panels as “Figure 10C–3 Warning Signs and Light Rail Station Sign” and adds to and revises the signs illustrated in the figure, to reflect changes elsewhere in Part 10.

372. The FHWA adds a new section numbered and titled “Section 10C.16 Low Ground Clearance Highway-Rail Grade Crossing Sign (W10–5)” which describes the use of the Low Ground Clearance (W10–5) sign at highway-light rail transit grade crossings. In the NPA, the FHWA proposed that the title of the section and name of the sign be “Low Ground Clearance Highway-Light Rail Transit Grade Crossing Sign,” however the FHWA received four comments suggesting that “light” and “transit” be deleted because low-ground clearance signs can be used for grade-crossings

generally, not just light-rail operations. The FHWA agrees and changes the section title and sign name in this final rule.

In the NPA, the FHWA proposed to include the same STANDARD, GUIDANCE, OPTION, and SUPPORT statements in this section regarding the use of this sign as was contained in Section 8B.17 Low Ground Clearance Highway-Rail Grade Crossing Sign. The FHWA believes that this is redundant, and instead includes a SUPPORT statement in this final rule that references Section 8B.17 for additional information regarding the use of the W10-5 sign. The FHWA renumbers the remaining sections accordingly.

373. The FHWA adds a new section numbered and titled "Section 10C.18, Storage Space Signs (W10-11, W10-11a, W10-11b)" which describes the use of Storage Space (W10-11) signs at highway-light rail transit grade crossings. In the NPA, the FHWA proposed including a copy of the full text from Section 8B.17 Low Ground Clearance Highway-Rail Grade Crossing Sign in this new section. The FHWA received one comment from the Ohio DOT suggesting that the FHWA cross-reference Section 8B.18 Storage Space Signs, rather than include the full text. The FHWA agrees and deletes the second paragraph of the GUIDANCE statement and the OPTION statements as proposed in the NPA, and adds a SUPPORT statement indicating that information regarding the use of the W10-11, W10-11a, and W10-11b signs is contained in Section 8B.18 in this final rule.

374. The FHWA adds a new section numbered and titled "Section 10C.19 Skewed Crossing Sign (W10-12)" which describes the use of Skewed Crossing (W10-12) sign at highway-light rail transit grade crossings. In the NPA, the FHWA proposed to include a copy of the full text from Section 8B.19 Skewed Crossing Sign in this new section. The FHWA received two comments from the NCUTCD and the New Jersey DOT in support of the new section. The Ohio DOT suggested that the FHWA cross-reference Section 8B.19, rather than include the full text. The FHWA agrees and deletes the GUIDANCE and STANDARD statements as proposed in the NPA and adds a SUPPORT statement indicating that information regarding the use of the W10-12 sign is contained in Section 8B.19. The FHWA renumbers the remaining sections accordingly.

375. The FHWA adds a new section numbered and titled "Section 10C.21 Emergency Notification Sign (I-13 or I-13a)" which describes the use of

Emergency Notification (I-13 or I-13a) signs at highway-light rail transit grade crossings. This section essentially contains similar information as is contained in Section 8B.12 Emergency Notification Sign, and the FHWA believes that it is important to have this information in both parts of the MUTCD. The FHWA received several comments from members of the NCUTCD Railroad and Light Rail Transit Committee recommending the FHWA delete this section because these signs are not applicable in Part 10, especially in urban or downtown areas where calls to emergency would be 911. The FHWA adopts this section because not all light rail transit lines run only in downtown areas and there may be some jurisdictions that may want to use this sign. The FHWA revises the text to clarify that the intent is to place Emergency Notification signs on highway-light rail transit grade crossing on semiexclusive alignments, and the FHWA deletes the sentence from the GUIDANCE that states that these signs are typically located on the transit right-of-way. The FHWA renumbers the remaining sections accordingly.

376. The FHWA adds a new section numbered and titled "Section 10C.23 Pavement Markings" which describes the use of pavement markings at highway-light rail transit grade crossings. While this section is identical to Section 8B.20 Pavement Markings, it is important that the use of pavement markings at highway-light rail transit and highway-rail grade crossings is consistent so the FHWA believes that it is important to have this information in both parts of the MUTCD. The FHWA received several comments from the Ohio DOT suggesting that information from Part 8 be cross-referenced, rather than repeating the information in Part 10. The FHWA includes the full text because there are some differences in the figures between the two parts.

