Federal Register

Wednesday,
December 16, 2009

VIEWED 06/16/2011

Part II

Department of Transportation

Federal Highway Administration

23 CFR Part 655

National Standards for Traffic Control Devices; the Manual on Uniform Traffic Control Devices for Streets and Highways; Revision; Final Rule

DEPARTMENT OF TRANSPORTATION

Federal Highway Administration

23 CFR Part 655

[FHWA Docket No. FHWA–2007–28977]

RIN 2125–AF22

National Standards for Traffic Control Devices; the 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 for Streets and Highways (MUTCD) (also referred to as ''the Manual'') is incorporated by reference within our regulations, 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 applications. The MUTCD, with these changes incorporated, is being designated as the 2009 Edition of the MUTCD.

DATES: *Effective Date:* This final rule is effective January 15, 2010. 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 January 15, 2010.

FOR FURTHER INFORMATION CONTACT: Mr. Hari Kalla, Office of Transportation Operations, (202) 366–5915; or Mr. Raymond Cuprill, Office of the Chief Counsel, (202) 366–0791, Federal Highway Administration, 1200 New Jersey Ave., SE., 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 Federal eRulemaking portal at: *http://www.regulations.gov.* Electronic submission and retrieval help and guidelines are available under the help section of the Web site. It is available 24 hours each day, 365 days each year. Please follow the instructions. An electronic copy of this document may also be downloaded from 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.access.gpo.gov/nara.*

Background

On January 2, 2008, at 73 FR 268, the FHWA published an NPA proposing revisions to the MUTCD. Those changes were proposed to be designated as the next edition of the MUTCD. Interested persons were invited to submit comments to FHWA Docket No. FHWA–2007–28977. 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 2009 Edition of the MUTCD.

The text of the 2009 Edition of the MUTCD, with these final rule changes incorporated, and documents showing the adopted changes from the 2003 Edition, are available for inspection and copying, as prescribed in 49 CFR part 7, at the FHWA Office of Transportation Operations (HOTO–1), 1200 New Jersey Avenue, SE., Washington, DC 20590. Furthermore, the text of the 2009 Edition of the MUTCD, with these final rule changes incorporated, and documents showing the adopted changes from the 2003 Edition, are available on the FHWA's MUTCD Internet site *http://mutcd.fhwa.dot.gov.* The previous version of the MUTCD, the 2003 MUTCD with Revisions 1 and 2 incorporated, is also available on this Internet site. The 2009 Edition supersedes all previous editions and revisions of the MUTCD.

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Summary of Comments

The FHWA received 1,841 letters submitted to the docket, containing over 15,000 individual comments on the MUTCD in general or on one or more parts, chapters, sections, or paragraphs contained in the MUTCD. 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 submitted comments. The FHWA has reviewed and analyzed all of the comments received. The NCUTCD comments included support for all items in the NPA except as otherwise indicated. 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. All of the items discussed below were proposed in the NPA unless otherwise indicated.

Discussion of General Amendments to the MUTCD

1. The FHWA received several general comments from State DOTs, local agencies, associations, and citizens regarding the NPA. Two local agencies, a traffic control device vendor, an association, and two citizens expressed general support for the changes in the MUTCD, such as incorporating into the MUTCD recommendations of the Older Driver Handbook, the Synthesis of Non-MUTCD Traffic Signs, and new technologies. In addition to the overall general comments, some of the commenters had specific comments that relate to the entire MUTCD. Those topics that the FHWA considers to be substantive and non-editorial in nature are discussed in the following items within this section.

2. The NCUTCD submitted a letter suggesting that the FHWA issue a supplemental notice of proposed amendments (SNPA). Fourteen State DOTs, AASHTO, and the Chair of the NCUTCD submitted duplicate copies of the NCUTCD's letter in support of an SNPA. In addition, three State DOTs, a county DOT, an NCUTCD member, and a traffic engineering consultant also stated support for the NCUTCD's letter. The NCUTCD's letter included the following statements in support of an SNPA:

1. The NPA did not include a quantified assessment of the economic impacts of the proposed changes on public agencies and the private sector.

2. More details are needed regarding some of the proposed changes and some of the proposed changes need to be reorganized or reformatted.

3. The extent of the proposed changes and the number of expected comments is such that the final rule would be significantly different from the NPA version, and would therefore constitute a new document which should be reviewed as an SNPA prior to becoming a final rule.

4. Because of the interconnectivity between the language in the various sections, chapters, and parts, a change in one section might have impacts on multiple other sections. Therefore, an SNPA is needed in order to have the opportunity to review additional changes resulting from responses to comments to assess whether they are consistent with each other.

5. There is precedent for issuing multiple proposed rules for changes to the MUTCD.

6. It is essential that the FHWA provide an opportunity to review the FHWA responses to the docket so that implementation and liability changes can be identified, assessed, and discussed before a final rule is published.

7. An SNPA is needed to assess the FHWA response to comments and evaluate the level of engineering flexibility that will be provided in the next edition of the MUTCD.

Five State DOTs, a local agency, nine toll road operators, a major retail business owner, and a traffic engineering consultant also expressed general support for an SNPA.

Two bicycle associations, a traffic engineering consultant, and a citizen disagreed with the need for an SNPA and requested that FHWA publish a final rule. The two bicycle associations suggested that if an SNPA were to be published instead of a final rule, the FHWA should issue Interim Approvals for all new devices and applications in Part 9 so that public agencies can begin installing them to improve conditions for bicyclists.

The FHWA carefully reviewed and considered the concerns both for and against issuing an SNPA and decided that an SNPA is not necessary or appropriate. The FHWA determined that the seven specific statements cited by the NCUTCD in support of an SNPA do not justify delaying the finalization of a new edition of the MUTCD that will significantly improve the safety and efficiency of highway travel. Additionally, in making decisions in the final rule regarding the various technical issues cited in the letters from the NCUTCD and others who requested an SNPA, the FHWA has taken into consideration the concerns expressed. To address the concerns, in most cases the FHWA has revised certain provisions to make them less restrictive or has deleted from the final rule certain provisions that were proposed in the NPA, has reorganized and reformatted material to clarify it, and has eliminated specific target compliance dates or established long compliance periods consistent with service lives of the devices. In most cases the new provisions apply only to new installations or reconstructions of devices, and the provisions for systematic upgrading cited in Section 655.603(d)(1) of title 23, Code of Federal Regulations [1] allow existing noncompliant devices in good condition to remain in place until the end of their service lives, thus minimizing any impacts of new requirements on State or local highway agencies and owners of private roads open to public travel.

3. The FHWA received comments from three local agency DOTs, an association of counties, and a citizen suggesting that there are too many proposed changes to the MUTCD and that many of the changes are too complex. The FHWA believes that continuously updating the MUTCD is necessary in order to incorporate advances in technology, new research results, and state of the practice in traffic control devices. Since the MUTCD's purpose is to improve safety and efficiency, the MUTCD must be revised to remain current with these new technologies and applications.

4. A State DOT, 10 local agency DOTs, an association representing local DOTs, and a traffic engineering consultant expressed concern that there were too many new STANDARD statements (or GUIDANCE statements elevated to STANDARD statements) in the proposed revisions, and that the large number of changes places an undue financial burden on agencies. The FHWA believes that the changes to the MUTCD will provide improved uniformity in traffic control device applications across the country, thereby increasing safety, and that the additional Standards will not result in undue financial burden on agencies. As discussed under Amendments to the MUTCD Introduction, in the vast majority of cases existing devices in good condition that are not in compliance with new standards can remain in place for the remainder of their service life, thus minimizing any impacts of new requirements on State or local highway agencies and owners of private roads open to public travel.

5. The FHWA received comments from a State DOT and three city DOTs opposing the scope of the changes within the MUTCD and suggesting that many of the changes are more appropriate for a handbook, rather than the MUTCD. Several of the commenters expressed concern that the MUTCD was becoming more prescriptive in nature, thus limiting creativity, flexibility, and judgment. The FHWA believes that the widespread use of the MUTCD by State and local agencies and design professionals, and its importance as a Federal regulation for traffic control devices justifies the level of detail incorporated in the MUTCD. Further, the FHWA believes that sufficient justification has been provided for any new standards and that ample latitude for flexibility and judgment is provided in the application of Guidance and Options in the MUTCD.

6. The FHWA adopts a new cover page for this edition of the MUTCD that maintains general consistency with covers of previous editions, but with changes to give it a distinctive appearance to minimize the possibility of confusion by users. The date of this edition, which is identified on the cover and elsewhere within the document, is the year in which the final rule is issued.

7. The FHWA includes paragraph numbers in the margins for each paragraph of each section for the final page images of this edition of the MUTCD. The FHWA includes these paragraph numbers in order to aid practitioners in referencing the MUTCD, as well as to assist readers of future MUTCD notices of proposed amendments. The FHWA posted sample pages on its MUTCD Web site showing four possible methods for paragraph numbering and as part of the NPA asked interested persons to review the sample pages and provide comments to the docket on the paragraph numbering options. Based on comments, the FHWA numbers the paragraphs in the manner that was shown as Alternative #3, with dark numerals outside the margin, and in a font that is easy to read without being distracting.

8. The NCUTCD, two State DOTs, and a citizen provided comments regarding the format of MUTCD pages, print style, numbering of sections, etc. Based on a comment from the NCUTCD, the FHWA changes the font of GUIDANCE statements to italics to distinguish them from OPTION and SUPPORT statements. As part of this change, the FHWA eliminates italics from the titles of figures and tables.

9. The FHWA received several comments regarding the use of metric units in the MUTCD. The NCUTCD, six State DOTs, ATSSA, an NCUTCD member, and two traffic engineering consultants suggested that the metric units be removed in their entirety or that the English units precede the metric units, and a traffic engineering consultant suggested that the MUTCD continue to be issued with both systems of measurement. Because metric units are not currently used in the U.S. for traffic control device applications, the FHWA determines that only English units are to be used in the MUTCD text, figures, and tables and places metric

[1] The Code of Federal Regulations can be viewed at the following Internet Web site: *http://www.gpoaccess.gov/CFR/*.

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equivalent values for all English unit values used in the MUTCD in a new Appendix A2 in this final rule. This preserves the soft conversions of the English to metric values in the MUTCD while also providing a document that is less cumbersome to read and apply. This change is consistent with an Informational Memorandum from FHWA's Executive Director, dated November 25, 2008,[2] stating that use of metric measurements will now be optional in all FHWA documents, including letters, memoranda, publications, reports, and information on FHWA Web sites.

10. Throughout the MUTCD, the FHWA incorporates minor changes in text, figures, and tables for grammatical or style consistency, to improve consistency with related text or figures, to improve clarity, or to correct minor errors. Where the FHWA adds a new chapter within a part of the MUTCD, a new section within a chapter of the MUTCD, or a new item within a listing, the chapters or sections or items that follow the addition are renumbered or relettered accordingly. All Tables of Contents, Lists of Figures, Lists of Tables, and page headers and footers are revised as appropriate to reflect the changes.

11. The FHWA modifies figures and tables to reflect changes in the text and adds figures and tables to illustrate new or revised text.

12. In various sections of the Manual, the FHWA relocates statements or paragraphs in order to place subject material together in logical order, to provide continuity, or to improve flow. In addition, the FHWA changes the titles of some sections, figures, and tables in order to more accurately describe the content.

13. As proposed in the NPA, the FHWA removes the phrase ''reasonably safe'' throughout the Manual because it cannot be easily defined, and as a result it is open to too much subjective interpretation. The FHWA received a comment from a local DOT opposed to this revision, stating that there are some circumstances in the MUTCD where the phrase ''reasonably safe'' reflects real-world conditions, and that removing the phrase could pose a liability problem to State and local agencies in civil litigation. The FHWA disagrees because of the subjectivity of the term and for each occurrence of the term either eliminates or replaces the term with suitable language that is more appropriate.

14. The FHWA changes the references to the book previously titled ''Standard Highway Signs'' to refer to the current title, ''Standard Highway Signs and Markings.'' This reflects FHWA's change of the title of that book to more accurately reflect its content, which includes information regarding pavement markings. The FHWA received a comment from ATSSA in support of this change. The FHWA also resolves the inaccuracies between the sign illustrations in the MUTCD and the ''Standard Highway Signs and Markings'' (SHSM) book to the extent practical in the MUTCD figures.

15. The FHWA conducted a comprehensive review of all of the sign codes used throughout the Manual, and revises sign codes in several places in order to provide more consistency and clarity. As part of this process, the FHWA revises the term ''sign code'' to ''sign designation'' to avoid confusion with other uses of the word ''code.'' The FHWA received a comment from ATSSA in support of this change. A State DOT opposed sign nomenclature changes, stating that these changes could be complex for agencies that catalog sign inventory database based on the nomenclature. The FHWA understands the issues related to inventory databases but determines that the nomenclature changes are necessary for consistency. The FHWA received a comment from ATSSA suggesting that the suffix ''w'' be used for word message signs to avoid confusion with the ''a'' suffix being used for abbreviations in the route marker series (such as M4–1a and M4–7a). The FHWA disagrees and uses the ''a'' suffix in sign designations for word message signs that are alternatives to symbol signs, as presented in the NPA. The FHWA uses the ''P'' suffix for designations for plaques to clarify that these devices must accompany a sign and cannot be used alone. ATSSA supported this change. Also, based on a comment from a citizen, the FHWA adds a column to the sign size tables in Parts 6 and 9 to cite the applicable MUTCD Section for each sign so that MUTCD users can review the pertinent information for each sign. The sign size tables for other Parts of the MUTCD already have this column.

16. Based on a comment from the NCUTCD that a single location should be provided where all definitions can be found, the FHWA places all definitions in Part 1 by relocating to Section 1A.13 all definitions that were previously contained or repeated in the MUTCD Introduction and in Parts 2 through 10 of the 2003 MUTCD and in the NPA.

17. The FHWA adds information in the MUTCD regarding toll plaza applications, because toll facilities are becoming more common and there is a need to provide more consistent use of signs, signals, and markings in advance of and at toll plazas, in order to enhance safety and convenience for road users. The FHWA adds provisions on toll plaza traffic control devices to Parts 2, 3, and 4 that reflect the results of research studies on best practices for traffic control strategies at toll plazas,[3] FHWA's policy on toll plaza traffic control devices,[4] and FHWA's report on ''Strategies for Improving Safety at Toll Collection Facilities.''[5] The NCUTCD and 10 agencies that operate toll facilities suggested that the toll road related material be placed in a new, separate Part to facilitate the use of this material. The FHWA understands that the toll operators would like to have the information consolidated into one area, but disagrees with adding a separate Part. Instead, the FHWA creates new chapters for toll plazas within Parts 2, 3, and 4 and places the new toll-related material in those chapters.

18. The FHWA expands the provisions regarding preferential lanes and adds new provisions regarding managed lanes in various parts of the MUTCD to address the increasing complexity and use of these types of lanes. Although four agencies that operate toll facilities expressed support for the need for increased uniformity in traffic control devices on managed lanes for the purposes of improving traffic safety, eight agencies (including some of those who also supported the need for including toll facilities in the MUTCD) expressed concern that the changes will place a financial burden on their agency, and two of these agencies felt that the changes were too restrictive and should reflect recommendations, rather than requirements. The FHWA understands that changes in the MUTCD are often met with financial concerns; however, the FHWA believes that the provisions for systematic upgrading

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[2] Informational Memorandum, ''Update on Metric Use Requirements for FHWA Documents,'' by Jeffrey Paniati, dated November 25, 2008, can be viewed at the following Internet Web site: *http://www.fhwa.dot.gov/programadmin/contracts/1108metr.cfm.*

[3] ''State of the Practice and Recommendations on Traffic Control Strategies at Toll Plazas,'' June 2006, can be viewed at the following Internet Web site: *http://mutcd.fhwa.dot.gov/rpt/tcstoll/index.htm.*

[4] ''Toll Plaza Traffic Control Devices Policy,'' dated September 8, 2006, can be viewed at the following Internet Web site: *http://mutcd.fhwa.dot.gov/resources/policy/tcstollmemo/tcstoll_policy.htm.*

[5] ''Strategies for Improving Safety at Toll Collection Facilities,'' Report number FHWA–IF–08–005, May 2008, can be viewed at the following Internet Web site: *http://ops.fhwa.dot.gov/tolling_pricing/resources/report/toll_summary/index.htm.*

cited in Section 655.603(d)(1) of title 23, Code of Federal Regulations [6] will enable changes associated with the final rule to be accommodated without significant expense. The information on preferential and managed lanes is contained primarily in Parts 2 and 3 and is intended to address specific signing and marking issues associated with High Occupancy Toll (HOT) lanes, variable tolls and other operational strategies on managed lanes, etc. To better facilitate user understanding, the FHWA creates new chapters for preferential and managed lanes in Parts 2 and 3 and places the new and existing material on those subjects in those chapters. In addition, as proposed in the NPA, the FHWA eliminates some information regarding preferential lanes that is too specific for the MUTCD because it deals with highway planning and programmatic matters rather than the traffic control devices for preferential lanes.

19. The FHWA received comments from a variety of commenters on subject material that was not included in the NPA. In some cases those comments pertain to existing subject matter in the 2003 Edition that was not proposed for change in the NPA, while in other cases the commenters suggest new material for the MUTCD such as new signs or different traffic control device applications from those included in the 2003 Edition or the NPA. Comments received during the comment period that were outside the scope of this rulemaking are neither discussed in this preamble nor addressed in the final rule. The FHWA appreciates these comments, and might consider some of these ideas for potential future rulemaking activities.

Discussion of Amendments Within the Introduction

20. The FHWA revises paragraph 01 regarding the definition of traffic control devices to reflect that traffic control devices on private roads open to public travel are placed by authority of the private property owner or private official having jurisdiction. A State DOT commented that the existing language and that proposed in the NPA for this paragraph implied that public agencies have the authority to place traffic control devices on private roads open to public travel. The FHWA agrees that clarification is needed and revises the text accordingly.

21. In the NPA, the FHWA proposed revisions and additions to the text regarding the locations where the MUTCD applies. Two city DOTs, an NCUTCD member, three transportation professionals, a traffic control device vendor, and two citizens all supported the changes, as proposed in the NPA and as currently provided in the CFR, to apply the MUTCD to private roads open to public travel. Two State DOTs, a local DOT, and an employee of a State DOT opposed applying the MUTCD to private roads, mostly because of concerns about enforcement of the provisions. The FHWA recognizes that enforcement can only occur when a State includes the requirement to comply with MUTCD in State ordinances, local building codes, development approvals, site plans, etc., and as a result of the potential tort liability to the owners of the private roads. The FHWA believes that public agency traffic engineers are not expected to enforce this provision for existing conditions on private roads open to public travel.

Two State DOTs and two toll road operators suggested that the wording be revised to reflect that toll roads may be operated by public, quasi-public, or private entities and that toll roads are gated and restricted by tolling. The FHWA agrees and revises the language in this final rule and in 23 CFR 655.603(a),[7] to clarify that, for the purpose of applicability of the MUTCD, toll roads under the jurisdiction of public agencies or authorities or of public-private partnerships are considered to be public facilities, and that ''open to public travel'' includes private toll roads and roads within shopping centers, airports, sports arenas, and other similar business and/or recreation facilities that are privately owned, but where the public is allowed to travel without access restrictions. To address the comments from two toll road operators, this final rule language further clarifies that except for gated toll roads, roads within private gated properties where public access is restricted at all times shall not be considered to be open to public travel.

The FHWA received several comments from a major retail business operator suggesting that there are many items in the MUTCD that are not easily applicable to parking lots within shopping centers and the driving aisles within those parking lots. The FHWA agrees that, while MUTCD general principles and standard traffic control device designs should be used in parking lots, there are some MUTCD provisions that do not easily translate to conditions typically found in parking lots and parking garages. The FHWA believes that additional future consideration is needed to determine appropriate and feasible standards and guidance for the application of traffic control devices in parking lots. Therefore, the FHWA exempts parking spaces and driving aisles in parking lots, both privately and publicly owned, from MUTCD applicability in this final rule. The MUTCD continues to be applicable to ring roads, roads providing access to or egress from public roads, and circulation roads on private property open to public travel. Accordingly, throughout the MUTCD, where the term ''private property open to public travel'' was used in the NPA, the FHWA clarifies the term to be ''private road open to public travel'' and provides a precise definition of that term in Section 1A.13 in this final rule. The FHWA also incorporates these changes into 23 CFR 655.603(a).

As proposed in the NPA, the FHWA also modifies the wording of 23 CFR 655.603(a) to remove the exemption from MUTCD applicability for military bases, based on a request from the Military Surface Deployment and Distribution Command to include military bases, in order to facilitate road user safety through conformity and consistency with national standards.

22. The FHWA adds SUPPORT paragraph 05 to clarify that pictographs embedded within signs are not in themselves considered traffic control devices and thus the pictographs are not subject to the provisions in paragraph 04 that prohibit patented, copyrighted, or trademarked items. This clarification is necessary to address frequent questions from users of the MUTCD on this subject.

23. In concert with the change to show dimensions throughout the MUTCD in only English units, the FHWA revises the text in paragraphs 13 and 14 to provide a reference to new Appendix A2 for tables converting each of the English unit numerical values to the equivalent Metric values and to recommend that if metric units are to be used in laying out distances or determining sizes of devices, such units should be specified on plan drawings and made known to those responsible for designing, installing, or maintaining traffic control devices.

24. In the NPA, the FHWA proposed to revise the paragraph regarding adoption of MUTCD revisions by the States or other Federal agencies, substantial conformance of State or

[6] The Code of Federal Regulations can be viewed at the following Internet Web site: *http://www.gpoaccess.gov/CFR/.*

[7] The **Federal Register** Notice for the Final Rule, dated December 14, 2006, Vol. 71, No. 240, pages 75111–75115, can be viewed at the following Internet Web site: *http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=2006_register&docid=fr14de06-6.pdf.*

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other Federal agency MUTCDs or Supplements, and compliance periods for new and existing devices to reflect the requirements of the Code of Federal Regulations applicable to the MUTCD that have been in effect since 2006.[8] In this final rule, the FHWA further revises the text to make it clearer and more easily understood by users. The FHWA divides the single paragraph into several separate paragraphs containing applicable text on certain subjects that are presented in a more logical sequence. New text consistent with the CFR is added regarding compliance of new or reconstructed devices, and Option and Support text regarding replacement of existing noncompliant devices is revised for clarity and relocated from the end of the MUTCD Introduction to follow other related text.

25. In the NPA, the FHWA asked for comments regarding the possibility of incorporating the phase-in target compliance periods into the body of the MUTCD text throughout the applicable parts and sections in this Final Rule. The FHWA considered this change because the list of target compliance periods is lengthy, and it might be more convenient and effective for practitioners to have target compliance periods embedded in the text, rather than in a different area of the Manual. The Minnesota DOT has incorporated the target compliance periods into its State MUTCD text, and the FHWA asked whether Minnesota's method is preferable to listing all the target compliance periods in the MUTCD Introduction. The NCUTCD, ATSSA, a State DOT, a toll facility operator, an NCUTCD member, and a traffic control device vendor favored placing the compliance periods within the sections to which that they pertain. The NCUTCD also suggested that a reference be placed in the Introduction to a list of all target compliance dates on the MUTCD Web site. The FHWA understands that there are advantages and disadvantages to placing the target compliance dates within the text. Placing the target compliance dates within the sections to which they apply might result in some agencies delaying action to comply with the provision until the compliance date approaches. As a result, the FHWA continues to provide the target compliance date information in the Introduction, and does not embed the dates within the section text. However, to consolidate and improve the clarity of this information, the FHWA relocates the listing of target compliance dates from the body of the MUTCD Introduction to a new Table I–2.

In new Table I–2, FHWA includes the specific target compliance dates for those items whose dates were determined through previous rulemaking, now that the effective dates are known, and deletes from the listing any items for which the target compliance dates have passed by the date of the publication of this final rule.

The FHWA deletes most of the large number of new target compliance dates that were proposed in the NPA. Section 655.603(d)(1) of title 23, Code of Federal Regulations, states that for existing highways ''each State, in cooperation with its political subdivisions, and Federal agency shall have a program as required by 23 U.S.C. 402(a), which shall include provisions for the systematic upgrading of substandard traffic control devices and for the installation of needed devices to achieve conformity with the MUTCD.'' Although the FHWA may establish specific target compliance dates to achieve compliance with respect to specific devices, the systematic upgrade program allows public agencies and officials having jurisdiction to upgrade their existing noncompliant devices when the devices are no longer serviceable because they reach the end of their service life or otherwise need to be replaced, or when other events such as highway improvement or reconstruction projects occur, thus minimizing any impacts to State or local highway agencies and owners of private roads open to public travel. Target compliance periods shorter than expected service life have generally only been established in unusual cases when a new MUTCD requirement is deemed to be so critically important from a safety impact standpoint that it justifies earlier replacement of noncompliant existing devices. In some cases, the FHWA has adopted target compliance dates for certain provisions, such as a requirement to do a study or to evaluate the timing of traffic signal clearance intervals, that are not directly related to the service life of a device but which the FHWA believes can be reasonably accommodated within typical agency procedures and practices. The FHWA reviewed all the proposed target compliance dates in the NPA in the context of the CFR language, the general intents stated above, and the comments received, and the FHWA establishes only 12 new target compliance dates in this final rule. Each of these new target dates is discussed in detail under the appropriate item later in this preamble.

Additionally, for new target compliance dates, the FHWA establishes specific dates (December 31 of a particular year) rather than the previous practice of setting target compliance dates as a certain number of years from the effective date of the final rule. The FHWA believes that specific end of calendar year target compliance dates will assist MUTCD users by making the dates clear without the need to determine what date a final rule became effective. It should also be noted that the target compliance dates define the end of the ''phase-in compliance period'' as discussed for various items in the remainder of this document.

Discussion of Amendments Within Part 1

26. In Section 1A.07, Responsibility for Traffic Control Devices, the FHWA revises paragraphs 01 and 02 to be consistent with the language of 23 CFR 655.603 regarding the applicability of the MUTCD as the national standard for all traffic control devices installed on any street, highway, bikeway, or private road open to public travel. The FHWA adopts language for these paragraphs in this final rule that is consistent with terminology regarding private roads as discussed above under Introduction to the MUTCD.

The FHWA received a comment from a citizen opposed to changing ''bicycle trail'' to ''bikeways'' as proposed in the NPA. However, because the MUTCD defines bikeway as the generic term for any road, street, or shared-use path that is specifically designated for bicycle travel, the FHWA retains the word ''bikeways'' in this final rule.

The FHWA received three comments from local agencies opposed to including the term ''private property'' because of their belief that the property owner should be responsible for maintaining traffic control devices on private property, not a public agency or other entity. As discussed previously, the FHWA revises the term ''private property'' to ''private roads.'' To respond to the comments from the local agencies, the FHWA modifies the language in this final rule to clarify that, in the case of private roads open to public travel, it is the property owner or the private official having jurisdiction who is responsible for traffic control device design, placement, maintenance, operation, and uniformity, consistent with language in the MUTCD Introduction.

The FHWA adds a Support sentence in this final rule about adoption of the national MUTCD, supplements, or State

[8] The **Federal Register** Notice for the Final Rule, dated December 14, 2006, Vol. 71, No. 240, pages 75111–75115, can be viewed at the following Internet Web site: *http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=2006_register&docid=fr14de06-6.pdf.*

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manuals by all States and a new GUIDANCE paragraph recommending that these State manuals or supplements should be reviewed for specific provisions relating to that State. The NCUTCD recommended these additions and the FHWA agrees that this is necessary to clarify that there is a need to review the specific State Manuals for local requirements.

As requested by the U.S. Military Command, and supported by ATSSA, the FHWA expands paragraph 07 to add the U.S. Military Command to the list of Federal agencies that have adopted the national MUTCD.

Two State DOTs opposed the proposed change of paragraph 08 to a GUIDANCE statement that would recommend that States adopt Section 15–116 of the Uniform Vehicle Code (UVC) because the adoption of State laws is outside of the control of State DOTs and is in the hands of elected officials. The FHWA retains and adopts this change in this final rule and reiterates that this is GUIDANCE, a statement of recommended but not mandatory practice, and as a result the MUTCD is merely recommending the adoption of this section of the UVC by the States, in accordance with their laws and constitutions.

27. In Section 1A.08 Authority for Placement of Traffic Control Devices, in the NPA the FHWA proposed adding a new SUPPORT statement describing certain signs and other devices that do not have any traffic control purpose that are placed with the permission of the public agency or official having jurisdiction and a new GUIDANCE statement that such signs and other devices should not be located where they will interfere with or detract from traffic control devices. The FHWA proposed this change to clarify that there are some signs and devices that are placed within the right-of-way for distinct purposes that are not traffic control devices. The FHWA received comments from the NCUTCD, five State DOTs, a local agency, a vendor, and an association agreeing with the proposed SUPPORT statement. A State DOT, a local DOT, and a traffic device vendor suggested that some of the items included in the SUPPORT statement, such as markers to guide snowplow operators, markers that identify fire hydrant locations, markers that identify underground utility locations, and design features such as speed humps are indeed traffic control devices and their application should be standardized by including them in the MUTCD. The FHWA disagrees with adding explicit standards for these devices in the MUTCD, noting that States may establish requirements for these devices and design features under their adopted policy for use of the public right-of-way. The FHWA adopts the SUPPORT statement, as proposed in the NPA but with minor editorial changes, in this final rule.

Based on comments from the NCUTCD, a State DOT, and a toll road operator, the FHWA changes the proposed GUIDANCE statement to a STANDARD statement in this final rule to require, rather than just recommend, that such signs and other devices shall not be located where they will interfere with or detract from traffic control devices, since it is important that traffic control devices not be blocked or interfered with. This is also necessary for consistency with other provisions in the MUTCD about device placement, such as the requirements in Sections 2D.50 and 2H.08 that community wayfinding signs and acknowledgement signs shall not be installed in a position where they would obscure the road users' view of other traffic control devices. Signs and other devices that do not have any traffic control purpose that are placed within the highway right-of-way have even less importance than community wayfinding and acknowledgement signs.

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28. In Section 1A.09 Engineering Study and Engineering Judgment, the FHWA received comments from the NCUTCD, a State DOT, and two toll road operators recommending the removal of the existing STANDARD statement stating that the MUTCD shall not be a legal requirement for the installation of traffic control devices, because it is a general provision for all devices in the Manual that is inconsistent with numerous specific requirements elsewhere in the MUTCD that specific devices must be installed, and such requirements are ''legal requirements.'' The commenters also suggested that this Standard statement may not be consistent with the Guidance statement that immediately follows it. The FHWA agrees that this STANDARD statement is not easily understood by users of the MUTCD outside of the legal profession, but this statement has been the subject of important court interpretations regarding the applicability of the MUTCD and has legal significance beyond its plain meaning. The FHWA believes that, in the future, consideration should be given to removing or revising this statement, but additional legal study should be undertaken before doing so. Therefore, the FHWA decides to retain this STANDARD statement but cautions users of the MUTCD to consult with legal counsel before attempting to ascertain the meaning of the statement.

The FHWA did not propose in the NPA a significant change to the second paragraph of the GUIDANCE statement as it appears in the 2003 MUTCD. However, four Kansas counties, the Kansas Association of Counties, and an engineer from Kansas suggested revising the language that recommends that jurisdictions with responsibility for traffic control that do not have engineers on their staffs who are trained and/or experienced in traffic control devices should seek engineering assistance from others. The commenters felt that many applications of the MUTCD are straightforward and well illustrated, and engineering assistance is not needed. As a result, the commenters felt that the language should be revised to recommend engineering assistance only if warranted due to the complexity of the situation. The commenters also recommended removing language about smaller agencies requesting assistance of larger agencies because of liability reasons. The FHWA disagrees with these comments and in this final rule adopts the revisions to the GUIDANCE statement as proposed in the NPA. However, to address the concerns, the FHWA also adds a SUPPORT statement noting that, as part of the Federal-aid Program, each State is required to have a Local Technology Assistance Program (LTAP) that provides technical assistance to local highway agencies and that requisite technical training in the application of the principles of the MUTCD and, as needed, engineering assistance, is available from the State's LTAP.

The FHWA received a comment suggesting that the first paragraph of the GUIDANCE statement in the 2003 MUTCD be revised so that the phrase ''this Manual should not be considered a substitute for engineering judgment'' cannot be used to ignore Standards based on ''engineering judgment,'' such as creating new sign symbols. The FHWA agrees that this language conflicts with other statements in the Manual regarding the intent and strength of Standards and in this final rule revises the GUIDANCE statement in Section 1A.09, the definition of the text heading ''Standard'' in Section 1A.13, and the definitions of engineering judgment and engineering study in Section 1A.13, to resolve the conflict and to make these statements consistent with each other.

29. In Section 1A.10 Interpretations, Experimentations, Changes, and Interim Approvals, in the NPA the FHWA proposed to revise paragraph 03 to indicate that electronic submittals of

requests for interpretation, permission to experiment, interim approvals, or changes shall be submitted electronically rather than by standard mail, and proposed to include the e-mail address for such electronic submittals. As part of this change, the FHWA proposed to add an OPTION statement that includes the postal address for mailing of requests in the event that the submitter does not have access to e-mail. The FHWA received comments from the NCUTCD, a State DOT and two toll road operators recommending that the STANDARD statement be changed to GUIDANCE or SUPPORT as this might not be convenient for all agencies. The FHWA disagrees with these comments as adequate provision for submission by standard mail is provided in the OPTION statement. The FHWA is aware that some written requests that are submitted by standard mail are lost or damaged in the screening of all postal mail that is sent to FHWA headquarters. As a result, e-mail submittals are preferred but standard mail submittals are also allowed. The FHWA adopts in this final rule the STANDARD and OPTION as proposed in the NPA but with minor editorial changes.

The FHWA in this final rule adopts the proposed change of paragraph 20, regarding local jurisdictions informing their State DOT of locations where they are using devices under an Interim Approval, to a GUIDANCE statement (formerly a STANDARD statement in the 2003 MUTCD). The FHWA received comments from a State DOT and two toll road operators in support of the revision and a comment from another State DOT opposed to the revision because of their belief that the local jurisdiction should be required, rather than merely recommended, to notify the State DOT of locations where a traffic control device or application under an interim approval is being used. The FHWA disagrees with this comment as not all State DOTs believe that such notifications are needed and because State DOTs can require such notification when they adopt the MUTCD.

The FHWA received a comment from a State DOT suggesting that a new STANDARD statement as proposed in the NPA be expanded to also require that jurisdictions check with their State DOT for official status of an Interim Approval in their State before requesting permission from the FHWA. The FHWA agrees with the concept and adopts a new GUIDANCE paragraph 21 in this final rule about requests for both experimentation and interim approvals, which recommends that local agencies be aware of any State requirements and policies that might apply to these processes.

30. In Section 1A.11 Relation to Other Publications, the FHWA proposed in the NPA to add four FHWA publications and a publication by the American National Standards Institute (ANSI). The FHWA publications cover topics such as roundabouts, designing sidewalks and trails for access, older drivers, and ramp management and control. The ANSI publication discusses high-visibility public safety vests. In addition, the FHWA proposed revising the list to reflect current editions of the publications and adding Web site addresses to obtain the documents. The FHWA adopts these new publications and revisions in this final rule. In addition, based on comments from the NCUTCD, a utility commission, and an engineering consultant, the FHWA adds several other new publications that are useful sources of information. These publications include four FHWA documents covering topics in signal timing, signalized intersections, railroad-highway grade crossings, and changeable message signs and an AASHTO publication on pedestrian facilities.

31. In Section 1A.12 Color Code, in the NPA the FHWA proposed adding to the STANDARD statement the assignment of the color purple to indicate facilities or lanes that are allowed to be used only by vehicles equipped with electronic toll collection (ETC) devices. ATSSA, a State DOT, four toll road operators, a traffic control device vendor, and a citizen all supported adding the color purple for signing and marking ETC facilities and lanes. A toll road operator in Florida stated that their past experience has shown that the color purple fades rapidly in Florida and will likely do so in other States with similar climates. A toll road operator in Texas questioned whether there were any purple materials for signs and markings that would meet Texas DOT durability and nighttime standards. The Illinois Tollway expressed a similar concern about challenges in design and application to ensure that effective color contrast is provided under all circumstances. The FHWA disagrees with comments that adequate materials do not exist, particularly with the adjustment in color values discussed below, and incorporates this change to readily identify such facilities or lanes using signs and pavement markings as discussed in the changes in Parts 2 and 3. As a part of the change, in this final rule the FHWA revises the text to reflect the intended general use of the color purple for lanes restricted to use only by vehicles with registered electronic toll accounts, such as in ETC systems utilizing transponders or video/license plate recognition systems to identify a vehicle with a registered toll account. Where a toll lane or facility is not restricted to specific vehicles and any vehicle without a toll account can use a toll lane or facility because a license plate recognition system sends the vehicle owner a bill for the toll, the use of the color purple is inappropriate.

Color specifications for signing and marking materials are contained in title 23 of the Code of Federal Regulations, part 655, appendix to subpart F, Tables 1 through 6. The FHWA received a comment from a signing material manufacturer stating that the proposed values for the color coordinates in the NPA were too restrictive. Based on retroreflectivity evaluations, the commenter suggested that the daytime chromaticity coordinates for the purple colored sign sheeting be shifted to a redder shade, and that a new set of chromaticity coordinates be generated for a nighttime color that also allows for a redder shift and that might be different from the daytime requirements. A toll road operator suggested that the color purple designated by the chromaticity coordinates is not the same hue as the color their agency currently uses. The FHWA has reviewed the color properties of the purple signing materials available from a variety of manufacturers and adopts daytime and nighttime color coordinates for purple retroreflective sign material (Tables 1 and 2) that are slightly revised from the values that were proposed in the NPA. The adopted daytime color coordinates are based on a large series of measurements of various purple materials that are close to or match the Pantone color selected by the EZ–Pass consortium. With the minor adjustments as adopted, there are sufficient materials that meet the values to provide for competition, but without reducing color recognition. The adopted nighttime color coordinates are similar to the nighttime coordinates for purple pavement markings. The FHWA also adopts daytime and nighttime color coordinates and luminance factors for purple retroreflective marking material (Tables 5, 5A, and 6) as proposed in the NPA. The values for purple in the tables are as indicated below (no change in the existing values for luminance factors for purple as contained in Table 1A):

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TABLE 1—DAYTIME CHROMATICITY COORDINATES FOR PURPLE RETROREFLECTIVE SIGN MATERIAL

x	y
0.302	0.064
0.310	0.210
0.380	0.255
0.468	0.140

TABLE 2—NIGHTTIME CHROMATICITY COORDINATES FOR PURPLE RETROREFLECTIVE SIGN MATERIAL

x	y
0.355	0.088
0.385	0.288
0.500	0.350
0.635	0.221

TABLE 5—DAYTIME CHROMATICITY COORDINATES FOR PURPLE RETROREFLECTIVE PAVEMENT MARKING MATERIAL

x	y
0.300	0.064
0.309	0.260
0.362	0.295
0.475	0.144

TABLE 5A—DAYTIME LUMINANCE FACTORS FOR PURPLE RETROREFLECTIVE PAVEMENT MARKING MATERIAL

Minimum	Maximum
5	15

TABLE 6—NIGHTTIME CHROMATICITY COORDINATES FOR PURPLE RETROREFLECTIVE PAVEMENT MARKING MATERIAL

x	y
0.338	0.380
0.425	0.365
0.470	0.385
0.635	0.221

32. In Section 1A.13 Definitions of Headings, Words and Phrases in This Manual, as discussed previously, the FHWA places all definitions in Part 1 by relocating to Section 1A.13 all definitions that were previously contained or repeated in the MUTCD Introduction and in Parts 2 through 10. In regard to the definitions of the text headings ''Standard'' and ''Guidance,'' the FHWA clarifies that the verb ''may'' is not used in STANDARD or GUIDANCE statements, based on comments from a State DOT. Also based on a State DOT comment, the FHWA further clarifies the definition of STANDARD statements by adding that such statements shall not be modified or compromised based on engineering judgment or engineering studies. This prohibition has always been inherent in the meaning of Standards, but the FHWA is aware of cases where the lack of explicit text to this effect has resulted in the misapplication of engineering judgment or studies. Some agencies believed that Standards could be ignored based on engineering judgment or an engineering study, which is not the case.

Additionally, the FHWA revises the definitions for various words and phrases to better reflect accepted practice and terminologies and for consistency in the usage of these terms in one or more Parts of the MUTCD. Except as specifically discussed, there were a few comments of an editorial nature regarding some of these definitions that the FHWA incorporates in this final rule, as appropriate.

The FHWA proposed in the NPA to specify that the height of a raised pavement marker is not to exceed approximately 1 inch above the road surface, rather than specifying a minimum height, in order to clarify that tubular markers and other similar devices that might be placed on or in the roadway are not raised pavement markers. Based on recommendations from the NCUTCD, two State DOTs, and a traffic control device manufacturer, the FHWA changes the height requirement of a raised pavement marker to not exceed 1 inch for a permanent marker or 2 inches for a temporary flexible marker and references Part 6 for information on temporary flexible markers.

The FHWA clarifies the definition of ''intersection'' to reflect comments from three State DOTs, two city DOTs, and an NCUTCD member suggesting that several of the items within the definition were confusing and needed clarification. The FHWA also clarifies the definition of ''special purpose road'' by deleting the phrase ''or that provides local access,'' because the definition in the 2003 MUTCD was overly broad. The FHWA received comments from two local DOTs in Washington State opposed to the FHWA's proposed clarification that neighborhood residential streets are not special-purpose roads and signing for such streets should be the same as that for other conventional roads. One of those commenters suggested that neighborhood residential streets should be treated differently from other conventional roads and suggested that there should be two classes of conventional roads: High-speed and low-speed. The FHWA disagrees with the commenters and retains the definition, as proposed in the NPA in Section 2A.01, and notes that neighborhood streets are two-lane conventional roads within the definition for ''conventional road.''

The FHWA also adds definitions for a variety of new terms to the list of definitions because they are used in the MUTCD and need to be defined. In the NPA, the FHWA proposed using the term ''hybrid signal;'' however, based on comments from two State DOTs and three city DOTs, the FHWA changes the term ''hybrid signal'' to ''hybrid beacon'' throughout the MUTCD to emphasize that it is not intended that approaching vehicles stop at a dark beacon face as they are required to do at a dark traffic control signal in some States. To address comments from the NCUTCD, two State DOTs, and seven agencies that operate toll facilities, the FHWA adopts the definition for ''open road tolling (ORT),'' rather than ''open road electronic toll collection'' as proposed in the NPA, to match current use of the term. To reflect the changes discussed previously in the MUTCD Introduction, in this final rule the FHWA revises the term ''private property open to public travel'' to ''private road open to public travel'' and clarifies the definition to reflect that parking areas and driving aisles within parking areas are not included. The FHWA also adds a definition of ''parking area'' since that term is used in the MUTCD. The FHWA also makes minor revisions to several definitions to improve clarity and consistency, as suggested by comments. In the NPA, the FHWA proposed to include in the definition of the term ''school zone'' that it is an area where special law enforcement activity or increased fines for traffic violations are authorized. An NCUTCD member suggested that such enforcement is not required for the area to be considered a school zone. The FHWA agrees, and deletes that criterion from the definition in this final rule. The NCUTCD, two State DOTs, two toll road operators, and an NCUTCD member suggested that the proposed definition of ''worker'' be revised to include workers that are not on foot, such as equipment operators, toll collectors, etc. In addition, the NCUTCD, a State DOT, and a toll road operator suggested that ''pathway'' also be added to the definition of ''worker'' since workers on pathways are also subject to potential harm. The FHWA decides to add pathway to the

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definition, but does not make the other suggested change, because this definition is general in nature and other specifics about workers are covered in Section 6D.03.

The FHWA received many comments suggesting other new terms be added to the list of definitions. In response to the comments received, the FHWA decides not to add all of the terms suggested, but adds definitions for ''accessible pedestrian signal detector,'' ''altered speed zone,'' ''attended lane,'' ''average daily traffic (ADT),'' ''downstream,'' ''dropped lane,'' ''ETC account only lane,'' ''exact change lane,'' ''grade crossing,'' ''lane drop,'' ''open road tolling point,'' ''overhead sign,'' ''plaque,'' ''post-mounted sign,'' ''primary signal face,'' ''pushbutton information message,'' ''rail traffic,'' ''signing,'' ''statutory speed zone,'' ''supplemental signal face,'' ''toll booth,'' ''toll island,'' ''toll lane,'' ''toll plaza,'' ''toll-ticket system,'' and ''upstream'' because they are used in the MUTCD and should be defined.

33. The FHWA adds a new section following Section 1A.13. This new section is numbered and titled Section 1A.14 Meanings of Acronyms and Abbreviations in This Manual, and contains a STANDARD statement with 42 acronyms and abbreviations and their meanings. The FHWA adds this new section to assist readers with the acronyms and abbreviations used throughout the Manual. In the NPA, the FHWA proposed 38 acronyms and abbreviations. The NCUTCD, ATSSA, and two State DOTs suggested several more acronyms and abbreviations. The FHWA conducted a review of terms used more than once in the MUTCD text and/or figures and adds five acronyms and their definitions in this final rule. For those terms used only once, the FHWA decides not to include their acronyms and their definitions in this final rule. The FHWA also deletes one of the abbreviations, km/h, that was proposed in the NPA, because of the deletion of metric values from the MUTCD.

34. In Section 1A.15 (numbered Section 1A.14 in the 2003 MUTCD) Abbreviations Used on Traffic Control Devices, the FHWA adds paragraph 02 indicating that when the word messages shown in Table 1A–2 need to be abbreviated on a Portable Changeable Message Sign (PCMS), the abbreviations shown in Table 1A–2 shall be used and that, unless indicated by an asterisk, these abbreviations shall only be used on PCMSs. The original research [9] on abbreviations was based on the need to shorten words when used on portable changeable message signs because of the limited number of characters available, unlike fixed-message signs. Many of the abbreviations were developed for words that would not otherwise normally be abbreviated on signs, and the intent was not to abbreviate such words on fixed-message signs. A local DOT opposed adding abbreviations to the MUTCD, preferring instead to allow their use only on a case-by-case basis. The NCUTCD suggested that Table 1A–2 be moved to Part 6 because PCMSs are covered in Chapter 6F; however, the FHWA decides not to relocate the table because PCMSs can be used outside of temporary traffic control zones and some of the abbreviations used on PCMSs apply to applications other than temporary traffic control.

35. In Table 1A–1 Acceptable Abbreviations, the FHWA adds several additional abbreviations for various terms that are often used on signs or markings and for which a single abbreviation for each is needed to enhance uniformity. A traffic engineering consultant opposed the use of the abbreviation AM for two separate meanings (morning and AM radio); however, the FHWA retains the abbreviation for both meanings based on effective use of both abbreviations by several States and because context of use differentiates the meanings. Based on comments from a State DOT and a traffic engineering consultant regarding the use of the abbreviation ''LA'' for lane, the FHWA places the note ''see Table 1A–2'' in the column for the abbreviation for lane, and makes subsequent changes in Table 1A–2 to clarify the use of the abbreviation ''LN'' for use with PCMSs. Another State DOT suggested adding several abbreviations and the FHWA agrees to add abbreviations for ''Saint,'' ''Mount,'' and ''Mountain'' as ''ST,'' ''MT,'' and ''MTN,'' respectively. Although the FHWA proposed an abbreviation for township in the NPA, the FHWA removes this abbreviation from this final rule based on comments from a traffic engineering consultant. The FHWA also removes several abbreviations from Table 1A–1 that are symbols rather than abbreviations (such as ''D'' for diesel on general service signs) and revises several abbreviations based on accepted practice in the specific context of the manner in which fixed messages are developed. The FHWA removes from Table 1A–1 some words that should not be abbreviated on static signs or large permanent full-matrix changeable message signs.

In concert with these changes to Table 1A–1, the FHWA revises the title of Table 1A–2 to ''Abbreviations That Shall Only Be Used on Portable Changeable Message Signs'' and adds to Table 1A–2 some of the abbreviations that were removed from Table 1A–1. The FHWA also revises the content of Table 1A–2 to specifically list the abbreviations (some of which can only be used with a prompt word) that are appropriate for use only on PCMSs. A local DOT opposed the abbreviations for downtown and slippery as being unclear. The FHWA disagrees, because the abbreviations are based on research and experience, and retains in this final rule the abbreviations for these terms that were proposed in the NPA. Three State DOTs suggested that the abbreviations for eastbound (and the other directions) be shortened to two letters. While the FHWA agrees that traffic engineers understand the two-letter abbreviations (EB, WB, NB, and SB), research has shown that those abbreviations are not well understood by the public. Two State DOTs suggested that there might be cases where abbreviations need to be used on static signs, and as a result, the FHWA reviewed the list of abbreviations and has added additional asterisks to items that are acceptable for use on permanent CMSs and static signs. As discussed above, the FHWA revises the prompt word for the abbreviation ''LN'' to include the roadway name and allows the use of the combination ''[roadway name] LN'' to be used on traffic devices other than PCMSs without the use of the prompt words ''Right,'' ''Left,'' or ''Center.''

Discussion of Amendments Within Part 2—Signs —General

36. In this final rule, the FHWA reorganizes the information regarding toll road signs and preferential and managed lane signs into two separate chapters. Although the information was not organized in the NPA in this manner, the FHWA received comments from several State and local DOTs, as well as toll road operators, suggesting that the information would be easier to find if it was contained in separate Parts of the MUTCD. As discussed above under General, the FHWA disagrees with adding new Parts but agrees with consolidating this information into new chapters and adopts new Chapters 2F Toll Road Signs and 2G Preferential and Managed Lane Signs in this final rule.

[9] Report number FHWA/RD–81/039 ''Human Factors Design of Dynamic Displays'' by C.L. Dudek and R.D. Huchingson, Final Report, May 1982, is available from the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161, and at the Web site: *http://www.ntis.gov.*

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Discussion regarding specific elements of those chapters and comments submitted to the docket are contained in the appropriate sections below.