Additionally, to be consistent with changes made to Part 3, the FHWA revises the second paragraph of the STANDARD statement to clarify that a no-passing marking on two-lane highways is needed only in locations where centerline markings are used. The FHWA also adds two new figures. The first figure is numbered and titled "Figure 10C-5 Example of Placement of Warning Signs and Pavement Markings at Highway-Light Rail Transit Grade Crossings" and illustrates the placement of warning signs and pavement markings at highway-light rail transit grade crossings. The second new figure is numbered and titled "Figure 10C-6 Examples of Highway-Light Rail Transit Grade Crossing Pavement Markings"

and illustrates the use of R X R and associated pavement markings at highway-light rail transit grade crossings. These figures were numbered Figures 10C-10 and 10C-11 in the NPA. While these figures are identical to Figures 8B-6 and 8B-7, respectively, it is important that the warning signs and pavement markings at highway-light rail transit and highway-rail grade crossings are consistent so the FHWA believes that it is important to have this information in both parts of the MUTCD.

377. The FHWA adds a new section numbered and titled "Section 10C.24 Stop Lines" which describes the use of stop lines at highway-light rail transit grade crossings. The FHWA received one comment from the Ohio DOT suggesting that the FHWA cross-reference Section 8B.21 Stop Lines, rather than include the full text. The FHWA agrees and deletes the GUIDANCE statement as proposed in the NPA and adds a SUPPORT statement indicating that information regarding the use of stop lines at grade crossings is contained in Section 8B.21. The FHWA renumbers the remaining sections accordingly.

378. In Section 10C.25 Dynamic Envelope Markings (numbered and titled "Section 10C.15 Dynamic Envelope Delineation Markings" in the 2000 MUTCD), the FHWA retitles the section to clarify that the text refers to pavement markings.

Additionally, the FHWA modifies the STANDARD statement to clarify that, if used, the pavement marking used to delineate the dynamic envelope shall be a normal solid white line, contrasting pavement color, and/or contrasting pavement texture. This STANDARD is identical to that in Section 8B.22 Dynamic Envelope Markings. The FHWA received several editorial comments regarding changes to this section and figures and incorporates the applicable comments in this final rule.

379. In Section 10D.01 Introduction, the FHWA removes the STANDARD statement because the information is already properly contained in Section 10A.01 Introduction.

Additionally, in the NPA, the FHWA proposed to add to the OPTION statement that In-Roadway Stop Line Lights and In-Roadway Warning Lights may be installed at highway-light rail transit grade crossings that are controlled by active grade crossing warning systems. The FHWA received ten comments from the NCUTCD, members of the NCUTCD Railroad and Light Rail Transit Committee, State DOTs and railroad associations opposed to allowing the use of In-Roadway

Lights for this application, stating that there has not been enough research regarding the effectiveness of In-Roadway Lights. The FHWA agrees and withdraws this paragraph in this final rule.

380. In Section 10D.02 Flashing Light Signals (numbered Section 10D.04 in the 2000 MUTCD), the FHWA moves this entire section to follow Section 10D.01 Introduction so that content contained in Sections 10D.01 and 10D.02 appears in the same order as it appears in Part 8. The FHWA received one comment from the City of Tucson, Arizona, in support of this change and adopts this change.

381. In Section 10D.03 Automatic Gates, the FHWA changes the last SUPPORT statement to an OPTION statement to be consistent with the same language contained in Section 8D.04 Automatic Gates, on how the effectiveness of gates may be enhanced by the use of channelizing devices or raised median islands to discourage driving around lowered automatic gates. The FHWA received one comment from the City of Tucson, Arizona, in support of this change and adopts this change.

382. In Section 10D.04 Four-Quadrant Gate Systems (numbered Section 10D.02 in the 2000 MUTCD), the FHWA moves this entire section to follow Section 10D.03 LOOK Sign (R15-8) so that content contained in this section appears in the same order as it appears in Section 8D.05 Four-Quadrant Gate Systems.

The FHWA revises and adds to the GUIDANCE statement information to describe the various operating modes of exit gates and how they should be used to be consistent with changes as discussed in Section 8D.05 Four-Quadrant Gate Systems.

The same NCUTCD Committee also suggested deleting the GUIDANCE statement regarding placement of exit gates to provide a safe zone because this practice is seldom used. Because Four-Quadrant Gates are a relatively new concept to grade crossings, the FHWA believes that if space is available, the exit gates should be set back at least one design vehicle length from the nearest rail in order to reduce the chances of a vehicle becoming trapped on the tracks. The FHWA adopts the changes as proposed in the NPA.

Additionally, the FHWA revises the third paragraph of the STANDARD statement to accommodate constant warning time or other advanced systems to be consistent with changes as discussed in Section 8D.05 Four-Quadrant Gate Systems.

Based on a comment received from a railroad company regarding identical

text in Section 8D.05, the FHWA revises the third and fourth paragraphs of the GUIDANCE statement to include coordination with the affected transit agency when determining the operating mode of exit gates and the Exit Gate Clearance Time.

383. In Section 10D.08 Pedestrian and Bicycle Signals and Crossings, the FHWA changes the first OPTION statement (in the 2000 MUTCD) to a GUIDANCE statement to emphasize that if an engineering study shows that flashing-light signals alone would not provide sufficient notice of an approaching light rail transit vehicle, the LOOK (R15-8) sign and/or pedestrian gates should be considered. The FHWA received several comments from members of the NCUTCD Railroad and Light Rail Transit Committee recommending that the FHWA keep this paragraph an OPTION because pedestrian gates are too easily circumvented and their effectiveness has never been adequately demonstrated. The FHWA changes the text to a GUIDANCE in this final rule because if an engineering study has determined that flashing-light signals are not enough, then the additional measures should be recommended for consideration, not just permitted.

Discussion of Adopted Amendments to Appendix A1—Congressional Legislation

384. In Appendix A1 Congressional Legislation, the FHWA adds Section 306 Motorist Call Boxes to the listing of pertinent sections of Public Law 104-59—Nov. 28, 1995 (National Highway System Designation Act of 1995). This section discusses the uses of motorist call boxes along the National Highway System. No comments were received on this addition and the FHWA adopts it as proposed in the NPA.

Rulemaking Analyses and Notices

Executive Order 12866 (Regulatory Planning and Review) and U.S. DOT Regulatory Policies and Procedures

The FHWA has determined that this action is not a significant regulatory action within the meaning of Executive Order 12866 or significant within the meaning of the U.S. Department of Transportation regulatory policies and procedures. The economic impact of this rulemaking will be minimal. Most of the changes in this final rule provide additional guidance, clarification, and optional applications for traffic control devices. The FHWA believes that the uniform application of traffic control devices will greatly improve the traffic operations efficiency and roadway

safety. The standards, guidance, and support are also used to create uniformity and to enhance safety and mobility at little additional expense to public agencies or the motoring public. Therefore, a full regulatory evaluation is not required.

Regulatory Flexibility Act

In compliance with the Regulatory Flexibility Act (Pub. L. 96-354, 5 U.S.C. 601-612) the FHWA has evaluated the effects of this action on small entities. This final rule adds some alternative traffic control devices and only a very limited number of new or changed requirements. Most of the changes are expanded guidance and clarification information. The FHWA hereby certifies that this action will not have a significant economic impact on a substantial number of small entities.

Unfunded Mandates Reform Act of 1995

This rule does not impose unfunded mandates as defined by the Unfunded Mandates Reform Act of 1995 (Pub. L. 104-4, March 22, 1995, 109 Stat. 48). The revisions directed by this action can be phased in by the States over specified time periods in order to minimize hardship. The changes made to traffic control devices that would require an expenditure of funds all have future effective dates sufficiently long to allow normal maintenance funds to replace the devices at the end of the material life-cycle. To the extent the revisions require expenditures by the State and local governments on Federal-aid projects, they are reimbursable. This rule does not impose a Federal mandate resulting in the expenditure by State, local, and tribal governments, in the aggregate, or by the private sector, of \$100 million or more in any one year (2 U.S.C. 1531 *et seq.*).

Executive Order 13132 (Federalism)

This action has been analyzed in accordance with the principles and criteria contained in Executive Order 13132, and the FHWA has determined that this action does not have a substantial direct effect or sufficient federalism implications on States and local governments that would limit the policymaking discretion of the States and local governments. Nothing in the MUTCD directly preempts any State law or regulation.

The MUTCD is incorporated by reference in 23 CFR part 655, subpart F. These amendments are in keeping with the Secretary of Transportation's authority under 23 U.S.C. 109(d), 315, and 402(a) to promulgate uniform guidelines to promote the safe and efficient use of the highway. The

overriding safety benefits of the uniformity prescribed by the MUTCD are shared by all of the State and local governments, and changes made to this rule are directed at enhancing safety. To the extent that these amendments override any existing State requirements regarding traffic control devices, they do so in the interest of national uniformity.