Discussion of Amendments Within Chapter 2A

37. In Section 2A.03 Standardization of Application, in the NPA the FHWA proposed deleting paragraph 02, which recommends that signs should be used only where justified by engineering judgment or studies. Although ATSSA agreed with the proposal, three State DOTs, three local DOTs, and two associations suggested retaining the statement because determining the placement of signs is an engineering function. The FHWA agrees and retains the paragraph in this final rule. The FHWA notes that this statement is not a requirement for an engineering study for the determination to use each individual sign because the determination for the use of many regulatory signs is based upon State laws and local agency ordinances.

38. In Section 2A.06 Design of Signs, as proposed in the NPA, the FHWA relocates a STANDARD paragraph regarding symbols on signs, and the associated OPTION paragraph, from Section 1A.03 to this section. The FHWA incorporates this change because Section 2A.06 is the most likely place for a reader to look for information regarding sign design.

In addition, as proposed in the NPA, the FHWA adds information regarding the use of e-mail addresses to paragraphs 14 and 16. The use of e-mail addresses on signs is to be the same as Internet Web site addresses. Five State DOTs opposed the provisions and suggested that Internet and e-mail addresses be allowed because they provide important information for travelers, including information about work zones, carpools, and toll facilities. The FHWA agrees that Internet information can be helpful, but adopts the changes as proposed based upon research[10] that has identified the upper range of driver workload to be 4 bits of information (4 individual characters) before glancing back to the road. E-mail addresses are just as difficult to read and remember as Internet Web site addresses and constitute the same issues for a driver traveling at highway speeds.

Lastly, the FHWA in this final rule relocates and consolidates existing and proposed text concerning the design of pictographs on signs from other sections in chapters 2D, 2E, and 2J to a new paragraph 17 in Section 2A.06. This material on pictographs also incorporates the FHWA's Official Interpretation 2–646(I).[11]

39. The FHWA relocates the information in Section 2A.07 of the 2003 MUTCD to new Chapter 2L in order to consolidate all information on changeable message signs into one chapter.

40. In Section 2A.07 Retroreflectivity and Illumination (Section 2A.08 in the 2003 MUTCD), the FHWA proposed in the NPA to revise the existing GUIDANCE statement to clarify that overhead sign installations on freeways and expressways should be illuminated unless an engineering study shows that retroreflection will perform effectively without illumination, and that overhead sign installations on conventional or special purpose roads should be illuminated unless engineering judgment indicates that retroreflection will perform effectively without illumination. ATSSA, an NCUTCD member, and a traffic control device manufacturer all supported the change. A State DOT and two local DOTs opposed the revision, because they felt that illumination of overhead signs, particularly on conventional roadways, is not necessary. In this final rule, the FHWA deletes the existing and proposed guidance about illumination of overhead signs, because the minimum maintained retroreflectivity levels for overhead signs that were adopted as Revision 2 of the 2003 MUTCD[12] provide for adequate performance of these signs. Highway agencies can determine to illuminate overhead signs based on their own policies or on studies of specific problem areas.

In the NPA, the FHWA proposed to add a paragraph prohibiting the use of individual LED pixels and groups of LEDs within the background area of a sign, except for the STOP/SLOW paddles used by flaggers and the STOP paddles used by adult crossing guards. The FHWA's intent was to clarify that LEDs are to be used only in the border or in the legend/symbol and not in the background of signs. Although ATSSA supported the clarification, three State DOTs, a local DOT, and a traffic engineering consultant expressed confusion and possible contradiction between this statement and others in the MUTCD. To respond to the need to clarify the statement, and the desire to place all of the information related to LEDs and their application in one place, the FHWA adds paragraphs 07, 08, 11, and 12 to this section in this final rule.

41. On January 22, 2008, after the NPA was published, the FHWA adopted revision Number 2 of the 2003 MUTCD to add minimum maintained retroreflectivity requirements for signs in Section 2A.09 (Section 2A.08 in the NPA) and a new Table 2A–3 detailing minimum retroreflectivity values. The FHWA incorporates that text and table into Section 2A.08 in this final rule, with a minor editorial correction to the table to match the applicable text. The FHWA also in this final rule adds to the table the new Bold Symbol signs (W2–7, 8 Double Side Roads and W11–16–22 Large Animals) that are adopted in Chapter 2C, for consistency and accuracy regarding minimum retroreflectivity values.

42. In Section 2A.10 Sign Colors (Section 2A.11 in the 2003 MUTCD), the FHWA proposed in the NPA to add an OPTION statement that allows the use of fluorescent colors when the corresponding color is required. The NCUTCD, State DOT, two local agencies, and an NCUTCD member all supported the use of fluorescent colors, while a traffic engineering consultant opposed the addition of fluorescent colors without guidance on when they should be used. The FHWA adopts this change in this final rule with minor editorial revisions in order to give jurisdictions the flexibility to use fluorescent colors when they determine they are needed in order to attract additional attention to the signs. As part of this change, the FHWA revises the color specifications in 23 CFR part 655, appendix to subpart F, Tables 3, 3A, and 4 to add the fluorescent version of the color red, as proposed in the NPA. The color specifications for fluorescent yellow, fluorescent orange and fluorescent pink are already included in those tables of the appendix to 23 CFR part 655, subpart F.

43. The FHWA proposed in the NPA to make several changes to Table 2A–5 Common Uses of Sign Colors, to correspond to proposed changes in the text. Specifically, the FHWA proposed to add the color purple for Electronic Toll Collection signs and to remove the use of the color yellow from school signs. The FHWA also proposed to add additional types of Changeable Message Signs and expand the table to include various legend and background colors for those signs, consistent with the

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[10] "Additional Investigations on Driver Information Overload," NCHRP Report 488, 2003, can be viewed at the following Internet Web site: *http://www.trb.org/news/blurb_detail.asp?id=1324.*

[11] This official interpretation can be viewed at the following Internet Web site: *http://mutcd.fhwa.dot.gov/resources/interpretations/2_646.htm.*

[12] Sign retroreflectivity final rule was published in the **Federal Register** at 72 FR 72574 on December 21, 2007 and can be viewed at the following Internet Web site: *http://www.gpoaccess.gov/fr/index.html.*

proposed text of proposed new Chapter 2M (numbered Chapter 2L in this final rule) as discussed below. In addition, the FHWA proposed to note that fluorescent versions of orange, red, and yellow background colors may be used. The NCUTCD and ATSSA supported these changes. The FHWA adopts the changes and, for consistency with Section 1A.12, the FHWA adds a footnote to Table 2A–5 to indicate that the color purple is only used on plaques or header panels mounted with other signs and only for lanes restricted to vehicles with registered toll accounts, and that purple is not used as a full sign background, nor is it used for toll lanes with video/license plate recognition that any vehicle without a registered toll account may use.

44. In Section 2A.11 Dimensions (Section 2A.12 in the 2003 MUTCD), in this final rule the FHWA adds new provisions to the STANDARD and GUIDANCE statements regarding the appropriate use of the various columns in the tables throughout the MUTCD that describe sizes for signs on various classes of roads, as proposed in the NPA. While a traffic control device manufacturer supported the referenced tables, a State DOT, two city DOTs, and an NCUTCD member opposed the dimensions, stating that they are too prescriptive, no longer allow jurisdictions to use good engineering judgment in determining sign sizes, and could result in larger signs. The FHWA disagrees, because the sizes specified are appropriate to enable letter sizes sufficient to meet the legibility needs of all drivers, including older drivers. These sizes remain largely unchanged from the 2003 MUTCD and only a few specific sign sizes were increased. The FHWA adopts this language to clarify how the columns in the sign size tables are intended to be used. The FHWA also adds language in each of the sections throughout the MUTCD that refer to a sign size table, to refer back to this generally applicable text in Section 2A.11, and deletes repetitive text on use of the various columns in the size tables that appeared in other sections throughout the 2003 MUTCD.

45. In Section 2A.12 Symbols (Section 2A.13 in the 2003 MUTCD), the FHWA adds a STANDARD statement and a corresponding OPTION statement at the end of the section prohibiting the use of symbols from one type of sign on a different type of sign, except in limited circumstances or as specifically authorized in the MUTCD. While a State DOT and a local DOT supported these revisions, two other State DOTs and another local DOT opposed the changes and suggested that it would be simpler to use the same symbols for recreational and cultural interest areas on other signs. The FHWA disagrees with the commenters because many approved symbols for recreational and cultural area guide signing are not appropriate for use on warning or regulatory signs. The colors and shapes of symbols are designed to have a specific impact depending on the intended use of that type of sign. Intermixing symbols from one type of sign to a different type of sign can affect the impact and can be potentially confusing, and therefore should be specifically prohibited. The FHWA adopts this change as proposed in the NPA, with minor editorial revisions.

46. In Section 2A.13 Word Messages (Section 2A.14 in the 2003 MUTCD), the FHWA revises the first GUIDANCE statement to recommend that the minimum specific ratio for letter height should be 1 inch of letter height per 30 feet of legibility distance. In conjunction with this proposed change, the FHWA deletes the SUPPORT statement that followed this paragraph in the 2003 MUTCD. The NCUTCD and ATSSA supported these changes. Four State DOTs, seven local DOTs, an NCUTCD member, a traffic engineering consultant, and a citizen all opposed the change, stating that the larger letter heights would create larger signs, and suggesting that there was a lack of significant research and justification. The FHWA notes that the majority of sign sizes remain the same as the 2003 MUTCD and only a few specific sign designs which had legends too small to be read from an appropriate distance were increased in size. Additionally, signs in good condition may remain in place as long as they are serviceable until they are replaced under the periodic maintenance program of each agency. The FHWA adopts these changes in order to be consistent with recommendations from the Older Driver Handbook [13] that sign legibility be based on 20/40 vision. Most States allow drivers with 20/40 corrected vision to obtain driver's licenses, and with the increasing numbers of older drivers, the FHWA believes that 20/40 vision should be the basis of letter heights used on signs. This change will generally not impact the design of guide signs because the provisions in the 2003 MUTCD for guide sign letter heights already provided sufficient legibility distances for 20/40 vision in most cases. The sizes of regulatory and warning signs used in some situations will need to be increased to provide for larger letter sizes. Specific changes to sign sizes resulting from the change in letter height are discussed below in the items pertaining to the sign size tables in other chapters in Part 2 and in certain other Parts of the MUTCD.

ATSSA, a State DOT, a research institute, and a traffic engineering consultant suggested that the FHWA add the positive contrast Clearview font into the SHSM and MUTCD based on the research done under the experimental use of the font demonstrating significant legibility enhancements for older drivers. The FHWA did not propose such an addition in the NPA and the FHWA disagrees with the commenters and does not add the font. Although the Clearview font received Interim Approval in September 2004 for positive-contrast guide sign legends only, some research to date has shown that negative contrast mixed-case Clearview legends are not as legible as standard SHSM alphabets. The practicality of maintaining two separate alphabet systems, one for positive-contrast and one for negative-contrast legends, has also been taken into consideration. Further, the alternative alphabet did not undergo any testing on numerals and special characters, which have been reported to be problematic from a legibility standpoint, nor has any testing been performed on a narrower series. It would be premature to categorically adopt the alternative alphabet for a marginal theoretical improvement in legibility where no supporting evidence of a demonstrable improvement has been reported by those agencies who have erected signing using the alternate alphabets. Highway agencies can continue to use the Clearview font for positive contrast legends on guide signs under the provisions of the FHWA's Interim Approval IA–5 dated September 2, 2004.[14]

ATSSA, a State DOT, a local agency, and a citizen supported the FHWA's proposal to eliminate the option to use all upper-case letters for names of places, streets, and highways and to require that such names be composed of a combination of lower-case letters with initial upper-case letters. However, 5

[13] ''Highway Design Handbook for Older Drivers and Pedestrians,'' FHWA Report no. FHWA–RD–01–103, May 2001, can be viewed at the following Internet Web site: *http://www.tfhrc.gov/humanfac/01103/coverfront.htm.* Also see recommendation number II.A(1) in ''Guidelines and Recommendations to Accommodate Older Drivers and Pedestrians,'' FHWA Report no. FHWA–RD–01–051, May 2001, which can be viewed at the following Internet Web site: *http://www.tfhrc.gov/humanfac/01105/cover.htm.*

[14] Interim Approval IA–5 can be viewed at the following Internet Web site: *http://mutcd.fhwa.dot.gov/res-ia_clearview_font.htm.*

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State DOTs, 10 local DOTs, an NCUTCD member, an association of local counties, and a traffic engineering consultant opposed the change and suggested that the use of all upper-case letters remain an option, or that the FHWA change the proposed STANDARD statement to a GUIDANCE statement. Many of the commenters expressed concern with cost and thought that while the mixed-case words might be easier to read, the amount of improvement in legibility did not justify the cost. The FHWA adopts the STANDARD requirement for mixed-case lettering for names of places, streets, and highways because published research [15] supports the enhanced legibility of mixed-case legends in comparison to all upper-case legends. The FHWA also notes that under the systematic upgrading provisions of Section 655.603(d)(1) of title 23, Code of Federal Regulations, existing signs in good condition can remain for the remainder of their service life.

The FHWA also adds text in Section 2A.13 regarding fractions, hyphens, and relationships of upper case to lower case letters in mixed-case words used in word messages in this final rule, for consistency with other MUTCD provisions in Chapters 2D and 2E, information in the SHSM book, and accepted sign design practices necessary for proper sign word message legibility.

47. In Section 2A.14 Sign Borders (Section 2A.15 in the 2003 MUTCD), the FHWA clarifies the GUIDANCE statement to indicate that the corner and border radii on signs should be concentric with one another. The FHWA received a comment from ATSSA in support of this revision and the FHWA adopts the proposed text with editorial revisions in this final rule to better facilitate the use of sign fabrication software with inset borders.

48. The FHWA adds a new section numbered and titled Section 2A.15 Enhanced Conspicuity for Standard Signs. This section contains an OPTION statement regarding the methods that may be used to enhance the conspicuity of standard regulatory, warning, or guide signs and a STANDARD statement prohibiting the use of strobe lights as a sign conspicuity enhancement method. The NCUTCD, ATSSA, and several State and local DOTs, NCUTCD members, and traffic engineering consultants commented on the various conspicuity enhancement methods proposed in the NPA. Some commenters felt that having a large variety of methods for sign conspicuity would not help with uniformity, and therefore the methods should be deleted altogether, or at least the number of items reduced. Other commenters provided comments about the specific methods. Several commenters suggested that a red strip (item F in the NPA) should only be permitted on signs indicating that a stop, yield, or prohibition is involved with the sign. To avoid confusion, the FHWA does not adopt item F in this final rule. The FHWA believes that adding specific methods for increasing sign conspicuity will actually result in more uniform use of conspicuity methods, because agencies will have access to a list of optional uses, rather than creating an unlimited number of their own methods. The methods contained in the OPTION reflect widespread and successful practices by State and local agencies, and as a result, the FHWA incorporates the methods, with minor editorial changes for consistency with other MUTCD sections, in this final rule.

The New York State DOT opposed the FHWA's proposed prohibition of the use of strobe lights for conspicuity of highway signs, stating that there is no research indicating that their use is dangerous and that information about their use in New York shows that they can have a very positive effect on highway safety. The FHWA disagrees and notes that published reports [16] on experimentation with the application of strobe lights to traffic signals have not demonstrated lasting safety effects and therefore it is unlikely that application of strobes to other traffic control devices would have lasting effects. The FHWA also notes that New York State has not provided any documentation of positive effects.

The FHWA incorporates this new section to provide improved uniformity of enhanced conspicuity treatments to benefit road users.

49. The FHWA received several comments associated with Figure 2A–1 Examples of Enhanced Conspicuity for Signs. Many of the comments were the same as those expressed for the written text in Section 2A.15. Based on comments from a State DOT, the FHWA adds two new drawings illustrating the use of the words ''NEW'' and ''NOTICE'' on the yellow sign panel and renumbers the drawings accordingly. The FHWA also adds that orange flags may be used on drawing B and deletes the drawing showing the use of a red strip of retroreflective sheeting on a regulatory sign panel.

50. In Section 2A.16 Standardization of Location, the FHWA adds to paragraph 06 an additional recommended criterion for locating signs where they do not obscure the line of sight to approaching vehicles on a major street for drivers who are stopped on minor-street approaches. The FHWA received comments from two State DOTs and a local DOT supporting this proposed revision and the FHWA adopts this change in this final rule to reflect good engineering practice and improved safety.

As proposed in the NPA, the FHWA adds to paragraph 10 that the placement of community wayfinding and acknowledgment guide signs should have a lower priority than other guide signs. The FHWA received a comment from a State DOT and local DOT in support of this addition and incorporates it in this final rule to clarify the priority of sign type placement, reflecting the addition to the manual of new types of guide signs.

In the NPA, the FHWA proposed to add a paragraph to the last GUIDANCE statement to provide recommendations on the placement of STOP and YIELD signs at intersections, and to clarify that the dimension shown in Figure 2A–3 for the maximum distance of STOP or YIELD signs from the edge of the traveled way of the intersected roadway is GUIDANCE. A State DOT, a local DOT, and an NCUTCD member agreed with this statement. In this final rule the FHWA moves this statement to Section 2B.10 based on a comment, since the statement is more appropriately related to the content of that section.

51. The FHWA received comments from the NCUTCD regarding proposed revisions to Figure 2A–2, and as a result, changes the title to ''Examples of Heights and Lateral Locations of Sign Installations'' to indicate that these are examples and to be consistent with the text in Sections 2A.16, 2A.18, and 2A.19. Although a State DOT, an NCUTCD member, and a traffic engineering consultant opposed the use of the 12-foot dimension between the edge of the pavement and the sign in drawings A and D, the FHWA disagrees and retains the 12-foot dimension in this final rule, because the guidance text in Section 2A.19 recommends the 12-foot dimension, and therefore the figure should reflect the text. The FHWA received similar comments about the

[15] Research on this topic is cited and discussed in ''Highway Design Handbook for Older Drivers and Pedestrians,'' FHWA Report no. FHWA–RD–01–103, May 2001, which can be viewed at the following Internet Web site: *http://www.tfhrc.gov/humanfac/01103/coverfront.htm.*

[16] ''Evaluation of Strobe Lights in Red Lens of Traffic Signals,'' by Benjamin H. Cottrell, Virginia Transportation Research Council, was published in 1995 in Transportation Research Record number 1495, which is available for purchase from the Transportation Research Board's bookstore, which can be accessed at the following Internet Web site: *http://pubsindex.trb.org/.*

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lateral offset dimensions in Figure 2A–3; however, the FHWA retains the offsets as shown in the NPA, because the MUTCD text remains unchanged. The dimensions in the figure were merely corrected to maintain consistency with the text.

52. In Section 2A.18 Mounting Height, the FHWA adopts the change of paragraph 01 to a STANDARD, as proposed in the NPA, to require that the provisions of this section apply to all signs and object markers, unless specifically stated otherwise elsewhere in the Manual. The FHWA incorporates this change to emphasize that the mounting heights in this section are mandatory, including in relation to pedestrian considerations.

The FHWA also clarifies that mounting heights are to be measured vertically from the bottom of the sign to the level of the edge of the traveled way. The FHWA also adds text to clarify that a minimum height of 7 feet is to be used for signs installed at the side of the road in business, commercial, or residential areas where parking or pedestrian movements are likely to occur, or where the view of the sign might be obstructed, or where signs are installed above sidewalks. In concert with these changes, the FHWA adds that a sign shall not project more than 4 inches into a pedestrian facility if the bottom of a secondary sign that is mounted below another sign is mounted lower than 7 feet. The FHWA had proposed these provisions as a GUIDANCE statement in the NPA; however, based on comments from the Utah DOT and an advocacy group for the blind, the FHWA changes this to a STANDARD statement in this final rule to be consistent with requirements of the Americans with Disabilities Act as set forth in ADAAG provisions [17] regarding signs in the vicinity of pedestrian activity and in order to make the mounting height language consistent throughout the Manual. In addition, the FHWA reorganizes the order of the text within the STANDARD statements in this section for clarity.

53. In Section 2A.19 Lateral Offset, the FHWA received a comment from a State DOT expressing the need to reconcile the compliance date for the existing statement in this Section that requires post-mounted supports to be crashworthy if in the clear zone. The FHWA notes that there is an existing target compliance date of January 17, 2013, that was established with the final rule [18] for the 2003 Edition of the MUTCD for crashworthiness of sign supports for roads with posted speed limits of 50 mph or higher. No specific target compliance date was established for roads with posted speed limits of 45 mph or less and for all roads with unposted speed limits. The FHWA believes that no target compliance date is needed for crashworthiness of sign supports on these lower speed roads and that systematic upgrading processes will suffice in ultimately achieving crashworthiness of all sign supports.

Discussion of Amendments Within Chapter 2B

54. As proposed in the NPA, in Section 2B.02 Design of Regulatory Signs, the FHWA adopts the change of paragraph 01 to a STANDARD statement to clarify that regulatory signs are rectangular unless specifically designated otherwise. As part of this change, the FHWA also adds a reference to the Standard Highway Signs and Markings [19] book for sign design elements.

The FHWA also relocates the first two paragraphs of Section 2B.54 of the 2003 MUTCD to a new OPTION statement in Section 2B.02, because the paragraphs contain information about regulatory word messages and symbols that is more relevant in this section.

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55. In Section 2B.03 Size of Regulatory Signs, the FHWA had proposed in the NPA to reference a new Table 2B–2 with minimum sizes for certain regulatory signs facing traffic on multi-lane conventional roads. Based on comments from the NCUTCD and an NCUTCD member, the FHWA instead adds a column to Table 2B–1 for multi-lane conventional roads in this final rule, rather than an entire new table. To address these comments, as well as those from two State DOTs, concerning specific regulatory signs identified in Table 2B–1 other than STOP signs, the FHWA also adds two exemptions to the requirement to use the larger sign sizes on multi-lane conventional roads: (1) For the size of signs mounted in the median on the left-hand side of the roadway that are in addition to the signs placed on the right-hand side and (2) for multi-lane conventional roads with posted speed limits of 35 mph or less. The FHWA received comments in opposition to the larger sign sizes, primarily because of cost concerns, from three local DOTs and a traffic engineering consultant. The FHWA disagrees with these comments because any impacts are mitigated by the systematic upgrading provisions (23 CFR 655.603(d)(1)) that enable highway agencies to upgrade to the larger sizes as the existing signs are replaced at the end of their service life. The FHWA believes that the new text and information in the table is necessary to provide signs on multi-lane approaches that are more visible and legible to drivers with visual acuity of 20/40. On multi-lane roads, increased legibility distances are also needed because of the potential blockage of signs by other vehicles.

In the NPA, the FHWA also included a requirement that the minimum size of 36 inches x 36 inches shall be used for STOP signs that face multi-lane approaches. While ATSSA, the NCUTCD, a State DOT, and a local DOT supported the requirement, a State DOT and six city DOTs opposed the change, particularly as it related to STOP signs on low-speed roads. The FHWA adopts the requirement to use larger STOP signs, because increased STOP sign sizes have been shown to reduce crashes by 19%.[20] However, the FHWA clarifies the minimum size requirement for STOP signs as 36 inches x 36 inches facing side roads (one or more lanes) where they intersect multi-lane highways that have speed limits of 45 mph or higher. For multi-lane highways or streets that have speed limits of 40 mph or less, the STOP signs on the side-road approaches shall follow the sizes shown for conventional roads in Table 2B–1. STOP signs that face traffic on the multi-lane highway shall be a minimum size of 36 inches x 36 inches.

Finally, based on a comment from a State DOT, the FHWA adds a GUIDANCE statement that the minimum size for regulatory signs facing traffic on exit and entrance ramps should be the size identified in Table 2B–1 for the mainline roadway classification listed for each of the columns.

56. The FHWA received comments related to specific sign sizes in Table 2B–2 proposed in the NPA. As discussed above, the FHWA combines proposed Table 2B–2 into Table 2B–1 in this final rule. The NCUTCD, two State DOTs, two local DOTs, two NCUTCD

[17] The Americans With Disabilities Accessibility Guidelines (ADAAG) can be viewed at the following Internet Web site: *http://www.access-board.gov/ada-aba/index.htm.*

[18] The **Federal Register** Notice for this Final Rule, dated November 20, 2003 (Volume 68, Number 224, Page 65496–65583) can be viewed at the following Internet Web site: *http://mutcd.fhwa.dot.gov/texts/2125-AE67.pdf.*

[19] The current edition of ''Standard Highway Signs and Markings,'' FHWA, 2004 Edition, can be viewed at the following Internet Web site: *http://mutcd.fhwa.dot.gov/ser-shs_millennium.htm.*

[20] ''Crash Reduction Factors Desktop Reference,'' publication number FHWA–SA–07–015, September, 2007, can be viewed at the following Internet Web site: *http://www.transportation.org/sites/scohts/docs/Crash%20Reduction%20Factors%20Desktop%20Reference%2012–19–07.pdf.*

members, and a traffic engineering consultant opposed the larger sizes of various signs, including YIELD signs, DO NOT ENTER signs, ONE WAY signs, parking signs, and signs used on traffic signal mast arms. The FHWA adopts the larger sizes as proposed in the NPA because of the critical nature of the information conveyed by these signs. These larger sizes are more legible, especially to older drivers, and therefore these critical message signs merit larger sized legends.

57. The FHWA makes several changes to Table 2B–1 Regulatory Sign and Plaque Sizes. These changes include adding more sizes in the ''Minimum'' column for use in low-speed environments and adding several more signs and supplemental plaques to the table to correspond with other changes within Part 2. A local DOT opposed many of the minimum sizes shown in the table because they are larger than those used in that State's urban areas. The commenter believes that in urban areas the space available for signs along sidewalks and medians can often be very narrow, making it difficult to place larger signs without encroaching into the street, buildings, landscaping, utilities, signals, or pedestrian right-of-way. A traffic engineering consultant questioned the justification for the increased sizes and expressed concern about the wind loading on traffic signal mast arms because of the larger sign sizes. A State DOT and a local DOT also expressed the desire to use smaller sign sizes on traffic signal mast arms and for some other signs. The FHWA reiterates that the increase in sign and plaque sizes is to improve driver recognition and response time, with the intent of meeting the needs of road users with 20/40 visual acuity. Letter heights smaller than 6 inches become problematic in meeting the needs of drivers with 20/40 visual acuity, therefore the FHWA adopts in this final rule the proposed increases in the sizes of signs. The FHWA also received several comments from the NCUTCD and its members suggesting additional revisions beyond those shown in the NPA that the FHWA incorporates in this final rule. These revisions include adding signs to the table that were inadvertently not included in the NPA and adjusting the sizes of some of the signs to reflect the larger letter sizes associated with 20/40 visual acuity as discussed previously under Chapter 2A.

58. The FHWA adds a new section numbered and titled Section 2B.04 Right-of-Way at Intersections. This section contains information contained in Section 2B.05 of the 2003 MUTCD. In addition, as proposed in the NPA, the FHWA adds recommendations on the factors that should be considered in establishing intersection control and the use of STOP and YIELD signs. A State DOT and a city DOT supported these new criteria. A State DOT supported the majority of the criteria, but suggested that approach speeds should not be included in the conditions. The FHWA agrees and deletes that condition in this final rule. Two city DOTs suggested that the criteria, particularly item B, required too much data collection, which can be expensive and require resources beyond those available at the local level. The FHWA disagrees and adopts the remaining criteria, because the FHWA believes an engineering evaluation, which includes data collection, needs to be performed for STOP and YIELD sign applications, which are critical right-of-way controls. The additional guidance is intended to provide a more logical progression from least restrictive to more restrictive controls.

As proposed in the NPA, the FHWA adds paragraph 05, to the existing GUIDANCE statement that YIELD signs should not be used for speed control. The 2003 MUTCD already included the recommendation that STOP signs not be used for speed control. A local DOT supported the addition of YIELD signs to this recommendation; however, a State DOT and a local DOT suggested that the FHWA revise the statement to indicate that STOP and YIELD signs should not be used ''exclusively'' for speed control, because there are occasions where STOP and YIELD signs serve a secondary purpose as speed control measures. The FHWA disagrees with revising the language and notes that a system of alternating two-way stops remains allowable for neighborhood traffic control.

The FHWA also adds a STANDARD statement that prohibits the use of STOP and YIELD signs in conjunction with other traffic control signal operation, except for the cases specified in the STANDARD. Much of this information was in Section 2B.05 of the 2003 MUTCD; however, the FHWA adds a specific case regarding channelized turn lanes to the list of cases where STOP or YIELD signs can be used, reflecting common practice.

As proposed in the NPA, the FHWA adds a STANDARD statement prohibiting the use of STOP signs and YIELD signs on different approaches to the same unsignalized intersection if those approaches conflict with or oppose each other, except as noted in Section 2B.09. Two State DOTs, a city DOT, and an NCUTCD member opposed this statement because they felt that there are circumstances where this practice should be allowed. The FHWA disagrees, because this prohibition is needed for consistency with the adopted STANDARD statement for use of STOP and YIELD signs in conjunction with traffic signal operation, and the FHWA notes that an EXCEPT RIGHT TURN R1–10P plaque is incorporated in this final rule in Section 2B.05 to address many of the situations cited by the commenters.

Finally, the FHWA adds a STANDARD statement as proposed in the NPA for the use of folding STOP signs for traffic signal power outages by adding language to the MUTCD that corresponds to Official Interpretation #2–545.[21] Although two city DOTs opposed this language, in part because of concerns about liability, three State DOTs and a city DOT supported the language, with editorial changes. Many of the comments pertained to incorporating additional information from the Official Interpretation into the MUTCD. The FHWA does not believe that the MUTCD is the appropriate location for this information. The FHWA does, however, revise the text in this final rule to clarify the language on how folding STOP signs are to be installed and manually retrieved in conjunction with signal operation upon restoration of electrical power.

59. The FHWA renumbers and retitles Section 2B.04 of the 2003 MUTCD to Section 2B.05 STOP Sign and ALL WAY Plaque. As part of this change, the FHWA proposed to revise the STANDARD statement to require the use of the ALL-WAY supplemental plaque if all intersection approaches are controlled by STOP signs, to limit the use of the ALL-WAY plaque to only those locations where all intersection approaches are controlled by STOP signs, and to prohibit the use of supplemental plaques with the legend 2-WAY, 3-WAY, 4-WAY, etc., below STOP signs. ATSSA, a local DOT, a traffic engineering consultant, and a citizen supported the new requirements, while five State DOTs, four local DOTs and an association representing local DOTs, and a NCUTCD member opposed the proposed requirements. Many of the commenters felt that all or some of the existing 2-WAY, 3-WAY, or 4-WAY plaques should be retained because they are understood by road users, and to replace the signs would be unnecessarily expensive. The FHWA disagrees for two reasons: (1) The ALL-WAY plaque is the same size as the 2-

[21] FHWA's Official Interpretation #2–545, April 9, 2004, can be viewed at the following Internet Web site: *http://mutcd.fhwa.dot.gov/resources/interpretations/pdf/2_545.pdf.*

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WAY, 3-WAY, and 4-WAY plaques and the required replacements can be accomplished through the systematic upgrading processes of Section 655.603(d)(1) of title 23, Code of Federal Regulations; and (2) the word message ''ALL-WAY'' more clearly communicates that all approaches are required to stop, which is critical information for road users facing a STOP control at an intersection. The FHWA adopts the requirements, as proposed, to provide uniformity in the use of supplemental plaques with STOP signs, especially at locations where all approaches are controlled by STOP signs.

The FHWA adds a GUIDANCE statement recommending the use of plaques with appropriate alternate messages, such as TRAFFIC FROM RIGHT DOES NOT STOP, where STOP signs control all but one approach to the intersection. A city DOT opposed this recommendation, suggesting that it should be either an Option, or eliminated from the MUTCD. The FHWA disagrees and adopts the change to encourage the use of these plaques at intersections that need increased driver awareness regarding an unexpected right-of-way control. A State DOT opposed the revision because the regulatory and warning signs should not be installed on the same post. The FHWA adds language to Section 2A.16 to clarify that these plaques may be posted below a STOP sign.

Finally, as proposed in the NPA, the FHWA adds an OPTION allowing the use of a new EXCEPT RIGHT TURN (R1–10P) plaque mounted below a STOP sign when an engineering study determines that a special combination of geometry and traffic volumes is present that makes it possible for right-turning traffic on the approach to be permitted to enter the intersection without stopping. ATSSA, a State DOT, and a local DOT supported this new plaque and associated language, while a State DOT and a local DOT opposed it, citing their beliefs that it might cause conflicts between vehicles that have to stop with those that do not have to stop and that it will reduce the integrity of the STOP sign. The FHWA disagrees and adopts this change to give agencies flexibility in establishing right-of-way controls for such special conditions. Since this is an optional use, agencies are not required to use this sign. The Sign Synthesis Study [22] found that at least 12 States have developed 7 different sign messages for this purpose. The adopted sign provides for the uniform use of the simplest, most accurate legend.

60. The FHWA relocates much of the information in Section 2B.05 STOP Sign Applications of the 2003 MUTCD to Section 2B.04 Right-of-Way at Intersections. The FHWA adds additional language to the remaining GUIDANCE statement in Section 2B.06 STOP Sign Applications that lists conditions under which the use of a STOP sign should be considered. A State DOT supported the language with the criteria for STOP signs, and several commenters provided editorial comments or asked questions. The FHWA reiterates that the language in this section provides agencies with specific and quantitative guidance regarding the use of STOP signs only, while the guidance and criteria set forth in Section 2B.05 encompass the need for right-of-way control in the form of YIELD and STOP conditions. The FHWA also received a comment from a retail owner suggesting that this section does not specifically address the use of STOP signs in parking areas. As discussed previously regarding the MUTCD Introduction, the FHWA exempts parking lots from MUTCD applicability.

61. The FHWA deletes Section 2B.06 STOP Sign Placement from the 2003 MUTCD because most of the text in this section is incorporated into Section 2B.10 of this final rule.

62. In Section 2B.09 YIELD Sign Applications, as proposed in the NPA, the FHWA clarifies the STANDARD statement by adding that YIELD signs at roundabouts shall be used to control the approach roadways and shall not be used to control the circular roadway. Four State DOTs, two local DOTs, two NCUTCD members, five bicycle/pedestrian advocacy associations, and four citizens supported the changes to this section. A State DOT and a local DOT expressed concern about portions of the section that were removed that would allow YIELD signs to be used instead of STOP signs at some locations and the removal of the visibility requirement for YIELD sign installations. The FHWA disagrees with these commenters because the text changes in Section 2B.09 do not materially change the meaning of the provisions regarding where YIELD signs may be used. The FHWA adopts this change to provide uniformity in signing at roundabouts and to reflect the prevailing practices of modern roundabout design.

Two traffic engineering consultants suggested that YIELD signs be prohibited to assign the right-of-way on all approaches to an intersection, other than for a roundabout intersection. The FHWA agrees and clarifies the proposed STANDARD statement in this final rule so that it is explicitly clear that YIELD signs shall not be used to control the right-of-way on all approaches to an intersection, other than for all approaches to a roundabout intersection, for consistency with requirements for traffic signal controlled intersections and STOP controlled intersections.

63. The FHWA retitles Section 2B.10 to ''STOP Sign or YIELD Sign Placement'' to reflect the relocation of language regarding STOP sign placement from Section 2B.06 of the 2003 MUTCD to this section.

In the NPA the FHWA proposed to delete the requirement from paragraph 01 that YIELD signs be placed on both the left-hand and right-hand sides of approaches to roundabouts with more than one lane and instead makes this a GUIDANCE statement in paragraph 16. In concert with this change, the FHWA also proposed to add an OPTION allowing similar placement of a YIELD sign on the left-hand side of a single lane roundabout approach if a raised splitter island is available. A local DOT and a traffic engineering consultant supported these changes, and the FHWA adopts this language to reflect current practice on signing roundabout approaches and to allow agencies additional flexibility.

To address comments from the NCUTCD, a State DOT, and a local DOT, the FHWA relocates the GUIDANCE statement recommending that STOP and YIELD signs not be placed further than 50 feet back from the edge of the pavement of the intersected roadway to this section in this final rule. In the NPA, this statement was proposed in Section 2A.16.

In the NPA, the FHWA proposed adding a paragraph to the STANDARD that prohibited the mounting of items other than retroreflective strips on the supports, official traffic control signs, sign installation dates, inventory stickers, anti-vandalism stickers, and bar codes on the fronts or backs of STOP or YIELD signs or on their supports. To address a comment from a State DOT suggesting that the FHWA clarify the intent of the language, the FHWA separates the information into three paragraphs in this final rule. Paragraph 04 details the placement of items on the fronts of STOP or Yield signs, paragraph 05 describes items placed on the backs of STOP or Yield signs, and paragraph 06 describes the placement of items on the fronts or backs of STOP or YIELD signs supports.

[22] ''Synthesis of Non-MUTCD Traffic Signs,'' FHWA, December 2005, page 18, can be viewed at the following Internet Web site: *http://tcd.tamu.edu/documents/rwstc/Signs_Synthesis-Final_Dec2005.pdf.*

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The FHWA also proposed in the NPA to indicate that a sign that is mounted back-to-back with a STOP or YIELD sign should stay within the edges of the STOP or YIELD sign. While two DOTs and an NCUTCD member supported this language, four State DOTs, two local DOTs, and a citizen opposed this language, because they felt that DO NOT ENTER signs should be allowed to be mounted on the back of STOP signs without increasing the size of the STOP sign to the extent required. Two local DOTs and a citizen opposed the language in general, because they felt that a sign mounted on the back of a STOP or YIELD sign would show its bare aluminum side, which would serve to highlight or frame the STOP or YIELD sign. The FHWA disagrees with the commenters because it is critical to assure that the shape of these very important intersection right-of-way signs can be discerned from the opposite direction of approach. The FHWA adopts these changes to clarify the GUIDANCE statement that a sign that is mounted back-to-back with a STOP or YIELD sign should stay within the edges of the STOP or YIELD sign, and adds that, if needed, the size of the STOP or YIELD sign should be increased to accomplish this recommendation.

The FHWA adds paragraph 16 recommending that an additional YIELD sign be placed on the left-hand side of the multi-lane roundabout approach if a raised splitter island is available. A State DOT and a traffic engineering consultant supported this recommendation, while a local agency felt that it should be an option, rather than a recommendation. The FHWA believes that the left-hand side YIELD sign is important for multi-lane approaches to roundabouts due to the curvature at the roundabout entry and this sign should be provided if a splitter island is present. The FHWA adopts the NPA language in this final rule.

As proposed in the NPA, the FHWA adds paragraph 19 prohibiting the placement of multiple STOP signs or multiple YIELD signs on the same support facing the same direction. The NCUTCD, a State DOT, and two local DOTs supported this change. The FHWA adopts this change to prohibit this practice, because there have been no studies or research documenting any safety benefits of this practice and it is potentially confusing, and there are many other acceptable and proven methods of adding emphasis, such as detailed in Section 2A.15.

64. The FHWA retitles Section 2B.11 to ''Yield Here to Pedestrians Signs and Stop Here for Pedestrians Signs'' to reflect additional language in the STANDARD, GUIDANCE, and OPTION statement that FHWA adds to this section regarding the use of Stop Here for Pedestrians Signs. The language is consistent with similar language in Part 7 regarding the placement of these signs, as well as stop and yield lines. The FHWA proposed adding the Stop Here for Pedestrians sign because some State laws require motorists to come to a full stop for, rather than just yield to, pedestrians in a crosswalk. The NCUTCD, a local DOT, and a bicycle/pedestrian advocacy association supported the changes; however, a State DOT and an NCUTCD member opposed restricting the use of R1–5 Yield (Stop) Here to Pedestrian signs to only multi-lane approaches. The FHWA adopts the changes as proposed and notes that these signs were developed as a countermeasure for the multiple threat situations for pedestrians and there is no need for advance yielding (stopping) on a single lane approach to a crosswalk.

In addition, the FHWA proposed in the NPA to add STANDARD and OPTION statements at the end of the section regarding the combination use of the Yield Here to (Stop Here for) Pedestrian (R1–5 series) sign in the vicinity of the Pedestrian Crossing Warning (W11–2) sign. The FHWA received comments from the NCUTCD, three State DOTs, four local DOTs, and two traffic consultants who supported the concept, but found the wording confusing. As a result, the FHWA adopts a revised STANDARD statement in this final rule that restricts blocking the view of the W11–2 sign, or placing it on the same post as a R1–5 series sign. The FHWA also adopts paragraph 05 in the OPTION statement to allow Pedestrian Crossing signs to be mounted overhead where Yield Here to (Stop Here for) signs have been installed in advance of the crosswalk. The FHWA also allows the use of advance Pedestrian Crossing (W11–2) signs on the approach with AHEAD or distance plaques and In-Street Pedestrian Crossing signs at the crosswalk where Yield Here to (Stop Here for) Pedestrian signs have been installed. The FHWA adopts this new language to be consistent with similar language that is being adopted in Part 7, which is based on FHWA's Official Interpretation # 2–566.[23]

65. In Section 2B.12 In-Street and Overhead Pedestrian Crossing Signs, the FHWA proposed in the NPA to add STANDARD, GUIDANCE, and OPTION statements regarding the use of the new Overhead Pedestrian Crossing (R1–9 or R1–9a) sign that may be used to remind road users of laws regarding right-of-way at an unsignalized pedestrian crosswalk. ATSSA, an NCUTCD member, and a local DOT supported the inclusion of the Overhead Pedestrian Crossing signs and their design, while another NCUTCD member, two State DOTs, and a local DOT opposed the signs and/or their designs because they wanted more flexibility. The FHWA disagrees with the commenters and adds the text as proposed and this sign, with the design as proposed in the NPA, in this final rule. This is based on the Sign Synthesis Study,[24] which revealed that some agencies use an overhead sign because it is needed in some applications. The FHWA adds this sign to Table 2B–1, Figure 2B–2, and to the appropriate text and figures in Part 7, for consistency.

In the NPA, the FHWA proposed to insert new GUIDANCE and OPTION statements regarding conditions and criteria to be used in determining when In-Street Pedestrian Crossing signs should be used at unsignalized intersections. The NCUTCD, an NCUTCD member, 2 State DOTs, and 3 local DOTs opposed the recommended criteria, specifically the criteria to use the signs at crossing locations where there are 25 or more pedestrians per hour. The FHWA agrees and removes the criteria from this final rule, and adopts the OPTION statement allowing highway agencies to develop criteria for determining the applicability of In-Street Pedestrian Crossing signs.

As proposed in the NPA, the FHWA also adds paragraph 03 requiring that the In-Street Pedestrian Crossing sign, if used, be placed only in the roadway at the crosswalk location on the center line, on a lane line, or on a median island. While an NCUTCD member supported the language, two State DOTs and two local DOTs opposed the language, suggesting that locating this sign in the crosswalk was not the original intent of this device, and that doing so might actually pose a safety issue by distracting or obstructing the pedestrian's or driver's view. The FHWA received comments from a City DOT opposed to the proposed language restricting the location of overhead pedestrian crossing signs to over the roadway at the crosswalk location and

[23] FHWA's Official Interpretation #2–566(I), July 27, 2005, can be viewed at the following Internet Web site: *http://mutcd.fhwa.dot.gov/resources/interpretations/2_566.htm.*

[24] ''Synthesis of Non-MUTCD Traffic Signs,'' FHWA, December 2005, page 19, can be viewed at the following Internet Web site: *http://tcd.tamu.edu/documents/rwstc/Signs_Synthesis-Final_Dec2005.pdf.*

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prohibiting the installation of the signs at signalized locations. The commenter felt that there are unique locations where the requirements need to be relaxed to allow flexibility. The FHWA disagrees with these comments, because the experimentation that led to the original inclusion of the R1–6 In-Street Pedestrian Sign in the MUTCD only involved signs located in the street itself, where it is highly visible to the approaching driver, and did not include any application of the R1–6 sign behind the curb. The FHWA does not have any information that would support placement of this sign at locations out of the roadway itself. The FHWA adopts the language in this final rule to be consistent with similar language proposed in Part 7, which is based on FHWA's Official Interpretation # 7–64(1).[25]

In addition, in the NPA the FHWA proposed revising paragraph 10 to specify that the In-Street Pedestrian Crossing sign shall have a black legend and border on a white background, surrounded by an outer fluorescent yellow-green background area, or by a yellow background area. The FHWA adopts this language, with editorial edits, based on comments from two State DOTs suggesting the need to clarify the color of the background area.

The FHWA also proposed revising paragraph 11 to indicate that unless an In-Street Pedestrian Crossing sign is placed on a physical island, it is to be designed to bend over and then bounce back to its normal vertical position when struck by a vehicle. A local DOT and a traffic control device manufacturer supported this provision, while a State DOT opposed the language, stating that drums, cones, and other types of devices used within roadways are not required to have this ability. The FHWA adopts this language in this final rule because while all signs must be crashworthy, these in-street signs need to have special supports to minimize damage to vehicles and injuries to pedestrians if the signs are struck by a passing vehicle.

Finally, the FHWA adds paragraph 13 that provides requirements for the mounting heights of In-Street Pedestrian Crossing signs. A traffic control device manufacturer opposed the mounting height requirements; however, FHWA adopts these requirements as proposed in the NPA to preclude incorrect mounting of this sign when it is on an island and to assure that the signs are crashworthy by not being mounted above vehicle windshield height.[26]

66. In Section 2B.13 Speed Limit Sign, the FHWA proposed in the NPA to add to the STANDARD a statement that speed zones (other than statutory speed limits) shall only be established on the basis of an engineering study that includes an analysis of the current speed distribution of free-flowing vehicles. A State DOT and a local DOT supported this new language, while a State DOT, a local DOT, and an advocacy association opposed the language because they felt it was too restrictive. In addition, a State DOT, an association of local DOTs, and six local DOTs expressed concern that some roadways do not have volumes that are high enough to allow the collection of speed distributions, and there are some types of roads, such as residential streets and school zones, where the free-flow speed is actually the safety issue. The FHWA adopts this change in this final rule to clarify that consideration is to be given to the free-flow speed when determining altered speed zones, and to clarify that statutorily established speed limits, such as those typically established by State laws setting statewide maximum limits for various classes of roads (such as neighborhood roads and school zones) do not require an engineering study. The FHWA also proposed to add a new SUPPORT statement to provide additional information about the difference between a statutory speed limit and an altered speed zone. A citizen opposed the descriptions because he believes they offer a way to avoid doing a proper speed survey and thus enable jurisdictions to post unreasonably low speed limits. The FHWA disagrees, as this is only a SUPPORT statement that does not affect the other provisions regarding studies to establish speed limits, and the FHWA adopts the SUPPORT statement in this final rule to clarify the difference between statutory speed limits and altered speed zones.

The FHWA also proposed to add a new OPTION statement to permit the use of several new plaques (R2–5P series) to be mounted with the Speed Limit Sign when a jurisdiction has a policy of installing speed limit signs only on the streets that enter from a jurisdictional boundary or from a higher-speed street to indicate that the speed limit is applicable to the entire city, neighborhood, or residential area unless otherwise posted. A State DOT, a local DOT, and a retired traffic engineer supported the new language; however, a State DOT opposed the language, because it felt that such plaques can be difficult to enforce and have the potential to be abused. The FHWA disagrees with the commenter and adopts this change in this final rule, with editorial clarification, to reflect common practice in some urban areas, as documented by the Sign Synthesis Study,[27] and because it is often unnecessary and overly costly to install a speed limit sign on every minor residential street.

The FHWA also proposed to add paragraph 09 to recommend that a Reduced Speed Limit Ahead sign be used where the speed limit is being reduced by more than 10 mph, or where engineering judgment indicates the need for advance notice. One State DOT supported this new recommendation; however, another State DOT opposed this recommendation, stating that to install reduced speed limit signs in advance of every 10 mph reduction in speed would be infeasible. A turnpike authority suggested that speed limit drops of more than 10 mph at a time should be discouraged. The FHWA adopts this change in this final rule because the practice of installing reduced speed signs in advance of speed zones with more than a 10 mph reduction has been in place in many States for decades. In addition, some States and local highway agencies have engaged in the practice of establishing speed limits more than 10 mph lower than the rural statutory speed limit when entering a town or commercial area, and road users need to be warned of such situations. The FHWA also adopts this change in order to provide consistency with changes contained in Chapter 2C.

The FHWA clarifies the STANDARD statement proposed in the NPA for the establishment of speed zones on the basis of an engineering study of the current speed distribution of free-flowing vehicles, by adding SUPPORT and OPTION statements in this final rule in response to comments from the NCUTCD. That organization suggested more clarification as to engineering studies that should be conducted to reevaluate non-statutory speed limits and the posting of altered speed zones. The FHWA believes these adopted changes will assist agencies with reevaluating non-statutory speed limits on segments of their roadways that have

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[25] FHWA's Official Interpretation #7–64(I), July 23, 2004, can be viewed at the following Internet Web site: *http://mutcd.fhwa.dot.gov/resources/interpretations/7_64.htm.*

[26] Information on the FHWA's crash-testing of in-street signs can be viewed at the following Internet Web site: *http://safety.fhwa.dot.gov/roadway%5Fdept/policy_guide/road_hardware/breakaway/signsupports.cfm.*

[27] ''Synthesis of Non-MUTCD Traffic Signs,'' FHWA, December 2005, pages 19–20, can be viewed at the following Internet Web site: *http://tcd.tamu.edu/documents/rwstc/Signs_Synthesis-Final_Dec2005.pdf.*

undergone significant changes since the last review; such as the addition or elimination of parking, change in the number of travel lanes, changes in bicycle lane configuration, or signal coordination and in determining speed limits in speed zones.