Executive Order 13175 (Tribal Consultation)

The FHWA has analyzed this action under Executive Order 13175, dated November 6, 2000, and believes that it will not have substantial direct effects on one or more Indian tribes; will not impose substantial direct compliance costs on Indian tribal governments; and will not preempt tribal law. Therefore, a tribal summary impact statement is not required.

Executive Order 12372 (Intergovernmental Review)

Catalog of Federal Domestic Assistance Program Number 20.205, Highway Planning and Construction. The regulations implementing Executive Order 12372 regarding intergovernmental consultation on Federal programs and activities apply to this program.

Paperwork Reduction Act

Under the Paperwork Reduction Act of 1995 (PRA) (44 U.S.C. 3501, *et seq.*), Federal agencies must obtain approval from the Office of Management and Budget (OMB) for each collection of information they conduct, sponsor, or require through regulations. The FHWA has determined that this action does not contain a collection of information requirement for the purposes of the PRA.

Executive Order 12988 (Civil Justice Reform)

This action meets applicable standards in Sections 3(a) and 3(b)(2) of Executive Order 12988, Civil Justice Reform, to minimize litigation, to

eliminate ambiguity, and to reduce burden.
Executive Order 13045 (Protection of Children)

The FHWA has analyzed this action under Executive Order 13045, Protection of Children from Environmental Health Risks and Safety Risks. This is not an economically significant action and does not concern an environmental risk to health or safety that may disproportionately affect children.

Executive Order 12630 (Taking of Private Property)

This action would not affect a taking of private property or otherwise have taking implications under Executive Order 12630, Governmental Actions and Interference with Constitutionally Protected Property Rights.

Executive Order 13211 (Energy Effects)

The FHWA has analyzed this final rule under Executive Order 13211, Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use. We have determined that this is not a significant energy action under that order because it is not a significant regulatory action under Executive Order 12866 and is not likely to have a significant adverse effect on the supply, distribution, or use of energy. Therefore, a Statement of Energy Effects under Executive Order 13211 is not required.

Regulation Identification Number

A regulation identification number (RIN) is assigned to each regulatory action listed in the Unified Agenda of Federal Regulations. The Regulatory Information Service Center publishes the Unified Agenda in April and October of each year. The RIN contained in the heading of this document can be used to cross reference this action with the Unified Agenda.

List of Subjects in 23 CFR Part 655

Design standards, Grant programs—Transportation, Highways and roads,

Incorporation by reference, Signs, Traffic regulations.
Issued on: November 7, 2003.
Mary E. Peters,
Federal Highway Administrator.
■ In consideration of the foregoing, the FHWA amends title 23, Code of Federal Regulations, part 655, subpart F as follows:

PART 655—TRAFFIC OPERATIONS

- 1. The authority citation for part 655 continues to read as follows:
Authority: 23 U.S.C. 101(a), 104, 109(d), 114(a), 217, 315, and 402(a); 23 CFR 1.32; and 49 CFR 1.48(b).

Subpart F—Traffic Control Devices on Federal-Aid and Other Streets and Highways—[Amended]

- 2. Revise § 655.601(a), to read as follows:

§ 655.601 Purpose.
* * * * *
(a) Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD), 2003 Edition, FHWA, dated October, 2003. This publication is incorporated by reference in accordance with 5 U.S.C. 552(a) and 1 CFR part 51 and is on file at the Office of the Federal Register, 800 North Capitol Street, NW., Suite 700, Washington, DC. It is available for inspection and copying at FHWA, 400 Seventh Street, SW., Room 3408, Washington, DC 20590, as provided in 49 CFR part 7. The text is also available from the FHWA Office of Transportation Operations' Web site at: <http://mutcd.fhwa.dot.gov>.
* * * * *

Appendix to Subpart F of Part 655—Alternate Method of Determining the Color of Retroreflective Sign Materials and Pavement Marking Materials—[Amended]

- 3. Amend Table 3 by adding (after the color Fluorescent Green) the color Fluorescent Pink with Chromaticity Coordinates as follows:

Color	Chromaticity coordinates							
	1		2		3		4	
	x	y	x	y	x	y	x	y
* * *	*		*		*		*	
Fluorescent Pink	0.450	0.270	0.590	0.350	0.644	0.290	0.536	0.230

■ 4. Amend Table 3a by adding (after the color Fluorescent Green) the color Fluorescent Pink with Luminance Factor Limits (Y) as follows:

Color	Luminance factor limits (Y)		
	Min	Max	Y _F
* * *	*	*	*
Fluorescent Pink	25	None	15

[FR Doc. 03-28673 Filed 11-19-03; 8:45 am]

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