As discussed above, in the NPA the FHWA proposed to add in paragraph 01 of the STANDARD statement a requirement that the engineering study that is performed to determine a speed zone shall include an analysis of the current speed distribution of free-flowing vehicles. Based on a comment from the Regulatory and Warning Signs Technical Committee of the NCUTCD to include additional guidance and supporting information for the establishment of speed zones in the vicinity of signalized intersections, the FHWA adds paragraph 13 to the GUIDANCE statement to recommend that speed studies on signalized intersection approaches be taken outside the influence area of the traffic control signal, which is generally considered to be approximately ½ mile, to avoid obtaining skewed results for the 85th percentile speed. Following this GUIDANCE, the FHWA adds a SUPPORT statement regarding the use of advance warning signs in the vicinity of signalized intersections. The FHWA believes that this new text provides agencies with additional information that is useful in establishing speed zones and gaining motorists' awareness.

Finally, the FHWA adds a new GUIDANCE statement to indicate that Speed Limit signs should not be used to warn of an advisory speed for a roadway condition, based on a comment from the NCUTCD that this is needed for consistency with the provisions of Section 2C.08 Advisory Speed Plaque. The FHWA also adds a reference to Section 2C.08 for information on advisory speed plaques for these conditions.

67. In Section 2B.17 Higher Fines Signs and Plaque, the FHWA proposed changes to OPTION, GUIDANCE, STANDARD, and SUPPORT statements. In this final rule, the FHWA revises the existing and proposed text to be consistent with similar provisions in Chapter 6F and Chapter 7B for the application of Higher Fines signs and plaque.

68. The FHWA relocates all of the text from Section 2B.18 Location of Speed Limit Sign of the 2003 MUTCD to Section 2B.13 Speed Limit Sign (see item 66 above).

69. In Section 2B.18 (Section 2B.19 of the 2003 MUTCD), the FHWA changes the title to ''Movement Prohibition Signs'' to incorporate the inclusion of the No Straight Through (R3–27) sign in the GUIDANCE statement in this section. The NCUTCD, ATSSA, a State DOT, two local DOTs, an association, and two citizens supported this new sign, although some of the commenters also suggested that the signs be allowed for other applications. A State DOT and two local DOTs opposed the new sign because they felt that it was unnecessary. The commenters suggested that the DO NOT ENTER (R5–1) sign serves the same purpose. The FHWA disagrees and adopts the symbolic No Straight Through sign as proposed in the NPA. The sign is most commonly used for traffic restrictions associated with traffic calming programs. The sign is useful at intersections having four approaches, where the through movement to be prohibited is onto a street or road that does not have a ''Do Not Enter'' condition, such as when 90-degree turns into the roadway are allowed, but the straight ahead movement into the roadway is prohibited. This new sign uses the standard Canadian MUTCD RB–10 sign as the basis of the design. The FHWA adds an illustration of this new sign to Figure 2B–4.

The FHWA also changes paragraph 09 regarding the use of Turn Prohibition Signs adjacent to signal heads from an OPTION to a GUIDANCE statement. Although a local DOT opposed strengthening this language to a recommendation, the FHWA believes that for conspicuity reasons, these signs should be mounted near the appropriate signal face, and this reflects typical practice. Therefore, the FHWA adopts in this final rule the proposed changes to a recommended practice rather than an option.

Additionally, the FHWA adds new STANDARD and SUPPORT statements at the end of this section to prohibit the use of No Left Turn, No U-Turn, and combination No U-Turn/No Left Turn signs at roundabouts in order to prohibit drivers from turning left onto the circular roadway of a roundabout. The language also indicates that Roundabout Directional Arrow and/or ONE WAY signs are the appropriate signs to indicate the travel direction for this condition. The NCUTCD and two of its members, a State DOT, two local DOTs, and a traffic engineering consultant supported the proposed language. Some comments in support of the proposal also indicated that there might be unique existing situations where the design of the roundabout is confusing and/or driver expectancy is such that a No Left Turn sign is needed to correct driver behavior at roundabout approaches. The FHWA disagrees with those comments and suggests that the Roundabout Directional Arrow and/or ONE WAY signs can be used to help in those situations. The FHWA adopts the language as proposed in the NPA to provide uniformity in signing at roundabouts and to reduce the possibility of confusion for drivers that intend to turn left by circumnavigating the roundabout.

70. In Section 2B.19 (Section 2B.20 of the 2003 MUTCD) Intersection Lane Control Signs, the FHWA proposed to add to the GUIDANCE statement that overhead lane control signs should be installed over the appropriate lanes on signalized approaches where lane drops, multiple-lane turns with shared through-and-turn lanes, or other lane-use controls that would be unexpected by unfamiliar road users are present. The NCUTCD, an NCUTCD member, a local DOT, and a citizen supported the language that lane control signs should be mounted overhead. Eight State DOTs and seven local DOTs, however, suggested that placing lane control signs overhead, as well as using oversized post-mounted signs, should be an option, rather than a recommendation, because of the costs involved. The FHWA adopts the recommendation to use overhead signs for the stated conditions, however to address the comments from the DOTs, the FHWA provides additional information in this final rule to clarify alternatives to mounting overhead signs when it is impractical to do so. These changes are adopted to enhance safety and efficiency by providing for more effective signing for potentially confusing intersection configurations.

The FHWA also proposed to add a paragraph at the end of the OPTION statement regarding the types of arrows that may be used on Intersection Lane Control signs at roundabouts. ATSSA, the NCUTCD, an NCUTCD member, a State DOT, and two local DOTs supported the arrow shapes, while another NCUTCD member thought that including four different ways to show each movement lacked uniformity. A traffic engineering consultant supported the various options for arrows because he believes that road users understand and interpret normal lane control arrows better than fish hook arrows. A local DOT suggested that the left-turn arrow should be prohibited from use at roundabout intersections. The FHWA adopts the changes as proposed in the NPA along with ''Figure 2B–5 Intersection Lane Control Sign Arrow Options for Roundabouts'' illustrating the signs, to reflect current practice for roundabout signing and to correspond with similar options for pavement

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marking arrows on roundabout approaches in Part 3. The FHWA notes that human factors research [28] found that all of the arrow designs shown for roundabout movements were well understood by the public.

71. In Section 2B.20 (Section 2B.21 in the 2003 MUTCD) Mandatory Movement Lane Control Signs, the FHWA proposed in the NPA to revise the first paragraph of the STANDARD statement to clarify that Mandatory Movement Lane Use Control signs shall indicate only the single vehicle movement that is required from each lane, and to clarify the placement of the signs. The FHWA also proposed to add that where three or more lanes are available to through traffic and Mandatory Movement Lane Control symbol signs are used, they shall be mounted overhead. A State DOT supported this requirement; however, four State DOTs, three local DOTs, two NCUTCD members, and a citizen opposed the requirement, suggesting that overhead installations are not always practical and that post-mounted R3–5 signs with plaques are sufficient and easily understood. The FHWA disagrees and notes that the intent is to prohibit post-mounted lane use control signs on approaches with three or more through lanes, because the needed lane use information is more visible overhead rather than off to the side where traffic in the adjacent lanes limits the visibility of post-mounted signs. In addition, lane use regulatory signing is to be placed over the lane to which it applies on approaches with three or more through lanes, and not just where one of the lanes changes to a mandatory turn lane or combination turn lane. This is crucial information for motorists and the lack of overhead lane use signing contributes to crashes on multilane approaches to intersections. The FHWA also adopts these changes for consistency with Section 2B.21.

In this final rule, the FHWA changes paragraph 05 from a STANDARD statement to a GUIDANCE statement to recommend, rather than require, that R3–5 series supplemental plaques (LEFT LANE, TAXI LANE, etc.) for R3–5 series lane control signs on two-lane approaches be mounted above the associated R3–5 sign. Although these changes were not proposed in the NPA, the FHWA adopts these changes in response to comments from the NCUTCD and a citizen. The commenters suggested that this statement was more appropriate as a recommendation, and they also indicated that the supplemental plaques should be added above the sign, rather than below, since placing the information at the top of the sign assembly allows drivers to quickly determine if the sign applies to them. The FHWA agrees and incorporates these changes in this final rule.

The FHWA also add paragraphs 06 and 07 in response to a comment from the NCUTCD to clarify the use of R3–7 LEFT (RIGHT) LANE MUST TURN LEFT (RIGHT) Mandatory Movement Lane Control signs, because they are being misused throughout the country. The FHWA agrees and adds these paragraphs in the final rule to clarify where these signs should and should not be used.

Finally, as proposed in the NPA, the FHWA adds an OPTION statement at the end of this section describing the optional use of the new BEGIN RIGHT TURN LANE (R3–20R) and BEGIN LEFT TURN LANE (R3–20L) signs at the upstream end of the turn lane taper of mandatory turn lanes. The FHWA adds this change to give agencies flexibility to use these new signs to designate the beginning of mandatory turn lanes where needed for enforcement purposes. The NCUTCD, ATSSA, and a local DOT supported this change. A State DOT and a NCUTCD member opposed the introduction of the R3–20 sign, because the R3–7 and R3–5 signs are available and therefore they believe that another sign is not needed and would reduce uniformity. The FHWA disagrees, because this new optional sign will provide road users additional information regarding mandatory turn lanes. The FHWA adopts the R3–20 sign, incorporating an editorial suggestion regarding its placement, in this final rule.

72. In Section 2B.21 (Section 2B.22 in the 2003 MUTCD) Optional Movement Lane Control Sign, the FHWA revises the STANDARD statement, as proposed in the NPA, to clarify that, if used, Optional Movement Lane Control signs shall be located in advance of and/or at the intersection where the lane controls apply. This change also provides consistency with Section 2B.20 regarding placement of Mandatory Movement Lane Control Signs.

The FHWA also adopts the proposed paragraph 05 requiring that Optional Movement Lane Control (R3–6) signs be mounted overhead if used on an approach where the number of lanes available to through traffic is three or more. Similar to the comments in Section 2B.20, a local DOT supported this change, while two State DOTs, two local DOTs, and two NCUTCD members opposed this change, suggesting that it should be optional rather than recommended. The FHWA disagrees because lane use regulation is critical information for drivers that can be obscured by other traffic on approaches of three or more through lanes when post-mounted.

Similar to comparable provisions in Section 2B.20, in this final rule the FHWA changes paragraph 06 from a STANDARD statement, as proposed in the NPA, to a GUIDANCE statement to recommend, rather than require, that R3–5 series supplemental plaques (LEFT LANE, TAXI LANE, etc) for R3–5 series lane control signs on two-lane approaches be mounted above the associated R3–6 sign, for consistency with a similar statement in Section 2B.20.

The FHWA also adds paragraph 08, as proposed in the NPA, prohibiting the use of the word message ONLY when more than one movement is permitted from a lane. The FHWA adopts this change in this final rule to be consistent with other requirements in the MUTCD regarding the use of the term ONLY for lane use.

73. In Section 2B.22 Advance Intersection Lane Control Signs (Section 2B.23 in the 2003 MUTCD), the FHWA proposed in the NPA to add paragraph 05 prohibiting the overhead placement of Advance Intersection Lane Control (R3–8) signs where the number of lanes available to traffic on an approach is three or more. In such cases, overhead R3–5 signs are used. The NCUTCD, a State DOT, three local DOTs, and a traffic engineering consultant pointed out confusing language in the statement proposed in the NPA. The FHWA clarifies the language in this final rule to refer to the total number of lanes, not just through lanes. This section pertains to advance lane use signs, while Section 2B.19 addresses lane use control signs at the intersection.

74. The FHWA adds a new section numbered and titled Section 2B.23 RIGHT (LEFT) LANE MUST EXIT Sign. This section, as proposed in the NPA, contained an OPTION statement describing the use of this sign for a lane of a freeway or expressway that is approaching a grade-separated interchange where traffic in the lane is required to depart the roadway onto the exit ramp at the next interchange. As documented in the Sign Synthesis Study,[29] at least 12 States currently use

[28] ''Lane Restriction Signing and Marking for Double-Lane Roundabouts'', Final Report, October 2007, by John A. Molino, Vaughn W. Inman, Bryan J. Katz, and Amanda Emo, for the Traffic Control Devices Pooled Fund Study, can be viewed at the following Internet Web site: *http://www.pooledfund.org/documents/TPF-5_065/FinalRoundaboutReport.pdf.*

[29] ''Synthesis of Non-MUTCD Traffic Signs,'' FHWA, December 2005, page 22, can be viewed at

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this type of regulatory sign for freeway lane drop situations to establish the ''must exit'' regulation and make it enforceable where warning signs (such as the overhead ''Exit Only'' black-on-yellow warning plaque on guide signs) and markings alone have proven ineffective. ATSSA, an NCUTCD member, and a local DOT supported the new RIGHT (LEFT) LANE MUST EXIT (R3–33) sign; however, another NCUTCD member opposed the sign because he felt that there are similar signs in the MUTCD that can be used. The FHWA disagrees because there are no other post-mounted regulatory signs that adequately convey this message. The FHWA adopts this section in this final rule with revisions to indicate that this sign may be used to supplement an overhead EXIT ONLY guide sign, in response to a comment from a toll road operator that further clarification was needed to preclude unintended uses of the R3–33 sign.

75. Although the FHWA did not propose in the NPA any significant changes to Section 2B.24 Two-Way Left Turn Only Signs, the FHWA received comments from three local DOTs suggesting that two-way left turn only signs are no longer necessary because this turn configuration has been in use for long enough that motorists are familiar with its operation. The commenters suggested that two-way left turn only signs be optional, rather than recommended. The FHWA disagrees because the operation of two-way left-turn lanes is a regulatory application requiring motorists to turn left out of the lane rather than using the lane as an auxiliary through lane. Lane markings alone regulate traffic only for NO PASSING zones; therefore two-way left turn only signs are needed. The FHWA retains this section, as it existed in the 2003 MUTCD, with minor editorial changes.

76. Although not proposed in the NPA, the FHWA adds a new section numbered and titled Section 2B.25 BEGIN and END Plaques, consisting of an OPTION statement for the optional use of the BEGIN or END plaque and a STANDARD statement that, if the plaque is used, it is to be placed above a regulatory sign. The FHWA adds this new section in response to comments from the NCUTCD that the existing END plaques already contained in Section 2D.22 and the BEGIN plaque proposed in the NPA in Section 2D.23 should be made available for optional use with any regulatory sign. The NCUTCD based its suggestion on recommendation #15 from the Sign Synthesis Study.[30] The FHWA agrees and adopts this new section, along with an illustration of the plaques in Figure 2B–6, in this final rule.

77. The FHWA adds a new section titled Section 2B.27 Jughandle Signs. As proposed in the NPA, this section contains SUPPORT, STANDARD, and OPTION statements regarding the use of regulatory signs for jughandles. A State DOT suggested that road users would be better served by advance guide signing for jug handles, rather than regulatory signing. The FHWA disagrees because regulatory signing is critical for jughandles since the geometry typically requires left turns and U-turns to be made via a right turn, either in advance of or beyond the intersection, and this is contrary to normal driver expectations. The Sign Synthesis Study[31] found that jughandles are currently in common use in at least six States and the FHWA believes that jughandles are likely to see increasing use in the future in more States in order to improve intersection safety and operations. Therefore, in order to provide agencies with uniform signing practices for several of the most common geometric layouts of jughandles, the FHWA adds this new section along with several new signs and a figure to illustrate their use. ATSSA and a local DOT supported the regulatory signs illustrated in the figure. The NCUTCD suggested editorial changes to the text and to the arrows on some of the signs, which the FHWA adopts in this final rule. Although a local DOT opposed the use of ''U Turn and Left Turn'' language on the R3–24 signs, the FHWA incorporates the sign designs, as proposed in the NPA, because the sign designs and their applications have effectively been in use in several States for decades and are critical information for road user decisions for the condition of an indirect left turn.

78. In Section 2B.28 DO NOT PASS Sign (Section 2B.29 of the 2003 MUTCD), in the NPA the FHWA proposed a new symbol sign for the DO NOT PASS (R4–1) Sign. ATSSA, three local DOTs, and two citizens supported the new symbol signs. Although the proposed symbol sign has been in use and is well understood in Europe and Canada (the Canadian MUTCD RB–31 sign) for many decades,[32] the FHWA does not adopt the symbol sign in this final rule because of comments from the NCUTCD and two of its members, seven State DOTs, and five local DOTs suggesting that U.S. drivers would not understand its meaning. The FHWA agrees that additional human factors testing of the symbol is desirable before future consideration of adoption of this symbol.

79. In the NPA, the FHWA proposed to add a new section numbered and titled Section 2B.35 DO NOT PASS WHEN SOLID LINE IS ON YOUR SIDE sign, which contained an OPTION statement describing the use of this word message sign. ATSSA and two local DOTs supported this new sign. Although at least five States use signs to remind road users of the meaning of a solid yellow line for no-passing zones, the NCUTCD and two of its members, eight State DOTs, four local DOTs, and a local association of traffic engineers recommended deleting this section and the associated sign in its entirety because they felt that the proposed sign was not needed. Many stated that the No Passing Pennant (W14–3) warning sign may be used for this purpose. The FHWA agrees and does not adopt this section or the sign in this final rule.

80. In the NPA, the FHWA proposed to retitle Section 2B.31 of the 2003 MUTCD to ''KEEP RIGHT EXCEPT TO PASS Sign and SLOWER TRAFFIC KEEP RIGHT Sign'' to reflect the proposed addition of a new KEEP RIGHT EXCEPT TO PASS sign in this section. The Sign Synthesis Study[33] found that at least 19 States use a ''Keep Right Except to Pass'' sign to legally require vehicles to stay in the right-hand lane of a multi-lane highway except when passing a slower vehicle, and the FHWA feels that a consistent message should be provided to road users. The NCUTCD, an NCUTCD member, ATSSA, and a local DOT supported the new KEEP RIGHT EXCEPT TO PASS sign. The NCUTCD also noted that the new KEEP RIGHT EXCEPT TO PASS sign is used for different situations than the SLOWER TRAFFIC KEEP RIGHT sign. The FHWA agrees and adopts

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the following Internet Web site: *http://tcd.tamu.edu/documents/rwstc/Signs_Synthesis-Final_Dec2005.pdf.*

[30] ''Synthesis of Non-MUTCD Traffic Signs,'' FHWA, December 2005, pages 22–23, can be viewed at the following Internet Web site: *http://tcd.tamu.edu/documents/rwstc/Signs_Synthesis-Final_Dec2005.pdf.*

[31] ''Synthesis of Non-MUTCD Traffic Signs,'' FHWA, December 2005, page 24, can be viewed at the following Internet Web site: *http://tcd.tamu.edu/documents/rwstc/Signs_Synthesis-Final_Dec2005.pdf.*

[32] ''Synthesis of Non-MUTCD Traffic Signs,'' FHWA, December 2005, page 24, can be viewed at the following Internet Web site: *http://tcd.tamu.edu/documents/rwstc/Signs_Synthesis-Final_Dec2005.pdf.*

[33] ''Synthesis of Non-MUTCD Traffic Signs,'' FHWA, December 2005, page 25, can be viewed at the following Internet Web site: *http://tcd.tamu.edu/documents/rwstc/Signs_Synthesis-Final_Dec2005.pdf.*

revisions in this final rule to separate the applications of each of the signs, including placing the new KEEP RIGHT EXCEPT TO PASS sign in its own Section, numbered Section 2B.30 in this final rule.

81. In Section 2B.31 (numbered Section 2B.32 in the 2003 MUTCD), as proposed in the NPA, the FHWA retitles the Section to ''TRUCKS USE RIGHT LANE Sign'' and revises the section to discontinue the use of the TRUCK LANE XXX FEET (R4–6) as a regulatory sign because the message is one of guidance information (distance to the start of the truck lane) rather than regulatory in nature. This is consistent with changes in Chapter 2D that add a new guide sign with this message. The FHWA also adds an OPTION statement, as proposed in the NPA, which describes the appropriate optional use of the TRUCKS USE RIGHT LANE sign on multi-lane roadways to reduce unnecessary lane changing.

82. In Section 2B.32 Keep Right and Keep Left Signs (numbered Section 2B.33 in the 2003 MUTCD) the FHWA adds a new narrow Keep Right (R4–7c) sign that may be installed on narrow medians where there is insufficient lateral clearance for a standard width Keep Right sign. ATSSA, a State DOT, two local DOTs, and a traffic engineering consultant supported this new sign. In the NPA, the FHWA proposed that this narrower sign may be installed on medians less than 6 feet in width; however, in this final rule the FHWA revises the permitted use of this sign to medians less than 4 feet wide based on a comment from ATSSA. The FHWA adopts this new sign, which is only 12 inches wide rather than the standard 24-inch wide R4–7 sign, to reflect current practice in some States and to provide other agencies with the flexibility to use this sign where applicable.

83. As proposed in the NPA, the FHWA adds three new sections following Section 2B.32. The first new section is numbered and titled Section 2B.33 STAY IN LANE Sign, and contains OPTION and GUIDANCE statements on the use of STAY IN LANE (R4–9) signs and the pavement markings that should be used with them. The second new section is numbered and titled Section 2B.34 RUNAWAY VEHICLES ONLY Sign, and contains a GUIDANCE statement regarding the use of the RUNAWAY VEHICLES ONLY sign near truck escape ramp entrances. Both the STAY IN LANE and RUNAWAY VEHICLES ONLY signs are existing signs illustrated in Figure 2B–10 (Figure 2B–8 of the 2003 MUTCD), but not described in the text of the 2003 MUTCD. The third new section is numbered and titled Section 2B.35 Slow Vehicle Turn-Out Signs, and contains SUPPORT, OPTION, and STANDARD statements regarding three new signs that may be used on two-lane highways where physical turn-out areas are provided for the purpose of giving a group of faster vehicles an opportunity to pass a slow-moving vehicle. ATSSA and a local DOT supported the SLOW VEHICLES WITH XX OR MORE FOLLOWING VEHICLES MUST USE TURN–OUT (R4–12) sign; however, two State DOTs opposed the sign because of safety concerns. As documented in the Sign Synthesis Study,[34] at least eight States, mostly in the west, use regulatory signs to legally require slow moving vehicles to use the turnout if a certain number of following vehicles are being impeded. Most of the eight States use similar wording on their signs, but there are some variations. The FHWA adds these new signs in this final rule to provide for uniformity of the message.

84. As proposed in the NPA, the FHWA adds a new section numbered and titled Section 2B.36 DO NOT DRIVE ON SHOULDER Sign and DO NOT PASS ON SHOULDER Sign, which contains an OPTION statement regarding the use of these two new signs to inform road users that use of the shoulder as a travel lane or to pass other vehicles is prohibited. ATSSA supported these two new signs. The FHWA adopts these 2 new signs in this final rule because the Sign Synthesis Study[35] found that at least 19 States are using some version of regulatory sign to prohibit driving, turning, and/or passing on shoulders and the FHWA feels that consistent and uniform messages for these purposes should be provided to road users.

85. In Sections 2B.37 DO NOT ENTER Sign and 2B.38 WRONG WAY Sign (Sections 2B.34 and 2B.35 of the 2003 MUTCD) the FHWA adds SUPPORT statements, as proposed in the NPA. These statements reference Section 2B.41, which allows lower mounting heights for Do Not Enter and Wrong Way signs as a specific exception when an engineering study indicates that it would address wrong-way movements at freeway/expressway exit ramps. The FHWA adopts this exception based on recommendations from the Older Driver handbook[36] and positive experience in several States.

86. In Section 2B.39 Selective Exclusion Signs (Section 2B.36 in the 2003 MUTCD), as proposed in the NPA, the FHWA changes the legend of several existing selective exclusion signs to use the word NO rather than PROHIBITED or EXCLUDED, to simplify the messages and make them easier to read from a distance. ATSSA, a State DOT, and a local DOT supported this change. The FHWA also adds the new No Skaters (R9–13) and No Equestrians (R9–14) signs to this list, as well as to Figure 2B–11, based on comments from the NCUTCD, a State DOT, two NCUTCD members, and several pedestrian/bicycle associations.

To respond to a comment from a State DOT, the FHWA adds paragraph 06 to recommend that the NO PEDESTRIANS OR BICYCLES (R5–10b) sign, when used on a freeway or expressway exit or entrance ramp, should be installed in a location where it is clearly visible to any pedestrian or bicyclist attempting to enter the limited access facility from a street intersecting the exit ramp.

In the NPA, the FHWA proposed to add two new regulatory signs, AUTHORIZED VEHICLES ONLY and FOR OFFICIAL USE ONLY to the last OPTION statement to reflect current practice. While ATSSA and a local DOT supported both of these signs, an NCUTCD member suggested that their meaning was so similar that only one sign is needed. The FHWA agrees and adopts the AUTHORIZED VEHICLES ONLY (R5–11) sign in this final rule and deletes the FOR OFFICIAL USE ONLY sign.

87. In Figure 2B–26 (Figure 2B–18 in the 2003 MUTCD) Pedestrian Signs and Plaques, the FHWA in this final rule modifies the designs of the R10–3, R10–3a through R10–3e, R10–4 and R10–4a to include the Canadian MUTCD standard symbol for pushbuttons (in addition to the words), as proposed in the NPA, to begin the symbolization of the ''pushbutton'' message. The FHWA adopts this change to provide better harmony in North American signing design, which is needed as a result of the increased travel between the U.S., Canada, and Mexico resulting from NAFTA. The FHWA is adopting this new pushbutton symbol on several signs throughout the MUTCD.

[34] ''Synthesis of Non-MUTCD Traffic Signs,'' FHWA, December 2005, page 25, can be viewed at the following Internet Web site: *http://tcd.tamu.edu/documents/rwstc/Signs_Synthesis-Final_Dec2005.pdf.*

[35] ''Synthesis of Non-MUTCD Traffic Signs,'' FHWA, December 2005, page 25, can be viewed at the following Internet Web site: *http://tcd.tamu.edu/documents/rwstc/Signs_Synthesis-Final_Dec2005.pdf.*

[36] ''Guidelines and Recommendations to Accommodate Older Drivers and Pedestrians,'' FHWA Report no. FHWA–RD–01–051, May 2001, can be viewed at the following Internet Web site: *http://www.tfhrc.gov/humanfac/01105/cover.htm.* Recommendation II.D(4d).

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88. As proposed in the NPA, in Section 2B.40 ONE WAY Signs (Section 2B.37 of the 2003 MUTCD), the FHWA changes paragraph 03 to a STANDARD to require, rather than recommend, that at an intersection with a divided highway having a median width of 30 feet or more, ONE WAY signs be placed on the near right and far left corners of each intersection with the directional roadways to reflect recommendations from the Older Driver handbook.[37] In concert with these changes, and based on comments from a State DOT, the FHWA clarifies that, at an intersection with a divided highway that has a median width of less than 30 feet, Keep Right (R4–7) signs shall be installed, visible to traffic on the divided highway and each crossroad approach, and/or ONE WAY signs shall be placed, visible to each crossroad approach, on the near right and far left corners of the intersection. The FHWA also adds an OPTION statement allowing ONE WAY signs to also be placed on the far right corner of an intersection with a divided highway that has a median width of less than 30 feet. The FHWA revises Figures 2B–15 through 2B–17 accordingly.

The FHWA also adds two STANDARD paragraphs as proposed in the NPA to require two ONE WAY signs for each approach for T-intersections and cross intersections, one on the near side and one on the far side. The FHWA adopts this change to reflect recommendations from the Older Driver handbook.[38]

The FHWA establishes a target compliance date of December 31, 2019, (approximately 10 years from the effective date of this final rule) for the installation of the additional ONE WAY and/or Keep Right signs required to achieve compliance with these provisions at existing locations. The FHWA establishes this target compliance date because of the demonstrated safety issues associated with wrong-way travel on divided highways and because the FHWA anticipates that installation of the required additional signs at existing locations will provide significant safety benefits to road users. State and local highway agencies and owners of private roads open to public travel can schedule the installation of the additional required signs in conjunction with their programs for maintaining and replacing other signs at existing locations that are worn out or damaged, thus minimizing any impacts.

The FHWA also adds new OPTION, GUIDANCE, and SUPPORT statements at the end of the Section regarding the use of ONE WAY signs on central islands of roundabouts. The FHWA adopts this text to promote consistency in signing for roundabouts.

Additionally, to respond to a comment from the NCUTCD and to provide highway agencies with a uniform method of communicating potentially important messages, in this final rule the FHWA adds BEGIN ONE WAY and END ONE WAY signs as optional signs that may be used to notify approaching road users of the beginning point or ending point of a one-way directional roadway. These new optional signs are consistent with existing sign designs. The Signs Synthesis Report[39] indicates these signs are in use in some States. The FHWA adopts the signs in the text and includes them in Figure 2B–13, and notes that the impact of this addition is mitigated as the use of these signs is optional.

89. As proposed in the NPA, the FHWA relocates the information from Section 2E.50 of the 2003 MUTCD to a new section numbered and titled Section 2B.41 Wrong-Way Traffic Control at Interchange Ramps. The FHWA adopts this change because these types of signs are regulatory in nature, rather than guide signs.

In addition, the FHWA adds paragraph 06 allowing the option to mount a DO NOT ENTER sign(s) and/or a WRONG WAY sign(s) along the exit ramp facing a road user at a lower mounting height under specific conditions. A local DOT supported this option, while two State DOTs and a local DOT expressed concerns about the crashworthiness of signs at this lower mounting height. Another local DOT suggested that a lower mounting height should not be allowed for signs, because other signs are restricted from being installed in this manner. The FHWA disagrees with the commenters and adopts this language in this final rule because of the effective application of this option in several States,[40] research conducted by Texas Transportation Institute,[41] and the results of crash testing of sign supports of various heights as documented in AASHTO's Roadside Design Guide.[42]

90. In Section 2B.42 Divided Highway Crossing Signs (Section 2B.38 in the 2003 MUTCD), the FHWA proposed in the NPA to change the first OPTION statement to a STANDARD statement to require the use of Divided Highway Crossing Signs for all approaches to divided highways in order to encompass recommendations from the Older Driver handbook.[43] Although ATSSA supported this change, six State DOTs, eight local DOTs, three NCUTCD members, a traffic engineering consultant, and a citizen all opposed the change, suggesting that it was unrealistic in urban areas and would involve the installation of too many signs. As a result of the comments, the FHWA reevaluated this proposal and the underlying research and recommendations from the Older Driver Handbook. Based on that review, the FHWA revises the first STANDARD statement to require the installation of a Divided Highway Crossing sign on unsignalized minor-street approaches from which both left turns and through movements are permitted onto a divided highway having a median width at the intersection itself of 30 feet or greater. The FHWA notes that the operational and safety issues with side road approaches to divided highways is for left turns out of the side road approach onto the divided highway and for through crossing movements from the side road approach, rather than for right turn movements, and revises the STANDARD and OPTION statements accordingly. As part of this change, the FHWA also adopts an OPTION statement to allow the Divided Highway Crossing sign to be omitted if the divided road has average annual daily traffic less than 400 vehicles per day and a speed limit of 30 mph or less. The FHWA also adopts an OPTION

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[37] ''Guidelines and Recommendations to Accommodate Older Drivers and Pedestrians,'' FHWA Report no. FHWA–RD–01–051, May 2001, can be viewed at the following Internet Web site: *http://www.tfhrc.gov/humanfac/01105/cover.htm.* Recommendations I.E(4), I.K(2), and I.K(3).

[38] ''Guidelines and Recommendations to Accommodate Older Drivers and Pedestrians,'' FHWA Report no. FHWA–RD–01–051, May 2001, can be viewed at the following Internet Web site: *http://www.tfhrc.gov/humanfac/01105/cover.htm.* Recommendations I.K(4) and I.K(5).

[39] ''Synthesis of Non-MUTCD Traffic Signs,'' FHWA, December 2005, page 26, can be viewed at the following Internet Web site: *http://tcd.tamu.edu/documents/rwstc/Signs_Synthesis-Final_Dec2005.pdf.*

[40] ''Marking the Way to Greater Safety,'' Senior Mobility Series: Article 4, Public Roads Magazine, July/August 2006, page 55, can be viewed at the following Internet Web site: *http://www.tfhrc.gov/pubrds/06jul/08.htm.*

[41] ''Countermeasures for Wrong-Way Movement on Freeways: Overview of Project Activities and Findings,'' Report number FHWA/TX–04/4128–1, January 2004, by Scott A. Cooner, A. Scott Cothron, and Steven E. Ranft, can be viewed at the following Internet Web site: *http://tti.tamu.edu/documents/4128–1.pdf.*

[42] ''Roadside Design Guide, 3rd Edition,'' 2002, is available for purchase from the American Association of State Highway and Transportation Officials, via the Internet Web site: *https://bookstore.transportation.org/item_details.aspx?ID=148.*

[43] ''Guidelines and Recommendations to Accommodate Older Drivers and Pedestrians,'' FHWA Report no. FHWA–RD–01–051, May 2001, can be viewed at the following Internet Web site: *http://www.tfhrc.gov/humanfac/01105/cover.htm.* Recommendation I.K(1).

statement permitting the use of the Divided Highway Crossing sign facing signalized minor-street approaches from which both left and right turns are permitted onto a divided highway having a median width of 30 feet or greater at the intersection.

The FHWA also proposed in the NPA to change the existing 2nd OPTION statement to a STANDARD statement in order to require that the Divided Highway Crossing sign be located on the near right corner of the intersection. The FHWA adopts this change as proposed. As part of this change, the FHWA also adds an OPTION statement to permit the installation of an additional Divided Highway Crossing sign on the left-hand side of the approach to supplement the sign on the near right corner of the intersection. The FHWA adopts these to implement recommendations from the Older Driver handbook.[44]

91. As proposed in the NPA, the FHWA adds a new section numbered and titled Section 2B.43 Roundabout Directional Arrow Signs, containing STANDARD, GUIDANCE, and OPTION statements on the use of Roundabout Directional Arrow Signs. ATSSA, an NCUTCD member, a local DOT, and a traffic engineering consultant supported the use of these signs. Two State DOTs, three local DOTs, two traffic engineering consultants, an NCUTCD member, and a citizen commented about the design of the sign. The NCUTCD member supported the sign design. Many of the commenters suggested that the background color should be yellow rather than white. The FHWA disagrees, noting that the use of the black and yellow W1–8 Chevron sign is reserved for application to warning of horizontal curvature. The FHWA notes that the regulatory sign for use at roundabouts is the Roundabout Directional Arrow and not the Chevron Alignment sign, which is a warning sign.

The FHWA adopts the recommendation to mount the sign at least 4 feet high when used on the central island of a roundabout, as proposed in the NPA. A traffic engineering consultant supported this recommendation, while a State DOT expressed concerns about the mounting height. The FHWA notes that information regarding crashworthiness of sign supports at various mounting heights is provided in AASHTO's Roadside Design Guide.[45]

92. The FHWA adopts a new section numbered and titled Section 2B.44 Roundabout Circulation Plaque, as proposed in the NPA, that contains GUIDANCE and OPTION statements regarding the use of the Roundabout Circulation Sign at roundabouts and other circular intersections. ATSSA, a local DOT, and a traffic engineering consultant supported this new section and the associated sign, while a State DOT and a local DOT suggested that more signs at roundabouts are not needed. Three local DOTs suggested that a supplemental YIELD TO TRAFFIC IN CIRCLE plaque under the YIELD sign be permitted. The FHWA disagrees and does not incorporate the supplemental plaque in this final rule, because the FHWA is not aware of any studies documenting the effectiveness of such a plaque, but the FHWA notes that the MUTCD provides agencies the flexibility to develop and use word message plaques at problem locations if they deem it necessary. The FHWA adopts this section and the associated sign as proposed in the NPA.

93. The FHWA also adopts a new section numbered and titled Section 2B.45 Examples of Roundabout Signing, as proposed in the NPA, that contains a SUPPORT statement referencing new Figures 2B–21 through 2B–23 that illustrate examples of regulatory and warning signs for roundabouts of various configurations. The SUPPORT statement also references other areas in the Manual that contain information on guide signing and pavement markings at roundabouts. The FHWA adopts this new section in order to add valuable information regarding regulatory and warning signs at roundabouts to the MUTCD.

An NCUTCD member supported the designs depicted in Figures 2B–21 through 2B–23 on the basis of applied laboratory studies. A State DOT, a local DOT, and a traffic engineering consultant suggested that the Pedestrian Crossing signs shown in Figures 2B–21 and 2B–22 should be required, rather than optional. Two State DOTs suggested that the Roundabout Advance Warning sign should be required, rather than optional. The FHWA disagrees because the decision to place a warning sign is based upon engineering judgment and that the only mandatory warning signs are the advance railroad crossing warning sign and certain horizontal alignment warning signs in certain conditions.

94. In Section 2B.47 Design of Parking, Standing, and Stopping Signs (Section 2B.40 in the 2003 MUTCD), the FHWA adopts several changes to the colors of the borders of parking signs, as proposed in the NPA. The FHWA revises paragraph 03 to reflect that the Parking Prohibition signs R8–4 and R8–7 and the alternate design for the R7–201aP plaque shall have a black legend and border on a white background, and the R8–3 sign shall have a black legend and border and a red circle and slash on a white background. A traffic engineering consultant supported the black border, while a local DOT opposed the use of a black border. The FHWA adopts the color changes to reflect the existing designs of these specific signs.

Based on a comment from an NCUTCD member, the FHWA relocates the VAN ACCESSIBLE plaque from this section and Figure 2B–24 to Chapter 2I and Figure 2I–1. As part of this change, the FHWA changes its sign designation to D9–6a. The FHWA also changes paragraph 08 to a STANDARD to require that a VAN ACCESSIBLE plaque be installed below the R7–8 sign where parking spaces that are reserved for persons with disabilities are designed to accommodate wheelchair vans. The FHWA adopts this change to reflect Section 502.6 of the Americans with Disabilities Act. A traffic engineering consultant opposed this requirement and questioned how agencies are to enforce the requirement on private property. As discussed previously under the MUTCD Introduction, the FHWA deletes the requirement for MUTCD applicability to parking lots.

The FHWA also adds information in this STANDARD (paragraph 08) that specifies the required colors of the R7–8 sign and the R7–8P plaque to reflect the existing color schemes for this sign and plaque as illustrated in Figure 2B–24. A local DOT opposed the colors for the R7–8 sign, because all of the signs in that State have white lettering on a blue background. The FHWA disagrees and notes that such signs do not conform to the MUTCD standard design of green legend and border with white on blue ADA symbol. The FHWA notes that it did not propose a change to the existing sign design in the NPA.

Finally, the FHWA adds information, as proposed in the NPA, regarding the use of Pay for Parking and Parking Pay Station signs where a fee is charged for parking and a midblock pay station is used instead of individual parking meters. The FHWA adopts these signs to

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[44] "Guidelines and Recommendations to Accommodate Older Drivers and Pedestrians," FHWA Report no. FHWA–RD–01–051, May 2001, can be viewed at the following Internet Web site: *http://www.tfhrc.gov/humanfac/01105/cover.htm.* Recommendation I.K(1).

[45] "Roadside Design Guide, 3rd Edition," 2002, is available for purchase from the American Association of State Highway and Transportation Officials, via the Internet Web site: *https://bookstore.transportation.org/item_details.aspx?ID=148.*

reflect current practice in many areas where cities and towns are replacing individual parking space meters with a ''pay and display'' system. The FHWA adopts a design for the fee station sign that is very similar to a standard European symbol, because the results of the Sign Synthesis Study[46] showed that several U.S. cities are using a sign very similar to the European design. ATSSA and a local DOT supported the addition of the Pay for Parking series of signs; however, an NCUTCD member suggested that the signs needed to be more standardized. The FHWA agrees and removes the signs designated as R7–21a and R7–22a from the text of this final rule and Figure 2B–24. Based on comments from the NCUTCD, the FHWA also adopts an OPTION statement regarding the color-coding of time limits to provide clearer and quicker recognition by the driver for different time limits.

95. In Section 2B.51 Pedestrian Crossing Signs (Section 2B.44 in the 2003 MUTCD), the FHWA proposed in the NPA to add a GUIDANCE statement to recommend that No Pedestrian Crossing signs be supplemented with detectable guidance, such as grass strips, landscaping, planters, fencing, rails or barriers, in order to provide pedestrians who have visual disabilities with additional guidance as to where not to cross. A local DOT supported the revision as proposed in the NPA. Three associations for the visually impaired, an orientation and mobility specialist, and seven citizens suggested that this statement be strengthened to a requirement because, without a physical restriction of the crossing, pedestrians who are visually impaired might cross at a location without realizing that crossing is prohibited, creating a dangerous situation. While the FHWA understands the concerns raised by the commenters, there are too many variables to make this action mandatory. Many sites cannot accommodate physical barriers, as evidenced by two local DOTs that requested that this statement be an option because they felt that the recommendation was too restrictive and unachievable in many instances, especially within already built environments. In addition, a State DOT and two local DOTs commented that the items proposed in the NPA for creating the physical barrier are not traffic control devices, and therefore should not be included in the MUTCD. The FHWA agrees that this statement is not appropriate for the MUTCD and does not adopt the language in this final rule.

96. In the changes adopted in this final rule the FHWA separates the material proposed in the NPA for Section 2B.59 Traffic Signal Signs (Section 2B.45 of the 2003 MUTCD) into three separate sections. The FHWA believes that separating the material into three sections, based on the type of signs, will make it easier for practitioners to find information about the various types of signs. The new sections are adopted in this final rule as Section 2B.52 Traffic Signal Pedestrian Actuation Signs, Section 2B.53 Traffic Signal Signs, and Section 2B.54 No Turn on Red Signs.

97. In Section 2B.52 Traffic Signal Pedestrian and Bicycle Actuation Signs, the FHWA revises paragraphs 02 and 03 and the sign images in Figure 2B–26 to correspond with adopted changes in Chapter 4E requiring that signs for pedestrian pushbuttons clearly indicate which crosswalk signal is actuated by each pedestrian detector. The revisions eliminate the use of the R10–1, R10–3, and R10–4 sign designs (as shown in the 2003 MUTCD) because these do not identify a specific crosswalk, and therefore do not meet the requirements in Chapter 4E. ATSSA supported the new sign designs as proposed in the NPA; however, a State DOT and two traffic control device vendors opposed the creation of new pedestrian crosswalk signs. The commenters suggested that the multiple changes in signs place a costly burden on both the industry and local municipalities for new artwork, tooling, and mixed inventory of signs, which in turn compromises uniformity. The FHWA disagrees with the opponents' comments because it is important that pedestrians be given a clear indication of which crosswalk the pushbutton controls.

A State DOT and two local DOTs opposed removal of the R10–4b sign, because they are using the sign and feel it is readily understood by the public. The FHWA disagrees and removes the existing R10–4b sign, because the new R10 series signs include an illustration of a hand with a finger touching the pushbutton. The NCUTCD, ATSSA, and a local DOT supported the new hand illustration. A traffic control device vendor and a citizen opposed the increase in size of pedestrian signs from 9 inches x 12 inches to 9 inches x 15 inches to accommodate the finger symbol. The commenters felt that the existing size is sufficiently large enough and that the larger size will increase the cost of the sign and potentially encourage graffiti. A State DOT, three local DOTs, three NCUTCD members, four bicycle/pedestrian associations, two traffic control device vendors, and a citizen opposed the use of the hand illustration in the sign designs because of concerns about user understanding and the size and orientation of the hand illustration in relation to the arrow on the sign. The FHWA believes that, based on Canadian usage, the hand illustration will be understood by users and that addition of the symbol justifies the slightly larger sign size; however, in response to the comments, in this final rule the FHWA adds a GUIDANCE paragraph 05 to recommend that the orientation of the finger should point in the respective direction of the arrow on the signs, and revises the sign images in Figure 2B–26 accordingly.

A local DOT suggested that the legend on the educational plaques for the R10–3e and R10–3i signs be revised to more accurately reflect the instructions that should be given to pedestrians at a crosswalk with countdown signals. As a result, the FHWA revises the legend to be consistent with the text of Section 4E.02. The FHWA adopts the new sign designs and revises the text in this section to clarify how to use the R10 series of pushbutton signs appropriately.

The FHWA also adds paragraphs 07 and 08 regarding the use of new R10–24 and R10–26 signs, where a pushbutton detector has been installed exclusively to actuate a green phase for bicyclists, and a new R10–25 sign, where a pushbutton detector has been installed for pedestrians to activate In-Roadway Warning Lights or flashing beacons. Bikes need less time to cross than pedestrians do, so the pushbuttons actuate timing specifically appropriate for bikes, which is an operationally efficient strategy. The FHWA received comments from the NCUTCD, two of its members, a State DOT, and four bicycle/pedestrian associations in support of the new R10–24 sign, but with suggestions to rephrase the wording to specify a ''green phase for bicyclists,'' rather than a ''special bicycle phase.'' The FHWA agrees and adopts the new sign, and associated revised text, as well as an alternative design with an arrow designated R10–26, in this final rule. ATSSA and an association for the blind supported the new R10–25 sign to activate warning lights. The association for the blind suggested changing the text on the sign to ''flashing lights'' to clarify the message. The FHWA adopts in this final rule these new signs to reflect current practice as documented by the

[46] ''Synthesis of Non-MUTCD Traffic Signs,'' FHWA, December 2005, page 27, can be viewed at the following Internet Web site: *http://tcd.tamu.edu/documents/rwstc/Signs_Synthesis-Final_Dec2005.pdf.*

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Sign Synthesis Study,[47] and to provide consistent and uniform messages for these purposes.

In the NPA, the FHWA proposed to add a new FOR MORE CROSSING TIME HOLD BUTTON DOWN FOR 2 SECONDS (R10–32P) sign to this section for use where an extended push button press is used to provide additional crossing time. Although two local DOTs were opposed to this sign, stating that it might lead to pedestrian confusion, or might be used inappropriately, the FHWA adopts this sign in this final rule, with a revised legend which more clearly communicates to pedestrians the meaning than the legend that was proposed in the NPA, to correspond with comparable provisions in adopted in Chapter 4E. The FHWA also illustrates the sign image in Figure 2B–26. The adopted sign legend is PUSH BUTTON FOR 2 SECONDS FOR EXTRA CROSSING TIME.

98. In Section 2B.53 Traffic Signal Signs, the FHWA deletes the first GUIDANCE statement that appeared in the 2003 MUTCD. This statement, regarding the placement of Traffic Signal signs adjacent to traffic signal faces, was overly broad. Instead, in this final rule, the FHWA specifically recommends the locations of individual signs as appropriate.

The FHWA removes the LEFT TURN SIGNAL YIELD ON GREEN (R10–21) sign in this final rule, because the provisions in Part 4 that are the only reason for using this sign have been removed in the adopted text for Part 4. The FHWA also adds paragraphs 03 and 04 regarding the location of LEFT ON GREEN ARROW ONLY and LEFT TURN YIELD ON GREEN signs, independently and with an AT SIGNAL supplemental plaque, as proposed in the NPA. The FHWA adopts this language based on recommendations from the Older Driver handbook.[48]

Finally, to correspond with changes proposed in Part 4 to add a new Pedestrian Hybrid Beacon, the FHWA proposed a paragraph in the NPA that describes the use of a CROSSWALK STOP ON RED (R10–23) sign that is to be used in conjunction with pedestrian hybrid beacons. While ATSSA supported the new sign, four local DOTs opposed the new sign, primarily because they thought that it was not needed. Some commenters felt that road users should know to stop on a red signal and should not need a sign instructing them to do so. Other commenters felt that the sign would cause confusion, because road users are to stop on a solid red and then proceed on a flashing red after they stop, while other felt that they should have more flexibility to develop a better sign. The FHWA disagrees with the commenters because the extensive experience with the sign in Tucson, AZ has not indicated a problem with the sign being understood by road users and the sign is needed at pedestrian hybrid beacons to reinforce the regulatory requirements. To address a comment from a local DOT suggesting that the use of this sign be restricted to only locations with pedestrian hybrid beacons, but not required at all pedestrian hybrid beacons as proposed in the NPA, the FHWA adopts revised language in this final rule, to clarify that the sign is to be used only at locations with pedestrian hybrid beacons.

99. In Section 2B.54 No Turn on Red Signs, in paragraph 03, the FHWA adds item F to the list of conditions where consideration should be given to the use of No Turn on Red signs. In the NPA, the FHWA proposed that this item refer to locations where the skew angle of the intersecting roadways creates difficulty for older drivers to see traffic approaching from their left. The FHWA proposed this change based on recommendations from the Older Driver handbook.[49] A former NCUTCD member suggested that the specific criteria regarding skewed intersections should not be added, since sight distance to the left is covered under condition A. The FHWA disagrees with the commenter and retains item F in this final rule because the adequacy of sight distance is associated with the selection of adequate gaps for a right turn on red movement. Three State DOTs, two local DOTs, and an NCUTCD member suggested that turns at skewed intersections can be difficult for all drivers, not just older drivers, and suggested that FHWA delete the word ''older.'' The FHWA agrees and adopts item F in this final rule to indicate that skew angled intersections are difficult for all drivers, by deleting the word ''older.''

The FHWA adds paragraph 05 regarding the use of a blank-out sign instead of a NO TURN ON RED sign during certain times of the day or during portions of a signal cycle where a leading pedestrian interval is provided. An NCUTCD member supported this new information, and the FHWA adopts this new text to correspond to other changes in Part 4 regarding the use of these signs. The FHWA also adds information regarding the use of a post-mounted NO TURN ON RED EXCEPT FROM RIGHT LANE sign and a NO TURN ON RED FROM THIS LANE (with down arrow) overhead sign that may be used on signalized approaches with more than one right-turn lane.

100. Concerning Figure 2B–27 Traffic Signal Signs and Plaques (Figure 2B–19 in the 2003 MUTCD) proposed in the NPA, the FHWA received comments from ATSSA, a State DOT, a local DOT, an NCUTCD member, and a traffic engineering consultant supporting the design change of the TURNING TRAFFIC MUST YIELD TO PEDESTRIANS (R10–15) sign to a symbolic, rather than word message sign. An NCUTCD member, a State DOT, and a local DOT opposed the new design because of the use of yellow (normally reserved for warning signs) on the regulatory sign background and the symbols and sign layout. The sign design has been extensively and successfully used by the New York City DOT[50] and was reviewed favorably by the Regulatory and Warning Sign Technical Committee and the full NCUTCD. The FHWA adopts this new design to reduce the number of words, give a more precise symbolized message, and make the sign more conspicuous to road users.

ATSSA and a local DOT supported the proposed LEFT TURN YIELD ON FLASHING RED ARROW AFTER STOP (R10–27) sign; however, a State DOT and an NCUTCD member opposed this new sign because they felt that road users should stop, rather than yield at a red signal. The FHWA disagrees and adopts the sign as proposed in the NPA, noting that the legend that begins with ''LEFT TURN YIELD * * *'' has been evaluated as the preferable text and it includes the words ''AFTER STOP.'' Another State DOT and a traffic engineering consultant suggested adding similar signs to alert road users to yield on flashing yellow arrows. The FHWA does not adopt this suggested addition,

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[47] ''Synthesis of Non-MUTCD Traffic Signs,'' FHWA, December 2005, page 29, can be viewed at the following Internet Web site: *http://tcd.tamu.edu/documents/rwstc/Signs_Synthesis-Final_Dec2005.pdf.*

[48] ''Guidelines and Recommendations to Accommodate Older Drivers and Pedestrians,'' FHWA Report no. FHWA–RD–01–051, May 2001, can be viewed at the following Internet Web site: *http://www.tfhrc.gov/humanfac/01105/cover.htm.* Recommendation I.H(4).

[49] ''Guidelines and Recommendations to Accommodate Older Drivers and Pedestrians,'' FHWA Report no. FHWA–RD–01–051, May 2001, can be viewed at the following Internet Web site: *http://www.tfhrc.gov/humanfac/01105/cover.htm.* Recommendations I.A(3) and I.I(3).

[50] Information on New York City's experience with the adopted R10–15 sign design can be obtained from the New York City Department of Transportation, Division of Traffic Planning, Room 928, 40 Worth Street, New York, NY 10013, telephone 212–442–6641.

because NCHRP Report 493 [51] found that a regulatory sign is not needed to instruct drivers to yield on flashing yellow arrows.

101. In Section 2B.55 Photo Enforced Signs and Plaques (Section 2B.46 in the 2003 MUTCD) and Figure 2B–3, the FHWA adds to the word message PHOTO ENFORCED (R10–19) plaque (as it existed in the 2003 MUTCD) the option to use a new symbol plaque for Photo Enforced. The FHWA retains the existing word message plaque as an alternate. In addition, the FHWA revises the design of the TRAFFIC LAWS PHOTO ENFORCED (R10–18) sign to add the symbolic camera. Although ATSSA and a local DOT supported the new camera symbol on the Photo Enforced signs and plaques, two NCUTCD members, two State DOTs, and two local DOTs opposed the addition of the new symbol because they did not think that road users would understand the symbol. The FHWA disagrees and adopts the new symbol based on road user understanding of the symbol documented in research results of the ''Evaluation of Selected Symbol Signs'' study [52] conducted by the Traffic Control Devices Pooled Fund Study. To address comments from two toll road operators and a State DOT, the FHWA also adds an OPTION and a GUIDANCE regarding the optional use of the Photo Enforced symbol or word message plaques at toll plazas to address situations where video enforcement is in use at toll plazas.

102. The FHWA adds a new section numbered and titled Section 2B.56 Ramp Metering Signs. In the NPA, the FHWA proposed to add a GUIDANCE statement describing the recommended use of new regulatory signs that should accompany ramp control signals. Based on comments from the NCUTCD and a State DOT, the FHWA adopts the language as an OPTION statement. This allows agencies to determine whether the use of the signs is appropriate for their conditions based on enforcement experience. The FHWA adds these new signs because ramp metering signals are used in several States, but there were no standard signs for them in the 2003 MUTCD, so States have developed a variety of signs, as documented by the Sign Synthesis Study.[53] In this new Section, the FHWA adopts two new signs, X VEHICLES PER GREEN and X VEHICLES PER GREEN EACH LANE. ATSSA and a local DOT supported these new signs. Another local agency expressed concerns that allowing more than one vehicle per green might cause driver confusion, especially if they are behind a large vehicle on a ramp. The FHWA adopts these signs based upon effective application in many States and to provide uniformity in ramp meter signing.

103. In Section 2B.60 Weigh Station Signs (Section 2B.50 of the 2003 MUTCD), the FHWA changes the text of the R13–1 sign to ''TRUCKS OVER XX TONS MUST ENTER WEIGH STATION—NEXT RIGHT'' to reflect that the message is regulatory, rather than guidance. A local DOT supported this change. Although three State DOTs and two NCUTCD members suggested that either the original language be retained, or other revisions be made to the sign text, the FHWA adopts the text of the sign as proposed in the NPA. The FHWA notes that a State at the time of its adoption of the MUTCD may include appropriate additional information in its supplement. In addition, in Figure 2B–30, the FHWA illustrates the customary regulatory sign color of a black legend on a white background, rather than the allowable option of the reverse color pattern, for the TRUCKS OVER XX TONS MUST ENTER WEIGH STATION—NEXT RIGHT sign. ATSSA supported this change in the illustration.

104. The FHWA adds a new section numbered and titled Section 2B.64 Headlight Use Signs, containing GUIDANCE, SUPPORT, and OPTION statements that describe the use of several new signs that may be used by States to require road users to turn on their vehicle headlights under certain conditions. ATSSA and a local DOT supported the new signs, as proposed in the NPA. An NCUTCD member opposed this new section because he felt that the installation of these types of signs is already covered in other sections in the MUTCD, and that since wording of the signs is based on laws that vary from State to State, it is not appropriate to standardize a series of signs in the MUTCD. The Sign Synthesis Study [54] found that there is a wide variation in the legends currently being used by States for this purpose and the FHWA adopts these new signs to provide increased uniformity of the messages for road users. Based on comments from two State DOTs and a traffic engineering consultant, the FHWA does not adopt the proposed TURN OFF HEADLIGHTS sign from this final rule, because commenters felt that it might communicate an inappropriate message to road users during nighttime conditions.

105. The FHWA adds a new section numbered and titled Section 2B.65 FENDER BENDER Sign. This new section contains an OPTION statement regarding the use of a new FENDER BENDER MOVE VEHICLES FROM TRAVEL LANES sign that agencies may use to inform road users of laws or ordinances that require them to move their vehicles from the travel lanes if they have been involved in a minor non-injury crash. As an integral part of active incident management programs in many urban areas, an increasing number of States and cities are using signs requiring drivers that have been involved in relatively minor ''fender bender'' or non-injury crashes to move their vehicles out of the travel lanes. A variety of sign messages are in use for this purpose, as documented by the Sign Synthesis Study.[55] Although ATSSA and a State and a local DOT supported the new sign, as proposed in the NPA, the NCUTCD and two of its members and three State DOTs provided comments about the sign design. Several of the commenters from Arizona suggested that the term ''Fender Bender'' be revised to reflect the wording of signs in their State. A few commenters suggested that the use of yellow and white backgrounds on the same sign is inappropriate, and many of the commenters opposed the symbol for fender bender, because they did not feel that it had been tested for road user comprehension. Based on the comments, the FHWA removes the symbol from the sign but is adopting the black on yellow header panel in the design, noting that the regulatory portion of the sign is a black legend and border on a white background. The FHWA adopts this sign because a standardized sign legend is needed.

106. In this final rule, the FHWA changes the number and title of Section

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[51] NCHRP Report 493, ''Evaluation of Traffic Signal Displays for Protected/Permissive Left-Turn Control,'' 2003, can be viewed at the following Internet Web site: *http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_493.pdf.*

[52] ''Design and Evaluation of Selected Symbol Signs,'' Final Report, May 2008, conducted by Bryan Katz, Gene Hawkins, Jason Kennedy, and Heather Rigdon Howard, for the Traffic Control Devices Pooled Fund Study, can be viewed at the following Internet Web site: *http://www.pooledfund.org/documents/TPF–5_065/symbol_sign_report_final.pdf.*

[53] ''Synthesis of Non-MUTCD Traffic Signs,'' FHWA, December 2005, pages 28–29, can be viewed at the following Internet Web site: *http://tcd.tamu.edu/documents/rwstc/Signs_Synthesis-Final_Dec2005.pdf.*

[54] ''Synthesis of Non-MUTCD Traffic Signs,'' FHWA, December 2005, page 31, can be viewed at the following Internet Web site: *http://tcd.tamu.edu/documents/rwstc/Signs_Synthesis-Final_Dec2005.pdf.*

[55] ''Synthesis of Non-MUTCD Traffic Signs,'' FHWA, December 2005, page 31, can be viewed at the following Internet Web site: *http://tcd.tamu.edu/documents/rwstc/Signs_Synthesis-Final_Dec2005.pdf.*

2B.54 Other Regulatory Signs, as it appeared in the 2003 MUTCD to Section 2B.66 Seat Belt Symbol. As discussed in item 54 above, the FHWA is relocating the OPTION statements that were in this section to Section 2B.02. In the NPA, the FHWA proposed to add a FENDER BENDER MOVE VEHICLES FROM TRAVEL LANES sign to this section and retitle the section to ''Miscellaneous Regulatory Signs''; however, as noted above, the FHWA adopts a new Section 2B.65 for the Fender Bender sign in this final rule and the only remaining text in Section 2B.66 discusses the Seat Belt Symbol. Therefore, the FHWA revises the section title to ''Seat Belt Symbol'' in this final rule.

107. In the NPA, the FHWA proposed to add a new chapter numbered and titled Chapter 2L Object Markers, Barricades, and Gates. In addition to containing information on object markers, this new chapter was to have contained information from Section 3F.01 of the 2003 MUTCD on barricades, without any significant changes. A State DOT, four local DOTs, and an NCUTCD member supported moving these items to Part 2. A State DOT opposed moving object markers and barricades to Part 2 because it felt that they are used to mark obstructions and help in guidance and delineation of the roadway, the same as pavement markings. The FHWA agrees that barricades and gates are more appropriately related to Chapter 2B, and places Section 2B.67 Barricades and Section 2B.68 Gates in this chapter.

108. The FHWA adds a new Section 2B.68 Gates (numbered 2L.06 in the NPA) that contains provisions regarding the design and use of gates for a variety for traffic control purposes beyond the most common use at highway-rail grade crossings. Two local DOTs supported this new section and several agencies provided comments. The NCUTCD, two State DOTs, and an NCUTCD member suggested that the FHWA provide clarification regarding whether one or both sides of gate arms and fences are to be reflectorized. The FHWA agrees and adds clarifying language in this final rule to indicate that both sides are to be reflectorized, with an option to reflectorize only the side facing moving traffic in the normal direction if used at ramps. Based on comments from the U.S. Department of Agriculture, a State DOT, two toll road operators, and an NCUTCD member, the FHWA removes the crashworthiness and mounting height requirements for gate arms to better serve their application. The FHWA adds a requirement that gates be designed so that the gate arms are securely locked in either the open position or closed position, based on a comment from the U.S. Department of Agriculture indicating that it is appropriate to lock gates securely in either of these positions. The FHWA adopts this new section in order to provide for enhanced uniformity of gates, as they are used in a wide variety of traffic control applications.

Discussion of Amendments Within Chapter 2C—General

109. In the NPA, the FHWA proposed to move object markers from Part 3 to a new chapter, titled Chapter 2L Object Markers. A State DOT, four local DOTs, and an NCUTCD member supported moving these items to Part 2. A State DOT opposed moving object markers to Part 2 because it felt that they are used to mark obstructions and help in guidance and delineation of the roadway, the same as pavement markings. The FHWA disagrees with retaining object markers in the chapter with pavement markings because, although these devices can provide some delineation, the primary function of object markers is as a warning sign. Due to the warning function that object markers serve, in this final rule the FHWA moves object markers to Chapter 2C and revises the title of Chapter 2C to include object markers.

110. As proposed in the NPA, the FHWA removes the following word message signs from the MUTCD, because comparable symbol signs have been in use for 35 years, thereby making these word signs obsolete: HILL Sign (W7–1b), DIVIDED HIGHWAY (W6–1a) and DIVIDED ROAD (W6–1b), DIVIDED HIGHWAY ENDS (W6–2a) and DIVIDED ROAD ENDS (W6–2b), STOP AHEAD (W3–1a), YIELD AHEAD (W3–2a), and SIGNAL AHEAD (W3–3a). A State DOT opposed eliminating the use of many of these word signs, because it felt that the word message signs were added to and included in previous editions of the MUTCD to enable agencies to use the optional signs for the benefit of better understanding of signs. The commenter also suggested that since the word messages are fulfilling the purpose for signs, it is difficult to justify the cost of replacing the signs. The FHWA disagrees with the commenter and notes that the symbol designs for many of these signs have been in use for more than 35 years and that symbol warning signs are more readily recognized and comprehended by drivers with fewer driver errors. In addition, existing word message signs in good condition may remain in service until such point in time that they are replaced as part of the agency's periodic sign maintenance program.

Discussion of Amendments Within Chapter 2C—Specific

111. In Section 2C.02 Application of Warning Signs, the FHWA proposed in the NPA to remove paragraph 01 requiring the use of engineering studies or judgment in determining the use of warning signs. A State DOT and two local DOTs opposed the removal of this STANDARD because they felt that engineering studies or judgment are necessary. The FHWA agrees and retains the requirement in this final rule and adds a reference to Section 1A.09 regarding engineering studies and engineering judgment.

112. In Section 2C.03 Design of Warning Signs, in place of the existing paragraph in the OPTION statement, the FHWA adds two new paragraphs that describe allowable changes in warning sign sizes and designs, as proposed in the NPA. The FHWA adopts these changes to provide agencies with flexibility in designing signs to meet field conditions. This includes allowing sign sizes larger than Oversized in Table 2C–2 to be rectangular or square and modifications to be made to the symbols shown on intersection warning signs in order to approximate the geometric configuration of the roadway. A State and two local DOTs supported these new paragraphs and offered an editorial change that the FHWA adopts in this final rule.

Additionally, in the NPA the FHWA proposed to change paragraph 05 to a GUIDANCE statement to recommend, rather than merely allow, a fluorescent yellow-green background for warning signs regarding conditions associated with pedestrians, bicyclists, and playgrounds. While ATSSA supported this change, the NCUTCD and one of its members, many State and local DOTs, and a traffic engineering consultant opposed changing the language to GUIDANCE, suggesting instead that it remain an OPTION. The commenters provided a variety of reasons, the most prominent being that some State and local DOTs reserve the use of the fluorescent yellow-green background for only school-related warning signs in order to add emphasis to those locations. A State and a local DOT, an NCUTCD member, a traffic engineering consultant, and a private citizen expressed concern about the lack of research supporting the effectiveness of the fluorescent yellow-green color that would justify elevating the provision to a recommendation, rather than an option. Some of the commenters suggested that an overuse of the fluorescent yellow-green would reduce the effectiveness of the color. In

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addition, some commenters said that the color fades more quickly over time, and that it is significantly more expensive than yellow. Based on the comments, the FHWA decides to retain the language as an OPTION in this final rule, allowing the use of a fluorescent yellow-green background for warning signs regarding conditions associated with pedestrians, bicyclists, and playgrounds.

The FHWA also adopts a new STANDARD statement requiring that warning signs associated with schools and school buses have a fluorescent yellow-green background, as proposed in the NPA. The FHWA also revises similar wording in other sections in Chapter 2C and in Part 7. In the intervening years since the use of fluorescent yellow-green background color was introduced as an option in the MUTCD, most highway agencies have adopted policies to use this color for school warning signs. This predominant usage is because of the enhanced conspicuity provided by fluorescent yellow-green, particularly during dawn and twilight periods. ATSSA and two local DOTs supported this change, while a State DOT, a State association of counties, and a local DOT suggested that the school bus sign should not be included in the requirement. As discussed in the preceding paragraph, a comment from Utah DOT suggesting State DOT, three local DOTs, and an NCUTCD member oppose any requirement to use fluorescent yellow-green. These commenters feel that there is not sufficient research demonstrating that the color modifies behavior and the high cost, along with the tendency to fade more quickly than yellow, does not justify requiring its use. The FHWA disagrees and notes that in-place evaluation of fluorescent yellow-green by State DOTs has identified acceptable durability and sheeting life and the FHWA also adopts this background color for school bus warning signs for consistency with the requirement for other school warning signs.

113. In Section 2C.04 Size of Warning Signs, the FHWA proposed in the NPA to add a STANDARD paragraph to establish a minimum size of 36 inches x 36 inches for all diamond-shaped warning signs facing traffic on multi-lane conventional roads. This is consistent with other changes adopted in Section 2A.13 and discussed previously in this preamble, concerning basing sign size dimensions on the letter sizes needed for a visual acuity of 20/40, which results in larger sign sizes. Although ATSSA and two local agencies supported the language as proposed, four State DOTs, six local DOTs, an NCUTCD member, and a traffic engineering consultant expressed concern about installing 36 inch x 36 inch signs on low-speed roads and on roads in urban areas where there is limited space for signs. Many of those commenters suggested that the larger size signs be optional for such roadways. Four additional local DOTs opposed the requirement for larger signs specifically because of insufficient space in urban areas. On multi-lane roads, increased legibility distances are needed because of the potential blockage of signs by other vehicles, but the FHWA agrees in part with the commenters and adopts revisions to this section in this final rule that are consistent with similar revisions to Section 2B.03 by adding two exceptions to the requirement to use the larger sign sizes on multi-lane conventional roads for: (a) The size of the left-hand side signs mounted in the median to supplement the right-hand side placement, and (b) multi-lane conventional roads with posted speed limits of 35 mph or less.

Finally, the FHWA adds a GUIDANCE statement that the minimum size for warning signs facing traffic on exit and entrance ramps should be the size identified in Table 2C–2 for the mainline roadway classification listed for each of the columns. In response to a comment from Utah DOT suggesting that this language be added for consistency with other sections of the MUTCD. This language is consistent with similar guidance that the FHWA adds in Section 2B.03 as discussed previously.

114. The FHWA revises Table 2C–2 Warning Sign and Plaque Sizes to incorporate additional sign series and to specify that, for several diamond-shaped signs, the minimum size required for signs facing traffic on multi-lane conventional roads is 36 inches x 36 inches. Based on comments from the NCUTCD (and to be consistent with a similar change in Table 2B–1), the FHWA adds a column to Table 2C–2 for multi-lane conventional roads in this final rule. The FHWA also adopts additional changes in Table 2C–2 to address comments from the NCUTCD and one of its members, and to provide consistency between the table and other changes within the chapter. These include adding additional sizes for signs and plaques, adding new signs while deleting signs no longer used, and clarifying the note at the bottom of the table regarding exceptions to the requirement to use the larger sign sizes on multi-lane conventional roads (as discussed above). The FHWA adopts the increases in sign sizes to provide signs on multi-lane approaches that are more legible to drivers with visual acuity of 20/40 and to be consistent with and incorporate other changes adopted in Chapter 2C.

115. As proposed in the NPA, the FHWA revises in Section 2C.05 Placement of Warning Signs the SUPPORT and GUIDANCE statements to refer to the use of Perception-Response Time (PRT), rather than Perception, Identification, Emotion, and Volition (PIEV) Time, in determining the placement of warning signs. The older terminology of PIEV Time has been replaced with PRT, which has come into common use and is the terminology used in the current policies of the AASHTO. The Traffic Control Devices Handbook [56] addresses both terms, but correctly identifies PRT as the terminology now in common use. Accordingly, it is appropriate to update the MUTCD using the common terminology PRT. The NCUTCD and a local DOT supported these changes.

In addition to the changes adopted in Section 2C.05, the FHWA is also revising the notes for Table 2C–4 by replacing ''PIEV time'' with ''PRT,'' as well as other changes in the notes and values in Table 2C–4 in order to provide adequate legibility of warning signs for 20/40 visual acuity. Two State DOTs, four local DOTs, two traffic engineering consultants, and an NCUTCD member commented about the values as well as the notes in Table 2C–4. As a result, in this final rule the FHWA further refines the notes in this final rule regarding the legibility distance for Condition A. The FHWA notes that increasing the minimum legend size to 6 inches causes the table values to change from those in the 2003 MUTCD, and that the distances and associated notes in the table are guidance, which by its nature allows flexibility.

116. The FHWA adds a new section numbered and titled Section 2C.06 Horizontal Alignment Warning Signs, containing SUPPORT, STANDARD, and OPTION statements regarding the use of the new Table 2C–5 Horizontal Alignment Sign Selection, in which the FHWA establishes a hierarchal approach to use of these signs and plaques and defines required, recommended, and optional warning signs. A State DOT and four local DOTs supported the overall intent of the proposed new section and associated table, but felt that FHWA should modify the language to allow the use of engineering judgment rather than

[56] The Traffic Control Devices Handbook, 2001, is available for purchase from the Institute of Transportation Engineers, at the following Internet Web site: *http://www.ite.org*. PIEV and PRT are discussed on pages 34 to 39.

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require the use of Table 2C–5 and should clarify that actual prevailing speeds should be used when determining the need for horizontal alignment warning signs. Several of these agencies also commented in opposition to the requirement to place warning signs on arterials and collectors with average annual daily traffic (AADT) of over 1,000. To address some of the concerns, the FHWA revises the STANDARD statement in this final rule to clarify that alignment warning signs shall be used in accordance with Table 2C–5 based on the speed differential between the roadway's posted or statutory speed limit or 85th percentile speed, whichever is higher, and the horizontal curve's advisory speed. This change is consistent with the methodology on application of posted or statutory speed limit or 85th percentile speed is consistent with FHWA's ''Program Memorandum on Consideration and Implementation of Proven Safety Countermeasures,'' Measure #7, Yellow Change Intervals.[57] As part of this change, the FHWA also includes in the STANDARD statement the use of the prevailing speed in determining the speed differential to the horizontal curve's advisory speed along with posted and statutory speed and 85th percentile speed. Regarding the requirement to place warning signs on functionally classified arterials and collectors over 1,000 AADT, the FHWA believes that this is appropriate because these road classifications represent higher-volume roadways, which have a larger percentage of unfamiliar drivers, and have the potential to yield the largest safety benefits in reducing crashes resulting from road users' lack of awareness of a change in horizontal alignment, as documented in a recent NCHRP study.[58] The FHWA retains the option to use Horizontal Alignment Warning signs on other roadways or on arterial and collector roadways with less than 1,000 AADT based on engineering judgment.

Nine State DOTs, six local DOTs, two NCUTCD members, and a citizen opposed the inclusion of Table 2C–5 in the MUTCD, or suggested that the some or all of the values in the table be recommended, rather than required, because they felt that engineering experience and judgment are superior to prescribing values. The FHWA disagrees and notes that fatalities at horizontal curves account for 25 percent of all highway fatalities even though horizontal curves are only a small portion of the nation's highway mileage. The past and current basis of the application of engineering judgment for determination of horizontal curve signing has not sufficiently improved the safety performance of horizontal curves. Therefore, the FHWA adopts Table 2C–5 with revisions as a STANDARD statement to improve the safety performance of horizontal curves. Six State DOTs, five local DOTs, a State association of counties, and two traffic engineering consultants suggested that the row concerning Chevron signs should be deleted, that the wording be reverted to that used in the 2003 Edition of the MUTCD, and that the use of Chevron signs not be required. The FHWA disagrees and adopts in this final rule the Chevron signs and their values, as proposed in the NPA based upon research regarding their safety effectiveness[59] and because Chevron signs are a key element in the hierarchy of horizontal alignment warning signs in that Chevron signs provide positive guidance to a road user entering a curve as to alignment of the road and the sharpness of the curve. However, based on comments from the NCUTCD, five State DOTs, five local DOTs, a State association of counties, and a traffic engineering consultant expressing concerns that application of the speed differential in proposed Table 2C–5 to freeway ramps would have resulted in the placement of Truck Rollover warning signs on the majority of the loop ramps on the nation's highway system which would be a financial burden to highway agencies, the FHWA deletes the Truck Rollover warning sign from Table 2C–5. The incidence of truck rollover crashes is more specific to individual freeway ramp geometry than to speed differential.

117. In concert with the changes adopted in the previous item, the FHWA adopts several changes to Section 2C.07 Horizontal Alignment Signs (Section 2C.06 of the 2003 MUTCD) to incorporate the material in Table 2C–5 and to provide agencies with additional information on the appropriate use of horizontal alignment signs. In the NPA, the FHWA proposed to add a GUIDANCE statement recommending the use of a Turn (W1–1) sign instead of a Curve sign in advance of curves that have advisory speeds of 30 mph or less. A State DOT, two local DOTs, and a NCUTCD member suggested that the statement be changed to a STANDARD to promote uniformity. The FHWA agrees and adopts the requirement in this final rule. In the 2003 MUTCD, a GUIDANCE statement indicated that Table 2C–5 should be used, and Note 1 of the table stated that ''Engineering judgment should be used to determine whether the Turn or Curve Sign should be used.'' In the NPA the FHWA proposed to delete this table and its notes and replace it with a completely new Table 2C–5 referenced in the text in a STANDARD that the table shall be used. Inherent in new Table 2C–5 is a definitive choice, either required (STANDARD), or recommended (GUIDANCE), or Option (OPTION); an option to choose either the TURN or the CURVE for the same advisory speed and speed difference is no longer possible within the STANDARD statement. Hence, the addition of the STANDARD statement is consistent with the STANDARD in Table 2C–5 rather than carrying forward a note from the old table. The FHWA also revises the language regarding the use of the Winding Road sign to allow its use to be optional, rather than recommended, based on comments from the NCUTCD and a local DOT. The FHWA also adds Figure 2C–2 to illustrate an example of the use of warning signs for a turn, and modifies Figure 2C–3 (Figure 2C–7 in the 2003 MUTCD) to illustrate horizontal alignment signs for a sharp curve on an exit ramp.

118. As proposed in the NPA, the FHWA relocates Section 2C.46 of the 2003 MUTCD Advisory Speed Plaque so that it appears earlier in the Chapter as Section 2C.08 because of its predominant application with horizontal alignment warning signs. In addition, the FHWA adopts several revisions to the section to incorporate new Table 2C–5, and to require that Advisory Speed plaques be used where it is determined to be necessary on the basis of an engineering study that follows established traffic engineering practices. A State DOT and several local DOTs in that State supported using engineering judgment, rather than engineering studies, for determining advisory speeds. The FHWA disagrees, noting that the application of engineering judgment that is implicit in the determination of an appropriate advisory speed should be documented in writing as an engineering study. A State DOT, a local DOT, and a traffic

[57] FHWA's Program Memorandum on Consideration and Implementation of Proven Safety Countermeasures, dated July 10, 2008 can be viewed at the following Internet Web site: *http://safety.fhwa.dot.gov/policy/memo071008/*.

[58] NCHRP Report 500, Volume 7, ''A Guide for Reducing Collisions on Horizontal Curves,'' can be viewed at the following Internet Web site: *http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_500v7.pdf*.

[59] The FHWA Roadway Departure Crash Reduction Factors can be viewed at the following Internet Web site: *http://safety.fhwa.dot.gov/tools/crf/*.

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engineering consultant suggested that eliminating references to ball-bank indicators, as proposed in the NPA, should be reconsidered, because it might cause agencies to unnecessarily believe that a more extensive engineering study is needed. The FHWA agrees and adopts in this final rule a SUPPORT statement identifying appropriate engineering practices for determining advisory speeds. This includes the use of an accelerometer, design speed evaluation, or a ball-bank indicator.

119. In Section 2C.09 Chevron Alignment Sign (Section 2C.10 of the 2003 MUTCD), the FHWA changes paragraph 01 to a STANDARD to require the use of the Chevron Alignment sign in accordance with the hierarchy of use as listed in Table 2C–5 and to be consistent with Section 2C.06. Similar to the discussion above in item 116, several commenters were opposed as they prefer to retain the choice to use Chevron Alignment signs based upon engineering judgment. The FHWA disagrees and adopts the STANDARD Table 2C–5 requiring the use of Chevron Alignment signs, because application of Chevron Alignment signs can reduce crashes on horizontal curves by 35 percent.[60] As proposed in the NPA, the FHWA also adds information to paragraph 04 regarding the minimum installation height of these signs. A local DOT and an NCUTCD member supported the minimum 4-foot mounting height, while two local DOTs suggested allowing even lower mounting heights, in part because they felt it would enable chevron signs to be better illuminated by headlights. The FHWA disagrees and adopts a minimum mounting height of 4 feet as an exception to the normal minimum mounting height for signs, consistent with provisions in Section 3F.04 for delineator placement. The FHWA also adds a reference in the GUIDANCE statement to Table 2C–6 Approximate Spacing of Chevron Alignment Signs on Horizontal Curves. The spacing criteria are based on research.[61]

The FHWA also adds a new STANDARD statement at the end of the section specifying the conditions when the Chevron Alignment sign shall not be used, as proposed in the NPA. Although a local DOT supported the revision, three State DOTs, a local DOT, and an NCUTCD member opposed the prohibition of Chevron Alignment signs at T-intersections to warn drivers that a through movement is not physically possible. The FHWA disagrees and adopts the prohibition on the use of the Chevron Alignment sign for this purpose, because this is the function of a Two-Direction (or One-Direction) Large Arrow sign. A State DOT supported the prohibition of Chevron Alignment signs to mark obstructions within or adjacent to the roadway, and the FHWA adopts in this final rule expanded text to also prohibit the use of the Chevron Alignment sign to mark the beginning of adjacent guard rail or barrier to address a comment from a local DOT. The FHWA adopts this text to preclude possible misinterpretations of the appropriate use of this sign.

120. In Section 2C.10 Combination Horizontal Alignment/Advisory Speed Signs (Section 2C.07 of the 2003 MUTCD), the FHWA amplifies the existing STANDARD statement in order to clarify how these signs are to be used. Although a local DOT supported the revised language, a State DOT, a local DOT, an NCUTCD member, and a traffic engineering consultant opposed the language. Some of the commenters felt that there are some locations where the Combination Horizontal Alignment/Advisory Speed sign serves the purpose better than the other advance horizontal alignment warning signs, and therefore should be used alone, as a substitute for the advance horizontal alignment warning signs. The FHWA disagrees because it is inherent in the application of warning signs that they be located in advance of the hazard in order to provide the time and distance for a road user to reduce speed and act in a timely manner. The FHWA also notes that the combination Horizontal Alignment/Advisory Speed sign shall only be used to supplement advance horizontal alignment warning signs. Furthermore, the advance horizontal alignment warning signs are placed in advance of the curve and the combination Horizontal Alignment/Advisory Speed sign is placed at the beginning of the curve. The FHWA adopts the revisions with minor editorial changes in this final rule.

121. In Section 2C.12 One-Direction Large Arrow Sign (Section 2C.09 in the 2003 MUTCD), the FHWA adds a STANDARD statement as proposed in the NPA prohibiting the use of a One-Direction Large Arrow sign in the central island of a roundabout, as proposed in the NPA. A traffic engineering consultant supported this change, and the FHWA adopts this change in this final rule in conjunction with other changes in Chapters 2B and 2D to provide consistency in signing at roundabouts.

122. In Section 2C.13 Truck Rollover Warning Sign (Section 2C.11 of the 2003 MUTCD), the FHWA had proposed in the NPA to add a STANDARD statement requiring the use of the Truck Rollover Warning sign on freeway and expressway ramps in accordance with the new Table 2C–5. Two State DOTs, an association of local DOTs, and an NCUTCD member opposed the required use of Truck Rollover warning signs because of concerns as noted above in Section 2C.06. The FHWA agrees and removes in this final rule that requirement from this section, as well as from Table 2C–5, as the incidence of truck rollover crashes is more specific to individual freeway ramp geometry than to speed differential.

In this final rule, the FHWA reverts to the optional use of the Truck Rollover warning sign (as in the 2003 Edition of the MUTCD) and adds the use of an engineering study to determine the need for the sign. As part of this change, the FHWA adds a SUPPORT statement describing appropriate engineering practices for determining recommended curve speeds.

123. As proposed in the NPA, the FHWA relocates Section 2C.36 of the 2003 MUTCD so that it appears earlier in the chapter as new Section 2C.14 to consolidate all sections relating to horizontal alignment in one area of the chapter for ease of reference and consistency. In addition, the FHWA revises the title of the section to ''Advisory Exit and Ramp Speed Signs'' and revises the text to remove the optional Curve Speed sign, as proposed in the NPA. Although a local DOT supported deleting the Curve Speed Advisory sign, a citizen opposed its removal. The Curve Speed sign has had only limited usage and, with the new hierarchal approach to warning sign usage for horizontal curves, this sign is no longer needed. The FHWA believes it is desirable to broaden the consistent usage of a few signs providing better driver communications rather than adding potential driver confusion with a mixed application of several signing options.

124. For all of the changes in applications of warning signs and plaques for horizontal curves in Sections 2C.06 through 2C.14 and in Table 2C–5, the FHWA establishes a target compliance date of December 31, 2019 (approximately 10 years from the effective date of this final rule) for the installation of the additional signs and revisions in advisory speed values

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[60] The FHWA Roadway Departure Crash Reduction Factors can be viewed at the following Internet Web site: *http://safety.fhwa.dot.gov/tools/crf/*.

[61] FHWA/TX–04/0–4052–1, ''Simplifying Delineator and Chevron Applications for Horizontal Curves,'' dated March 2004, can be viewed at the following Internet Web site: *http://tti.tamu.edu/documents/0-4052-1.pdf*.

required to achieve compliance with these provisions at existing locations. The FHWA establishes this target compliance date because of the demonstrated safety issues associated with run-off-the road crashes at horizontal curves. As noted above, fatalities at horizontal curves account for 25 percent of all highway fatalities, yet horizontal curves are only a small portion of the nation's highway mileage. The FHWA anticipates that installation of the required additional signs at existing locations will provide significant safety benefits to road users. State and local highway agencies and owners of private roads open to public travel can schedule the installation of the additional required signs in conjunction with their programs for maintaining and replacing other signs at existing locations that are worn out or damaged, thus minimizing any financial impacts.

125. The FHWA adds a new section numbered and titled Section 2C.15 Combination Horizontal Alignment/ Advisory Exit and Ramp Speed Signs. As proposed in the NPA, the FHWA incorporates these new signs for optional use where ramp or exit curvature is not apparent to drivers in the deceleration or exit lane or where the curvature needs to be specifically identified as being on the ramp rather than on the mainline. ATSSA, two local DOTs, an NCUTCD member, and a citizen supported these new signs. The FHWA adopts the design and the use of this sign based on the Sign Synthesis Study,[62] which found that at least four States have developed signs for this purpose, but with varying designs. The FHWA adopts a uniform design for this type of sign, to provide consistency for road users.

126. In the NPA, the FHWA proposed to relocate Section 2C.13 of the 2003 MUTCD Truck Escape Ramp Signs to Chapter 2F (Chapter 2I in this final rule), to reflect the proposed new classification and design of these signs as general service signs. As discussed in detail under Amendments to Chapter 2I, the FHWA retains Truck Escape Ramp signs as Section 2C.17 in this final rule. The FHWA also retains the warning sign designations for the associated signs, and retains the color of the background of these signs as yellow and the color of the legend, border, and arrows as black. The sign images for these signs are shown in Figure 2C–4 in this final rule.

127. In Section 2C.19 ROAD NARROWS Sign (Section 2C.15 in the 2003 MUTCD) the FHWA proposed in the NPA to revise the language describing the situations under which a ROAD NARROWS sign should be used. A local DOT and a State association of counties and several of its members suggested that the proposed language actually changed the intent of the section. As a result, the FHWA clarifies the language in this final rule to state that the ROAD NARROWS sign should be used in advance of a transition on two-lane roads where the pavement width is reduced abruptly to a width such that vehicles traveling in opposite directions cannot simultaneously travel through the narrow portion of the roadway without reducing speed. The FHWA also adds a SUPPORT statement to describe the optional use of this sign on low-volume local streets with speed limits of 30 mph or less.

128. In Section 2C.22 Divided Highway Sign (Section 2C.18 in the 2003 MUTCD), the FHWA adds a STANDARD that the Divided Highway (W6–1) sign shall not be used instead of a Keep Right (R4–7 series) sign in the median island, as proposed in the NPA. The FHWA adopts this change to reflect accepted signing practices and prevent misuse of the W6–1 sign.

129. In Section 2C.23 Divided Highway Ends Sign (Section 2C.19 of the 2003 MUTCD), as proposed in the NPA, the FHWA changes the OPTION statement to a GUIDANCE statement, recommending that the Two-Way Traffic (W6–3) sign should also be used to warn of the transition to a two-lane, two-way section. The FHWA adopts this change in this final rule in order to be consistent with the GUIDANCE in Section 2C.44 that the W6–3 sign should be used for this condition.

130. The FHWA adds a new section numbered and titled Section 2C.24 Freeway or Expressway Ends Signs (numbered Section 2C.23 in the NPA) containing OPTION and GUIDANCE statements regarding the use of these new signs. The FHWA adopts these new signs because there are many locations where a freeway or expressway ends by changing to an uncontrolled access highway, and it is important to warn drivers of the end of the freeway or expressway conditions. In other cases, the need for this type of warning might be generated by other conditions not readily apparent to the road user, such as the need for all traffic to exit the freeway or expressway on exit ramps. The Sign Synthesis Study[63] found that at least 21 States have developed their own standard warning signs for this purpose, but with varying legends and designs. The FHWA adopts uniform designs for these signs, to provide consistency for road users.

131. In the NPA, the FHWA proposed to change the title of Section 2C.31 (Section 2C.26 of the 2003 MUTCD) to ''Shoulder and Uneven Lanes Signs.'' The FHWA proposed to incorporate a new symbolic Shoulder Drop Off sign and a plaque, as well as a new UNEVEN LANES plaque, to warn road users of either a low shoulder or uneven lanes. The FHWA proposed these new signs and plaques as a result of the Sign Synthesis Study,[64] which found that symbol signs and/or different word messages are being used in at least 13 States to convey these or similar messages, with a wide variety of legends and symbol designs. The States are not consistent in how the symbol signs are used, with some being used for uneven lanes and some for low shoulder or shoulder drop-off conditions. The Canadian MUTCD prescribes a single standard symbol warning sign (TC–49) for use to warn of either a low shoulder or uneven lanes. The NCUTCD, one of its members, and a local DOT commented that an UNEVEN LANES word message warning sign is more appropriate than using a Shoulder Drop Off symbol with a supplemental UNEVEN LANES plaque to depict uneven lanes. The FHWA agrees that the proposed symbol sign tends to convey a meaning of shoulder drop off more than it does of uneven lanes and revises the language in this final rule to allow the use of an UNEVEN LANES word message sign to warn of a difference in elevation between lanes. Further, the FHWA relocates the text regarding the word message UNEVEN LANES sign to Section 2C.32 Surface Condition Signs in this final rule, because it is more appropriately located there. As part of this change, the FHWA does not adopt the UNEVEN LANES supplemental plaque, since the use of this plaque to supplement a Shoulder Drop Off symbol sign is not adopted. The FHWA retains the Shoulder Drop Off symbol sign to depict an unprotected shoulder drop-off, as stated in the 2003 Edition of the MUTCD.

In the NPA, the FHWA also proposed to add an optional use of the NO

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[62] ''Synthesis of Non-MUTCD Traffic Signs,'' FHWA, December 2005, page 43, can be viewed at the following Internet Web site: *http://tcd.tamu.edu/documents/rwstc/Signs_Synthesis-Final_Dec2005.pdf.*

[63] ''Synthesis of Non-MUTCD Traffic Signs,'' FHWA, December 2005, pages 43–44, can be viewed at the following Internet Web site: *http://tcd.tamu.edu/documents/rwstc/Signs_Synthesis-Final_Dec2005.pdf.*

[64] ''Synthesis of Non-MUTCD Traffic Signs,'' FHWA, December 2005, page 37, can be viewed at the following Internet Web site: *http://tcd.tamu.edu/documents/rwstc/Signs_Synthesis-Final_Dec2005.pdf.*

SHOULDER sign to allow agencies to use a sign of uniform legend that would warn road users that shoulders do not exist along the roadway. This sign and its design are based on the ''Sign Synthesis Study,'' [65] which found inconsistencies in the legends of signs currently in use by the States for this purpose. The NCUTCD suggested that road users would be better served by two signs, one indicating that there is no shoulder and another indicating that a shoulder ends. The FHWA agrees and adopts in this final rule two optional signs, the NO SHOULDER sign to warn of the lack of a shoulder on a short segment of a roadway without a shoulder, as proposed in the NPA, and a new SHOULDER ENDS sign to provide advance warning that a shoulder is ending. Although not proposed in the NPA, use of the new SHOULDER ENDS sign is optional, and the FHWA believes that some agencies may find it appropriate to use this sign.

132. The FHWA changes the title of Section 2C.32 to ''Surface Condition Signs'' (Section 2C.27 in the 2003 MUTCD) and incorporates several additional signs and supplemental plaques into this section, as proposed in the NPA. The FHWA adds information in the OPTION regarding the use of supplemental plaques with legends such as ICE, WHEN WET STEEL DECK and EXCESS OIL with the W8–5 sign to indicate the reason that the slippery conditions might be present.

The FHWA also adds information in the OPTION regarding the LOOSE GRAVEL and ROUGH ROAD word signs, as proposed in the NPA. These signs and plaques have been illustrated in the MUTCD and the SHSM book, but had not previously been discussed in the MUTCD text.

In addition, the FHWA incorporates the information from Section 2C.28 BRIDGE ICES BEFORE ROAD sign of the 2003 MUTCD into this section, as proposed in the NPA, in order to maintain cohesiveness of information.

Finally, in the NPA the FHWA proposed adding a new symbolic Falling Rocks sign and an educational plaque to this section to reflect common practice in many States to warn road users of the frequent possibility of rocks falling (or already fallen) onto the roadway. The Sign Synthesis Study [66] found a lack of consistency in the sign legends or symbols currently in use by States for this purpose. To provide consistency in sign design, the FHWA proposed to add a symbol sign (along with an educational plaque for use if needed) that may be used to warn road users of falling or fallen rocks, slides, or other similar situations. Although the most common sign currently used in the U.S. is a word sign, Canadian, Mexican, European, and international standards use symbols, all of which are very similar, for this message. The FHWA proposed to adopt the standard Mexican MUTCD symbol, because its design appeared to offer the best simplicity and legibility. Although ATSSA and a local DOT supported this new sign and plaque, the NCUTCD and one of its members opposed the symbol on the sign and the plaque because they felt that it would not be well understood by the travelling public and that a word sign would be more appropriate. The FHWA believes that additional human factors testing of alternative symbols for this message would be desirable prior to future consideration of adopting a symbol and therefore the FHWA does not adopt the symbol sign or plaque in this final rule. Instead, the FHWA adopts a FALLEN ROCKS word message sign.

133. As proposed in the NPA, the FHWA adds a new section numbered and titled Section 2C.33 Warning Signs and Plaques for Motorcyclists, that contains SUPPORT and OPTION statements regarding the use of two new warning signs and an associated symbolic plaque that may be specifically placed to warn motorcyclists of road surface conditions that would primarily affect them, such as grooved or brick pavement and metal bridge decks. The FHWA adds the new signs to promote needed sign uniformity, based on the results of the Sign Synthesis Study,[67] which found a variety of different messages in use by the States for these purposes. Subsequently, a study [68] evaluated several different motorcycle symbols and arrangements of such symbols both within the primary warning sign and as a supplemental plaque. The study found that the best legibility distance is provided by depicting a motorcycle on a supplementary plaque and that one particular style of motorcycle provides the best comprehension of the intended message. ATSSA, the Motorcycle Safety Foundation, a State DOT, a local DOT, and a citizen supported these new signs and plaques. As a result, the FHWA adopts word message signs with standardized legends of GROOVED PAVEMENT and METAL BRIDGE DECK and a new supplementary plaque featuring a side view of a motorcycle. Based on comments from three NCUTCD members, a traffic engineering consultant, and a citizen suggesting edits to the symbol and flexibility in the mounting of the plaque, the FHWA also clarifies the text and Figure 2C–6 in this final rule to show the motorcyclist on the plaque facing left and to allow the Motorcycle plaque to be mounted either above or below the sign if the warning is intended to be directed primarily to motorcyclists.

134. In the NPA, the FHWA proposed adding a new section numbered and titled Section 2C.34 NO CENTER STRIPE Sign. The FHWA adopts this new section based on a review of the 2003 MUTCD and 2004 SHSM book that revealed that the MUTCD did not contain language about this existing sign, which is illustrated in Figure 2C–6. However, in this final rule the FHWA revises the legend of the sign to NO CENTER LINE to reflect current terminology, and revises the title and text of Section 2C.34 accordingly.

135. As proposed in the NPA, the FHWA adds a new section numbered and titled Section 2C.35 Weather Condition Signs, containing OPTION and STANDARD statements regarding the use of four new signs to warn users of potential adverse weather conditions. The FHWA based the proposed signs on results of the Sign Synthesis Study [69] that showed that signs for various weather conditions were in very common use in many parts of the country, but with widely varying legends. In the NPA, the FHWA proposed to use the legend WATCH FOR FOG. Although ATSSA supported the proposed legend, the NCUTCD and one of its members and a local DOT suggested that ''WATCH FOR'' is unnecessary text on a warning sign. The FHWA agrees and adopts the legend FOG AREA in this final rule. ATSSA supported the GUSTY WINDS sign, while a State DOT, a local DOT, and an

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[65] ''Synthesis of Non-MUTCD Traffic Signs,'' FHWA, December 2005, page 37, can be viewed at the following Internet Web site: *http://tcd.tamu.edu/documents/rwstc/Signs_Synthesis-Final_Dec2005.pdf.*

[66] ''Synthesis of Non-MUTCD Traffic Signs,'' FHWA, December 2005, pages 37–38, can be viewed at the following Internet Web site: *http://tcd.tamu.edu/documents/rwstc/Signs_Synthesis-Final_Dec2005.pdf.*

[67] ''Synthesis of Non-MUTCD Traffic Signs,'' FHWA, December 2005, pages 39–40, can be viewed at the following Internet Web site: *http://tcd.tamu.edu/documents/rwstc/Signs_Synthesis-Final_Dec2005.pdf.*

[68] ''Design and Evaluation of Selected Symbol Signs,'' Final Report, May, 2008, conducted by Bryan Katz, Gene Hawkins, Jason Kennedy, and Heather Rigdon Howard, for the Traffic Control Devices Pooled Fund Study, can be viewed at the following Internet Web site: *http://www.pooledfund.org/documents/TPF-5_065/symbol_sign_report_final.pdf.*

[69] ''Synthesis of Non-MUTCD Traffic Signs,'' FHWA, December 2005, pages 38–39, can be viewed at the following Internet Web site: *http://tcd.tamu.edu/documents/rwstc/Signs_Synthesis-Final_Dec2005.pdf.*

NCUTCD member suggested alternate wording or questioned the need for the sign. The FHWA adopts the wording GUSTY WINDS, as proposed in the NPA as this message is simpler and clearer than any alternate wordings. ATSSA, a State DOT, a local DOT, and a citizen supported the new ROAD MAY FLOOD and Depth Gauge signs. The NCUTCD and a State DOT suggested revisions to clarify the placement of these optional signs to indicate the depth of the water at the deepest point on the roadway. The FHWA agrees with the suggested revisions and adopts them in this final rule because they provide clearer and less ambiguous information to road users. The FHWA adopts uniform designs for these signs to provide road users with consistent messages.

136. As proposed in the NPA, the FHWA adds a new section numbered and titled Section 2C.37 Advance Ramp Control Signal Signs, containing OPTION, GUIDANCE, and STANDARD statements regarding the use of two new signs. ATSSA and two local DOTs supported the addition of these signs to the MUTCD. The NCUTCD and a State DOT suggested clarifying the placement of the RAMP METERED WHEN FLASHING sign to allow flexibility in where it is placed. The FHWA agrees and revises the language accordingly in this final rule to clarify the GUIDANCE statement as to the placement of the sign in advance of the ramp control signal near the entrance to the ramp or on the arterial on the approach to the ramp. The FHWA also adopts the RAMP METER AHEAD and RAMP METERED WHEN FLASHING signs to provide uniformity of signing at ramp metering locations, especially because the practice of ramp metering continues to grow. The common existing use of these signs is documented in the Sign Synthesis Study [70] and is recommended in the FHWA's Ramp Management and Control Handbook.[71]

137. The FHWA changes the title of Section 2C.38 to ''Reduced Speed Limit Ahead Signs'' (Section 2C.30 of the 2003 MUTCD) to reflect the change of the sign name to be consistent with the Stop Ahead, Yield Ahead, and Signal Ahead warning sign names. A State DOT and a citizen supported the use of these signs.

As proposed in the NPA, and to correspond to changes adopted in Section 2B.13, the FHWA revises the GUIDANCE statement to recommend that a Reduced Speed Limit Ahead sign be used where the speed limit is being reduced by more than 10 mph, or where engineering judgment indicates the need for advance notice. A local DOT supported this revision. Two State DOTs suggested that it is infeasible to install reduced speed signs in advance of every 10 mph reduction in speed. The FHWA reiterates that the Reduced Speed Limit Ahead warning sign should be used for speed limit drops in excess of 10 mph and would remain only an option, rather than a recommendation, for a 10 mph difference in posted speed limits. The FHWA believes that reductions in speed limit of more than 10 mph are unexpected by road users and might require special actions to reduce speed before reaching the start of the lower speed zone, and thus justify the use of a warning sign. The FHWA adopts this change in order to provide consistency for determining where speed reduction signs should be placed.

138. The FHWA adds a new section numbered and titled Section 2C.39 DRAW BRIDGE Sign, as proposed in the NPA, that contains a STANDARD statement and a figure regarding the use of this sign. The FHWA adopts this new Section in this final rule because Section 4J.02 Design and Location of Moveable Bridge Signals and Gates (Section 4I.02 of the 2003 MUTCD) requires the use of the DRAW BRIDGE sign in advance of all drawbridges. Because the W3 series is used for advance warning signs and this sign is required in advance of the condition, it is appropriate to include the text and a figure in Chapter 2C, which covers Warning Signs. ATSSA supports the required use of this sign at drawbridges. Based on a comment from a local DOT, the FHWA revises the design of the W3–6 sign to be a two line legend warning sign with DRAW as the first line and BRIDGE as the second line, as Draw Bridge is two words rather than one in the dictionary and a two-line legend allows for larger letters that are more legible to road users, and deletes AHEAD from the legend, since the shape and color of the sign implies that the condition listed is ahead.

139. As proposed in the NPA, in Section 2C.40 Merge Signs (Section 2C.31 of the 2003 MUTCD), the FHWA adds an OPTION statement at the end of the section to incorporate the new NO MERGE AREA supplemental plaque that may be mounted below a Merge sign, an Entering Roadway Merge sign, a Yield Ahead sign, or a YIELD sign. The purpose of this plaque is to warn road users on an entering roadway or channelized right-turn movement that they will encounter an abrupt merging situation at the end of the ramp or turning roadway. ATSSA, two State DOTs, and a local DOT supported the new plaque. Two local DOTs opposed its use, suggesting that it might be misinterpreted. The FHWA believes that when there are only a few entrance ramps or channelized right turns in an area that do not have acceleration lanes, those few locations do not meet driver expectations. Therefore, the FHWA adopts this plaque in this final rule based on the results of the Sign Synthesis Study,[72] which indicated that some States routinely use this plaque to provide road users with important warning information for these conditions.

140. In Section 2C.42 Lane Ends Signs (Section 2C.33 of the 2003 MUTCD), the FHWA proposed in the NPA to allow the use of the W4–7 THRU TRAFFIC MERGE RIGHT (LEFT) sign, as a supplement to other signs, to warn road users in the right or left lane that their lane is about to become a mandatory turn or exit lane. ATSSA and the NCUTCD supported this new sign; however, a local DOT suggested that an additional sign is not needed, because the existing W9–1 and W9–2 Series signs already serve this purpose. The FHWA agrees and does not adopt the proposed use of this sign in this final rule. The FHWA believes this sign legend can be confusing when there are more than two through lanes. Instead, the FHWA adds a GUIDANCE statement in Section 2C.42 in this final rule to recommend the use of the RIGHT (LEFT) LANE ENDS (W9–1) adjacent to the Lane-Reduction Arrow pavement markings. The FHWA also clarifies the application of the W4–2, W9–1, and W9–2 warning signs in this final rule by adding a STANDARD statement prohibiting their use where a thru lane is designated as a mandatory turning lane approaching an intersection. The FHWA adopts these changes to be consistent with changes adopted in Sections 2B.20 and 3B .04. The FHWA retains the current use of the W4–7 sign for temporary conditions in Part 6.

141. The FHWA adds a new section numbered and titled Section 2C.43 RIGHT (LEFT) LANE EXIT ONLY AHEAD Sign. This section contains OPTION, STANDARD, GUIDANCE, and SUPPORT statements regarding the use

[70] ''Synthesis of Non-MUTCD Traffic Signs,'' FHWA, December 2005, page 34, can be viewed at the following Internet Web site: *http://tcd.tamu.edu/documents/rwstc/Signs_Synthesis-Final_Dec2005.pdf.*

[71] ''Ramp Management and Control Handbook,'' FHWA, January 2006, page 5–29, can be viewed at the following Internet Web site: *http://ops.fhwa.dot.gov/publications/ramp_mgmt_handbook/manual/manual/pdf/rm_handbook.pdf.*

[72] ''Synthesis of Non-MUTCD Traffic Signs,'' FHWA, December 2005, page 34, can be viewed at the following Internet Web site: *http://tcd.tamu.edu/documents/rwstc/Signs_Synthesis-Final_Dec2005.pdf.*

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of this new sign to provide advance warning of a freeway lane drop. ATSSA and two local DOTs supported this sign, while the NCUTCD and two of its members opposed the addition of this warning sign, because they felt that the sign should be a regulatory sign, since it is used when traffic is required to depart the roadway. The FHWA notes that this warning sign is for post-mounted application in advance of the RIGHT LANE MUST EXIT supplementary regulatory sign to the overhead guide sign EXIT ONLY where physical constraints prevent overhead signing of the EXIT ONLY sign. Several of the commenters suggested that the word ''AHEAD'' be deleted from the sign, because warning signs already imply that the condition is ahead. The FHWA retains the ''AHEAD'' legend in this final rule, because it warns of an exit requirement, which is different from many other warning signs. The FHWA adopts this sign based on the results of the Sign Synthesis Study [73] that showed several States use a similar warning sign for these conditions, particularly when overhead guide signs are not present on which to use EXIT ONLY plaques.

142. In the NPA, the FHWA proposed adding a new section numbered and titled Section 2C.46 Two-Way Traffic on a Three-Lane Roadway Sign. The proposed sign was a variant of the existing W6–1 two-way traffic warning sign. ATSSA and two local DOTs supported the sign; however, an NCUTCD member and a citizen expressed concern that the sign might convey inaccurate information to drivers if the sign rotated to an upside down position as the result of vandalism or sign damage. The FHWA agrees and does not adopt this section or the associated signs in this final rule.

143. As proposed in the NPA, the FHWA relocates the information from Section 2C.36 of the 2003 MUTCD Advisory Exit, Ramp, and Curve Speed Signs, to Section 2C.14 in order to place all horizontal alignment warning signs in the same area of Chapter 2C.

144. In Section 2C.46 Intersection Warning Signs (Section 2C.37 of the 2003 MUTCD), as proposed in the NPA, the FHWA adds an OPTION allowing an educational plaque with a legend such as TRAFFIC CIRCLE or ROUNDABOUT to be mounted below a Circular Intersection symbol sign. ATSSA and a local DOT supported this new plaque.

In the NPA, the FHWA proposed to delete from the GUIDANCE statement the recommendation that Circular Intersection symbol warning signs should be installed on the approaches to a YIELD sign controlled roundabout. Based on a comment from a traffic engineering consultant suggesting that advance notice of a circular intersection needs to be given on higher speed approaches, the FHWA decides not to delete the existing GUIDANCE statement in the 2003 MUTCD and instead retains the GUIDANCE statement with a modification that recommends installing the Circular Intersection (W2–6) symbol sign in advance of a roundabout if the approach has a statutory or posted speed limit of 40 mph or higher The FHWA also adds new Offset Side Roads and Double Side Roads symbols for use on Intersection Warning Signs to the GUIDANCE statement, as proposed in the NPA. ATSSA and a local DOT supported these symbol signs, while the NCUTCD and a traffic engineering consultant provided comments about the design of the Offset Side Road intersection warning sign. As a result, the FHWA adds two GUIDANCE statements providing recommendations that the Double Side Roads W2–8 symbol sign should be used instead of the Side Road symbol sign when two closely spaced side roads are on the same side of the highway, that no more than two side road symbols should be displayed on the same side of the highway on a W2–7 or W2–8 symbol sign, and no more than three side road symbols should be displayed on a W2–7 or W2–8 symbol sign. The FHWA adopts these new symbols to address the results of the Sign Synthesis Study,[74] which showed that variants of the W2–2 sign depicting offset side roads or two closely spaced side roads are used in many States, but the relative distance between the two side roads and the relative stroke widths of the roadways varies significantly. As a result, the FHWA adopts uniform designs in this final rule.

145. In Section 2C.47 Two-Direction Large Arrow Sign (Section 2C.38 of the 2003 MUTCD), the FHWA adopts the STANDARD statement as proposed in the NPA that the Two-Direction Large Arrow sign shall not be used in the central island of a roundabout. A traffic engineering consultant supported this restriction, while a local DOT suggested that this restriction was not needed, because no one would use the sign for that application. The FHWA notes that the Two Direction Large Arrow warning sign is frequently used inappropriately in the central island of a roundabout intersection. The FHWA adopts this change in this final rule in conjunction with other changes in Chapters 2B and 2D to provide consistency in signing at roundabouts.

146. In Section 2C.48 Traffic Signal Signs (Section 2C.39 of the 2003 MUTCD), as proposed in the NPA, the FHWA adopts text clarifying the STANDARD statement that W25–1 and W25–2 signs are to be vertical rectangles. Two local DOTs and an NCUTCD member opposed the existing provisions of requiring the use of the W25–1 and W25–2 signs to warn drivers of extended green signal indications in the opposite direction. The commenters felt that the sign text should be revised to improve the understanding of the legend, or should be eliminated. The FHWA notes that the provisions for their use are clearly indicated in the text referred to in Part 4, and that they are not required for all permissive left-turn applications, only for those few where a ''yellow trap'' signal sequence is operated.

147. In the NPA, the FHWA proposed adding a new Combined Bicycle/Pedestrian sign and TRAIL X–ING supplemental plaque in Section 2C.49 (Section 2C.40 of the 2003 MUTCD) Vehicular Traffic Warning Signs. With the increasing mileage of shared-use paths in the U.S., the number of places where shared-use paths, used by both bicyclists and pedestrians, cross a road or highway is also increasing. To provide advance warning of these crossings and to indicate the location of the crossing itself, the provisions of the STANDARD statements of the 2003 MUTCD made it necessary to use both the supplementary application of the W11–1 (bicycle) and W11–2 (pedestrian) crossing warning signs, mounted together on the same post at the crossing when used to supplement the advance warning placement, or sequentially along the road The Sign Synthesis Study [75] revealed that several States have developed combination signs to simplify and improve the signing for shared-use path crossings, using either a single sign with combined bicycle and pedestrian symbols or a word message sign with a variety of different legends. As a result, the FHWA proposed in the NPA a new Combined

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[73] ''Synthesis of Non-MUTCD Traffic Signs,'' FHWA, December 2005, page 35, can be viewed at the following Internet Web site: *http://tcd.tamu.edu/documents/rwstc/Signs_Synthesis-Final_Dec2005.pdf.*

[74] ''Synthesis of Non-MUTCD Traffic Signs,'' FHWA, December 2005, page 33, can be viewed at the following Internet Web site: *http://tcd.tamu.edu/documents/rwstc/Signs_Synthesis-Final_Dec2005.pdf.*

[75] ''Synthesis of Non-MUTCD Traffic Signs,'' FHWA, December 2005, page 42, can be viewed at the following Internet Web site: *http://tcd.tamu.edu/documents/rwstc/Signs_Synthesis-Final_Dec2005.pdf.*

Bicycle/Pedestrian sign and TRAIL X–ING supplemental plaque. ATSSA, a State DOT, and three local DOTs supported the Combined Bicycle/Pedestrian sign application and the design of the sign as proposed in the NPA. The NCUTCD and three of its members, four State DOTs, three local DOTs, an association representing local DOTs, five associations representing bicyclists and/or pedestrians, and three citizens supported the use of the Combined Bicycle/Pedestrian sign, but suggested that the design proposed in the NPA was confusing, tested poorly in research studies, or was unclear. As a result of those comments, the FHWA revises the sign design adopted in this final rule to show a bicycle symbol at the top of the sign and a pedestrian symbol at the bottom, as suggested by the NCUTCD. The FHWA also adds a TRAIL CROSSING word message alternative sign in this final rule because it agrees with a comment from the NCUTCD that such a sign might be needed in locations where the recreational path includes equestrians or snowmobiles.

ATSSA, a State DOT, two NCUTCD members and a traffic engineering consultant commented that the color of the Combined Bicycle/Pedestrian sign and TRAIL X–ING plaque shown in Figure 2C–10 should be changed to reflect that the standard background color is yellow, and that the fluorescent yellow-green color is optional. The FHWA agrees and revises the sign illustrations in this final rule accordingly, consistent with adopted revisions in Section 2A.10.

Although not proposed in the NPA, the FHWA adds an OPTION statement that the Combination Pedestrian/Bicycle symbol sign and TRAIL CROSSING word message sign may be supplemented with plaques with the legend AHEAD, XX FEET, or NEXT XX MILES when used in advance of a pedestrian and bicycle crossing. The FHWA adds this language in this final rule to provide consistency with other sections in the MUTCD involving the use of plaques with Vehicular Traffic Warning signs.

In addition, the FHWA adds a STANDARD to clarify that post-mounted Bicycle (W11–1), Golf Cart (W11–11), Combined Pedestrian/Bicycle (W11–15), and TRAIL CROSSING (W11–15a) signs shall be supplemented with a diagonal downward pointing arrow (W16–7P) plaque when used at a crossing. Although not proposed in the NPA, the FHWA adds this requirement to be consistent with the current STANDARD in the 2003 MUTCD (included in Section 2C.51 in this final rule) that requires the use of the W16–7P plaque at crossings.

148. In Section 2C.50 Non-Vehicular Warning Signs (Section 2C.41 of the 2003 MUTCD) the FHWA changes the 2nd OPTION statement in the 2003 Edition of the MUTCD to a GUIDANCE statement. Although not proposed in the NPA, the FHWA adopts this change to recommend the use of warning signs supplemented with plaques with the AHEAD or XX FEET legend when they are used with or in advance of a pedestrian, snowmobile, or equestrian crossing to inform road users that they are approaching a point where crossing activity might occur. The FHWA adopts this change in this final rule to be consistent with the use of these plaques at crossings, as required throughout the MUTCD. Application of the Non-Vehicular Warning signs without the plaques stating distance or AHEAD or downward sloping arrow at the crossing can be confusing to road users as to the location of the crossing. FHWA notes the serious consequences to a pedestrian or wheel chair bound user if the operator of a much heavier vehicle operator is confused as to the location where to expect them to enter the highway.

The FHWA also revises the existing STANDARD in paragraph 04 to clarify that the placement of a supplemental downward pointing arrow plaque shall be below post-mounted Non-Vehicular Warning signs, and to prohibit the use of the diagonal downward pointing arrow on overhead-mounted Non-Vehicular Warning signs. Although not proposed in the NPA, the FHWA adopts these clarifications in response to a comment from a State DOT suggesting that an arrow on an overhead sign would not be pointing to the appropriate location. The resulting STANDARD in this final rule specifies that the diagonal downward sloping arrow (W16–7P) plaque shall not be used with an overhead mounting of the W11–6, W11–7 or W11–9 Non-Vehicular Warning symbol signs. This is necessary so that the application of the W16–7 downward sloping arrow uniquely identifies the location of the crossing.

The FHWA adds STANDARD and OPTION statements regarding the combination use of the Yield Here To (Stop Here For) Pedestrian sign in the vicinity of the Pedestrian Crossing (W11–2) sign in this final rule that restricts blocking the view of the W11–2 sign, or placing it on the same post as a R1–5 series sign. These additional statements are necessary for consistency with the STANDARD and OPTION statements in Sections 2B.11 and 2B.12. The FHWA also adopts the OPTION statement to allow Pedestrian Crossing signs to be mounted overhead where Yield Here To (Stop Here For) signs have been installed in advance of the crosswalk. The FHWA also allows the use of advance Pedestrian Crossing (W11–2) signs on the approach with AHEAD or distance plaques at the crosswalk where Yield Here To (Stop Here For) Pedestrian signs have been installed. The FHWA adopts this new language to be consistent with similar language that is adopted in Part 7, which is based on FHWA's Official Interpretation # 2–566.[76]

In the NPA, the FHWA proposed to add a STANDARD statement that required school signs and their related supplemental plaques to have a fluorescent yellow-green background with a black legend and border to be consistent with changes in Chapter 2A and in Part 7. In this final rule, the FHWA relocates this statement to Section 2A.10 Sign Colors, based on comments from an NCUTCD member, a State DOT, a local DOT, and a traffic engineering consultant, suggesting that Section 2A.10 is a more appropriate location for the information, since that section discusses the color of signs.

In the NPA, the FHWA proposed to change paragraph 09 to a GUIDANCE statement to recommend, rather than merely permit, the use of fluorescent yellow-green for pedestrian, bicycle, and playground Non-Vehicular Warning signs and their supplemental plaques. The NCUTCD and two of its members, three State DOTs, and two local DOTs opposed including the Bicycle (W11–1) warning sign in this statement that elevates the use of the fluorescent yellow-green background to a recommendation (rather than an option as in the 2003 MUTCD), because Bicycle warning signs are not always school related. Because bicycles are defined as vehicles, the Bicycle W11–1 warning sign is a Vehicular Traffic Warning sign, and therefore the FHWA moves it to Section 2C.49 in this final rule. As discussed above in 2C.49, the use of fluorescent yellow-green is an option for Vehicular Traffic Warning signs, including the W11–1 sign. To be consistent with changes adopted in Section 2C.03 and discussed therein, in this final rule the FHWA adopts an OPTION to use fluorescent yellow-green for non-school Non-Vehicular Warning signs and their associated plaques.

[76] FHWA's Official Interpretation #2–566(I), July 27, 2005, can be viewed at the following Internet Web site: *http://mutcd.fhwa.dot.gov/resources/interpretations/2_566.htm.*

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149. In both Section 2C.49 Vehicular Traffic Warning Signs and Section 2C.50 Non-Vehicular Warning Signs (Sections 2C.40 and 2C.41 of the 2003 MUTCD), in the NPA the FHWA proposed to add OPTION statements regarding the use of Warning Beacons and supplemental WHEN FLASHING plaques to indicate specific periods when the condition or activity is present or is likely to be present. A local DOT supported this additional information; however, an NCUTCD member suggested that the language was confusing. The FHWA revises the language in this final rule to clarify the application of a supplemental WHEN FLASHING (W16–13P) plaque. The FHWA adopts these changes to clarify the allowable use of this plaque, for consistency with provisions regarding warning beacons contained in Part 4 of the 2003 MUTCD and in the adopted 2009 MUTCD.

150. In Figure 2C–11 (Figure 2C–12 in the NPA) Non-Vehicular Warning Signs, the FHWA adds images of new symbolic warning signs for moose, elk/antelope/caribou, wild horses (horse without a rider), burros/donkeys, sheep, bighorn sheep, and bears, as proposed in the NPA. The 2003 MUTCD included only three signs to warn of the possible crossings of large animals—deer crossing (W11–3), cattle crossing (W11–4), and equestrian crossing (horse with rider, W11–7). The prevalence of other types of large animals that might cross roads (and which might cause significant damage or injury if struck by a vehicle) has caused at least 16 States to develop signs (usually symbolic) for warning of one or more different animal crossings, as documented in the Sign Synthesis Study.[77] ATSSA supported the new large animal symbol signs, however a State DOT and a local DOT suggested that there is not sufficient research to show that the existing animal warning signs are effective, so there is no reason to add considerably more animal symbol warning signs. The NCUTCD and two of its members provided comments about the design of the bear, sheep, elk, moose, and wild horse symbols. Based on those comments, the FHWA revises the moose symbol in this final rule to show the animal with its head up and removes the grass from beneath the elk's feet. The FHWA adopts the new signs because the new animal symbols look significantly different from the three animal symbols in the 2003 MUTCD and the standard signs do not provide accurate meaning and adequate warning. The FHWA also adopts the uniform symbol designs to address the lack of consistency in the signs currently being used for this purpose by the States.

151. The FHWA adds a new section numbered and titled Section 2C.52 NEW TRAFFIC PATTERN AHEAD Sign, containing OPTION and GUIDANCE statements regarding the use of this sign to provide advance warning of a change in traffic patterns, such as revised lane usage, roadway geometry, or intersection control. ATSSA, an NCUTCD member, and a local DOT supported this sign as presented in the NPA. A State DOT, an NCUTCD member, two local DOTs, a traffic engineering consultant, and a citizen either opposed the message because they felt that it was not clear or suggested that alternate legends be added for this sign. A State DOT suggested deleting the sign and allowing agencies to develop a specific sign to indicate what is different. A State DOT, two local DOTs, and an NCUTCD member suggested that the background of the sign be orange, since it represents a temporary situation, and that the sign should be in Part 6, rather than in Part 2. The FHWA declines removing the proposed sign from Part 2 because it is a warning sign for a change in conditions that may not be associated with temporary traffic control. However, the FHWA also adds this sign in this final rule (with an orange background) in Chapter 6F. The FHWA understands that some agencies are using different legends; however, the FHWA declines adding additional legends to the MUTCD in order to establish a uniform design and most importantly a uniform meaning to road users. The FHWA adopts in this final rule the legend as shown in the NPA to reflect existing practices in many States and numerous local jurisdictions as documented in the Sign Synthesis Study[78] and to provide a uniform legend for this purpose, consistent with similar adopted changes in Part 6.

152. In Section 2C.58 Advance Street Name Plaque (Section 2C.49 of the 2003 MUTCD), as proposed in the NPA, the FHWA adds a requirement that the lettering on Advance Street Name plaques shall be composed of a combination of lower-case letters with initial upper-case letters. ATSSA and a citizen supported this change. Two State DOTs, two local DOTs, and an NCUTCD member supported the use of mixed-case letters, but suggested that their use not be mandatory. The commenters felt that there is not enough evidence to support the change to mandate the use of mixed-case letters and that the cost of replacing the signs is disproportionate to the benefit to be received by changing the letters. The FHWA disagrees that there are significant cost impacts, as existing Advance Street Name plaques in good condition may remain in service until such point in time that they are replaced as part of the agency's periodic sign maintenance program. The FHWA retains the requirement for mixed-use letters based on published research[79] that demonstrates the improved recognition and legibility distances for place names and destinations that are comprised of an upper-case first letter followed by lower-case lettering.

Consistent with the current design requirements in Chapter 2D for the application of directional arrows to Street Name signs and Advance Street Name signs, the FHWA adds a requirement that directional arrows be used adjacent to street names when two street names are used on the Advance Street Name plaque. The FHWA adopts this requirement in this final rule based on a comment from the NCUTCD suggesting the need to account for side roads that have different names, and to provide consistency for road users. The added text reflects common practice by highway agencies and MUTCD principles for arrows on guide signs.

The FHWA adds a GUIDANCE statement, and an accompanying figure, that recommends the order in which street names should be displayed on an Advance Street Name plaque, as proposed in the NPA. ATSSA and a local DOT supported this recommendation.

153. In Section 2C.59 CROSS TRAFFIC DOES NOT STOP Plaque (Section 2C.50 of the 2003 MUTCD), the FHWA adds a GUIDANCE statement as proposed in the NPA that plaques with appropriate alternative messages, such as TRAFFIC FROM LEFT DOES NOT STOP, be used at intersections where STOP signs control all but one approach to the intersection. ATSSA and a local DOT supported the plaques. Similar to comments about Chapter 2B proposals regarding ALL-WAY plaques with STOP signs, two local DOTs opposed using

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[77] "Synthesis of Non-MUTCD Traffic Signs," FHWA, December 2005, pages 41–42, can be viewed at the following Internet Web site: *http://tcd.tamu.edu/documents/rwstc/Signs_Synthesis-Final_Dec2005.pdf.*

[78] "Synthesis of Non-MUTCD Traffic Signs," FHWA, December 2005, page 33, can be viewed at the following Internet Web site: *http://tcd.tamu.edu/documents/rwstc/Signs_Synthesis-Final_Dec2005.pdf.*

[79] Research on this topic is cited and discussed in "Highway Design Handbook for Older Drivers and Pedestrians," FHWA Report no. FHWA–RD–01–103, May 2001, which can be viewed at the following Internet Web site: *http://www.tfhrc.gov/humanfac/01103/coverfront.htm.*

these plaques because they feel that the existing plaques are effective. The FHWA disagrees that the meaning and understanding of these types of supplemental plaques by road users has confused drivers facing a STOP sign as to which other approaches are required to stop. The FHWA believes to the contrary, that these plaques are helpful for informing and warning road users, and the FHWA adopts these plaques in this final rule to be consistent with changes adopted in Chapter 2B.

154. In Section 2C.60 SHARE THE ROAD Plaque (Section 2C.51 of the 2003 MUTCD), the FHWA adds a new STANDARD statement that requires that the SHARE THE ROAD plaque be used only as a supplement to a Vehicular Traffic or Non-Vehicular sign. ATSSA and a State DOT supported this standard, while a local DOT suggested that prohibiting the use of this plaque alone is not justified. The FHWA disagrees because road users need more clarity on the type of vehicle or nonvehicle that might be present, and because plaques are not intended for independent use. The FHWA adopts this change in this final rule as proposed in the NPA. The FHWA proposed in the NPA to require the use of fluorescent yellow-green background for all school, pedestrian, and bicycle applications. As discussed above in Section 2C.03, in this final rule the FHWA revised Section 2C.03 to make the mandatory application of fluorescent yellow-green apply only to School area signs and adopted an OPTION statement that the background color of Non-Vehicular Warning signs may be either yellow or fluorescent yellow-green consistent with Table 2A–5. Based on a comment from a State DOT, a local DOT, two NCUTCD members, and a traffic engineering consultant suggesting the need for consistency with Section 2C.03, FHWA adds a STANDARD statement to Section 2C.60 to provide for the consistent application of the appropriate background color to the SHARE THE ROAD plaque.

155. In Section 2C.61 Photo Enforced Plaque (Section 2C.53 of the 2003 MUTCD), the FHWA replaces the ''PHOTO ENFORCED'' word message plaque with a new symbol plaque depicting a camera and designated as W16–10P, as proposed in the NPA. The existing word message plaque is retained as an alternate to the new symbol plaque and its sign designation reassigned as W16–10aP. ATSSA supported the addition of the symbol sign, while a State DOT, a local DOT, and two NCUTCD members opposed the symbol sign, primarily because they felt that its meaning was not clear. The FHWA disagrees and adopts the new symbol sign in this final rule, noting that the results of the ''Design and Evaluation of Symbol Signs'' study [80] found that subjects in a human factors study demonstrated excellent correct understanding of the symbol when displayed with a Signal Ahead warning sign as meaning a warning of Red Light Enforcement Cameras.

156. In the NPA, the FHWA proposed to add a section numbered and titled Section 2C.66 METRIC Plaque. The FHWA does not adopt this section in this final rule, reflecting the removal of metric signs from the MUTCD.

157. The FHWA adds a new section numbered and titled Section 2C.62 NEW Plaque (numbered Section 2C.67 in the NPA) that describes the use of this optional plaque that may be mounted above a regulatory sign when a new traffic regulation takes effect or above an advance warning sign for a new traffic control condition. ATSSA, the NCUTCD, a State DOT, a local DOT, and a traffic engineering consultant supported the plaque and its design as proposed in the NPA. Two local DOTs and two NCUTCD members suggested that the design of the plaque be changed to a black legend on yellow background. A State DOT, two local DOTs, and an NCUTCD member opposed the new plaque because of its design and the fact that Section 2A.15 addresses other ways to enhance sign conspicuity. The FHWA revises the design of the plaque in this final rule to be the black legend ''NEW'' and a black border on a yellow background without the black and white sunburst graphic. Although not opposed to the plaque, a local DOT expressed concern that that the addition of this supplemental plaque to the MUTCD might result in overuse of the plaques by agencies being pressured to ''do more by adding this plaque to many signs'' for a particular situation, regardless of whether the plaque's effectiveness is demonstrated. The FHWA understands this concern, and notes that in response to a comment from the NCUTCD, the FHWA adopts language in this final rule restricting the use of the NEW plaque so that it cannot be used alone. The FHWA adopts this new plaque based on the Sign Synthesis Study,[81] which showed that some States and Canadian provinces are using similar plaques and signs for this purpose, and to provide a uniform plaque design for consistency.

In the NPA, the FHWA also proposed in a GUIDANCE statement that the use of this plaque be limited to the first 6 months after the traffic regulation has been in effect. A State and a local DOT supported this time limitation, while another local DOT suggested that its use be limited to 3 months. To address a comment from the State DOT suggesting that if the plaque remains in place for a long time (possibly years) it would degrade the effect of the same sign at a location that has a new restriction, the FHWA revises the statement to a STANDARD in this final rule, thereby limiting its use to a maximum 6-month time period. The FHWA believes that timely removal of this plaque is essential, warranting mandatory language.

158. In Section 2C.63 Object Marker Design and Placement Height (Section 3C.01 of the 2003 MUTCD, numbered Section 2L.01 of the NPA), the FHWA adopts several revisions in this final rule based on comments submitted by the NCUTCD suggesting the need to clarify the design of object markers due to their relocation into Part 2 signs to avoid inconsistencies with existing and proposed revisions to the MUTCD. The resulting changes clarify existing standards that object markers do not have a border in their design, that Type I object markers are diamond shaped, that retroreflectors are in fact retroreflective devices, and providing information regarding the design of the Type 4 object marker that is used to mark the end of a roadway. These revisions will not have a significant impact on agencies; rather they provide clarification and combine similar information all in one location, which the FHWA believes will be beneficial to practitioners.

159. In Section 2C.64 Object Markers for Obstructions Within the Roadway (Section 3C.02 of the 2003 MUTCD, Section 2L.02 of the NPA), the FHWA proposed in the NPA adding an OPTION statement regarding the placement of Type 1 or Type 3 markers on the nose of a median island. The NCUTCD, a State DOT, and a local DOT, supported the concept, but suggested editorial changes that the FHWA adopts in this final rule. A local DOT suggested including the option to install Type 2

[80] ''Design and Evaluation of Selected Symbol Signs,'' Final Report, May, 2008, conducted by Bryan Katz, Gene Hawkins, Jason Kennedy, and Heather Rigdon Howard, for the Traffic Control Devices Pooled Fund Study, can be viewed at the following Internet Web site: *http://www.pooledfund.org/documents/TPF-5_065/symbol_sign_report_final.pdf.*

[81] ''Synthesis of Non-MUTCD Traffic Signs,'' FHWA, December 2005, page 33, can be viewed at the following Internet Web site: *http://tcd.tamu.edu/documents/rwstc/Signs_Synthesis-Final_Dec2005.pdf.*

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markers in the same manner; however the FHWA disagrees because the approach end of a median island is in the roadway, not adjacent to the roadway, therefore only Type 1 and 3 markers are appropriate.

160. In Section 2C.65 Object Markers for Obstructions Adjacent to the Roadway (Section 3C.03 of the 2003 MUTCD, Section 2L.03 of the NPA), as proposed in the NPA, the FHWA adds to the STANDARD statement to specify that Type 1 and Type 4 object markers shall not be used to mark obstructions adjacent to the roadway. The FHWA relocates the STANDARD statement from Section 2C.64 Object Markers for Obstructions Within the Roadway to Section 2C.65 Object Markers for Obstructions Adjacent to the Roadway, because the STANDARD statement applies to objects adjacent to the roadway. In this final rule the FHWA also revises the STANDARD statement to clarify the application of Type 3 object markers to the approach ends of guardrail and other roadside appurtenances to address a comment from a State DOT suggesting the need to address the required size where the ends of the guardrail or roadside appurtenances are of a size other than 12 inches x 36 inches, for consistency with existing STANDARD requirements for Type 3 Object Markers. The FHWA adopts this clarification to provide for the predominant practice by highway agencies.

161. In Section 2C.66 Object Markers for Ends of Roadways (Section 3C.04 of the 2003 MUTCD, Section 2L.04 of the NPA), the FHWA adds a STANDARD statement as proposed in the NPA, to require that if an object marker is used to mark the end of a roadway, a Type 4 object marker shall be used. The FHWA adopts this change to provide clarity that the Type 4 object marker is the only type of object marker to be used to mark the end of a roadway.

To address a comment from the NCUTCD to place design information for all types of object markers in the same section, the FHWA relocates the information regarding the design of the Type 4 marker to Section 2C.63 in this final rule.

Discussion of Amendments Within Chapter 2D—General

162. As proposed in the NPA, in Section 2D.30 Junction Assembly (Section 2D.28 of the 2003 MUTCD), Section 2D.31 Advance Route Turn Assembly (Section 2D.29 of the 2003 MUTCD), and Section 2D.40 Location of Destination Signs (Section 2D.35 of the 2003 MUTCD), the FHWA revises the requirements and recommendations for the locations of these signs. In Section 2D.30, the FHWA proposed to change the sign placement distances in advance of an intersection from STANDARD to GUIDANCE, to recommend, rather than require, that the signs be installed at the distances stated therein. In Sections 2D.31 and 2D.40, the FHWA proposed to add new recommendations regarding the distances between signs to provide consistency with the sign placement distances included in Section 2D.30. In this final rule the FHWA adopts these changes as proposed in the NPA, in order to provide more flexibility for the placement of these various signs, particularly as it relates to rural areas, and to indicate that the dimensions shown on Figure 2D–7 are recommendations.

Discussion of Amendments Within Chapter 2D—Specific

163. In Section 2D.04 Size of Signs, the FHWA adds a requirement, as proposed in the NPA, that the sizes of conventional road guide signs that have standardized designs shall be as shown in Table 2D–1, except as noted in Section 2A.11. Although a local DOT supported this change, two State DOTs and an NCUTCD member opposed this change, suggesting that States needed to have flexibility in sign size when the need arises, and to exercise engineering judgment, rather than needing to follow requirements at all times. The FHWA disagrees that signs with standard legends need not conform in overall size and believes that non-conformance to the standard sign sizes results in smaller letter sizes that cannot be read at distances adequate to react to the message. Signs listed in Table 2D–1 that have legends that might vary in length are adequately addressed by the footnote allowing for an appropriate adjustment in size for an atypical sign. The FHWA adopts the proposed language in this final rule.

164. In Section 2D.05 Lettering Style, the FHWA proposed a requirement in the NPA to use a combination of lower-case letters with initial upper-case letters for names of places, streets, and highways on conventional road guide signs. A transportation research institute, a traffic engineering consultant, and a citizen all supported this requirement, while two State DOTs, a local DOT, and an NCUTCD member suggested that the use of a combination of lower-case letters with initial upper-case letters be a recommendation, and that all upper-case letters be allowed as well. The commenters suggested that there is not enough convincing evidence to support making the change to upper-case and lower-case letters as a mandatory condition. The FHWA disagrees because the change to mixed-case alphabets is based directly on the outcome of a research study [82] that demonstrated improved recognition of familiar destinations on guide signs when displayed using mixed-case lettering. In this final rule the FHWA revises the language in this section from what was proposed in the NPA to clarify that the nominal loop height of the lower-case letters shall be three-quarters the height of the initial upper-case letter. The FHWA also adds clarifying language to help users of the MUTCD determine the appropriate letter height when a mixed-case legend letter height is specified referring only to the initial upper-case letter or when only to a lower-case letter is referred to. The FHWA adopts this language in this final rule to address comments in several sections of the NPA from various commenters suggesting that more information was needed to determine the appropriate letter heights for mixed-case legends.

The FHWA also adds a STANDARD at the end of this section in this final rule to clarify that the distortion of unique letter forms of the Standard Alphabet series is prohibited, and provides a reference to the provisions in Section 2D.04 regarding the prescribed methods to modify the length of a word for a given letter height and series. Although the referenced provisions exist in Section 2D.04 of the 2003 MUTCD, and state that the letter designs shall be as detailed in the ''Standard Highway Signs'' book, the FHWA has noticed that with the advancement and use of electronic technologies for sign design and fabrication, such distortion of letter forms to fit word legends on signs has become increasingly prevalent. The FHWA believes that this distortion compromises legibility, and adds this specific requirement in this final rule as a reiteration of the existing provision.

165. In Section 2D.07 Amount of Legend, the FHWA proposed in the NPA to revise the GUIDANCE statement to clarify that guide signs should be limited to no more than three lines of destinations and that action and distance information should be provided on guide signs in addition to the destinations, where appropriate. ATSSA and an NCUTCD member supported this change, whereas two State DOTs suggested that the language allow for more flexibility, such as when

[82] Research on this topic is cited and discussed in ''Highway Design Handbook for Older Drivers and Pedestrians,'' FHWA Report no. FHWA–RD–01–103, May 2001, which can be viewed at the following Internet Web site: *http://www.tfhrc.gov/humanfac/01103/coverfront.htm.*

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a destination name occupies more than one line, or at a location where four destinations are needed, such as a ramp terminal. The FHWA disagrees with this suggestion due to concerns about increasing the cognitive load imposed on a driver and adopts in this final rule the language as proposed in the NPA, with the addition of language to refer to exceptions noted elsewhere (such as in Section 2D.37 Destination Signs), that provide information on how to accommodate four destinations where necessary. FHWA adopts this language to reduce confusion regarding the number of lines on a guide sign and to address the results of recent NCHRP research on driver information overload.[83]

In the NPA, the FHWA proposed to revise the OPTION regarding the use of pictographs on guide signs. Because the information contained in this OPTION provides general provisions and applies to all cases in which pictographs are allowed, the FHWA relocates the information to Chapter 2A in this final rule, as discussed previously in this preamble.

In the NPA, the FHWA proposed to add a STANDARD statement specifying the maximum dimension of a pictograph on a guide sign. The proposed language stated that a pictograph shall not exceed the size of the route shield on the guide sign, and that if the guide sign does not include a route shield, the maximum size of the pictograph shall not exceed two times the letter height of the destination legend. ATSSA, a local DOT, and a toll road operator supported this language. A State DOT and two toll road operators suggested exempting ETC system pictographs from adhering to the width dimension requirements, because ETC pictographs are often rectangular, rather than square, in shape. Two toll road operators suggested that there be no limit on the size of ETC pictographs. The FHWA understands that there is a need for some flexibility with regard to ETC system pictographs because of their unique designs and the critical information conveyed by their use, unlike other pictographs that only complement and not replace an associated word legend. As a result, the FHWA adopts specific provisions on the size of ETC-system pictographs in Chapter 2F. In addition, the FHWA relocates specific provisions on pictographs to the relevant Sections where a pictograph is allowed to better group related information. The FHWA adopts these changes in order to incorporate information regarding pictographs in the MUTCD, to reflect FHWA's Official Interpretation number 2–646(I)[84] and to provide information on the maximum size of certain pictographs so that they do not detract from the primary legend of the signs.

166. In Section 2D.08 Arrows, the FHWA proposed in the NPA to make several revisions to this section to clarify the use and design of arrows on guide signs. The first STANDARD statement required that down arrows on overhead signs shall always be vertical and positioned directly over the approximate center of the applicable lane. ATSSA and a local DOT supported this language; however three State DOTs opposed it, stating that the location of arrows on the sign should be GUIDANCE, not a STANDARD statement. The FHWA disagrees with the opposing commenters and retains the language in this final rule in order to reduce uncertainty and confusion by providing positive guidance in sign legends. The FHWA also proposed to add a requirement that no more than one down arrow shall point to a lane on a single overhead sign (or on multiple overhead signs on the same sign structure). ATSSA, a State DOT and a local DOT supported this requirement, while three State DOTs opposed it because their States use multiple down arrows to point to a single lane. The FHWA believes that allowing one more arrow than the number of lanes present creates conflicting information for the road user to process and that adopting this language will substantially increase positive guidance and eliminate driver confusion and late lane changes, thereby improving highway safety. The FHWA adopts the language as proposed in the NPA in this final rule.

In the NPA, the FHWA proposed to add an OPTION permitting the use of diagonal arrows pointing diagonally downward on overhead guide signs only if each arrow is located directly over the center of the lane and only for the purpose of emphasizing a separation of diverging roadways. ATSSA and a local DOT supported this new OPTION, while one State DOT, an NCUTCD member and a citizen opposed this use of diagonally pointing arrows. The commenters believe that the arrows are unlikely to convey meaningful and consistent information to the driver, as there are no guidelines identifying the circumstances that would justify placing the arrows at an angle, and that there is a likely potential for inconsistent application, an implication of a lane change, and an overall practice that is not consistent with the use of upward-pointing arrows at similar locations. The FHWA agrees with the commenters and does not adopt this OPTION for overhead signs in this final rule.

The FHWA adopts the proposed OPTION statement to permit the use of curved-stem arrows that represent the intended driver paths to destinations involving left-turn movements on guide signs on approaches to roundabouts or circular intersections. ATSSA and an NCUTCD member supported this new OPTION. The FHWA clarifies through a STANDARD that the use of a curved-stem arrow on any sign not associated with a circular intersection is prohibited, because such use would be confusing and is not the intended use of this type of arrow. The FHWA adds this statement to clarify application of curved-stem arrows on guide signs.

In the NPA, the FHWA proposed adding GUIDANCE and OPTION statements regarding the use of various arrow types, including curved-stem and Types A through D arrows. ATSSA, a local DOT, and an NCUTCD member supported including this information; however, one of the commenters felt that the level of detail included in the GUIDANCE and the following OPTION was too much and that a reference to the SHSM book would suffice. Two State DOTs and another NCUTCD member suggested that some of the information regarding specific arrow types be deleted, or changed from a GUIDANCE to an OPTION, because their State was using a different arrow type. The FHWA disagrees and adopts in this final rule the statements as proposed in the NPA, because the selection of the arrow type and placement are critical to the overall appearance and legibility of the sign. A local DOT supported the NPA language recommending that the arrowheads for the Types A, B, and C directional arrows should be 1.5 to 1.75 times the height of the largest letter on the sign, while a State DOT opposed the revision because it felt that there was no value in providing that information. The FHWA disagrees and adopts the recommendation in the MUTCD because the GUIDANCE on arrow size ensures that the arrow is kept in relative proportion to the entire legend, preserving legibility.

167. In Section 2D.11 Design of Route Signs, the FHWA proposed in the NPA to change paragraph 07 to a GUIDANCE statement to recommend, rather than just allow, the use of a white square or

[83] NCHRP Report 488, ''Additional Investigations on Driver Information Overload'' 2006, page 65, can be viewed at the following Internet Web site: *http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_488c.pdf.*

[84] This official interpretation can be viewed at the following Internet Web site: *http://mutcd.fhwa.dot.gov/resources/interpretations/2_646.htm.*

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rectangle behind the Off-Interstate Business Route sign when it is used on a green guide sign. The FHWA proposed this change to enhance the conspicuity of the Off-Interstate Business Route sign in this usage, since the green route sign alone blends into the green guide sign background. ATSSA supported the proposed change; however, two State DOTs, two NCUTCD members, and a citizen opposed this change or suggested modifications. Many of the commenters suggested that if there is a problem with conspicuity of Off-Interstate Business Route signs, then they should be redesigned. The FHWA agrees with the commenters and does not adopt the proposed revision in this final rule, retaining the use of a white-square or rectangle as an option rather than as a recommendation. To address concerns with conspicuity of the route sign when used on a guide sign, the FHWA might consider modifications to the sign to enhance its conspicuity in a future rulemaking and/or a revision to ''Standard Highway Signs and Markings'' book.

Although not proposed in the NPA, the FHWA relocates a paragraph from Section 2D.14 to this section regarding the use of U.S. or State Route signs as components of guide signs. The FHWA adopts this change in this final rule to place similar information together in the same location.

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168. In Section 2D.12 Design of Route Sign Auxiliaries, the FHWA in this final rule revises paragraph 02 by deleting the first sentence related to the size of auxiliary signs carrying word messages and mounted with 30 inch x 24 inch Interstate Route signs. Although not proposed in the NPA, the FHWA deletes the sentence in this final rule to reflect the consistent practice of determining the size of the auxiliary sign based on the height of the route sign rather than its width, maintaining a consistent letter height for the auxiliary message as it relates to the numeral height within the route sign.

In the NPA, the FHWA proposed to add a GUIDANCE statement and corresponding STANDARD statement to clarify that if a route sign and its auxiliary signs are combined in a single sign, the background color of the sign should be green. Along with this GUIDANCE, the FHWA proposed adding a corresponding STANDARD that on such a sign the auxiliary messages shall be white legends placed directly on the green background and that auxiliary signs shall not be mounted directly to a guide sign. The FHWA proposed these changes to provide consistency for background colors, because the background colors currently in use for this application are not consistent across the country. Green is the appropriate background color for a directional guide sign, and the FHWA's intent is to preclude the incorrect use of auxiliary signs on green guide signs. ATSSA and a local DOT supported the STANDARD language as proposed in the NPA; however, an NCUTCD member suggested that the proposal in the NPA was too restrictive, because it implied that green backgrounds would be required for the signs. FHWA disagrees with the comment because the GUIDANCE statement specifically addresses the combination of route and auxiliary signs to form a guide sign as provided in the preceding OPTION and the prescribed background color of a guide sign is green. To address the specific concern raised by the NCUTCD member, the FHWA instead revises the STANDARD statement in paragraph 06 in this final rule to clarify that the intent is to apply an auxiliary message directly to the sign background, rather than display it as an auxiliary sign panel mounted to another sign when route signs and auxiliary messages are used as legend components on signs other than guide signs. Additionally, to provide consistency with Sections 2D.10 and 2D.29 and clarification regarding independently mounted route sign assemblies, in this final rule the FHWA also adds a GUIDANCE statement to indicate that the background, legend, and border of a route sign auxiliary should have the same colors as those of the route sign with which the auxiliary is mounted in a route sign assembly.

169. In Section 2D.13 Junction Auxiliary Sign, the FHWA revises this STANDARD to clarify that placement of the Junction (M2–1) auxiliary sign above a Cardinal Direction auxiliary sign where access is available only to one direction of the intersected route is one of the possible mounting locations. Although not proposed in the NPA, the FHWA includes this revision in this final rule to clarify the existing provision, which was overly restrictive in that it required the display of misleading information to the road user in such situations.

170. In Section 2D.14 Combination Junction Sign, as proposed in the NPA, the FHWA deletes the second paragraph of the OPTION statement that permitted the use of other designs to accommodate State and county route signs, implying that the basic requirements for the sign, such as legend and background colors, were appropriate. In concert with this change, in the NPA the FHWA proposed to revise the first paragraph of the GUIDANCE to clarify that only the unique outline of the official route marker should be used on guide signs and not the contrasting rectangular backplate for independent mounting in a directional assembly. Rather than include this design-related information in this section, in this final rule the FHWA relocates this information to Section 2D.11, incorporating comments from an NCUTCD member to clarify the intent, providing a reference accordingly in Section 2D.14.

171. As proposed in the NPA, the FHWA adds a new section numbered and titled Section 2D.23 BEGIN Auxiliary Sign, containing OPTION, STANDARD, and GUIDANCE statements regarding the use of this new sign where a numbered route begins. The FHWA proposed this sign in the NPA based on the Sign Synthesis Study [85] that revealed that several States use an auxiliary BEGIN sign above the confirming route marker at the start of a route to provide additional helpful information to road users. To address comments from the New York State DOT, the FHWA revises the language in this final rule to allow the use of the BEGIN auxiliary sign in any route assembly, rather than just for numbered routes as proposed in the NPA.

172. In Section 2D.26 Advance Turn Arrow Auxiliary Signs (Section 2D.28 of the NPA), the FHWA adds a paragraph to the STANDARD statement and adds a corresponding GUIDANCE to reflect that the use of the curved-stem Advance Turn Arrow auxiliary (M5–3) sign on the approach to a circular intersection would be appropriate when curved-stem arrows are used on corresponding regulatory lane-use signs, Destination signs, and pavement markings. Although not proposed in the NPA, the FHWA adds this information in this final rule to provide consistency with similar provisions in Section 2D.38 that are also added in this final rule to address a comment from a State DOT suggesting if the curved-stem arrows are used, they should be used consistently for a particular destination or movement. This language will ensure consistent use of the curved-stem arrow, when used.

173. The FHWA adds a new section numbered and titled Section 2D.27 Lane Designation Auxiliary Signs (numbered Section 2D.33 in the NPA). In the NPA, the proposed section contained an OPTION statement regarding the use of these optional signs that may be used as a method to tell road users which lane

[85] ''Synthesis of Non-MUTCD Traffic Signs,'' FHWA, December 2005, page 52, can be viewed at the following Internet Web site: *http://tcd.tamu.edu/documents/rwstc/Signs_Synthesis-Final_Dec2005.pdf.*

to use to access a particular numbered route and direction. In this final rule, the FHWA adds a STANDARD statement to clarify that these Lane Designation auxiliary signs shall be used only where the designated lane is a mandatory movement lane, due to road user confusion exhibited when such a message is used at locations where a lane is not a mandatory movement lane, causing unnecessary lane changes. The FHWA adopts these new signs based on the results of the Sign Synthesis Study,[86] which found that at least seven States use M6 auxiliary signs stating ''Left Lane,'' ''Center Lane,'' or ''Right Lane'' below route signs in route sign assemblies. This can be an effective, economical alternative to one or more guide signs in certain situations. The FHWA also adds an additional illustration in Figure 2D–5 to illustrate the use of these auxiliary signs.

174. In Section 2D.28 Directional Arrow Auxiliary Signs (Section 2D.26 of the 2003 MUTCD), the FHWA proposed in the NPA to add a STANDARD statement indicating that a Directional Arrow auxiliary sign that displays a double-headed arrow shall not be mounted below a route sign in advance of or at a circular intersection. The FHWA proposed this change to eliminate any possible confusion that would be created by the use of this sign in the proximity of a circular intersection, where direct left turns are not allowed. The NCUTCD and a traffic engineering consultant supported this revision. To further clarify the language, in this final rule the FHWA adopts language to indicate that a Directional Arrow auxiliary sign that displays a double-headed arrow shall not be mounted in a directional assembly in advance of or at a circular intersection.

Although not proposed in the NPA, the FHWA adds an OPTION and corresponding STANDARD to describe the optional use of the downward pointing diagonal arrow auxiliary (M6–2a) sign. The FHWA adds this language in this final rule for consistency with provisions adopted in Section 2D.46 Freeway Entrance signs.

175. In Section 2D.32 Directional Assembly (2D.34 in the NPA), the FHWA deletes the requirement that the end of a route shall be marked by a Directional assembly with an END auxiliary sign. Although not proposed in the NPA, the FHWA adopts this change in this final rule to remove a conflict with Section 2D.22, as suggested by a State DOT. In this final rule the FHWA also revises the language of Item C (numbered Item D(1) in the 2003 MUTCD) of the STANDARD statement to clarify the application of Directional assemblies where the intersected route is designated on both legs of the crossroad and adds a new item D to clarify the use of Directional assemblies where the intersected route is designated only on one of the legs. Although not proposed in the NPA, the FHWA adds this information to reduce the possibility of conflicting information being displayed to road users.

176. The FHWA adds a new section numbered and titled Section 2D.33 Combination Lane Use/Destination Overhead Guide Sign (Section 2D.35 in the NPA). In the NPA the FHWA proposed OPTION and GUIDANCE statements, as well as a figure, describing the use of these optional signs for dedicated lanes at complex intersection approaches involving multiple turn lanes and destinations. The FHWA proposed this new section, and the associated signs, based on the Sign Synthesis Study.[87] At complex intersections involving multiple turn lanes, multiple destinations, service roads, and/or various constraints often found in urban areas that can limit the ability to use a series of advance signs, many States have found it necessary to combine regulatory lane use information with destination information onto a single guide sign or sign assembly, especially to assist unfamiliar drivers in determining which lane or lanes to use for a particular destination. However, there is no consistency or uniformity in the colors used, the sign design layouts, or other aspects of these signs. A State DOT and a citizen supported this new section, while two other State DOTs and a local DOT opposed the proposed language. One of the commenters felt that the Combination Lane Use/Destination (D15–1) overhead guide sign is too large for retrofitting on span wires, and suggested a smaller sign. The FHWA disagrees with the commenters' proposed smaller sign, because it would be too small for viewing at a distance. The FHWA revises the proposed GUIDANCE statement regarding the design of the sign to a STANDARD in this final rule, to preclude conflict with other provisions for the design of guide signs and because the basic principles of guide sign design do not provide for flexibility in the sign design elements. In this final rule, the FHWA also adds that the Combination Lane Use/Destination (D15–1) overhead guide sign shall be used only where the designated lane is a mandatory movement lane (as illustrated in the corresponding figure), and shall not be used for lanes with optional movements, because such use would not be possible given the design criteria and would present a confusing message to road users. The FHWA notes that this sign is optional and adopts a uniform design for this type of sign, to provide consistency for road users.

177. Although not proposed in the NPA, in Section 2D.34 Confirming or Reassurance Assemblies (Section 2D.31 of the 2003 MUTCD), the FHWA adds to the STANDARD statement that where the Confirming or Reassurance assembly is for an alternative route, the appropriate auxiliary sign for an alternative route shall also be included in the assembly. Though not explicitly stated, this method is the only way in which to provide a correct message to a road user. The FHWA adds this requirement in this final rule to be consistent with the existing provisions of Section 2D.16.

178. In Section 2D.35 Trailblazer Assembly (Section 2D.32 of the 2003 MUTCD), the FHWA adds to the STANDARD statement that where the Trailblazer assembly is for an alternative route, the appropriate auxiliary sign for an alternative route shall also be included in the assembly. Although not proposed in the NPA, the FHWA adds this requirement in this final rule to be consistent with the existing provisions of Section 2D.16 and with the adopted changes in Section 2D.34.

In the NPA, the FHWA proposed to add a GUIDANCE statement to recommend that if shields or other similar signs are used to provide route guidance in following an auto tour route, they should be designed in accordance with the sizes and other design principles for route signs, such as those described in Sections 2D.10 through 2D.12. Although a local DOT and an NCUTCD member supported this language, another NCUTCD member suggested that this information is better suited for Section 2H.07 Auto Tour Route Signs. The FHWA agrees and in this final rule adopts and relocates this recommendation to Section 2H.07.

179. In Section 2D.36 Destination and Distance Signs (Section 2D.33 of the 2003 MUTCD), the FHWA clarifies the GUIDANCE statement to recommend a minimum height of a Route shield when used on Destination signs should be at least two times the height of the upper-case letters of the principal legend and

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[86] ''Synthesis of Non-MUTCD Traffic Signs,'' FHWA, December 2005, page 53, can be viewed at the following Internet Web site: *http://tcd.tamu.edu/documents/rwstc/Signs_Synthesis-Final_Dec2005.pdf.*

[87] ''Synthesis of Non-MUTCD Traffic Signs,'' FHWA, December 2005, pages 45–46, can be viewed at the following Internet Web site: *http://tcd.tamu.edu/documents/rwstc/Signs_Synthesis-Final_Dec2005.pdf.*

not less than 18 inches. Although not proposed in the NPA, the FHWA adopts this change, as suggested by two State DOTs, in this final rule to provide consistency with existing related provisions in Chapters 2D and 2E.

180. The FHWA adds a new section numbered and titled Section 2D.38 Destination Signs at Circular Intersections (Section 2D.40 in the NPA). In the NPA the proposed section contained STANDARD, OPTION, and SUPPORT statements, as well as figures, regarding the use of destination signs at circular intersections. In particular, the Section included information regarding Exit destination signs, and associated arrows and diagrammatic signs for roundabouts. The NCUTCD and one of its members, a State DOT, a local DOT, and a traffic engineering consultant supported this section. The State DOT suggested that the difference between the arrows used on the junction assembly and the destination signs may be confusing. To address this comment and reflect the use of the optional curved-stem arrow on destination signs, the FHWA adds a GUIDANCE statement in this final rule recommending that if they are used, they should also be used on corresponding regulatory lane-use signs, Directional assemblies, and pavement markings for a particular destination or movement. The FHWA adds this information in this final rule to facilitate consistent use of the optional curved-stem arrow, when used.

The FHWA also adds a STANDARD statement in this final rule prohibiting diagrammatic signs for circular intersections from depicting the number of lanes within the intersection circulatory roadway, or on its approaches or exits. Although not proposed in the NPA, the FHWA adds this statement in this final rule to reflect the provisions illustrated in the accompanying figures and to provide clarification due to the restoration in this final rule in Chapter 2E of the provisions for freeway and expressway diagrammatic signs (proposed for deletion in the NPA), on which the number of lanes is depicted.

181. In Section 2D.43 Street Name Signs (Section 2D.38 of the 2003 MUTCD), the FHWA proposed in the NPA to add a new OPTION statement to allow the use of a route shield on Street Name signs to assist road users who might not otherwise be able to associate the name of the street with the route number. Two State DOTs supported this new language. The FHWA adopts the OPTION for the use of these signs based on the results of the Sign Synthesis Study,[88] which showed that several agencies incorporate route shields into Street Name signs on streets that are part of a U.S., State, or county numbered route. Typically, route sign assemblies are only provided on intersecting roads that are also numbered routes, and on some very major unnumbered streets within cities. Including a route shield within the Street Name sign provides additional information for traffic on the cross streets that intersect the numbered route.

As proposed in the NPA, the FHWA adopts in this final rule a STANDARD requiring lettering for names of streets and highways on Street Name signs to composed of a combination of lower-case letters with initial upper-case letters. This requirement is consistent with the requirements adopted in Section 2A.13. As described above in the discussion of Section 2A.13 comments, several State and local DOTs opposed this requirement, while ATSSA and a citizen supported this requirement. As proposed in the NPA, the FHWA adopts in this final rule revisions to paragraphs 04 through 07 to clarify the letter heights for Street Name signs, based on the adopted use of mixed-case letters. These letter heights are based on the legibility index of 1 inch of letter height for 30 feet of viewing distance as discussed above in the General amendments to the MUTCD. While the requirement for the format and display of lettering is changed, the letter heights are unchanged from the 2003 MUTCD. ATSSA and several local DOTs supported this language, while other State and local DOTs opposed the language because they felt the letters were too large. The FHWA notes that the letter heights are based on the legibility distance for older drivers and that agencies may use narrower letter series for longer names and use reduced letter heights for auxiliary destinations (such as ''Pkwy'') to manage sign sizes.

In the NPA, the FHWA proposed to revise paragraph 13 to recommend that a pictograph used on a Street Name sign to identify a governmental jurisdiction or other government-approved institution should be positioned to the right, rather than the left, of the street name. The FHWA proposed this change because the name of the street is the primary message on the sign and the pictograph is secondary, and the primary message should be read first by being on the left. The NCUTCD, two State DOTs, three local DOTs, a transportation research institute, and a traffic engineering consultant opposed the revision and two State DOTs suggested that the pictograph should be allowed to be positioned to either the left or the right of the street name. The commenters cited the cost of replacing the signs and lack of research regarding the proposed change in pictograph location as their reasons for opposing the change. The FHWA agrees and does not adopt the proposal in this final rule, retaining the placement of the pictograph to the left of the street name, consistent with the 2003 MUTCD. Two State DOTs opposed using pictographs on Street Name signs; however, the FHWA allows their use based on the existing provisions of the 2003 MUTCD.

In the NPA, the FHWA proposed adding new OPTION, STANDARD, and GUIDANCE statements regarding the use of alternative background colors for Street Name signs where a highway agency determines that this is necessary to assist road users in determining jurisdictional orientation for roads. The FHWA proposed these new statements because, even though the background color for guide signs in general is specified as green, the MUTCD has contained a GUIDANCE statement that the background color ''should'' be green and the text has not explicitly limited the alternate colors for Street Name sign backgrounds, and as a result, there is wide variation in practice among jurisdictions. Sometimes inappropriate colors are being used that are reserved for other traffic control device messages, or the colors used have poor contrast ratio between legend and background. In the NPA, the FHWA proposed that the only acceptable alternative background colors for Street Name (D3–1 or D3–1a) signs are blue, brown, or black. To address a comment from ATSSA, a State DOT, and a traffic control device vendor, the FHWA eliminates the reference to black backgrounds in this final rule, because as a non-retroreflective background color, it is not as visible at night, especially to older drivers. ATSSA suggested that blue and brown not be allowed as background colors, because no minimum maintained levels of retroreflectivity have been established for these colors. The FHWA disagrees and allows the use of blue and brown backgrounds, as these colors are currently allowed for certain classes of guide signs and the FHWA anticipates that a future rulemaking process will propose the establishment of minimum maintained retroreflectivity levels for these colors. The FHWA adds the color

[88] ''Synthesis of Non-MUTCD Traffic Signs,'' FHWA, December 2005, page 47, can be viewed at the following Internet Web site: *http://tcd.tamu.edu/documents/rwstc/Signs_Synthesis-Final_Dec2005.pdf.*

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white as a permissible background color when used with a black legend in this final rule. The FHWA adopts these revisions in this final rule to address comments from four State DOTs, four local DOTs, and a citizen that more flexibility in Street Name sign backgrounds is needed. The FHWA also adopts the OPTION that the border may be omitted on Street Name signs, as proposed in the NPA. A local DOT supported this change, while another local DOT felt that the border helps recognition and legibility. The language in the 2003 MUTCD Edition of this section implies, but does not specifically state, that the border may be omitted. The FHWA believes that the practice of eliminating the border on Street Name signs can minimize the crowding of the legend resulting from reduced edge spacing and that the recognition of the sign under nighttime conditions is accomplished primarily by the combination of the contrasting background color and legend color of the signs and their typical and expected placement at intersections. As part of the revision in this final rule that allows the use of the color white as an alternative background color on Street Name signs, the FHWA adds to the STANDARD that the legend (and border, if used) shall be black, for consistency with other provisions regarding sign legends.

182. In the NPA the FHWA proposed to add a new table numbered and titled, ''Table 2D–2 Recommended Minimum Letter Heights on Street Name Signs'' that contains information regarding the letter sizes to be used on Street Name signs based on the mounting type, road classification, and speed limit. A State DOT and two local DOTs opposed the new table, either providing comments on the specific letter heights or suggesting it be deleted in its entirety. The comments were commensurate with those related to larger letter heights and/or the use of mixed-case legends, which are discussed elsewhere. The FHWA adopts Table 2D–2 in this final rule, reflecting existing and adopted provisions in the text of Section 2D.43 and providing additional clarification by distinguishing between letter heights for the name of the street and for any supplemental lettering or auxiliary designations, such as ''Ave'' and ''St,'' consistent with the OPTION in Section 2D.43.

183. In Section 2D.44 Advance Street Name Signs (Section 2D.39 of the 2003 MUTCD), the FHWA proposed in the NPA to add a GUIDANCE statement at the end of the section recommending the order in which street names should be displayed on an Advance Street Name plaque. A State DOT and two local DOTs supported this text; however, the State DOT suggested that the language and figure illustrating the full assembly should be in Chapter 2C. The FHWA deletes this information from this Section in this final rule, as the same information is provided in Chapter 2C. Instead, the FHWA adds a SUPPORT statement providing the appropriate reference to Section 2C.58.

184. As proposed in the NPA, the FHWA relocates the information from Section 2E.49 of the 2003 MUTCD to Chapter 2D as a new section numbered and titled Section 2D.45 Signing on Conventional Roads on Approaches to Interchanges. The FHWA adopts this proposed change in this final rule because the information in this section, and the associated figures, are about guide signing on conventional road approaches to a freeway, rather than signing on the freeway itself.

In the relocated section, the FHWA also proposed to add a STANDARD statement to require, rather than merely recommend, that on multi-lane conventional road approaches to a freeway interchange, guide signs shall be provided to identify which direction of turn is to be made for ramp access and/or which specific lane to use to enter each direction of the freeway. This information is critical for drivers on a multi-lane approach to an interchange because it allows drivers to choose the proper lane in advance and reduces the need to make last-second lane changes close to the entrance ramp. ATSSA and a local DOT supported this change. A State DOT and an NCUTCD member suggested that the language be retained as a recommendation, rather than a requirement. The FHWA adopts this statement as a STANDARD because the FHWA believes that the GUIDANCE statements in the 2003 MUTCD are not strong enough for this very important need and that this signing needs to be mandatory. To address comments from the NCUTCD and three local DOTs, in this final rule the FHWA adds a SUPPORT statement referring to existing figures in which overhead signs for this purpose are illustrated.

Although not proposed in the NPA, the FHWA adds SUPPORT and STANDARD at the end of the section to describe the appropriate optional use of Advance Entrance Direction diagrammatic guide signs. The FHWA adds this information in response to a comment from a State DOT recommending that consistency in signing of freeway entrance ramps in proximity to the intersection of a frontage roadway is needed. The FHWA agrees that consistency in use of this optional sign is critical to deterring wrong-way movements at freeway entrance ramps and assisting road users in safely making any lane changes needed to enter the freeway in the correct direction.

185. In the NPA, the FHWA proposed to relocate the information from Section 2E.50 of the 2003 MUTCD to Chapter 2D as a new section numbered and titled Section 2D.46 Freeway Entrance Signs. A local DOT supported this change. The FHWA adopts this change in this final rule so that all guide signing on conventional roads at and in advance of interchanges with freeways is located in the same chapter of the Manual.

Although not proposed in the NPA, in this final rule the FHWA adds two paragraphs to the OPTION statement to describe the permitted use of alternate legends, such as PARKWAY, in place of FREEWAY and the optional use of Directional assemblies at the corner of an intersection with a freeway or expressway entrance ramp. The FHWA adopts these paragraphs to provide consistency with provisions in Sections 2D.28 and 2D.32 and flexibility in signing the immediate point of entry to a freeway or expressway to discourage wrong-way entries on adjacent exit ramps at the same intersection.

186. In Section 2D.47 Parking Area Guide Sign (Section 2D.40 of the 2003 MUTCD) the FHWA proposed in the NPA to add a new sign to be an alternative to the Parking Area directional sign. This sign incorporated a white letter P in a blue circle symbol at the top of the sign. Although the proposed sign was consistent with the widespread use of the blue background and white P as a parking wayfinding symbol throughout Europe and at many airports and institutional sites in the United States, and was supported by MISA and an NCUTCD member, the NCUTCD opposed the use of the color blue, because they were concerned that it would be confused with ''police'' signs. Because of this potential inconsistency, FHWA does not adopt this proposal in this final rule.

187. As proposed in the NPA, the FHWA relocates Sections 2D.42 Rest Area Signs, 2D.43 Scenic Area Signs, and 2D.45 General Service Signs of the 2003 MUTCD to a new chapter titled Chapter 2I General Service Signs, in order to combine information regarding similar type signs in to one chapter of the Manual. The FHWA received no substantive comments on this proposal.

188. As proposed in the NPA, the FHWA relocates Sections 2D.46 Reference Location Signs and Intermediate Reference Location Signs, 2D.47 Traffic Signal Speed Sign, 2D.48

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General Information Signs, the first four paragraphs of 2D.49 Signing of Named Highways, and 2D.50 Trail Signs of the 2003 MUTCD to a new chapter titled Chapter 2H General Information Signs. The FHWA received no substantive comments on this proposal.

189. The FHWA adds a new section numbered and titled Section 2D.50 Community Wayfinding Signs (numbered Section 2D.52 in the NPA). Although the FHWA proposed adding this section in the NPA, in this final rule the FHWA reorganizes and revises its content to reflect comments from ATSSA, six State DOTs, two local DOTs, a research institute, and two citizens. The general comments about this new section included both support for the NPA proposal as written or with minor changes and opposition to community wayfinding signs in general. Commenters expressed concerns that the NPA proposal was too restrictive or that it was not detailed enough. Some commenters suggested that the information was so exhaustive that it justified a separate rulemaking activity or that community wayfinding signs need not be governed by the MUTCD. The FHWA adopts this new section with SUPPORT, STANDARD, GUIDANCE, and OPTION statements, as well as new figures illustrating typical usage, to provide practitioners with information regarding the use of community wayfinding guide signs to direct tourists and other road users to key civic, cultural, visitor, and recreational attractions and other destinations within a city or a local urbanized or downtown area.

The FHWA notes that many of the cities currently using community wayfinding signs are using different colors, design layouts, fonts, and arrows, and many of these signs are not well designed to properly serve road users. The FHWA believes that providing criteria for community wayfinding guide signing is important to address issues of legibility, placement, and excessive amounts of information displayed, and because of the extreme lack of uniformity among and proliferation of such signs. Many of the non-conforming installations have occurred without official experimentation as required by Section 1A.10. The following paragraphs in this item describe the significant differences between the proposed language in the NPA and the language adopted in this final rule.

In the NPA, the FHWA proposed recommending in a GUIDANCE statement that wayfinding signs be used only on conventional roads. Various agencies commented that community wayfinding signs are not appropriate for freeways and expressways due to the cognitive overload of information that can be displayed on this type of sign. To address these comments, the FHWA changes the proposed statement to a STANDARD in this final rule to clarify that community wayfinding guide signs shall be limited to conventional roads and not installed on freeway or expressway mainlines or ramps. For similar reasons, the FHWA also adds to the STANDARD that community wayfinding guide signs shall not be overhead-mounted. These changes are consistent with the experience gained in official experimentations that FHWA has approved to date, on which the MUTCD provisions are based, and which have only included conventional roads and post-mounted signs.

The FHWA adds a GUIDANCE statement in this final rule recommending that if used, a community wayfinding guide sign system should be established on a local, municipal, or equivalent jurisdictional level or for an urbanized area of adjoining municipalities, or equivalent, that form an identifiable geographic entity conducive to a cohesive and continuous system of signs. The FHWA adopts this recommendation because community wayfinding guide signs are not appropriate for use on a regional or statewide basis where infrequent or sparse placement does not contribute to a continuous or coordinated system of signing that is readily identifiable as such to the road user. In such cases, existing MUTCD provisions indicate that Destination or other guide signs should be used to direct road users to an identifiable area.

Although not proposed in the NPA, the FHWA adds SUPPORT and corresponding GUIDANCE statements to clarify that the provisions contained in this section apply to vehicular community wayfinding guide signs, not pedestrian wayfinding guide signs, and to provide recommendations regarding the placement of pedestrian wayfinding signs. The FHWA adopts these statements in this final rule because many jurisdictions use pedestrian wayfinding guide signs, and it is important that they not be confused with signing for vehicles because of the high potential for vehicles to reduce speed or stop unexpectedly to read signs that are not adequately sized for roadway applications and the potential to direct a motorist the wrong way on a one-way street when the message is actually intended only for pedestrians or other users of a sidewalk or roadside area.

In this final rule the FHWA revises the adopted language to clarify that color-coding of community wayfinding is an option, rather than a requirement, as implied in the NPA, and that only one boundary sign is used at each boundary crossing.

Although not proposed in the NPA, the FHWA adds information regarding the use of pictographs of the identification enhancement marker to paragraph 15, since many jurisdictions use pictographs and need regulations regarding their use. As part of this STANDARD, the FHWA expands the language adopted in this final rule to provide additional detail about the placement of color coded panels on the face of informational guide signs.

As proposed in the NPA, the FHWA adopts a prohibition on the use of red, orange, and yellow as background colors on wayfinding signs. In addition, FHWA also prohibits the use of fluorescent yellow-green and fluorescent pink as background colors for community wayfinding signs in this final rule to be consistent with existing MUTCD provisions that reserve these colors for critical Non-Vehicular Warning signs and for incident management signs.

Additionally, as proposed in the NPA the FHWA adds a GUIDANCE statement recommending that community wayfinding guide signs be rectangular in shape to prevent unusual shapes of wayfinding signs. The FHWA notes that only the identification enhancement marker may form a non-rectangular shape.

In the NPA, the FHWA proposed to allow the use of white or black horizontal lines to separate destinations from each other. In this final rule, the FHWA adopts more flexibility to the color of the separator line by allowing it to be of a contrasting color that meets the minimum contrast requirements, rather than limiting it to just black or white. As part of this change, the FHWA changes the use of this horizontal separator line from an OPTION to a GUIDANCE to encourage the use of the line to separate between groups of destinations by direction, consistent with the GUIDANCE provisions for a multi-line destination sign elsewhere in Chapter 2D.

In this final rule the FHWA adopts revised fifth STANDARDS in paragraphs 27 through 30 to provide more specificity as to the height, spacing, and style, of lettering on community wayfinding guide signs than was proposed in the NPA, consistent with official experimentations approved to date and with other changes adopted in Chapter 2D for general provisions for guide signs.

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The FHWA also clarifies the STANDARD in paragraph 32 of this final rule so that the provision allowing the use of Internet and e-mail addresses applies to bicyclists that are stopped or parked out of the traffic flow, since bicyclists in the flow of traffic have the same legibility and comprehension issues as other vehicle operators. This change also is consistent with existing and adopted provisions in Section 2A.06.

Because arrows on existing wayfinding signs are often not appropriately located, the FHWA revises the language in this final rule to require, rather than recommend, arrow location and priority order of destinations, as well as arrow designs to follow specific provisions in the MUTCD. This change is consistent with official experimentations that have been approved to date and eliminates a conflict with general provisions for guide signs in Chapters 2D and 2E.

Finally, the FHWA adds a GUIDANCE in paragraph 42 at the end of the section to clarify that the area of the identification enhancement marker shall not exceed one-fifth of the area of the community wayfinding guide sign with which it is mounted in the same sign assembly. This revision is consistent with experimentation experience with this type of sign and provides consistency with general guide sign design principles and assures that the non-critical enhancement message does not overpower the more important destination messages.

The FHWA adopts this section to provide a uniform set of provisions for the designs and locations of these signs based on accepted sign design principles, to achieve consistency for road users.

190. As proposed in the NPA, the FHWA adopts in this final rule two new sections numbered and titled Section 2D.51 Truck, Passing, or Climbing Lane Signs, and Section 2D.52 Slow Vehicle Turn-Out Sign. The FHWA adopts Section 2D.51 to be consistent with the elimination of regulatory truck lane signs from Section 2B.39 (Section 2B.32 of the 2003 MUTCD). These types of signs convey guidance information, rather than regulation. The FHWA adds Section 2D.52 based on the results of the Sign Synthesis Study,[89] which found that these signs are being used by a number of States. A State DOT suggested that the Slow Vehicle Turn-Out signs should be regulatory, rather than guide signs. The FHWA disagrees (see discussion under Chapter 2B above) and adopts these signs as guide signs, as proposed in the NPA. The FHWA also adds a new Figure 2D–21 to illustrate these signs.

Discussion of Amendments Within Chapter 2E—General

191. Although not proposed in the NPA, the FHWA revises the terminology to separate ''Overhead Arrow-per-Lane'' guide signs from traditional ''diagrammatic'' guide signs to better describe the type of guide sign being used. The NCUTCD, a State DOT, a toll road operator, and a toll road operator association recommended the change and the FHWA agrees. The FHWA makes this same terminology change wherever it appears throughout the MUTCD.

Discussion of Amendments Within Chapter 2E—Specific

192. As proposed in the NPA, the FHWA adopts in this final rule a new section, numbered and titled Section 2E.09 Signing of Named Highways, with a SUPPORT statement to refer to new Sections 2D.53 and 2M.10 where appropriate information is provided about the use of highway names on signing of unnumbered highways and memorial signing of roads, bridges, or highway components.

193. In Section 2E.10 (Section 2E.09 in the 2003 MUTCD) Amount of Legend on Guide Signs, the FHWA proposed in the NPA to revise the GUIDANCE statement to state that sign legends should not exceed three lines of copy, including route numbers and exit instructions. The NCUTCD, four State DOTs, a toll agency, and an NCUTCD member opposed the use of the word ''including'' that was proposed in the NPA. The FHWA agrees that this was an inadvertent error and replaces the word ''including'' with ''excluding'' in the section adopted in this final rule, which is consistent with the provisions of Section 2D.07. The GUIDANCE statement now states that sign legends should not exceed three lines of copy, *excluding* route numbers and exit instructions.

In the NPA, the FHWA proposed new OPTION and STANDARD statements regarding the use and maximum dimensions of pictographs on freeway and expressway signs. The NCUTCD, two State DOTs, and a toll agency agreed with the use of pictographs ATSSA agreed with the proposed maximum dimensions, while two State DOTs and three toll road operators opposed the restrictions on the dimensions of the pictograph. The FHWA relocates the provisions related to pictographs to the specific sections of the Manual to which they apply in this final rule, the provisions of which are based on Official Ruling No. 2–646(I)[90]. Further, to address the comments, the FHWA provides an exception and further guidance on the size of pictographs for electronic toll collection systems whose display does not accompany a duplicate word message and relocates the statement to Section 2F.04.

194. In Section 2E.11 (Section 2E.10 in the 2003 MUTCD) Number of Signs at an Overhead Installation and Sign Spreading, a State DOT recommended modifying the existing GUIDANCE to place an Advance Guide sign on the overcrossing structure when the crossroad goes over the mainline. Although this was not proposed in the NPA, the FHWA agrees that added flexibility is needed by highway agencies and adopts in this final rule an expanded paragraph 04 to also recommend placing the Advance Guide sign directly in front of the overcrossing structure on an independent support as an alternative to placing the sign directly on the overcrossing structure.

195. In Section 2E.14 (Section 2E.13 in the 2003 MUTCD) Size and Style of Letters and Signs, the FHWA proposed in the NPA a new STANDARD which requires freeway and expressway guide signs that have standardized designs to match the sizes shown in Table 2E–1, except as noted in Section 2A.11. A State DOT and an NCUTCD member opposed the change because it prohibits the use of at least one of the State DOT's standard sizes for guide signs. The FHWA disagrees because standard signs will, by virtue of a standard design, have predictable dimensions. The FHWA adopts this section in this final rule as proposed in the NPA. The FHWA also removes the sentence in GUIDANCE paragraph 08 regarding loop height of lower-case letters and adds a comparable sentence in STANDARD paragraph 04 for consistency with requirements adopted in Section 2D.05 and to eliminate the conflict between sections 2A.13 and 2D.05.

196. In Table 2E–1 Freeway or Expressway Guide Sign and Plaque Sizes, the FHWA proposed in the NPA minimum sizes for a variety of guide signs and plaques. Based on comments from two State DOTs, the FHWA in this final rule does not adopt the proposed entries for the Interchange Advance and

[89] ''Synthesis of Non-MUTCD Traffic Signs,'' FHWA, December 2005, page 46, can be viewed at the following Internet Web site: *http://tcd.tamu.edu/documents/rwstc/Signs_Synthesis-Final_Dec2005.pdf.*

[90] This Official Interpretation can be viewed at the following Internet Web site: *http://mutcd.fhwa.dot.gov/resources/interpretations/pdf/2_646.pdf.*

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Exit Direction signs because, due to the variation in the amount, size, and length of allowable legends, the sizes will vary and it is not practical to standardize this information in the table. The FHWA notes further that the information will be covered as standardized guide sign layout in the ''Standard Highway Signs and Markings'' book.

The FHWA received an anonymous comment that the information about the use of fractions on guide signs is contradictory and does not provide highway agencies with sufficient criteria for proper use, resulting in reduced legibility of sign messages. The FHWA agrees and clarifies criteria for the proper display of fractions on guide signs in this final rule and places this information in Section 2A.13 (see discussion above under that section).

197. In Section 2E.17 (Section 2E.16 in the 2003 MUTCD) Abbreviations, the FHWA adopts new GUIDANCE as proposed in the NPA, which states that periods, apostrophes, question marks, ampersands, or other punctuation or characters that are not letter or numerals should not be used on signs. A State DOT agreed with the change. Another State DOT opposed the restriction of ampersands because they are a way to shorten messages and reduce the cost of signs. As previously discussed in Section 2A.13, the FHWA disagrees and notes that ampersands are frequently confused with the numeral ''8'' and are less conspicuous than the use of the word ''AND.''

Although not proposed in the NPA, the FHWA adopts in the first GUIDANCE statement a recommendation that longer commonly used words that are not a part of a proper name and are readily recognizable should be abbreviated, to reduce the amount of information displayed on the sign and expedite recognition and processing time. The FHWA also adds a new GUIDANCE statement that a solidus is reserved for fractions only and should not be used to separate words on the same line of a legend. The FHWA makes these changes for consistency with existing recommendations on limiting the amount of legend on signs and to reflect current practice.

198. In Section 2E.19 (Section 2E.18 in the 2003 MUTCD) Arrows for Interchange Guide Signs, in the NPA the FHWA proposed to revise existing STANDARD and OPTION statements as well as add new OPTION and STANDARD statements to this section to clarify the style and placement of arrows on guide signs. Comments regarding the proposed language and the resulting language adopted in this final rule are described in the following paragraphs.

The FHWA proposed a new STANDARD in the NPA requiring down arrows on overhead signs to be positioned approximately over the center of the lane. The NCUTCD, four State DOTs, a toll road operator, a city, and a toll road operators association opposed the proposed requirements and recommended that the statements be GUIDANCE or OPTION. The FHWA disagrees and notes that non-conforming designs have been ineffectively employed in field applications, which demonstrates the need for the requirement. The FHWA adopts the new STANDARD in this final rule with editorial revisions to further clarify the new provision.

The FHWA also proposed a new STANDARD to explicitly prohibit the use of more than one down arrow on an overhead sign structure pointing to the same lane. Four State DOTs opposed the change and recommended allowing more flexibility in the application of the down arrows where an option lane is present. The FHWA disagrees with these comments because there had not been a provision in the MUTCD allowing such use and because this practice has been demonstrated to cause uncertainty to motorists on the approach to a decision point when the number of arrows displayed is greater than the number of lanes present. The Overhead Arrow-per-Lane signs adopted in Section 2E.21 have been shown to be a clearer, positive method of conveying lane use where an option lane is present at a decision point. Therefore, the FHWA adopts this new STANDARD in this final rule. Based on a comment from a State DOT, the FHWA provides a reference to the appropriate provisions for addressing the geometric conditions of an option lane.

In the NPA, the FWHA proposed the OPTION of using a directional arrow to point diagonally downward to emphasize the departure of diverging roadways. One State DOT, an NCUTCD member, and a citizen opposed this revision because of the potential for inconsistent application, the implication of a lane change, and because it would be an overall practice that is not consistent with the use of upward-pointing arrows at similar locations. The FHWA agrees and does not adopt this provision for overhead guide signs.

199. In the NPA, the FHWA proposed significant changes to Section 2E.19 of the 2003 MUTCD regarding Diagrammatic Signs. The changes proposed in the NPA included requiring a specific design for diagrammatic signs (now called the Overhead Arrow-per-Lane sign) for multi-lane exits that have an optional exit lane that also carries the through road, and for splits that include an optional lane. Several State DOTs expressed a concern that the proposed requirements were not practical in urban areas with closely spaced interchanges. The FHWA agrees and as a result adopts new and revised sections in this final rule to address provisions related to interchange signing with optional exit lanes. The resulting sections are: Section 2E.20 Signing for Splits and Multi-Lane Exits with an Option Lane, Section 2E.21 Design of Overhead Arrow-Per-Lane Guide Signs, Section 2E.22 Design of Freeway and Expressway Diagrammatic Guide Signs, and Section 2E.23 Signing for Intermediate and Minor Interchange Multi-Lane Exits with an Option Lane. These sections are discussed in the following items.

200. Section 2E.20 Signing for Option Lanes at Splits and Multi-Lane Exits, as adopted in this final rule, contains SUPPORT, STANDARD, and GUIDANCE statements regarding signing for freeway and expressway splits or multi-lane exit interchanges where an interior option lane serves two movements in which traffic can either leave the route or remain on the route, or choose either destination at a split, from the same lane. The FHWA is adopting this separate section in this final rule to provide an overview of the types of signing to be used for interchanges with optional lanes. The NPA would have required Overhead Arrow-per-Lane signs for all locations with an interior option lane. The adopted Section 2E.20 distinguishes that there are two types of signs, ''Overhead Arrow-per-Lane'' signs and ''Diagrammatic'' signs, and provides the general provisions that apply to the three Sections that follow, all of which provide for more flexibility in the signing of locations with interior option lanes. As part of this change, the FHWA relocates a STANDARD statement from Section 2E.21 as proposed in the NPA to Section 2E.20, where it is more appropriately located.

201. In Section 2E.21 Design of Overhead Arrow-per-Lane Guide Signs for Option Lanes (numbered and titled Section 2E.20 Diagrammatic Signs in the NPA), the FHWA adopts provisions for Overhead Arrow-per-Lane signs. As proposed in the NPA, the Overhead Arrow-per-Lane design features an upward arrow for each lane and is consistent with the recommendations of

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the Older Driver handbook [91] and a recent study [92] that confirmed that the up arrow for each lane diagrammatic design is significantly superior to the existing diagrammatic design or enhancements thereto in terms of providing a longer decision sight distance and higher rates of road user comprehension. The FHWA believes that the Overhead Arrow-per-Lane style, including the appropriate use of EXIT ONLY sign panels, is the clearest and most effective method of displaying to road users the essential information about the proper and allowable lanes to use to reach their destinations where an ''option lane'' is used for at an exit. The existing diagrammatic sign design that attempts to illustrate optional lane use via dotted lane lines on a single arrow shaft is too subtle to be easily recognized and understood by many road users, especially older drivers. A State DOT, a city, and a citizen agreed with the sign designs as proposed in the NPA, although the State DOT questioned the required size of the arrows on the signs. The NCUTCD, 13 State DOTs, 5 toll road operators, an NCUTCD member, and a citizen opposed the required use of the Overhead Arrow-per-Lane sign and argued for the continued allowable use of the diagrammatic signs recommended in the 2003 MUTCD. Several of the commenters also recommended changing the design of the existing diagrammatic signs if retained in the MUTCD. In this final rule the FHWA adopts the new style of Overhead Arrow-per-Lane signs proposed in the NPA and also decides to retain the provisions for the existing diagrammatic sign design as an alternative to the Overhead Arrow-per-Lane signs. The FHWA also adopts a SUPPORT statement at the beginning of the section to state that the Overhead Arrow-per-Lane design has been shown to be superior to diagrammatic signs and to encourage the use of that design. The FHWA also adopts modified figures within the section to illustrate the use of both the Overhead Arrow-per-Lane and existing diagrammatic signs.

The NCUTCD, a State DOT, and a city recommended additional changes to the proposed list of design criteria in the STANDARD statement for Overhead Arrow-per-Lane signs. The FHWA agrees that additional clarification will provide uniformity in sign design and, based on the comments, the FHWA adds items G, H, and I in this final rule to clarify the design and placement of distance messages on signs, the number of lanes displayed on signs, and the use of exit plaques.

202. The FHWA adopts a new section in this final rule numbered and titled Section 2E.22 Design of Freeway and Expressway Diagrammatic Guide Signs for Option Lanes, to describe the criteria under which diagrammatic signs are allowed to be used. The FHWA adopts a SUPPORT statement at the beginning of the section recognizing that diagrammatic signs have been shown to be less effective than conventional or Overhead Arrow-per-Lane guide signs at conveying the destination or direction(s) that each approach lane serves, whether dedicated or option lanes are present. However, based on comments submitted on the NPA, the FHWA recognizes that in some cases a diagrammatic sign is most practical, and therefore adopts in this final rule criteria for their use and design based on the 2003 MUTCD provisions for diagrammatic signs.

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203. The FHWA adopts a new section in this final rule numbered and titled Section 2E.23 Signing for Intermediate and Minor Interchange Multi-Lane Exits with an Option Lane, to provide recommendations on the types of signing to be used at intermediate and minor multi-lane exits where there is an operational need for the presence of an option lane for only the peak period, during which excessive queues might otherwise develop if the option lane were not present. The text proposed in the NPA (in Section 2E.19) would have required diagrammatic (now called Overhead Arrow-per-Lane) signs for these locations in a STANDARD statement and the 2003 MUTCD recommended diagrammatic signs for these locations in a GUIDANCE statement. The FHWA understands, based on past experience and comments on Section 2E.19 of the NPA, that in such cases, the Overhead Arrow-per-Lane or Diagrammatic guide signing described for option lanes in Sections 2E.21 and 2E.22 might not be practicable, depending on the need for and level of use of the option lane and the spacing of nearby interchanges, particularly in non-rural areas. The adopted provision provides flexibility and guidance on the signing for such locations where the Overhead Arrow-per-Lane or diagrammatic signs are not practicable due to various considerations.

204. In Section 2E.24 Signing for Interchange Lane Drops (Section 2E.21 of the 2003 MUTCD), the FHWA proposed in the NPA to require the use of the EXIT ONLY (down arrow) sign panel on signing of lane drops on all overhead advance guide signs for exits that do not have an ''option lane,'' and to provide design requirements for the bottom portion of Exit Direction signs. A citizen agreed with the proposed changes. Four State DOTs opposed the proposed requirements and requested that the STANDARD statements be changed to GUIDANCE or OPTION. The FHWA disagrees and notes that existing GUIDANCE has resulted in improper and ineffective methods of signing of option lanes. The FHWA believes that, for freeway splits and other interchange configurations that include a lane drop but do not involve ''option lanes,'' the use of down arrows and EXIT ONLY sign panels over each lane on the advance guide signs provide the clearest and most effective method of displaying to road users the essential information about the lane drop and about the proper lane(s) to use to reach their destinations. The FHWA also believes that the use of upward diagonal black arrows within an EXIT ONLY panel at the bottom of the Exit Direction signs for such interchanges more clearly reinforces the lane drop while still providing upward diagonal arrows in the direction of the exit. The NCUTCD, two State DOTs, a toll road operator, a toll road operators association, and a city agreed with the section, but recommended text changes. The FHWA adopts the language as proposed in the NPA in this final rule with revisions based on adopted changes to Sections 2E.22 and 2E.23 concerning the continued use of diagrammatic signs and the new Overhead Arrow-per-Lane signs.

A toll road operator opposed the proposed GUIDANCE that recommended the use of the Advance Guide sign with a distance message where the dropped lane is an auxiliary lane between successive entrance and exit ramps and the distance is less than 1 mile. The FHWA adopts a revision to paragraph 08 to clarify that the provision recommends displaying the distance in addition to the EXIT ONLY message.

205. Although not proposed in the NPA, the FHWA adopts a new section in this final rule numbered and titled Section 2E.28 Eisenhower Interstate System Signs. This section contains OPTION, GUIDANCE, and STANDARD

[91] ''Guidelines and Recommendations to Accommodate Older Drivers and Pedestrians,'' FHWA Report no. FHWA–RD–01–051, May 2001, can be viewed at the following Internet Web site: *http://www.tfhrc.gov/humanfac/01105/cover.htm.* Recommendation II.A(3).

[92] ''Evaluation of Diagrammatic Freeway Guide Signs,'' Final Report, May, 2008, conducted by Gary Golembiewski and Bryan Katz for the Traffic Control Devices Pooled Fund Study, can be viewed at the following Internet Web site: *http://www.pooledfund.org/documents/TPF-5_065/Diagrammatic_Freeway_Guide_Sign_Design_rev4_final.pdf.*

statements regarding the use of Eisenhower Interstate System (M1–10 and M1–10a) signs that may be used on Interstate highways at periodic intervals and in rest areas, scenic overlooks, or other similar roadside facilities on the Interstate system. This sign was adopted in an August 11, 1993 memorandum, subject ''Eisenhower Interstate System Sign,'' from the FHWA Executive Director to the Regional Federal Highway Administrators and the Federal Lands Highway Program Administrator. The sign was contained in the 2003 MUTCD by being included in a figure illustrating various guide signs and the sign design has also been in the Standard Highway Signs and Markings Book. However, there was no text in the 2003 MUTCD describing the sign or its intended use. The FHWA adds this section in this final rule to incorporate language regarding the optional use of this sign and, if used, GUIDANCE on where it should be located and a STANDARD on where it shall not be used. These provisions are consistent with adopted provisions for signing of Auto Tour Routes in Section 2H.07 and are necessary to assure that highway agencies that elect to use the sign do so properly in accordance with the 1993 FHWA direction and with adopted provisions for similar types of signs.

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206. In Section 2E.31 (Section 2E.28 in the 2003 MUTCD) Interchange Exit Numbering, the FHWA proposed in the NPA to revise paragraph 02 to clarify an existing provision that if suffix letters are used for exit numbering at a multi-exit interchange, the suffix letter shall be included on the exit number plaque and shall be separated from the exit number by a space having a width of at least half of the height of the suffix letter. This will enhance the legibility of the exit number and help avoid confusion, especially between the letter ''B'' and the numeral ''8.'' This provision was included in the 2003 MUTCD requiring a space between the number and the suffix, but the width of the space was not specified, implying that the space is equal to the letter height. Three State DOTs, a city, and an NCUTCD member opposed the revision because research has not been performed to justify the new requirement and because of concerns that adding the space between the suffix letter and exit number will cause confusion, increase the size of the signs, and add expenses to agencies because of the increased wind load. The FHWA disagrees because the new provision actually modifies an existing requirement and reduces the amount of space required between the number and letter. In this final rule the FHWA adopts the provision and specifies a space width of one-half to three-quarters of the letter height. This revision should have a minimal impact on agencies because Exit Number plaque widths are commonly standardized rather than customized fit to the exact legend, therefore the revision does not introduce a new requirement that did not exist in the 2003 MUTCD. Further, a Narrow Exit Gore sign is adopted in Section 2E.37 that will ameliorate issues regarding extra sign width for the space between the exit number and the suffix on Exit Gore signs. The FHWA adopts this change in this final rule in order to provide practitioners with clearer direction on the space between the exit number and the suffix than was previously provided in the MUTCD or the Standard Highway Signs and Markings book.

In addition, the FHWA proposed in the NPA a new STANDARD to make it clear that if suffix letters are used for exit numbering, an exit of the same number without a suffix letter cannot be used. The NCUTCD, two State DOTs, a toll road operator, a local DOT, a toll road operator association, and a citizen agreed with the proposal and suggested clarifying for situations where an interchange has multiple exits in one direction, but only a single exit in the opposite direction, suggesting that the provision should allow the use of an exit number without a suffix in the direction with only one exit. The FHWA agrees and adopts the proposal in this final rule with the suggested revision.

As proposed in the NPA, the FHWA replaces an OPTION with a STANDARD stating that interchange exit numbering shall use the reference location exit numbering method and that the consecutive exit numbering method shall not be used. The FHWA adopts this change because only 8 of the 50 States still use consecutive exit numbering and, based on past public comment and inquiries, the vast majority of road users now expect reference location exit numbering. The FHWA believes that road users will be better served by nationwide uniformity of exit numbering using the reference location method. Two local agencies and ATSSA agreed. Two State DOTs, a local DOT, and a county opposed the revision and suggested reducing the statement to GUIDANCE since their experience has shown consecutive exit numbering has not compromised safety or convenience. The commenters also had concerns about a potentially large cost associated with replacing all signs along the freeway with minimal benefit. The FHWA disagrees because uniform exit numbering is important for road user navigation and for the reporting of incidents to facilitate expedient and accurate emergency response and warrants consistency across the United States. It is expected that the conversion to reference-location based exit numbering would be accomplished on a systematic route-by-route basis, as has been done in many other States that have undergone such conversions over the past several decades.

The FHWA also proposed in the NPA to change a GUIDANCE statement in the 2003 MUTCD to a STANDARD statement to require that a left exit number (E1–5bP) plaque be used at the top left edge of the sign for numbered exits to the left to alert road users that the exit is to the left, which is often not expected. This change also required that the ''LEFT'' portion of the message be black on a yellow background. A State DOT agreed with the change. Another State DOT also agreed and suggested adding an example of an optional left exit scenario with a black on yellow LEFT LANE plaque below the parent guide sign. The FHWA disagrees, as the message display suggested by that State DOT is frequently misinterpreted as an indication of a dedicated lane with a mandatory exit movement and does not promote consistency of the message for similar situations. Two State DOTs, a city, and two NCUTCD members opposed the revision because they believe that the new provisions will not add a significant improvement from the provisions for diagrammatic signs in the 2003 MUTCD and suggested reducing the statement to GUIDANCE. The FHWA disagrees because the direction of the exit is better communicated by the positive sign legend and placement of the sign over the roadway. The FHWA adopts the proposed changes in this final rule for consistency of message to drivers and for consistency with other parts of the manual regarding left-side exits.

In the NPA, the FHWA proposed a target compliance period of 10 years for the implementation of LEFT (E1–5aP) and Left Exit Number (E1–5bP) plaques at left-side exits. In this final rule the FHWA adopts a target compliance date December 31, 2014 (approximately 5 years from the effective date of this final rule) for the requirements in Sections 2E.31, 2E.33, and 2E.36 to install LEFT (E1–5aP) or Left Exit Number (E1–5bP) plaques at all existing numbered and non-numbered left exits on freeways and expressways. The FHWA adopts this target compliance date to address a recent recommendation (Safety Recommendation H–08–7) by the

National Transportation Safety Board (NTSB).[93] The NTSB developed this recommendation as a result of an imminent safety concern exhibited with left-side freeway exits. The FHWA believes that the installation of these plaques at all existing left-side exits within 5 years is necessary to achieve critical safety improvements at left-side exits and that reliance on the systematic upgrade provisions of Section 655.603(d)(1) of title 23, Code of Federal Regulations is not appropriate in this case. The installation of these plaques would generally not require replacement of the existing sign or sign supports and this change affects relatively few locations throughout the country. The FHWA anticipates that installation of the required plaques at existing locations will provide significant safety benefits to road users.

207. In Section 2E.33 (Section 2E.30 in the 2003 MUTCD) Advance Guide Signs and in Section 2E.36 (Section 2E.32 in the 2003 MUTCD) Exit Direction Signs, the FHWA proposed in the NPA to add a STANDARD statement to require that a left exit number (E1–5bP) plaque be used at the top left edge of the sign for numbered exits to the left and that a LEFT (E1–5aP) plaque be added to the top left edge of the sign for non-numbered exits to the left. In this final rule the FHWA adopts this proposed statement to be consistent with the changes in Section 2E.31. A State DOT suggested reducing the statement to GUIDANCE because they believe it is not necessary to have the LEFT plaque in all cases. The FHWA disagrees because the suggestion would not provide a consistent, uniform message to road users. An NCUTCD member suggested changing the plaque message to LEFT EXIT instead of LEFT. The FHWA disagrees as non-numbered exits contain the word EXIT within the distance message and the word EXIT on the plaque would be redundant. As noted above in item 206, the FHWA also adopts a target compliance date of December 31, 2014 for the requirements for E1–5aP and E1–5bP plaques at left-side exits.

The NCUTCD, a State DOT, a toll road operator, and a toll road operator association suggested deleting paragraph 06 regarding the use of Advance Guide signs for multi-lane exits because the information is contained in other locations in Chapter 2E. The FHWA disagrees because the provision pertains specifically to Advance Guide signs. A State DOT suggested changing the statement to GUIDANCE. Another State DOT opposed the revision because Section 2E.33 states that diagrammatic signs can serve as Advance Guide signs. The FHWA disagrees with the commenters because uniformity in the display of messages regarding multi-lane exits is critical and the FHWA adopts the language as proposed in the NPA in this final rule.

208. The FHWA relocates the OPTION and STANDARD statements regarding the use of pictographs as proposed in Section 2E.10 of the NPA to Section 2E.35 (Section 2E.32 in the 2003 MUTCD) Other Supplemental Guide Signs in this final rule. As part of this change, the FHWA clarifies the provisions for the display of pictographs in this final rule. See Section 2E.10 discussion above for additional information.

209. In Section 2E.36 (Section 2E.33 in the 2003 MUTCD) Exit Direction Signs, the FHWA proposed in the NPA to revise the second STANDARD statement to clarify the appropriate signing for exits where a through lane is being terminated and for multi-lane exits having an optional exit lane that also carries the through route or for a split with an option lane. The NCUTCD suggested replacing Figures 2E–5, 2E–6 and 2E–8 through 2E–10 with alternate Figures provided in their comment and updating the corresponding references in this section. A State DOT suggested deleting references to Figures 2E–5 and 2E–6 because the Overhead Arrow-per-Lane signs must be placed at the point of divergence of the outside lane and not at the theoretical gore. Another State DOT also suggested revising the text to require Exit Direction signs overhead at the theoretical gore where there is a through lane being terminated and to require a diagrammatic sign near the point where the outside edge of the dropped lane begins to diverge from the mainline where there is a multi-lane exit with an optional exit lane. A State DOT and a toll road operator suggested changing the STANDARD statements to GUIDANCE. A State DOT opposed the revisions. The FHWA agrees with the comment regarding the inaccurate reference to the figures and references the appropriate figures in this final rule. The FHWA disagrees with changing the STANDARD statements to GUIDANCE and adopts the provisions as proposed in the NPA to promote uniformity in the application of signing at similar locations and to be consistent with other changes in the Manual regarding Overhead Arrow-per-Lane diagrammatic signs and plaques for exits.

A State DOT suggested changing paragraph 10 regarding the use of the LEFT plaque at non-numbered exits from STANDARD to GUIDANCE. The FHWA disagrees with the comment because it would conflict with similar provisions adopted in Section 2E.31 requiring the use of the left exit number plaque and is necessary for consistency in sign legends. In this final rule the FHWA adopts the requirements for E1–5aP or E1–5bP plaques at left-side exits. As noted above in item 206, the FHWA also adopts a target compliance date of December 31, 2014 for the requirements for E1–5aP and E1–5bP plaques at left-side exits.

Finally, the FHWA adopts the OPTION, as proposed in the NPA, to permit the use of an EXIT XX MPH (E13–2) sign panel at the bottom of the Exit Direction sign to supplement, but not to replace, the exit or ramp advisory speed warning signs where extra emphasis of an especially low advisory ramp speed is needed. This may be done by adding an EXIT XX MPH (E13–2) sign panel to the face of the Exit Direction sign near the bottom of the sign or by making the EXIT XX MPH message a part of the Exit Direction sign. The Sign Synthesis Study[94] found that at least four States have found it necessary to use similar advisory speed panels with Exit Direction signs to provide even more advance notice and emphasis of a very low ramp speed, typically because of curvature. The NCUTCD, a State DOT, a toll road operator, and a toll road operator association agreed and suggested text revisions to eliminate repetitive wording. The FHWA agrees with the suggested revision and rewords the provision to simplify and eliminate redundant language.

210. In Section 2E.37 (Section 2E.34 in the 2003 MUTCD) Exit Gore Signs, the FHWA adopts the revision to the STANDARD statement, as proposed in the NPA, to clarify that the space between the exit number and the suffix letter on an Exit Gore Sign shall be the width of one-half to three-quarters of the height of the suffix letter. This change correlates to a similar change in Section 2E.31 Interchange Exit Numbering.

The FHWA also adopts an additional paragraph in the OPTION statement, as proposed in the NPA, allowing the use of Type 1 object markers on sign supports below the Exit Gore sign to improve the visibility of the gore for exiting drivers. The FHWA adopts this

[93] NTSB Safety Recommendation H–08–7 is contained within NTSB's letter dated August 18, 2008, which can be viewed at the following Internet Web site: *http://www.ntsb.gov/recs/letters/2008/H08_3_7.pdf.*

[94] ''Synthesis of Non-MUTCD Traffic Signs,'' FHWA, December 2005, page 51, can be viewed at the following Internet Web site: *http://tcd.tamu.edu/documents/rwstc/Signs_Synthesis-Final_Dec2005.pdf.*

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based on recommendations from the Older Driver handbook.[95] A city and ATSSA agreed. A toll road operator opposed the revision because they believe that the object marker will not serve a useful purpose and will add to sign clutter. The FHWA disagrees because the object markers serve to visually tie the sign to the ground, which enhances nighttime visibility and depth perception of the physical gore.

Finally, as proposed in the NPA, the FHWA adopts an OPTION paragraph allowing the use of a vertical rectangular shaped Exit Gore sign for certain narrow gore areas an OPTION paragraph allowing the use of an Exit Number (E5–1bP) plaque above existing Exit Gore (E5–1) signs only when non-numbered exits are converted to numbered exits, and a STANDARD paragraph requiring the use of the Exit Gore (E5–1a) sign for a numbered exit when replacement of existing assemblies of the E5–1 and E5–1bP signs becomes necessary. The FHWA adopts these changes in this final rule to provide for more uniform design of Exit Gore signs. An NCUTCD member noted that the E5–1a sign is prohibited based on text elsewhere in Chapter 2E and Table 2E–1. The FHWA disagrees because an OPTION is provided in this Section for a vertically arranged Exit Gore sign and the FHWA adds the standard sizes for these signs into Table 2E–1 in this final rule for clarification. A State DOT suggested allowing a narrow version of the E5–1a sign at non-numbered exits. The FHWA disagrees because the E5–1a unnumbered Exit Gore signs are 6 feet wide, which should fit in most narrow gore situations and because in this final rule the FHWA also provides an OPTION allowing the mounting height of any Exit Gore sign to be 14 feet or more to address narrow gore situations.

211. In Section 2E.40 (Section 2E.37 in the 2003 MUTCD) Interchange Sequence Signs, a toll road operator opposed the proposed revisions to the STANDARD in the NPA regarding the LEFT EXIT or LEFT sign panel use where the exit direction is to the left. The commenter was concerned that left exits create driver expectancy issues and should therefore warrant individual guide sign panels from the one mile advanced sign through the exit direction assembly. The FHWA disagrees because the LEFT or LEFT EXIT message addresses the expectancy issues raised by the commenter. The FHWA adopts a revised provision in this final rule to retain the LEFT sign panel, but does not adopt the LEFT EXIT sign panel, because the intended use of both sign panels is identical and allowing two different messages for the same purpose does not promote uniformity in sign legends.

212. In Section 2E.44 (Section 2E.41 in the 2003 MUTCD) Freeway-to-Freeway Interchange, the FHWA proposed to add a STANDARD statement in the NPA requiring the use of the left exit number plaque at splits where the off-route movement is to the left. The NCUTCD, two State DOTs, a local DOT, and two toll road operators supported this requirement, while two State DOTs opposed it. One of the State DOTs stated that there is not enough justification for doing so, and that the practice of installing exit panels left justified for left exits and right justified for right exits is meant to orient motorists to the lane they will use to exit. The FHWA disagrees with the comment because left-side exits continue to violate driver expectancy and just placing the exit number plaques on the left is too subtle and does not convey a positive message to the motorist. The FHWA also adopts provisions in this section requiring the use of Overhead Arrow-per-Lane or diagrammatic signs for freeway splits with an option lane and for multi-lane freeway-to-freeway exits having an option lane, consistent with provisions adopted for Sections 2E.20 through 2E.22. The NCUTCD, a State DOT, and two agencies that operate toll facilities felt that this requirement duplicates language elsewhere in Chapter 2E and therefore should be removed from this section. The FHWA disagrees with the comment and includes the language in this section because the provision applies to the specific geometric condition and interchange type described in this section. A local DOT supported this requirement, while two State DOTs felt that the use of diagrammatic signs should be a recommendation, rather than a requirement. The FHWA disagrees and adopts the proposed changes to be consistent with other adopted changes in the Manual regarding signing for option lanes.

213. In Section 2E.48 (Section 2E.45 in the 2003 MUTCD) Diamond Interchange, the FHWA adopts the proposed removal of the second sentence of the first STANDARD statement regarding the prohibition of cardinal initials on exit numbers. This sentence is not applicable for a diamond interchange, because it has a single exit ramp. Section 2E.31 Interchange Exit Numbering already contains a prohibition on the use of cardinal directions as the suffix of exit numbers. The FHWA also rewords the STANDARD statement to clarify that the singular message EXIT shall be used as a part of either the distance message or the exit number plaque on the Advance Guide signs for non-numbered exits. This revision is made to clarify the specific application of the existing STANDARD.

214. As proposed in the NPA, the FHWA moves the information from Section 2E.52 (Section 2E.49 in the 2003 MUTCD) Signing on Conventional Road Approaches and Connecting Roadways to Section 2D.45 in this final rule, and leaves a SUPPORT statement to refer readers to the appropriate section. The FHWA adopts this change because the section and figures are about guide signing on conventional road approaches to a freeway, and therefore, are more appropriate for Chapter 2D.

215. The FHWA moves a majority of the information from Section 2E.53 (Section 2E.50 in the 2003 MUTCD) Wrong-Way Traffic Control at Interchange Ramps to Section 2B.41, as proposed in the NPA, and leaves a SUPPORT statement to refer readers to the appropriate section. The FHWA adopts this change in this final rule because the section and figure relate more to regulatory signs than guide signs, and therefore, are more appropriate for Chapter 2B.

The FHWA also adds a reference in this final rule to Section 2D.46 on the use of guide signs and Directional assemblies to mark the point of entry to a freeway or expressway. Although not proposed in the NPA, the FHWA adds this reference in this final rule to assist users of the Manual by providing additional information related to freeway and expressway entrance ramp signing.

216. As proposed in the NPA, the FHWA relocates Sections 2E.51 General Service Signs, 2E.52 Rest and Scenic Area Signs, 2E.53 Tourist Information and Welcome Center Signs, 2E.56 Radio Information Signing, and 2E.57 Carpool and Rideshare Signing (as numbered in the 2003 MUTCD) to a new Chapter in this final rule titled Chapter 2I General Service Signs (numbered 2F in the NPA).

217. As proposed in the NPA, the FHWA relocates Sections 2E.54 Reference Location Signs and Enhanced Reference Location Signs and 2E.55 Miscellaneous Guide Signs (as numbered in the 2003 MUTCD) to a new Chapter in this final rule titled Chapter 2H General Information Signs (numbered 2I in the NPA).

[95] "Guidelines and Recommendations to Accommodate Older Drivers and Pedestrians," FHWA Report no. FHWA–RD–01–051, May 2001, can be viewed at the following Internet Web site: *http://www.tfhrc.gov/humanfac/01105/cover.htm*. Recommendation II.A(4b).

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Discussion of Amendments Within Chapter 2F—Toll Road Signs—General

218. In this final rule, the FHWA adopts a new chapter numbered and titled, Chapter 2F Toll Road Signs. Although not proposed as a separate chapter in the NPA, this new chapter consolidates information proposed in the NPA related to toll road signing to address comments from practitioners that a separate chapter on toll road signing would be helpful.

219. In several sections of the NPA, the FHWA proposed adding a new symbol to denote that a toll facility's ETC payment system is nationally interoperable with all other ETC payment systems. The NCUTCD and a State DOT opposed this new symbol, because they felt that it is premature to address interoperability, especially with an untested symbol. Since efforts to achieve this interoperability have not made as much progress as previously anticipated, the FHWA does not adopt in this final rule the proposed interoperable symbol or requirements for its use.

Discussion of Amendments Within Chapter 2F—Toll Road Signs—Specific

220. In this final rule the FHWA adopts a new section, Section 2F.01 Scope, to respond to comments suggesting that toll road and managed lane signing be separated in the MUTCD. This new section includes a SUPPORT statement that clarifies that Chapter 2F applies to a route or facility on which all lanes are tolled, while Chapter 2G applies to the signing of managed lanes within an otherwise non-toll facility that employs tolling or pricing as an operational strategy to manage congestion levels, and to explain the scope of Chapter 2F in relation to other signing provisions elsewhere in Part 2. In this section, the FHWA also includes a STANDARD statement that, except where specifically indicated in this chapter, the provisions of other chapters in Part 2 shall apply to toll roads. The FHWA adopts this STANDARD to reflect the relocation of this material from Chapter 2E, as suggested by commenters who wanted a separate chapter for toll roads.

221. In Section 2F.02 Sizes of Toll Road Signs, the FHWA adopts STANDARD, SUPPORT, and OPTION statements referring to Section 2A.11 and Table 2F–1 in the MUTCD for information on sign sizes. Although not proposed as a separate section in the NPA, the FHWA adopts this consolidation of information from Chapters 2B, 2C, 2D, and 2E of the NPA into one section to provide uniformity in sign sizes.

222. The FHWA adds a new section in this final rule numbered and titled Section 2F.03 Use of Purple Backgrounds and Underlay Panels with ETC Account Pictographs. The FHWA adds this STANDARD and SUPPORT information to assure consistency with adopted requirements regarding the use of the color purple on signs as contained in Sections 1A.12, 2A.10, 2F.12, and 2F.16.

223. The FHWA adds a new section in this final rule numbered and titled Section 2F.04 Size of ETC Pictographs. The FHWA adds this STANDARD and GUIDANCE information to assure consistency with adopted requirements and recommendations regarding pictographs in Chapter 2A and in Section 2F.15 and to provide for adequate conspicuity and legibility of ETC pictographs on the approaches to toll plazas, where this information is critical.

224. The FHWA adopts in this final rule a new section numbered and titled Section 2F.05 Regulatory Signs for Toll Plazas. In the NPA, the FHWA proposed to number this Section 2B.31; however, the section number changes due to the reorganization of information in this final rule. The FHWA adopts this section to provide consistency and uniformity in signing practices for these types of facilities, which are becoming increasingly common and for which uniform signing provisions were not provided in the 2003 MUTCD.

In the NPA, the FHWA proposed GUIDANCE and OPTION statements regarding the recommended placement of optional Toll Rate Schedule signs in the vicinity of toll plazas. A local DOT suggested that the name of the sign be changed to ''Toll Rate sign,'' omitting the word ''schedule,'' because some toll road operators vary the toll amount by time of day. The FHWA agrees and revises the name of the sign to ''Toll Rate sign'' in this final rule. Three State DOTs and five toll road operators opposed the recommended sign placement (100 to 200 feet in advance of the toll plaza), suggesting that toll road operators need more flexibility to place the signs in a location where they can be easily read and understood by road users. One commenter suggested that the site characteristics of toll plazas vary so widely that a universal distance requirement for this sign may create unnecessary complications for some toll facilities, and could lead to the sign being placed in a less than desirable location. To address these comments, the FHWA adopts revised GUIDANCE in this final rule to recommend that the signs be placed between the toll plaza and the first advance sign informing traffic of the toll plaza. This revised language allows the information to be outside the immediate influence of the toll plaza area, at which driver attention is more appropriately focused on signs designating the appropriate lanes based on payment method, and there is often little space available for additional signing. In the NPA, the FHWA proposed recommending that the Toll Rate sign be limited to three lines of text. Three State DOTs and three toll road operators opposed the recommended limit of three lines of text because there are several methods that a toll agency can use in assessing rates, and that often requires more than three lines of text. The FHWA adopts the recommended limit of three lines of text in this final rule because it is consistent with existing provisions in the MUTCD regarding the number of lines of legend that are based on the maximum information load that a road user approaching a sign can read and process. To address the need to provide more detailed information, the FHWA also adds an OPTION in this final rule allowing the use of a more detailed toll rate schedule at attended toll booths where vehicles must stop to pay the toll.

225. The FHWA adopts in this final rule a new section numbered and titled Section 2F.06 Pay Toll Advance Warning Sign (numbered and titled in the NPA as Section 2C.44 Stop Ahead Pay Toll Sign). The FHWA revises the title of the section in this final rule to reflect the revised sign legend, based on comments as discussed herein. ATSSA, a toll road operator, and a local DOT supported the signs and their design, as proposed in the NPA. The NCUTCD, a State DOT, and nine toll road operators suggested that the proposed wording be changed to delete the words ''STOP AHEAD'' from the sign and its application, because the message ''Stop Ahead'' is not appropriate in advance of locations with ETC capabilities and because these advance signs are located at 1 mile and ½ mile in advance of the location where some or all lanes are required to stop at a toll plaza. The commenters also suggested that there be more flexibility in the wording of the sign. The FHWA agrees that STOP AHEAD is not appropriate on these advance signs that are so far from the condition requiring traffic to stop and modifies the design of the sign and the text in the section adopted in this final rule to reflect that this is a Pay Toll Advance Warning sign. However, as discussed below under Sections 2F.08 and 2F.09, the FHWA adopts similar

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signs and plaques that do bear the words ''STOP AHEAD'', for use closer to the toll plaza than ½ mile.

Except for suggesting the words ''STOP AHEAD'' be removed, as discussed above, the NCUTCD supported the W9–6 sign as proposed in the NPA and shown in proposed Figure 2C–9, but suggested that the W9–6P plaque be removed. A State DOT suggested that the signs and plaques be black text on a white background instead of on a yellow background, because payment is a requirement and is enforceable on toll facilities. The FHWA disagrees with both commenters, retaining the W9–6P plaque (and adopting a new Section 2F.07 in this final rule describing its use) and the yellow background color of the signs and plaques as proposed in the NPA, but reflecting the change of the sign text and plaque to Pay Toll Advance Warning. These signs and plaques are in advance of the toll collection point and are therefore warning, not regulatory. Three toll road operators commented on the proposed recommendations for advance placement of the signs. Although one of the commenters supported the proposed language, the other two suggested that there needed to be more flexibility, based on volumes of traffic and whether or not the lanes accepted cash payment. The FHWA notes that the placement of the signs is GUIDANCE, which allows adjustment in the location placement. The FHWA adopts this section regarding the use of these new signs on toll facilities to provide for consistency and uniformity of signing for messages and to implement the signing portions of FHWA's ''Toll Plaza Traffic Control Devices Policy.'' [96]

226. The FHWA adopts a new section numbered and titled Section 2F.07 Pay Toll Advance Warning Plaque (numbered and titled in the NPA as Section 2C.69 Stop Ahead Pay Toll Plaque). The FHWA revises the title of the section it adopts in this final rule to reflect a revised plaque legend, adopted in response to comments, as discussed above under Section 2F.06. In the NPA, the FHWA proposed including ''Stop Ahead'' on the Pay Toll plaque, however, similar to Section 2F.06, the FHWA removes ''Stop Ahead'' in this final rule to address comments from two toll road operators and a State DOT who suggested that message ''Stop Ahead'' is not appropriate in advance of locations with ETC capabilities.

Although not proposed in the NPA, the FHWA adds a requirement that the legend PAY TOLL be replaced with a suitable legend such as TAKE TICKET for toll plazas where road users entering a toll-ticket facility are issued a toll ticket. The FHWA adopts this change in this final rule based on comments from toll road operators on the need to provide an appropriate sign legend that will accommodate toll-ticket facilities.

Finally, the FHWA adopts an OPTION at the end of the section allowing the toll for passenger or 2-axle vehicles to be omitted from the W9–6P plaque if the toll information is displayed on the guide sign that the plaque accompanies. Although not proposed in the NPA, the FHWA adds this OPTION to address a comment from a toll road operator suggesting that incorporating a changeable message element into the W9–6P plaque should not be required if the information can be displayed on the accompanying guide sign. The FHWA adopts the use of this plaque to provide for consistency and uniformity of signing for these messages and to implement the signing portions of FHWA's ''Toll Plaza Traffic Control Devices Policy.'' [97]

227. The FHWA adopts in this final rule two new sections numbered and titled Section 2F.08 Stop Ahead Pay Toll Warning Sign and Section 2F.09 Stop Ahead Pay Toll Warning Plaque. As discussed above under Section 2F.06, the FHWA adopts this sign and plaque for use at locations less than ½ mile in advance of mainline toll plazas, and adopts these new sections to clarify their use.

228. The FHWA adopts a new section numbered and titled Section 2F.10 LAST EXIT BEFORE TOLL Warning Plaque (numbered section 2C.68 in the NPA). This section describes the use of this new plaque, as proposed in the NPA. ATSSA and a toll road operator supported this new plaque. Two State DOTs, a toll road operator, and an NCUTCD member suggested that alternate messages, such as LAST FREE EXIT be allowed on the sign. The FHWA declines to change the message on the plaque, because the message LAST FREE EXIT could be misinterpreted to mean that the limited access roadway was ending or that it is the last exit off the route. To maintain uniformity in the messages, the FHWA adopts the plaque as proposed in the NPA, in this final rule.

229. The FHWA adopts a new section numbered and titled Section 2F.11 Toll Auxiliary Sign (Section 2D.25 in the NPA) to require the use of this sign above the route sign of a numbered toll facility, in any route sign assembly providing directions from a non-toll highway to the toll facility or to a segment of a highway on which the payment of a toll is required. The Signs Synthesis Study [98] found that some States are using these signs to provide road users useful information that a numbered route is a toll facility. The proposed section was supported in concept by most commenters, but the NCUTCD and some toll facility operators suggested that provision should be included to allow the continued use of unique toll facility route shield designs that incorporate the word ''TOLL'' into the route shield itself, rather than as an auxiliary sign, and that pictographs be allowed in the TOLL auxiliary sign. The FHWA disagrees because a very wide variety of unique toll route shield designs are currently in use, and many do not conform to basic principles of sign design. Further, the TOLL sign is an auxiliary sign, not a route marker, and therefore the incorporation of a pictograph is not appropriate. The FHWA believes that uniformity in the display of similar messages is important for directional guidance and adopts a uniform provision for notifying road users of a toll route.

In the NPA, the M4–15 sign was proposed with black legend on a white background, similar to other auxiliary signs, such as cardinal directions, JCT, BYPASS, etc., that are used with route signs. Because this particular auxiliary sign is different in function from others, in that it also serves to provide a warning to road users that the route is a toll road, the FHWA believes that a black legend on a yellow background is appropriate for this sign. The FHWA received comments from several toll road operators expressing concerns that a white background is needed to make this a regulatory sign in order to enforce the requirement to pay the toll. The FHWA disagrees with those comments in relation to this particular auxiliary sign because there are many other signs associated with toll payment on a toll road that are designed as black-on-white regulatory signs or plaques and thereby enable enforcement. The FHWA adopts in this final rule this auxiliary sign with

[96] ''Policy on Traffic Control Strategies for Toll Plazas,'' dated October 12, 2006 can be viewed at the following Internet Web site: *http://mutcd.fhwa.dot.gov/resources/policy/tcstollmemo/tcstoll_policy.htm.*

[97] ''Toll Plaza Traffic Control Devices Policy,'' dated September 8, 2006, can be viewed at the following Internet Web site: *http://mutcd.fhwa.dot.gov/resources/policy/tcstollmemo/tcstoll_policy.htm.*

[98] ''Synthesis of Non-MUTCD Traffic Signs,'' FHWA, December 2005, page 52, can be viewed at the following Internet Web site: *http://tcd.tamu.edu/documents/rwstc/Signs_Synthesis-Final_Dec2005.pdf.*

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a yellow background and includes comparable text on this sign in Section 2F.13.

In the NPA, the FHWA also proposed to require the use of the TOLL (M4–15) auxiliary sign above all route signs of a numbered toll facility when a parallel or nearby free facility has the same route number. However, it was not the FHWA's intent to endorse the practice of duplicate route numbering for non-toll and toll routes, because it could not be consistently applied as an alternate route. The FHWA does not believe that such a non-uniform practice is helpful in road user guidance and navigation. As a result, the FHWA does not adopt this requirement in this final rule. This is different from the practice of assigning alternative routes, such as business, truck, or bypass designations on different alignments where there is always a primary numbered route, which is acceptable.

230. The FHWA adopts a new section numbered and titled Section 2F.12 Electronic Toll Collection (ETC) Account-Only Auxiliary Signs (Section 2D.26 in the NPA). The FHWA proposed these auxiliary signs in the NPA to complement and be consistent with signs in this chapter and in Chapter 2G that inform road users that a highway is restricted to use only by vehicles having a registered ETC payment account. Two toll road operators supported this new section. The NCUTCD and a State DOT suggested that the word ONLY be omitted when an ETC facility accepts multiple ETC payment systems. The FHWA disagrees, because the intent is to notify road users that only vehicles that have registered toll accounts can use the highway, and includes the word ONLY in the section adopted in this final rule.

As proposed in the NPA, the FHWA adopts in this final rule an option to use the NO CASH auxiliary sign in a route sign assembly directly below the ETC Account-Only auxiliary sign. The NCUTCD opposed this option because of confusion that can result at toll plazas where lanes are segregated by different payment methods; however, the FHWA retains the OPTION in this final rule because the application of this sign is not for toll plazas and the FHWA believes that the option of a NO CASH message might be helpful at the entry point to a toll road to inform road users in areas where ETC is not well established.

231. The FHWA adopts a new section numbered and titled Section 2F.13 Toll Facility and Toll Plaza Guide Signs—General (Section 2E.55 in the NPA). In the NPA, the FHWA proposed to adopt new symbols to denote exact change and attended lanes and proposed to require their use in toll plaza signing. The FHWA believed that symbols for these messages would help road users to more quickly identify the proper lane(s) to choose for the type of toll payment they will use. The proposed symbols were similar to those already in use for these purposes on some toll facilities in the U.S. The NCUTCD, two State DOTs, a local DOT, and four toll road operators opposed the requirement to use the proposed symbols because of their belief that the symbols had not been adequately tested and would not convey a clear, simple message at freeway speed. The FHWA adopts the symbols in this final rule, but agrees that the use of these symbols should not be required at this time, and therefore adopts an OPTION to use the symbols. As part of this change in this final rule, the FHWA adopts requirements to use word messages such as FULL SERVICE, CASH, CHANGE, or RECEIPTS on signs for attended lanes at toll plazas, and to use the word message EXACT CHANGE and the amount of the toll for passenger vehicles on signs for Exact Change lanes at toll plazas. The FHWA refines the designs and enlarges the minimum size of the symbols to enhance their legibility when used with accompanying word legends, and adds clarifying language in this final rule to indicate that these symbols are to be used only as panels within guide signs that accompany the required word messages, not as an independent sign or within a sign assembly.

ATSSA and a toll road operator supported the standardization of placement of signing for ETC facilities. Three State DOTs and nine toll road operators opposed some of the details that FHWA proposed in the NPA, particularly those related to the proposed ETC (pictograph) ONLY—NO CASH (R3–16) regulatory lane-use sign. Most of the commenters opposed the use of the term ''NO CASH'' because they felt that it might be misinterpreted to mean that payment may be made by other means, such as credit card, ticket, or video. To address these comments, in this final rule the FHWA revises the sign design, deleting the NO CASH text, and adopts this sign as a guide sign, rather than a regulatory sign.

In the NPA, the FHWA proposed requirements for the design of signs to be used on lanes or facilities that are open only to use by ETC device-equipped vehicles. Two State DOTs and two toll road operators opposed the language. One State DOT opposed the requirement to use a purple background, while the other commenters opposed using the word ''ONLY,'' unless there is only one accepted ETC system. The FHWA adopts the use of the color purple, because the intent is to use purple as an identifier of a requirement for vehicles to have a registered ETC account. However, to address the concerns of the commenter, the FHWA revises the requirements in this final rule to accommodate ETC pictographs whose predominant background color is purple. The FHWA retains the word ONLY because the word is intended to identify that the facility excludes vehicles without registered ETC accounts. To address the concerns expressed by the commenters, the FHWA adopts an OPTION allowing agencies to display information on a separate sign notifying road users that the facility will accept payments from other systems' transponders or devices in addition to its primary ETC-device payment system.

Although not proposed in the NPA, the FHWA adopts a STANDARD at the end of the section requiring signing to conform to the provisions of paragraphs 04 and 05 of this section for entrances to toll highways where ETC is employed only through license plate character recognition, such that road users are not required to establish a registered toll account, and thus any vehicle can use the facility without restriction. The FHWA adds this requirement to assure that the color purple and the provisions associated with signing where a registered ETC account is required are limited to facilities that are not unrestricted and are not misused on toll facilities where any vehicle can use the facility, consistent with adopted STANDARDS regarding the color purple in Section 1A.12 and 2F.03.

232. As proposed in the NPA, the FHWA adopts a new section numbered and titled Section 2F.14 Advance Signs for Conventional Toll Plazas (Section 2E.56 in the NPA) as proposed in the NPA. The NCUTCD and three toll road operators supported the NPA language. One toll road operator suggested changing the proposed text in this section from GUIDANCE to OPTION. The FHWA disagrees, and adopts the text as GUIDANCE because there is sufficient flexibility in the GUIDANCE statements to address special situations. Another toll road operator suggested that the proposed recommended use of overhead signs is most pertinent to mainline toll plazas, and that additional language was needed regarding signing for ramps. The FHWA disagrees that additional information is needed, because signing for ramps is already included in the provision, as proposed in the NPA. Three toll road operators

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opposed the language regarding placement distances for guide signs with lane information for the toll payment types, suggesting that the recommended distances were not appropriate. The FHWA disagrees because a minimum distance is given and is adequately qualified as being related to the approach geometry and visibility of the toll plaza canopy signs. The FHWA adopts the language in this final rule, as proposed in the NPA.

233. The FHWA adopts a new section numbered and titled Section 2F.15 Advance Signs for Toll Plazas on Diverging Alignments from Open-Road ETC Account-Only Lanes (Section 2E.57 in the NPA). Three toll road operators supported the intent of the guidance language in this section; however, they provided comments reflecting their own experience. The significant comments are discussed herein. In the NPA, the FHWA proposed to recommend that the ETC (pictograph) ONLY—NO CASH (R3–16) regulatory sign with a downward pointing arrow over the center of each lane that will become an Open-Road ETC lane be installed 1 mile and 0.5 miles in advance of the point where a separate alignment leading to the toll plaza diverges from mainline-aligned Open-Road ETC Account-Only lanes. Two toll road operators suggested that down arrows may be inappropriate at the one mile location depending on lane arrangement and traffic volume. In addition, they suggested that down arrows convey a more forceful and definitive message that action should be taken by the driver at that location. The commenters felt that one mile may be too far in advance of the plaza to begin traffic separation by payment method. The FHWA disagrees, because positive communication of lane use information is necessary for efficient segregation of traffic on the approach to an Open-Road ETC/toll plaza bifurcation, just as it is for any other major bifurcation or split. Since these provisions are recommendations, there is sufficient flexibility to use diagrammatic signing (as one toll road operator suggested) or Arrow-per-Lane signs as adopted in Chapter 2E, and there is no restriction on posting a distance message to convey the distance over which the lane changes can be made. As a result, the FHWA adopts in this final rule the language as proposed in the NPA.

In the NPA, the FHWA proposed recommending an additional set of overhead advance signs with lane information for the toll payment types 800 feet in advance of the toll plaza. Two toll road operators opposed this recommendation because the provisions already include three sets of guide signs in advance of the plaza, and locating a fourth set close to the plaza would interfere with the visibility of canopy signing. The FHWA disagrees because the mainline signing typically has far fewer lanes in which to display lane-specific information as it relates to the toll plaza lanes. Because this provision is guidance, deviations based on geometric constraints in which the distance specified is not available can be made. The FHWA adopts the provision in this final rule as proposed in the NPA. The FHWA notes that the recommendation suggests that these signs be placed at a location that avoids or minimizes any obstruction of the toll plaza canopy signs and lane-use control signals, as proposed in the NPA.

234. The FHWA adopts a new section numbered and titled Section 2F.16 Toll Plaza Canopy Signs (numbered Section 2E.58 in the NPA). This section contains STANDARD, OPTION, and SUPPORT statements regarding signs over the center of the lanes on the toll canopy, display of the toll fee, and lane-use control signals. A toll road operator supported the provisions as proposed in the NPA. Several other toll road operators submitted comments opposed to the language or recommending specific changes.

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In the NPA, the FHWA proposed a requirement to provide a sign above the center of each lane that is not an Open-Road ETC Account-Only lane, mounted on or suspended from the toll plaza canopy, or on a separate structure immediately in advance of the plaza, indicating the payment type(s) accepted in the lane and any restrictions or prohibitions of certain types of vehicles that apply to the lane. A State DOT suggested that requiring a sign above the center of each lane that is not an Open-Road ETC Account-Only lane was excessive, and that their experience showed that signs on the columns over ETC lanes have been very successful. The FHWA disagrees, because signs on the columns or booths alone do not adequately relate this critical information to individual travel lanes approaching and through the toll plaza. The NCUTCD and a State DOT suggested clarifying these signing requirements to more clearly indicate that Open-Road ETC Account-Only lanes are excluded from the requirement. The FHWA believes that the language, as proposed in the NPA, clearly indicates that Open-Road ETC Account-Only lanes are excluded, however the FHWA clarifies the provision in this final rule to require the overhead signing, when mounted on a structure rather than the canopy, be located such that each sign be clearly associated with an individual toll lane. In the NPA, the FHWA proposed including a requirement that the toll fee for passenger or 2-axle vehicles be included on the canopy sign or on a separate sign mounted on the upstream side of the toll booth. The NCUTCD, two State DOTs, and a toll road operator opposed this requirement for ticketed systems. The FHWA agrees and excludes toll-ticket systems from this requirement in this final rule.

In the NPA, the FHWA proposed an OPTION and associated STANDARD regarding the optional use of supplementary flashing yellow beacons at ETC Account-Only canopy lanes. The NCUTCD and two toll road operators opposed this language, because they felt that the beacons would interfere with or detract from the lane-use control signals. The FHWA disagrees because the beacons are optional, but their placement, if used, needs to be a STANDARD to assure that they are not inappropriately located so close to lane-use signals that they would be confusing. In the NPA, the FHWA proposed prohibiting the use of lane-use control signals to call attention to a lane for a specific toll payment type such as ETC Account-Only lanes. A State DOT and a toll road operator suggested that the flashing of a standard circular yellow signal indication within a lane-use control signal face has become widely recognized as an indicator of an open ETC Account-Only lane, and its use should be continued. The FHWA disagrees with the use of a standard circular traffic signal or beacon indications to display lane status, since red X and downward green arrow lane-use control signals are the appropriate displays for this use.

In the NPA, the FHWA proposed to allow the use of lane-use control signals above the center of Open-Road ETC Only lanes to indicate the open or closed status of the lane. Similar text was proposed in Part 4, and is adopted there in Section 4K.02 this final rule with revisions based on comments. The FHWA does not adopt the text in Section 2F.16 regarding lane-use signals with Open-Road ETC Only lanes and instead adds a reference to Section 4K.02 in this final rule.

In Section 2C.08 of the NPA, the FHWA proposed to add paragraphs describing the use of Advisory Speed plaques at toll plazas. The NCUTCD, three State DOTs, two local DOTs, and two NCUTCD members suggested changes to the wording to clarify the use of Advisory Speed plaques in relation to other signs at toll plazas. The FHWA decides to not allow the use of Advisory Speed Plaques at toll plazas

independent of other warning signs. Instead, the FHWA adopts text in Section 2F.16 describing the allowable display of an advisory speed within a horizontal rectangular panel with a black legend and yellow background within the bottom portion of a canopy sign for an ETC Account-Only toll plaza lane in which a regulatory speed limit is not posted and in which vehicles are not required to stop.

235. The FHWA adopts a new section numbered and titled 2F.17 Guide Signs for Entrances to ETC Account-Only Facilities (Section 2E.59 in the NPA). This section contains SUPPORT and STANDARD statements regarding the use of guide signs at entrances to facilities that are restricted to use only by vehicles with a registered ETC account. In the NPA, the FHWA proposed to include managed lanes in the provisions; however, in this final rule the FHWA removes the provisions for managed lanes from this section because FHWA adopts a new Chapter 2G in this final rule with provisions for managed lanes. A toll road operator supported the language as proposed in the NPA. The NCUTCD, two State DOTs and two toll road operators suggested removing specific references to ''transponder,'' as proposed in the NPA, and changing the language to account for other devices. The FHWA agrees and adopts revised language in this final rule to clarify that the section is intended to apply to a variety of electronic toll collection systems.

236. The FHWA adopts a new section numbered and titled Section 2F.18 ETC Program Information Signs (Section 2E.60 in the NPA). In the NPA, the FHWA proposed allowing signs that inform road users of telephone numbers, Internet addresses, and e-mail addresses for enrolling in an ETC program of a toll facility or managed lane, obtaining an ETC transponder, and/or obtaining ETC program information, but only in rest areas, in parking areas, or on low speed roadways. The NCUTCD, two State DOTs, and several toll road operators suggested that the proposed prohibition of signs in areas other than rest areas, parking areas, and low speed roadways was excessive and that some mechanism should be allowed to display this information in other areas. The FHWA understands that road users benefit from knowing how to obtain information about ETC programs, and as a result adopts an OPTION statement in this final rule allowing the use of ETC Program Information signs with telephone numbers of four or fewer numerals in certain other areas under certain specific conditions.

237. In the NPA, the FHWA proposed to add a section numbered and titled Section 2C.43 Toll Road Begins Signs, which, if adopted as a part of the consolidation of toll-related signing information into a separate chapter, would be located in Chapter 2F. Although ATSSA, a local DOT, and two toll road operators supported the sign, the NCUTCD, two other toll road operators, and a State DOT opposed the section and its associated signs because there is no consensus on whether the beginning of a toll road should be designated with a regulatory, warning, or guide sign because of variations in State laws. The FHWA believes that the signing before the toll road begins addresses this issue (see Sections 2F.10, 2F.11 and 2F.13) and adequately address notification to road users of the last exit before entering a toll facility and the entrance to a toll facility. As a result, the FHWA does not adopt this proposed section and the associated signs in this final rule.

Discussion of Amendments to Chapter 2G—Preferential and Managed Lane Signs

238. The FHWA adopts a new chapter numbered and titled Chapter 2G Preferential and Managed Lane Signs. Although not proposed as a separate chapter in the NPA, the FHWA adopts a separate chapter with 18 sections in this final rule to consolidate information that was proposed in other sections in the NPA related to preferential and managed lanes. As discussed previously in this preamble under General Amendments to the MUTCD, the FHWA creates this separate chapter to address comments from practitioners that a separate chapter would be helpful.

239. In Section 2G.01 Scope, the FHWA adopts relocated SUPPORT information from 2003 MUTCD Sections 2B.26 and 2B.27 describing operational considerations for preferential and managed lanes and additional SUPPORT text providing cross-references to other pertinent information in the MUTCD.

240. In Section 2G.02 Sizes of Preferential and Managed Lane Signs, the FHWA includes STANDARD, SUPPORT, and OPTION statements referring to other sections in the MUTCD for information on sign sizes, consistent with similar provisions in the chapters from which the provisions of this new chapter were relocated. The FHWA adopts this section to provide uniformity in Preferential and Managed Lane Sign sizes.

241. In the NPA, the FHWA proposed to edit and relocate paragraphs within and between existing Sections 2B.26 through 2B.28, and to reorganize the text into five sections (Sections 2B.26 through 2B.30) to improve the consistency and flow of information and improve its usability by readers. As adopted in this final rule, the FHWA relocates those proposed sections to new Chapter 2G, since they are related to preferential and managed lanes. The sections are numbered and titled Section 2G.03 Regulatory Signs for Preferential Lanes—General, Section 2G.04 Preferential Lane Vehicle Occupancy Definition Regulatory Signs, Section 2G.05 Preferential Lane Periods of Operation Regulatory Signs, Section 2G.06 Preferential Lane Advance Regulatory Signs, and Section 2G.07 Preferential Lane Ends Regulatory Signs.

242. The FHWA in this final rule adopts Section 2G.03 Regulatory Signs for Preferential Lanes—General (Section 2B.26 proposed in the NPA). Two toll road operators expressed concern that the proposed language would now classify toll plaza lanes that segregate traffic by payment method as preferential lanes and that there is a lack of research or justification for applicability to non-HOV preferential lanes, such as toll plaza lanes. The operators suggested that text regarding non-HOV preferential lanes should be limited to OPTION conditions until further research on safety and applicability is available. The FHWA disagrees with the suggested revision as an OPTION and adopts the language proposed in the NPA in this section but provides clarification in Section 2G.01 to address these concerns, explicitly stating that lanes that segregate traffic based on payment method are not considered to be preferential lanes.

In the NPA, the FHWA proposed to add GUIDANCE and OPTION statements regarding the installation of a post-mounted regulatory sign applicable only to a preferential lane on a median barrier where lateral clearance is limited. Based on comments from the NCUTCD, a State DOT, and a toll road operator expressing concerns that wider signs are not legible when installed at a skew relative to the approaching traffic and to resolve a conflict with an existing STANDARD statement in Section 2A.18, the FHWA revises the GUIDANCE statement in this final rule regarding signs mounted on median barriers. As part of this change, in this final rule, the FHWA adds a new STANDARD statement requiring that where lateral clearance is limited, Preferential Lane regulatory signs that are post-mounted on a median barrier and that are wider than 72 inches shall be mounted with a vertical clearance that complies with the provisions of Section 2A.18 for

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overhead mounting. This revision is also consistent with identical provisions in Sections 2G.08 and 2G.10.

In this final rule, the FHWA adopts a STANDARD statement that is relocated from Section 2B.32 as proposed in the NPA. This STANDARD is in regard to applying provisions for regulatory signs for preferential lanes to non-priced managed lanes that are operated by varying vehicle occupancy requirements (HOV) or by using vehicle type restrictions as a congestion management strategy. This includes provisions for the use of changeable message elements when certain types of vehicles are prohibited from using a managed lane or when a managed lane is restricted to use by only certain types of vehicles during certain operational strategies, and when the vehicle occupancy required for use of an HOV lane is varied as a part of a managed lane operational strategy.

243. The FHWA in this final rule adopts Section 2G.04 Preferential Lane Vehicle Occupancy Definition Regulatory Signs (Section 2B.27 proposed in the NPA). This section contains STANDARD, GUIDANCE, SUPPORT, and OPTION statements regarding the use of regulatory signs.

The FHWA adopts a revised STANDARD statement in paragraph 07 to clarify that the requirement for an overhead Vehicle Occupancy Definition sign in advance of the beginning of or the initial entry point to HOV lanes is applicable only to barrier- and buffer-separated or contiguous preferential lanes, where access between the preferential and general-purpose lanes is restricted to designated locations. The FHWA adopts this clarification to address comments from a State DOT and two toll road operators that correctly pointed out that the statement as proposed in the NPA was too broad and needed to be limited to only certain conditions. The FHWA agrees and adopts the revised STANDARD in this final rule.

244. The FHWA in this final rule adopts Section 2G.05 Preferential Lane Periods of Operation Regulatory Signs (Section 2B.28 proposed in the NPA). Although not proposed in the NPA, the FHWA adopts a STANDARD statement in this final rule requiring that for preferential lanes on which regulations are in effect on a full-time basis, either the full-time Periods of Operation (R3–11b and R3–14b) signs shall be used, or the legends of the part-time Periods of Operations (R3–11, R3–11a, R3–14, R3–14a) signs shall be modified to display the legend 24 HOURS. In addition this STANDARD prohibits the use of a full-time Periods of Operation (R3–14b) sign where the preferential lane is in effect only on a part-time basis. The FHWA adopts these changes in this final rule to provide clarification of an existing requirement, based on comments from the NCUTCD, three State DOTs, and three toll road operators.

Finally, the FHWA in the final rule adopts a GUIDANCE statement recommending that overhead (R3–14 series) or post-mounted (R3–11 series) Periods of Operation signs should be installed at periodic intervals along the length of a contiguous or buffer-separated preferential lane where continuous access with the adjoining general-purpose lanes is provided. Although not proposed in the NPA, the FHWA adopts this recommendation in this final rule to provide more flexibility in the placement of these signs by clarifying that signs need not be installed at periodic intervals on facilities where access is restricted to designated locations and is not continuous with the adjoining general-purpose lanes.

245. The FHWA adds a new section numbered and titled Section 2G.06 Preferential Lane Advance Regulatory Signs (Section 2B.29 in the NPA). This section contains GUIDANCE and OPTION statements regarding the use of these regulatory signs, as proposed in the NPA.

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246. The FHWA adds a new section numbered and titled Section 2G.07 Preferential Lane Ends Regulatory Signs (Section 2B.30 in the NPA). This section contains STANDARD and OPTION statements regarding the use of these regulatory signs, as proposed in the NPA.

247. The FHWA adopts in this final rule a new section numbered and titled Section 2G.08 Warning Signs on Median Barriers for Preferential Lanes (Section 2C.55 as proposed in the NPA). This section contains OPTION, STANDARD, and GUIDANCE statements regarding the use of warning signs applicable only to preferential lanes on median barriers. In the NPA, the FHWA proposed GUIDANCE and OPTION statements regarding the installation of a post-mounted warning sign applicable only to a preferential lane on a median barrier where lateral clearance is limited. Based on comments from the NCUTCD, a State DOT, and a toll road operator expressing concerns that wider signs are not legible when installed at a skew relative to the approaching traffic and to resolve a conflict with an existing STANDARD statement in Section 2A.18, the FHWA adopts a revised GUIDANCE statement in this final rule regarding signs mounted on median barriers. As part of this change, the FHWA adopts a new STANDARD statement requiring that where lateral clearance is limited, Preferential Lane warning signs that are post-mounted on a median barrier and that are wider than 72 inches shall be mounted with a vertical clearance that complies with the provisions of Section 2A.18 for overhead mounting. This revision is also consistent with identical provisions in Sections 2G.03 and 2G.10.

248. In this final rule, the FHWA relocates an existing provision to Chapter 2G in Section 2G.09 High-Occupancy Vehicle (HOV) Plaque (Section 2C.64 proposed in the NPA). This section contains OPTION and SUPPORT statements from the 2003 MUTCD regarding the use of these plaques and there are no substantive changes to the information.

249. As proposed in the NPA, the FHWA adopts four sections in this final rule that include the existing material in Section 2E.59 of the 2003 MUTCD and substantially edits the contents to improve consistency and understanding by grouping similar material together. The resulting sections are numbered and titled Section 2G.10 Preferential Lane Guide Signs—General, Section 2G.11 Guide Signs for Initial Entry Points to Preferential Lanes, Section 2G.12 Guide Signs for Intermediate Entry Points to Preferential Lanes, and Section 2G.13 Guide Signs for Egress from Preferential Lanes to General-Purpose Lanes. These four sections were proposed in the NPA as Sections 2E.51 through 2E.54 respectively. In conjunction with these changes, the FHWA adopts a variety of changes in the technical provisions, sign designs, and figures for preferential lane guide signing, as described in the following items, to reflect the state of practice for enhanced sign conspicuity and legibility, and to reflect recent FHWA policy guidance [99] regarding traffic control devices for preferential lane facilities.

250. The FHWA in this final rule adopts Section 2G.10 Preferential Lane Guide Signs—General (Section 2E.51 as proposed in the NPA). This section contains SUPPORT, GUIDANCE, STANDARD, and OPTION statements regarding preferential lane signing. Although not proposed in the NPA, the FHWA clarifies in a STANDARD statement in this final rule that HOV lanes that are managed by varying the occupancy requirements in response to changing conditions are also governed by the provisions in this section. The FHWA adds this statement to

[99] The FHWA's policy guidance can be viewed at the following Internet Web site: *http://mutcd.fhwa.dot.gov/resources/policy/tcdplfmemo/index.htm.*

distinguish that such HOV lanes are not governed by the provisions of subsequent sections that deal with managed lanes that also use pricing as a management strategy.

In the NPA, the FHWA proposed to prohibit showing occupancy requirements for preferential lanes on guide signs. A local DOT supported this provision, while a State DOT opposed it. The FHWA adopts this prohibition because the occupancy requirements are most appropriately displayed on regulatory signing.

To address comments from the NCUTCD, two State DOTs, and two toll road operators, the FHWA adopts reorganized and expanded provisions in this final rule to establish signing criteria for the initial and intermediate entry points into a preferential lane from the general-purpose lanes.

Although proposed as a GUIDANCE statement in the NPA, the FHWA adopts a STANDARD statement regarding the mounting of post-mounted Preferential Lane guide signs where lateral clearance is limited, to be consistent with revisions in Sections 2A.18, 2G.03, and 2G.08 for clearance to light fixtures and sign supports.

As proposed in the NPA, the FHWA adopts the STANDARD requirement to use a LEFT plaque on top left edge of the Advance Guide and Preferential Lane Entrance Direction signs where the entry point is on the left-hand side of the general-purpose lanes. Two State DOTs opposed this requirement for similar reasons discussed in Sections 2E.36 and 2E.40; however, the FHWA adopts the requirement to maintain uniformity and enhance road user understanding as described in Chapter 2E.

251. The FHWA in this final rule adopts Section 2G.11 Guide Signs for Initial Entry Points to Preferential Lanes (Section 2E.52 as proposed in the NPA). This section contains STANDARD, GUIDANCE, OPTION, and SUPPORT statements regarding guide signing for initial entry points to preferential lanes.

252. The FHWA in this final rule adopts Section 2G.12 Guide Signs for Intermediate Entry Points to Preferential Lanes (Section 2E.53 as proposed in the NPA). This section contains STANDARD, GUIDANCE, OPTION, and SUPPORT statements regarding guide signing for intermediate entry points to preferential lanes, as proposed in the NPA. Although not proposed in the NPA, in this final rule the FHWA relocates the information from the last STANDARD and SUPPORT statements regarding signing for direct access ramps to a new Section 2G.15.

253. The FHWA in this final rule adopts Section 2G.13 Guide Signs for Egress from Preferential Lanes to General-Purpose Lanes (Section 2E.54 as proposed in the NPA). In the NPA, the FHWA proposed a different title for this section, as well as additional content that included signing for egress from preferential lanes to another highway. In this final rule, the FHWA adopts a separate Section 2G.15 for that information. Section 2G.13 as adopted contains STANDARD, SUPPORT, and GUIDANCE statements regarding guide signing for egress from preferential lanes to general-purpose lanes, as proposed in the NPA.

The FHWA adopts the recommendation to use Pull-Through signs with the Egress Direction sign at exits to direct access ramps, as proposed in the NPA. A State DOT and two toll road operators suggested that Pull-Through signs should only be used when warranted, such as for left exits. The FHWA disagrees because of the ambiguity between single-lane preferential lanes and direct exits, whether left-hand or right-hand side.

Although not proposed in the NPA, the FHWA adopts a GUIDANCE statement to recommend that consideration be given to the use of overhead guide signs to display the information related to egress from the preferential lanes, where two or more adjoining preferential lanes are present in a single direction. The FHWA adds this provision in conjunction with other changes to address comments regarding the visibility of signs installed on median barriers.

254. The FHWA in this final rule adopts Section 2G.14 Guide Signs for Direct Entrances to Preferential Lanes from Another Highway. Although not proposed as a separate section in the NPA, this section contains STANDARD and SUPPORT statements from proposed Section 2E.53 in the NPA, related to guide signing for direct access ramps to preferential lanes.

255. The FHWA in this final rule adopts Section 2G.15 Guide Signs for Direct Exits from Preferential Lanes to Another Highway. Although not included as a separate section in the NPA, as discussed above under Section 2G.13, this section contains STANDARD, GUIDANCE, and SUPPORT statements related to guide signing for direct exits from preferential lanes to another highway. In the NPA, the FHWA proposed the use of a black and white header panel on a Pull-Through sign. A State DOT and two toll road operators opposed the color, stating that preferential lanes are assigned other colors, such as purple and white. The FHWA disagrees, as the purple header is reserved for priced or tolled facilities and is not assigned to the lane; rather, it conveys information and the requirement for a vehicle to be registered in an ETC account program to enter a priced managed lane. Once within the lane, this requirement is not displayed as the lanes are not named for or branded by the ETC account program. The FHWA adopts the use of a black and white sign panel for a Pull-Through sign in this final rule for a preferential lane and addresses similar signing for priced managed lanes in Section 2G.18.

The FHWA also adopts the recommendation to use Pull-Through signs with the Exit Direction sign at exits to direct access ramps, as proposed in the NPA. A State DOT and two toll road operators suggested that Pull-Through signs should only be used when warranted, such as for left exits. The FHWA disagrees because of the ambiguity between single-lane preferential lanes and direct exits, whether left-hand or right-hand side.

256. The FHWA in this final rule adopts ''2G.16 Signs for Priced Managed Lanes—General.'' Although not proposed as a separate section in the NPA, the FHWA adopts this section that contains SUPPORT and STANDARD statements that were proposed in Section 2E.61 of the NPA and significantly expands background information on the signing needs for managed lanes based on possible combinations of operational strategies employed, such as tolling or pricing, either alone or combined with an occupancy requirement for non-toll travel, and whether eligibility for non-toll travel requires registration in a local program. To address comments from a traffic engineering consultant, the FHWA provides a SUPPORT statement referring to the figures illustrating the advance signing sequence for priced lanes to begin 2 miles from the initial entry point due to the additional informational needs of road users to decide whether to use the lane and whether they are eligible to use the lane under certain operational strategies.

257. The FHWA in this final rule adopts ''2G.17 Regulatory Signs for Priced Managed Lanes'' (Section 2B.32 proposed in the NPA). This section contains STANDARD and OPTION statements regarding regulatory signing for priced managed lanes and includes new signs that are modified versions of similar preferential lane signs in response to comments from the NCUTCD and a toll road operator that specific signs should be provided instead of merely providing a reference to a provision for a different application.

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258. The FHWA in this final rule adopts Section 2G.18 Guide Signs for Priced Managed Lanes (Section 2E.61 proposed in the NPA). This section provides STANDARD, SUPPORT, GUIDANCE, and OPTION statements related to guide signing for priced managed lanes with operational strategies such as tolls, vehicle occupancy requirements, and vehicle type restrictions that are variable and put into effect on a real-time basis to respond to changing conditions. The FHWA adopts this separate section to further clarify and specifically address the various combinations of operational strategies for managed lanes that include pricing or tolling as a congestion management strategy, as suggested in a comment by the NCUTCD. This new section also provides for consistency with other adopted provisions regarding signing for preferential lanes, and addresses the state of the practice in priced managed lanes.

In the NPA, the FHWA proposed a requirement that guide signing for priced managed lanes strictly comply with the provisions in Sections 2G.10 through 2G.15. A toll road operator suggested that this requirement was too restrictive, and recommended adding options that would allow more flexible use of the purple background color. The FHWA disagrees because the use of the color purple is reserved for sign legends associated with the display of information for ETC account program registration requirements and information and is not intended to be used indiscriminately as an overall sign background for other uses. The FHWA adopts in this final rule the requirement to comply with the provisions of Sections 2G.10 through 2G.15 except as otherwise noted in this section.

The FHWA adopts the proposed GUIDANCE recommending the display of comparative travel times for managed lanes that are an alternative to general purpose lanes. The NCUTCD and a State DOT suggested that this recommendation be removed and replaced with a more general provision since it has had no prior use or testing. The FHWA disagrees and believes that including an abstract provision would result in widely non-uniform practices and therefore adopts in this final rule the language as proposed, but revises the sign design to be in conformance with accepted sign layout practices and the requirements for guide signs for minimizing the overall amount of information displayed on the sign.

In the NPA, the FHWA proposed the use of the word ''EXPRESS'' on guide signs for managed lanes. The NCUTCD and a State DOT opposed the use of the word ''EXPRESS,'' because they felt that it would imply limited access or limited stops. The FHWA disagrees with removing the use the term ''EXPRESS,'' but does revise the provision as adopted in this final rule to clarify that the signs are intended for the managed lanes of a freeway on which a toll is charged but which are available as an alternative to non-tolled lanes of the freeway. In addition, FHWA retains the designation of ''Express Lane'' because, by their nature of management strategies, such facilities further limit access to intersecting routes and the adjacent general-purpose lanes, and the designation, therefore, is appropriate. The FHWA also believes that, given the complexity of management strategies that could be employed on such facilities, specific terms strictly tied to the individual management strategies would become unwieldy and excessive for motorists to comprehend and that the various management strategies applied are more appropriately communicated by the regulatory signing and messages. In concert with similar changes elsewhere in Part 2, the FHWA adopts in this final rule revised provisions to reserve the diamond symbol exclusively for HOV lanes.

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259. The FHWA adds several new sign images and revises several existing sign images in Figure 2G–1 Examples of Preferential Lane Regulatory Signs (Figure 2B–8 in the NPA) to illustrate the various regulatory signs used to designate HOV and bus preferential lanes. A local DOT supported the addition of several of the signs and plaques. The FHWA revises the figure from what was illustrated in the NPA to reflect comments regarding the design of certain signs. As part of these changes, the FHWA revises the designs illustrated for the R3–12 series signs. A local professional organization suggested that the design of the Bus Lane Ahead and HOV Lane Ahead signs be revised to include a diagonal arrow, similar to the BEGIN RIGHT (LEFT) TURN LANE (R3–20 series) signs. Two toll road operators and a State DOT suggested that the R3–14 design does not provide desirable information for preferential lanes that operate continuously. The FHWA disagrees with the commenters and adopts in this final rule Figure 2G–1, with some revisions, to reflect the state of the practice for improved conspicuity and legibility of Preferential Lane regulatory signs for HOV Lanes, and to reflect recent FHWA policy guidance on traffic control devices for preferential lane facilities.[100]

260. The FHWA adopts Figure 2G–17 Regulatory Signs for Managed Lanes (Figure 2B–10 in the NPA) to illustrate examples of signs described in Section 2G.17. ATSSA and a local DOT supported the sign illustrations, whereas the NCUTCD suggested that the price signs shown in the figure should be researched prior to placing them in the MUTCD. The NCUTCD, two toll road operators, and a State DOT opposed the R3–31 sign illustrating the toll rate on a per-mile basis. Based on these and other comments, the FHWA deletes the sign illustrating the rate per mile and otherwise adopts the figure as proposed in the NPA, incorporating additional signs that are similar to those for preferential lanes, but with the legends modified to accommodate priced managed lanes because to provide consistency and uniformity in signing practices for priced managed lanes, which are becoming increasingly common, and for which uniform signing provisions are not currently contained in the MUTCD.

Discussion of Amendments Within Chapters 2H Through 2N

261. The FHWA adopts a new chapter numbered and titled Chapter 2H General Information Signs. In the NPA, the FHWA proposed to number this Chapter 2I; however, the chapter number changed due to the reorganization of the chapters adopted in this final rule. This chapter contains several sections from Chapters 2D and 2E of the 2003 MUTCD in order to group similar sign types in the same area of the Manual. A State DOT supported this new chapter. The new chapter includes Section 2H.01 Sizes of General Information Signs and Table 2H–1 (Section 2I.01 and Table 2I–1 proposed in the NPA) that establish the sizes of General Information signs. The FHWA also adopts Sections 2H.02 General Information Signs (I Series), 2H.03 Traffic Signal Speed Sign (I1–1), 2H.04 Miscellaneous Information Signs, 2H.05 Reference Location Signs and Intermediate Reference Location Signs, 2H.06 Enhanced Reference Location Signs, 2H.07 Auto Tour Route Signs, and 2H.08 Acknowledgement Signs, which contain information from Sections 2D.46, 2D.47, 2D.48, 2D.49, 2D.50, 2E.54, and 2E.55 of the 2003 MUTCD. The FHWA adopts these sections in Chapter 2H in a sequence

[100] This August 3, 2007 FHWA policy memorandum can be viewed at the following Internet Web site: *http://mutcd.fhwa.dot.gov/resources/policy/tcdplfmemo/index.htm.*

that presents the information in the most logical order.

262. The FHWA adopts in this final rule Section 2H.03 Traffic Signal Speed Sign (Section 2D.47 of the 2003 MUTCD and Section 2I.04 in the NPA) with a revised paragraph 04 that increases the minimum size of the Traffic Signal Speed sign from 12 x 18 inches to 24 x 36 inches to provide for suitable letter sizes, as proposed in the NPA. ATSSA and a local DOT supported the increased sign size. Another local DOT suggested that it might be too large for urban conditions, given the narrow space for signs due to landscaping, utility poles, etc., and might present structural problems when replacing existing signs on existing signal structures. The FHWA disagrees because the current size is too small to be read by road users with 20/40 visual acuity, even in urban situations, and notes that the adopted sign is actually smaller than a standard lane-use sign used on signal structures and is no larger than other signal-related regulatory signs that are commonly installed on mast arms or span wires.

263. In this final rule the FHWA adopts Section 2H.04 (Section 2E.55 of the 2003 MUTCD and Section 2I.06 in the NPA) with a revised title of ''Miscellaneous Information Signs'' and associated text to reflect the relocation of this section into the new Chapter 2H.

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264. In the NPA, the FHWA proposed to retain the title ''Trail Signs'' for Section 2H.07 (numbered Section 2D.50 in the 2003 MUTCD and Section 2I.08 in the NPA). However, to address a comment from the NCUTCD and one of its members, in this final rule the FHWA titles Section 2H.07 as ''Auto Tour Route Signs'' to better reflect the content of this section. In the adopted section, all occurrences of the word ''trail'' have been replaced with ''auto tour route.'' In the NPA, the FHWA proposed to add a STANDARD statement prohibiting the use of trail signs on freeways or expressways because trail signs were often misinterpreted to mean walking trails, rather than marked vehicular routes. The NCUTCD and one of its members, eight State DOTs, the National Park Service, numerous trail associations, and citizens opposed the restriction of trail signs on freeways and expressways. The FHWA agrees that there are some situations where it is necessary to install Auto Tour Route signs on freeways or expressways in order to provide continuity between discontinuous segments of conventional roadways that are designated as auto tour routes and for which a freeway or expressway provides the only connection. As a result, the FHWA adopts in this final rule a revised STANDARD and information regarding the circumstances under which Auto Tour Route signs may be installed on freeways and expressways, and information about the types of signs and assemblies to be used.

265. The FHWA adopts in this final rule Section 2H.08 Acknowledgement Signs (Section 2I.09 in the NPA.) As proposed in the NPA, this section contains SUPPORT, GUIDANCE, STANDARD, and OPTION statements regarding the placement and design of the signs that can be used as a way of recognizing a company, business, or volunteer group that provides a highway-related service. Although the Motorist Information Services Association (MISA), an NCUTCD member, and a local DOT supported this section, another NCUTCD member opposed this new section, stating that acknowledgement signs are not traffic control devices and do not belong in the MUTCD. Five State DOTs and a local DOT opposed the requirements related to the sign design and placement, including the restriction on telephone numbers and Internet addresses, stating that more flexibility is needed. The FHWA disagrees with allowing more flexibility and adopts the proposed provisions in this final rule to address the existing extreme variability in acknowledgement sign design and placement practices. The FHWA notes that the restriction on telephone numbers and Internet addresses is consistent with other sections of the MUTCD and that that some agencies' current practices have prioritized acknowledgement signs over more critical traffic control devices, which the FHWA discourages. As a result, the FHWA believes it is important to include sign design and placement regulations in the MUTCD. In this final rule, the FHWA adopts additional information about the design of the signs, including the location of the sponsor acknowledgment logo, the maximum size of the sign display, and a restriction on external and internal illumination. This information is based on the FHWA policy memo ''Optional Use of Acknowledgment Signs on Highway Rights-of-Way,'' dated August 10, 2005.[101]

266. The FHWA adopts in this final rule Chapter 2I General Service Signs. In the NPA, the FHWA proposed to number this Chapter 2F. This chapter contains several sections from Chapters 2D and 2E of the 2003 MUTCD in order to group similar sign types in the same area of the Manual. The FHWA received a comment from a local DOT supporting the creation of this new chapter.

267. The FHWA adopts in this final rule Section 2I.01 Sizes of General Service Signs, and a new Table 2I–1 to establish the minimum sizes of General Service signs and plaques. ATSSA supported the addition of Table 2I–1, while a State DOT and an NCUTCD member opposed establishing requirements for minimum sign sizes for General Service signs. Those in opposition felt that the requirements will no longer allow good engineering judgment in specifying signs that will perform well, but are smaller than the minimum dimensions in the new table. The FHWA disagrees and believes that consistency in sizes of standardized sign legends is intrinsic to the concept of uniformity and adopts the provisions as proposed in the NPA. In response to a comment from the NCUTCD suggesting that many of the sign sizes in Table 2I–1 appear to be larger than necessary, the FHWA notes that the signs have been designed and sized according to conventional design principles.

268. The FHWA adopts in this final rule Section 2I.02 General Service Signs for Conventional Roads that contains information from Section 2D.45 and 2B.70 of the 2003 MUTCD in the NPA, no significant changes were proposed to the information that is adopted in this section.

269. As proposed in the NPA, in Section 2I.03 General Service Signs for Freeways and Expressways (Section 2E.51 of the 2003 MUTCD), the FHWA changes the design of the Truck Parking (D9–16) sign, as illustrated in Figure 2I–1. ATSSA supported the new symbol for the Truck Parking sign. A recent study[102] tested several symbols for this message and found that the message can be successfully symbolized. The FHWA adopts in this final rule the symbol that was found to be the easiest to comprehend and that provides the greatest legibility distance.

270. As proposed in the NPA, the FHWA adopts in this final rule a new section numbered and titled Section 2I.04 Interstate Oasis Signing, containing SUPPORT, GUIDANCE, STANDARD, and OPTION statements regarding signing for facilities that have been designated by a State as having

[101] FHWA's Policy Memo can be viewed at the following Internet Web site: *http://mutcd.fhwa.dot.gov/res-mem_ack.htm.*

[102] ''Design and Evaluation of Selected Symbol Signs,'' Final Report, May, 2008, conducted by Bryan Katz, Gene Hawkins, Jason Kennedy, and Heather Rigdon Howard, for the Traffic Control Devices Pooled Fund Study, can be viewed at the following Internet Web site: *http://www.pooledfund.org/documents/TPF-5_065/symbol_sign_report_final.pdf.*

met the eligibility criteria of FHWA's Interstate Oasis Policy.[103] Although the MISA supported this new section, a State DOT opposed it because it felt that the Interstate Oasis program is not needed. The State DOT suggested that sufficient information is provided through the use of general service signs, specific service signs, and rest area signing. The FHWA adopts the section as proposed to comply with the requirements of SAFETEA–LU regarding the establishment of designation criteria and signing requirements for these facilities. The language of this section is based on the signing provisions of the FHWA's Interstate Oasis Policy.[104]

The FHWA also adopts a unique symbol for use on separate Interstate Oasis signs in conjunction with the word message. ATSSA and a local DOT supported the design of the Interstate Oasis (D5–12) sign, while a State DOT and an NCUTCD member suggested that the sign be classified as a D9 series services sign, not a D5 series sign. The FHWA disagrees and classifies the sign as a D5 series sign because it gives direction to a specific facility that is not an individual service. Other D5 series signs are for roadside facilities, such as Rest Area and Scenic Overlook. Based on a comment from a State DOT, the FHWA removes the sign image from the adopted Figure 2I–1, since the panel is not used on its own, and retains the image in Figure 2I–4.

271. As proposed in the NPA, the FHWA adopts Section 2I.05 Rest Area and Other Roadside Area Signs, that combines the text from Sections 2D.42, 2D.43, and 2E.52 of the 2003 MUTCD, so that similar information is located in one section. The FHWA adopts text revisions to clarify the types of signs to be used at rest areas and at scenic and other roadside areas. Section 2D.42 of the 2003 MUTCD can be misinterpreted as meaning that restrooms are required in order to use the Parking Area, Roadside Table, Roadside Park, and Picnic Area signs, which was not FHWA's intent. Restrooms are only required at locations designated as rest areas. An NCUTCD member supported this revision.

A State DOT and an NCUTCD member suggested that the requirements for installing advance roadside area signs were too restrictive. The FHWA agrees and in this final rule adopts the placement information as a GUIDANCE statement, rather than a STANDARD, consistent with the provisions in Section 2E.29.

As proposed in the NPA, the FHWA adopts two paragraphs at the end of this section to allow the use of the Telecommunications Devices for the Deaf (TDD) symbol sign and the Wireless Internet Services (Wi-Fi) symbol sign, to supplement advance guide signs for rest areas if such amenities are available. The FHWA adopts the TDD symbol based on the results of the Sign Synthesis Study[105] that showed that several States are using a similar sign, and because this sign design is specified by the Americans With Disabilities Act to indicate facilities that are equipped with TDD. The FHWA adopts the Wi-Fi symbol sign because many rest areas are being equipped with wireless Internet service for road users visiting these areas and many States are using word message or symbol signs to indicate the availability of this service in the rest area. A State DOT suggested that there be a requirement to install supplemental plaques identifying the Wi-Fi symbol; however, the symbol was evaluated and exhibited an acceptable level of comprehension.[106] The FHWA believes that a uniform symbol is needed for this rapidly expanding signing practice and the human factors testing indicates that the proposed symbol provides optimum comprehension, conspicuity, and legibility. MISA supported this new section.

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272. The FHWA adopts in this final rule two new sections numbered and titled Section 2I.06 Brake Check Area Signs, and Section 2I.07 Chain Up Area Signs, as proposed in the NPA as Sections 2F.10 and 2F.11. The FHWA adopts these new types of signs based on the results of the Sign Synthesis Study[107] that revealed that some States use signs for these specific purposes. Some States provide off-road areas (on the shoulder or in a physically separated rest area type of facility) for drivers to install and remove tire chains during winter weather conditions. Some States also provide similar areas for trucks and other heavy vehicles to check their brakes in advance of the start of a long downhill grade. The NCUTCD and four State DOTs opposed placing these signs in Chapter 2I, because they felt that these signs are not guide signs, rather they are warning signs. The FHWA does not consider these to be warning signs, rather it considers these types of areas to be roadside facilities and the signs should be consistent in color and legend with those for other roadside facilities.

273. As proposed in the NPA, the FHWA adopts a new Section 2I.08 Tourist Information and Welcome Center Signs (Section 2F.06 in the NPA) that contains the information from Section 2E.53 of the 2003 MUTCD. The FHWA adopts this change, to group like material in the same chapter. MISA supported this new section. Additionally, as proposed in the NPA, the FHWA adopts a revised design of the Tourist Information (D9–10) sign, as illustrated in Figure 2I–1. A recent study[108] found that the meaning of the existing ''question mark'' symbol for this service is poorly understood by road users. The abbreviation ''INFO'' was fully understood by 96 percent of the participants in the human factors testing. Further, the FHWA believes that the term INFO is understandable in most languages. Although the legibility distance of the tested version of ''INFO'' was less than that of the symbol, the FHWA adopts a design featuring larger and bolder letters to provide legibility that is expected to be comparable to the question mark symbol, consistent with minimum letter heights for guide signs.

274. As proposed in the NPA, the FHWA adopts in this final rule a new Section 2I.09 Radio Information Signing (Section 2F.07 in the NPA) that contains information from Section 2E.56 of the 2003 MUTCD. In the last OPTION statement, the FHWA adopts a revised legend for the D12–4 sign using the word ''CALL'' rather than ''DIAL'' in order to be consistent with the terminology used on the adopted D12–2 Carpool Information and D12–5 Travel Information signs and to reflect current terminology. ATSSA and a local DOT supported this change in legend text.

[103] FHWA's Interstate Oasis Policy, dated October 18, 2006, can be viewed at the following Internet Web site: *http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=2006_register&docid=E6-17367.*

[104] FHWA's Interstate Oasis Policy, dated October 18, 2006, can be viewed at the following Internet Web site: *http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=2006_register&docid=E6-17367.*

[105] ''Synthesis of Non-MUTCD Traffic Signs,'' FHWA, December 2005, page 48, can be viewed at the following Internet Web site: *http://tcd.tamu.edu/documents/rwstc/Signs_Synthesis-Final_Dec2005.pdf.*

[106] ''Design and Evaluation of Selected Symbol Signs,'' Final Report, May 2008, conducted by Bryan Katz, Gene Hawkins, Jason Kennedy, and Heather Rigdon Howard, for the Traffic Control Devices Pooled Fund Study, can be viewed at the following Internet Web site: *http://www.pooledfund.org/documents/TPF-5_065/symbol_sign_report_final.pdf.*

[107] ''Synthesis of Non-MUTCD Traffic Signs,'' FHWA, December 2005, pages 46–47, can be viewed at the following Internet Web site: *http://tcd.tamu.edu/documents/rwstc/Signs_Synthesis-Final_Dec2005.pdf.*

[108] ''Design and Evaluation of Selected Symbol Signs,'' Final Report, May 2008, conducted by Bryan Katz, Gene Hawkins, Jason Kennedy, and Heather Rigdon Howard, for the Traffic Control Devices Pooled Fund Study, can be viewed at the following Internet Web site: *http://www.pooledfund.org/documents/TPF-5_065/symbol_sign_report_final.pdf.*

275. The FHWA adopts in this final rule Section 2I.10 TRAVEL INFO CALL 511 Signs (Section 2F.08 in the NPA) that incorporates text from Section 2D.45 of the 2003 MUTCD associated with these signs. MISA supported this proposed new section. A State DOT suggested that the FHWA allow alternate designs of the sign that would eliminate the duplicate message ''511'' by incorporating a larger scale pictograph. The FHWA disagrees, because the suggested pictograph (the trademarked 511 pictograph) has not undergone legibility testing to determine whether it can be used independently.

276. As proposed in the NPA, the FHWA adopts in this final rule a new Section 2I.11 Carpool and Ridesharing Signing (Section 2F.09 in the NPA) that contains information from Section 2E.57 of the 2003 MUTCD. The FHWA adopts this change because this material relates to the content in Chapter 2I.

277. In the NPA, the FHWA proposed to relocate the information from Section 2C.13 of the 2003 MUTCD to a new section numbered and titled Section 2F.12 Truck Escape Ramp Signs. With the chapter reorganization adopted in this final rule, it would have been Section 2I.12. The FHWA proposed this change to clarify that these types of signs convey information on a form of roadside facility (similar to rest areas, brake check areas, etc.), rather than warnings. Although a local DOT supported this change, the NCUTCD and one of its members, six State DOTs, two local DOTs, and a citizen opposed truck escape ramp signs being reclassified, suggesting that this section and the associated signs remain in Chapter 2C. Based on the comments, FHWA agrees that truck escape ramp signs are only intended to communicate information in an emergency situation and the escape ramp is not to be entered except under such a condition, and thus a warning classification for the signs is more appropriate. The FHWA does not adopt proposed Section 2F.12 in this final rule, and retains the truck escape ramp signs in Chapter 2C with black legends on yellow backgrounds.

278. In this final rule the FHWA adopts Chapter 2J Specific Service Signs that contains the provisions of Chapter 2F of the 2003 MUTCD. This chapter was numbered Chapter 2G in the NPA. Significant proposed and adopted changes to provisions of 2003 MUTCD Chapter 2F are discussed below.

279. In the NPA, the FHWA proposed to revise the STANDARD statement in Section 2J.02 Application (Section 2F.02 of the 2003 MUTCD) to indicate that a service type is allowed to appear on up to two Specific Service signs, rather than only on one. MISA and an NCUTCD member supported this change. A State DOT opposed limiting the number to two, while a State travel information council opposed allowing more than one sign per service type because they felt that the overflow of service types onto two signs at one interchange would further complicate the signing. The FHWA disagrees that signing would be further complicated, based on the fact that the total number of signs allowed has not changed. The FHWA adopts in this final rule the change as proposed in the NPA to reflect FHWA's Interim Approval (IA–9) to Display More than Six Specific Service Logo Panels for a Type of Service, dated September 21, 2006,[109] which allows for up to 2 Specific Service signs containing up to 12 logos for a given type of service. As part of this change, the FHWA also adopts a paragraph 06 indicating that when a service type is displayed on two signs, the signs for that service type should follow one another in succession. MISA, a State DOT, and an NCUTCD member supported this provision. Two State DOTs felt that it would not be practical for the signs to follow one another in succession, because their existing sign panels would have to be removed and relocated. The commenters suggested that the wording allow installation of additional service signs as space allows. The FHWA declines revising the language as suggested because it is important that the signs be in succession to aid the driver in recollection and decision making.

280. In Section 2J.03 Logos and Logo Sign Panels (Section 2F.03 of the 2003 MUTCD), the FHWA proposed in the NPA to add to the first GUIDANCE statement a recommendation that the letter heights for word message logos should have the minimum letter heights described in Section 2J.05. A State DOT and a State travel information council commented that the minimum letter heights referenced in Section 2J.05 are in a STANDARD statement. Therefore, to avoid conflicts created by referencing a STANDARD statement in a GUIDANCE statement, the FHWA does not adopt the GUIDANCE as proposed in the NPA. Instead, in this final rule the FHWA adopts a SUPPORT statement referencing Section 2J.05 for minimum letter heights for logo sign panels.

[109] FHWA's Interim Approval IA–9, dated September 21, 2006, can be viewed at the following Internet Web site: *http://mutcd.fhwa.dot.gov/resources/interim_approval/pdf/ia_9_logopanels.pdf.*

As proposed in the NPA, the FHWA also adopts OPTION, STANDARD, GUIDANCE, and SUPPORT statements in this section regarding the use and design of supplemental messages within the logo sign panel. To enhance recognition of the presence of a supplemental message, the figures depict the logo sign panels with the supplemental messages on a yellow background. The FHWA adopts this new text to incorporate messages, such as DIESEL and 24 HOURS that are helpful to road users. ATSSA, a State travel information council, MISA, an NCUTCD member, and a traffic signing vendor supported the proposed language. In the NPA, the FHWA also proposed restricting the number of supplemental messages on a logo panel to just one. A State DOT opposed this restriction but the FHWA disagrees because the recommendation of a maximum of one supplemental message is based on driver information processing capabilities. An agency may, through engineering judgment based on applicable design considerations and human factors, display more than one supplemental message if it deems it to be essential to motorist direction.

In the NPA, the FHWA proposed to add recommendations regarding the specific minimum letter heights for the supplemental message for logo sign panels on Specific Service signs for various roadway classifications. A State DOT and an NCUTCD member suggested that the proposed letter height of only 4 inches on a mainline freeway or expressway sign is too small, and recommended a minimum letter height of 6 inches. The FHWA notes that 4 inches represents the minimum letter height, and agencies can use larger letter heights. The 4-inch supplemental legend was balanced with the recommendation for an 8-inch business name. In order to provide consistency and to avoid repeating language, the FHWA does not adopt the recommendation as proposed in the NPA. Instead, in this final rule the FHWA adopts a STANDARD statement that references Table 2J–1 for minimum height requirements for letters and numerals on supplemental messages displayed within the logo sign panel.

The FHWA adopts a new supplemental message for use with logo sign panels that may be used by businesses that are designed with facilities to accommodate the on-site movement and parking of recreational vehicles (RVs). As proposed in the NPA, the language was developed based on the conditions listed in Interim Approval IA–8, dated September 6,

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2005,[110] as well as additional criteria deemed necessary, such as alternate RV Access supplemental message design and placement, and the need for an engineering study to demonstrate that a U-turn can be made by RVs, if U-turns are needed to access the RV accessible site desiring to be signed as such. The proposed language created a significant amount of interest, particularly within the RV community. The FHWA received over 1,150 letters from RV owners, many of whom are members of the Family Motor Coach Association (FMCA). All of those commenters supported the concept of RV signing. Only one RV owner commented that RV accessible sites should not be signed because there are too many signs along the highway already and that special interest groups should not be candidates for additional signing. The large number of members of the FMCA who submitted letters, as well as a few additional citizens, suggested that the FHWA retain the existing sign designs contained in the Interim Approval, primarily because the program has already been implemented in 15 States, and they are concerned about the costs that those States would incur if they were forced to change their signs. These commenters felt that the 15 States that are already using these signs might abandon the RV accessible program instead of upgrading the signs. ATSSA, a State DOT, MISA, an NCUTCD member, a traffic engineering consultant, and three citizens supported the design proposed in the NPA for several reasons. Many thought that the design in the Interim Approval produced a cluttered appearance that was alleviated in the NPA design by keeping the RV Access supplemental message within the logo sign panel. The FHWA adopts the design proposed in the NPA, because the FHWA believes it is important to contain the RV symbol within the borders of the business logo to make it easier for the travelling public to determine which service accommodates RVs and to simplify the overall sign design. The FHWA points out to the RV owners who submitted comments that, due to the systematic upgrade provisions of Section 655.603(d)(1) of title 23, Code of Federal Regulations, the 15 States that have signs in place do not need to spend any funds on immediately upgrading their existing signs since they can keep their existing signs in place until they need to be replaced, at which time replacement with a sign that is compliant with the MUTCD would occur. In addition, although not proposed in the NPA, the FHWA adopts a GUIDANCE statement in this final rule recommending that agencies using the RV Access supplemental message should have a policy on the site requirements needed to qualify for such a designation. This incorporates additional information from the Interim Approval regarding the need for States to develop a policy on site requirements, as suggested in a comment from a citizen.

The FHWA also adopts a new OPTION statement allowing the use of the supplemental message OASIS within the logo panel of a business that has been designated as an Interstate Oasis facility. As proposed in the NPA, the FHWA adopts this additional supplemental message to reflect the Interstate Oasis Program and Policy that was published in the **Federal Register** on October 18, 2002.[111]

Finally, in the NPA, the FHWA proposed to add STANDARD, OPTION, and GUIDANCE statements regarding the use of dual logo panels (two smaller logos on the same panel) on Specific Service signs. The FHWA based this proposal on the results of research in Texas[112] which found that mixing food and gas logos in a dual logo panel did not significantly impact their effectiveness. Although a local DOT supported this proposal, the NCUTCD and one of its members, eight State DOTs, a State travel information council, MISA, and a traffic signing vendor opposed it. Further review by the FHWA indicates that the research in Texas was a simulation only. In addition, the FHWA has not received results from field experimentation underway in Texas and Kentucky to support inclusion of dual logos at this time. As a result, the FHWA does not adopt in this final rule the proposed use of dual logo sign panels on Specific Service signs.

281. The FHWA adopts in Section 2J.04 Number and Size of Signs and Logo Sign Panels (Section 2F.04 of the 2003 MUTCD) OPTION and STANDARD statements to permit the use of, and provide the associated requirements for, additional logo sign panels of the same specific service type when more than six businesses of a specific service type are eligible for logo sign panels at the same interchange. ATSSA, MISA, a local DOT, and an NCUTCD member supported this new provision as proposed in the NPA, while three State DOTs and a State travel information council expressed opposition. Those in opposition suggested that the additional logo sign panels of the same service type, beyond six, would lead to sign proliferation, potentially causing driver confusion. Some of the commenters stated that the purpose of the logo panels is to inform motorists of the specific services available at a particular interchange so that they can make informed decisions about essential motorist services before exiting the highway, and the fact that one sign would have the full complement of six specific service providers for a single type is a clear indication that the motorist will have a number of choices for that service type at that interchange. Thus, these commenters felt it is not necessary to identify each provider at that location. The FHWA understands the purpose of the program and notes that States may develop policies regarding the scope and use of Specific Service signing and might elect to use only General Service signing. The FHWA adopts this provision as proposed in the NPA, based on the Interim Approval to Display More than Six Specific Service Logo Panels for a Type of Service (IA–9), dated September 21, 2006.[113]

282. In the NPA, the FHWA proposed adding a STANDARD statement in Section 2J.05 Size of Lettering (Section 2F.05 of the 2003 MUTCD), specifying minimum letter heights for logo sign panels consisting only of word legends that are displayed on the mainlines of freeways and expressways and on conventional roads and ramps. ATSSA and a local DOT supported the letter heights as proposed in the NPA. Four State DOTs opposed the proposed sizes because they felt that the legend size on word-only logo sign panels should not be mandated and should be consistent with how trademarks are handled. The FHWA disagrees because the purpose of a minimum letter height is for legibility of legends that do not have recognition value by virtue of a unique graphic representation. Trademarked word graphic business representations

[110] Interim Approval IA–8 can be viewed at the following Web site: *http://mutcd.fhwa.dot.gov/res-interim_approvals.htm.*

[111] The Interstate Oasis Program and Policy can be viewed at: *http://mutcd.fhwa.dot.gov/res-policy.htm.*

[112] ''Effects of Adding Dual-Logo Panels to Specific Service Signs: A Human Factors Study,'' by H. Gene Hawkins and Elisabeth R. Rose, 2005, published in Transportation Research Record number 1918, is available for purchase from the Transportation Research Board at the following Internet Web site: *www.trb.org.* A brief summary of the research results can be viewed at the following Internet Web site: *http://pubsindex.trb.org/document/view/default.asp?lbid=772254.*

[113] FHWA's Interim Approval IA–9, dated September 21, 2006, can be viewed at the following Internet Web site: *http://mutcd.fhwa.dot.gov/resources/interim_approval/pdf/ia_9_logopanels.pdf.*

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constitute logos and are not subject to this provision. The NCUTCD, one of its members, and MISA supported the letter heights, with the exception of the letter heights on ramps, which they felt should be changed to 4-inch upper-case and 3-inch lower case to reflect that ramp panels are half the size of mainline panels. The FHWA disagrees because of the need to maintain legibility, regardless of panel size. In this final rule, the FHWA adopts a reference in the STANDARD to a new Table 2J–1 with minimum letter and numeral sizes for Specific Service signs according to sign type, rather than repeating the detailed requirements in the STANDARD statement. The FHWA adopts the minimum letter heights in Table 2J–1 to provide letter heights that will enhance legibility for older drivers. This new table includes the sizes for Specific Service signs, logo panels, and logo panel supplemental messages.

283. As proposed in the NPA, the FHWA adopts Section 2J.08 Double-Exit Interchanges (Section 2F.08 of the 2003 MUTCD) with a GUIDANCE paragraph 03 to recommend that where a service type is displayed on two Specific Service signs at a double-exit interchange, one of the signs should display the logo panels for the service type of the businesses that are accessible from one of the two exits and the other sign should display the logo panels for the service type of the businesses that are accessible from the other exit. MISA and an NCUTCD member supported the intent of this section, but suggested revisions to allow for a ''split-service'' sign format where two services would be displayed for one exit. The commenters suggested that ''split-service'' signs where the top section displays FOOD—EXIT 5A and the bottom section displays LODGING—EXIT 5A would not comply with the proposed text. The FHWA disagrees, noting that the purpose of this provision is to avoid situations where one sign is split between each exit, not service category. An example would be one sign displaying ''FOOD—EXIT 5A'' and ''FOOD—EXIT 5B'' followed by a second Food sign that also applies to both exits with the same headings. The FHWA's intent is that one sign should read ''FOOD—EXIT 5A'' while the other reads ''FOOD—EXIT 5B''. This provision does not preclude the display of two services on one sign. The FHWA adopts paragraph 03, as proposed in the NPA, to provide consistency in logo signing for double-exit interchanges when a service type is displayed on two signs.

284. The FHWA adopts Section 2J.09 Specific Service Trailblazer Signs, containing SUPPORT, STANDARD, GUIDANCE, and OPTION statements regarding these guide signs that are required along crossroads for facilities that have logo panels displayed along the main roadway and ramp, and that require additional vehicle maneuvers to reach. ATSSA supported this section as proposed in the NPA, while two DOTs and a State travel information council opposed the new section in its entirety, specifically the mandating of the use of Specific Service trailblazer signs, as indicated in paragraph 02. Two additional State DOTs suggested that more flexibility be provided to allow other official signs and legal outdoor advertising signs to serve as substitutes for Specific Service trailblazer signs, where it is not feasible or practical to install these signs. The FHWA disagrees because highway agencies do not control the content, format, or continued presence of off-premise signs and therefore reliance on off-premise signs is not advisable. The NCUTCD suggested relaxing the requirement that facilities shall not be considered eligible for signing from the ramp and main roadway where it is not feasible or practical to install Specific Service trailblazer signs. The FHWA disagrees, because the continuity of the system of signs is essential to motorists' guidance. The FHWA adopts this new section and an associated new figure, as proposed in the NPA, to enhance the uniformity of this signing practice, which is being used by many States.

285. The FHWA adopts Section 2J.10 Signs at Intersections (Section 2F.09 of the 2003 MUTCD) and expands paragraph 05, as proposed in the NPA, to require that the action message or the directional arrow shall all be on the same line as the type of service or below the logo sign panels. A State DOT opposed changing this to a requirement, because many of their signs do not meet this requirement and would need to be replaced. The FHWA disagrees and adopts the requirement in this final rule. The 2003 MUTCD language required the action message or directional arrow to be on the same line as the type of service, which was required to be above the logo(s), but provided an optional alternative to display the action message or directional arrow below the logo(s). The text adopted in this final rule merely consolidates the 2003 OPTION and STANDARD statements, and the consolidated STANDARD continues to allow the action message or directional arrow to be either (1) above the logos on the same line as the service type, or (2) below the logos. Further, under the systematic upgrade provisions of Section 655.603(d)(1) of title 23, Code of Federal Regulations, States can keep their existing signs in place until they need to be replaced, at which time replacement with a sign that is compliant with the MUTCD would occur.

286. In this final rule the FHWA adopts Chapter 2K Tourist-Oriented Directional Signs that contains the provisions of Chapter 2G of the 2003 MUTCD. The FHWA did not propose any significant changes to this chapter in the NPA (numbered 2H therein), nor does the FHWA adopt any significant changes to the text in this chapter in this final rule.

287. The FHWA adopts in this final rule a new Chapter 2L Changeable Message Signs (Chapter 2M in the NPA.) The NPA contained information from Sections 2A.07 and 2E.21 of the 2003 MUTCD as well as additional new information, organized into seven sections, specifically pertaining to the description, application, legibility and visibility, design characteristics, message length and units of information, installation, and display of travel times on changeable message signs. Five State DOTs, a local DOT, a local association, and two toll road operators suggested that FHWA clarify the terms Changeable Message Sign (CMS), Dynamic Message Sign (DMS), and Variable Message Sign (VMS), since the terms are used differently throughout the traffic engineering and the ITS/electronics industry. The FHWA adopts in this final rule the term Changeable Message Sign (CMS) as it is the standard nomenclature in the traffic engineering profession, and clarifies that this term is synonymous with signs referred to as DMS and VMS. The FHWA adopts this new chapter to consolidate all information about CMSs into one location in the Manual and to reflect the recommendations of extensive research on changeable message sign legibility, messaging, and operations conducted over a period of many years by the Texas Transportation Institute.[114] A State DOT, a traffic control device vendor, and a legal firm supported the creation of a consolidated chapter, whereas a local ITE chapter suggested that there needed to be clarification on what types of CMSs are covered by this chapter. The FHWA agrees and adopts clarifying text in this final rule to distinguish between various

[114] Information on the many research projects on changeable message signs conducted by the Texas Transportation Institute (TTI) can be accessed via TTI's Internet Web site at: *http://tti.tamu.edu/*.

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types of CMS and the applicability of these provisions to each type.

288. The FHWA adopts Section 2L.01 Description of Changeable Message Signs (Section 2M.01 in the NPA). ATSSA and a local DOT supported the proposed prohibition of advertising messages on CMSs. A law firm suggested that States need to have an opportunity to allow advertising on CMSs under controlled circumstances to assist with funding, thereby enabling modern CMS technology, which is a vital element of the ITS program. The FHWA disagrees, as advertising in the highway right of way is not permitted, and the FHWA believes it is a distraction from traffic conditions, official traffic control devices, and the driving task in general. ATSSA also supported the description of CMSs and the design language.

Although not proposed in the NPA, the FHWA adopts a GUIDANCE statement in this final rule to consolidate and clarify existing provisions stating that blank-out signs that display only single-phase, predetermined electronic-display legends that are limited by their composition and arrangement of pixels or other illuminated forms in a fixed arrangement (such as a blank-out sign indicating a part-time turn prohibition, a blank-out or changeable lane-use sign, or a changeable OPEN/CLOSED sign for a weigh station), should conform to the provisions of the applicable section for the specific type of sign, provided that the letter forms, symbols, and other legend elements are duplicates of the static messages, as detailed in the ''Standard Highway Signs and Markings'' book. The FHWA adopts this language in this final rule to provide information regarding these types of signs, allowing greater flexibility in the use of such signs.

289. The FHWA adopts Section 2L.02 Applications of Changeable Message Signs (Section 2M.02 in the NPA), which allows the use of CMSs, both permanent and portable, by State and local highway agencies to display emergency, homeland security, and America's Missing: Broadcast Emergency Response (AMBER) alert messages, in addition to safety or transportation-related messages already included in the 2003 MUTCD. The FHWA also adopts a GUIDANCE statement, as proposed in the NPA, that States have a policy regarding the display of these types of messages. ATSSA and a State DOT supported these changes. Another State DOT suggested that additional messages be allowed when used in a temporary traffic control zone. The FHWA believes that this information should be considered in the State's policy on the use of CMSs and not included in the MUTCD. Based on a comment from a State DOT, the FHWA also adopts in this final rule a GUIDANCE statement that when multiple CMSs are used to address a specific situation, the message displays should be consistent to the driver along the roadway corridor and adjacent corridors, and that different operating agencies should coordinate their messages accordingly.

290. In Section 2L.03 Legibility and Visibility of Changeable Message Signs (Section 2M.03 in the NPA), the FHWA had proposed adding a recommendation in the NPA regarding care and maintenance of the protective material on the front face of a CMS. Two State DOTs opposed this language, stating it was too prescriptive and that specific details regarding maintenance should not be included in the MUTCD. The FHWA agrees and does not adopt the proposed language in this final rule.

291. The FHWA adopts Section 2L.04 Design Characteristics of Changeable Message Signs (Section 2M.04 in the NPA), as proposed in the NPA, which expands the elements that are prohibited on CMSs to include advertising, exploding, scrolling, or other dynamic elements. Two State DOTs, three local DOTs, and an association of local ITS partners suggested that sequencing arrows be allowed. The FHWA disagrees because sequencing arrows are not appropriate for CMSs that can accommodate word legends that are comparable to static signs when installed at the roadside or in an overhead location. However, to address this issue, in this final rule the FHWA adopts a reference to Part 6 regarding the use of flashing arrow boards for lane closures that are placed in the closed portion of a lane.

As proposed in the NPA, the FHWA adopts a recommendation that except in the case of a limited-legend CMS (such as a blank-out or electronic-display changeable message regulatory sign) that is used in place of a static regulatory sign or an activated blank-out warning sign that supplements a static warning sign at a separate location, changeable message signs should be used as a supplement to, and not as a substitute for, conventional signs and markings. ATSSA, a State DOT, a local DOT, and a local chapter of ITE supported this language.

As proposed in the NPA, the FHWA adopts provisions for spacing between characters, words, and message lines, as well as letter heights and width-to-height ratios of the sign characters, in this section. ATSSA, a State DOT, three local DOTs, a traffic control device vendor, and a local ITE section suggested revisions to the proposed language or suggested that it be deleted because it was too prescriptive. The FHWA adopts the language as proposed, based on research evaluations [115] that support the provisions. The FHWA understands that CMS technology is continuing to develop and will consider those developments in future rulemaking and/or policy guidance.

The FHWA adopts a requirement that CMSs automatically adjust their brightness under varying light conditions to maintain legibility. ATSSA supported this language. A State DOT suggested that additional clarification be provided. The FHWA notes that Table 2A–5 provides information for the use of a white legend on a black background for the colors of regulatory electronic changeable displays.

The FHWA proposed in the NPA to recommend that the front face of a CMS be covered with protective material. A State DOT, a local DOT, and a local ITE chapter suggested that this recommendation be removed, since there might be signs that do not need a protective front material. The FHWA agrees and does not adopt the reference to protective material in this final rule.

In GUIDANCE paragraph 11, the FHWA decides to remove the specific recommended minimum values of luminance for CMSs because such precise information is more appropriately contained in other reference materials. Instead, the FHWA adopts the GUIDANCE statement as a recommendation that the luminance should meet industry criteria for CMS. The FHWA adopts the recommended range of luminance contrast as proposed in the NPA.

The remaining paragraphs that were proposed in this section are related to color messages and backgrounds on CMSs. ATSSA supported the proposed language, while several State and local DOTs, traffic control device manufacturers, and an NCUTCD member suggested changes to the text or suggested that the language be deleted. Some agencies felt that the language indicated that all CMSs are to be in color. The FHWA disagrees, as only the sign legend is required to be in color, not the background. Some commenters did not know that the capability exists for displaying the colors indicated in the NPA. The capability does exist and

[115] Information on the many research projects on changeable message signs conducted by the Texas Transportation Institute (TTI) can be accessed via TTI's Internet Web site at: *http://tti.tamu.edu/*.

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some agencies have begun to use signs that employ more advanced technologies, however; FHWA believes that agencies have not specified the use of the colors because of the lack of standards and apparent or implied acceptance of existing technologies in use. Based on the availability and effective use of signs that have the capabilities to display full color the FHWA adopts the language as proposed in the NPA. Based on a comment from a local ITE section, the FHWA also adopts information on the use of symbols regarding resolution and replication of static versions of signs.

292. The FHWA adopts Section 2L.05 Message Length and Units of Information (Section 2M.05 in the NPA), with revisions to the STANDARD to clarify that each message on a CMS shall consist of no more than two phases. Two State DOTs, seven local DOTs, an association of local DOTs, and a traffic engineering consultant opposed this language, stating that it was overly restrictive and that a third phase should be allowed. The FHWA disagrees, because messages composed of more than two phases exceed driver information processing capabilities and adopts the language as proposed in the NPA. Some of the commenters, as well as an NCUTCD member, suggested that the language conflicted with the last GUIDANCE statement in the section recommending an additional CMS to be used if the message required more than two phases. To address this comment, in this final rule the FHWA adopts a revision the last GUIDANCE statement to clarify that the display of information that would otherwise necessitate more than two phases would be handled by the use of two CMSs at separate locations, each with distinct, independent messages with a maximum of two phases each. In this final rule the FHWA also adds to the GUIDANCE statement an additional principle that the duration between the displays of two phases should not exceed 0.3 seconds, to clarify the issue of how long an interval between successive phases should be.

The FHWA adopts a requirement, as proposed in the NPA, that each phase of a message shall be understood by itself regardless of the sequence in which it is read. A State DOT, two local DOTs, and a toll road operator suggested that this language be changed to a recommendation, or be applicable only to permanent CMS. The FHWA disagrees and believes that the logical display of messages is critical to their comprehension and subsequent action by road users to promote effective traffic operation. The FHWA adopts the language as proposed in the NPA, in this final rule.

The FHWA adopts a requirement that techniques of message display such as animation, rapid flashing, dissolving, exploding, scrolling that travels horizontally or vertically across the face of the sign, or other elements, shall not be used. This language is similar to the requirements in Sections 2L.04 and 6F.60. The Minnesota DOT and a local ITE section suggested that there needed to be more guidance, particularly related to moving arrows. The FHWA disagrees with allowing the use of moving arrows on permanent CMSs. However, to address this issue, the FHWA adopts a reference to Part 6 regarding the use of flashing arrow boards for lane closures.

293. The FHWA adopts Section 2L.06 Installation of Permanent Changeable Message Signs (Section 2M.06 in the NPA) that contains recommendations on the factors that should be considered when installing permanent CMSs that are not used in place of static signs. ATSSA and a local DOT supported the provisions in this proposed section. To address a comment from the NCUTCD, the FHWA adopts language in this final rule to clarify that CMSs should be located upstream of known bottlenecks and high crash locations to enable drivers to choose an alternate route.

294. In the NPA, the FHWA proposed to add Section 2M.07 Display of Travel Times on Changeable Message Signs. Although ATSSA supported this new section, several State and local DOTs, the NCUTCD and several of its members, as well as other associations provided various comments regarding the specific language or opposed the new section in its entirety because it is not related to traffic control devices. Much of the proposed language included information about public involvement. The FHWA agrees with the commenters and does not adopt this section in this final rule. The information is contained in the FHWA's 2004 policy document titled ''Dynamic Message Sign (DMS) Recommended Practice and Guidance'' [116] if agencies would like more information.

295. In the NPA, the FHWA proposed in Section 2M.04 General Design Requirements for Recreational and Cultural Interest Area Symbol Guide Signs (Section 2H.04 of the 2003 MUTCD and Section 2J.04 in the NPA) to replace the entire set of recreational and cultural area symbol signs with a new, updated, and expanded set of signs based on the National Park Service's (NPS) updated Uniguide Standards Manual,[117] in addition to a few United States Forest Service standard symbol signs for activities not covered in the Uniguide Standards. The Society for Environmental Graphic Design (SEGD) and Harpers Ferry Center (part of the National Park Service) supported the integration of SEGD Recreation Symbols into the MUTCD, and suggested that even more of them be included in the MUTCD. The NCUTCD and one of its members, four State DOTs, two local DOTs, and the U.S. Army Corps of Engineers opposed the proposed symbols for several reasons, including: (1) Some of them conflict with other previously-adopted symbols in the MUTCD; (2) they had not undergone sufficient legibility testing; and (3) by adopting the proposed symbols, the MUTCD would contain a mixture of symbol systems, and therefore would not be uniform. In consideration of the comments, in this final rule the FHWA adopts only the current versions of the NPS Uniguide symbols that do not conflict with symbols adopted by other provisions of the MUTCD, and revises the figures in Chapter 2M accordingly. Because the symbols previously adopted by the MUTCD for roadway applications have undergone legibility and comprehension evaluations prior to adoption, FHWA determines that it is inappropriate to replace those already-adopted symbols with symbols that are untested and complex in their designs. In response to a comment regarding the numbering of the symbols, the FHWA adopts the current designations available at the time of rulemaking with the presumption that the designations adopted by the MUTCD will be adhered to as revisions to the SEGD materials evolve. The FHWA believes it is important to establish the primacy of the MUTCD as its contents are subject to the Federal rulemaking process.

In the NPA, the FHWA proposed adding ''Prohibited Activities and Items'' as one of the usage categories for recreational and cultural interest area symbol guide signs in this section and in Table 2M–1 (Table 2H–1 of the 2003 MUTCD and Table 2J–1 in the NPA). Based on comments discussed in the following item, the FHWA does not adopt this usage category in this final rule. The FHWA revises Table 2M–1 to reflect the new set of signs, as well as

[116] Dynamic Message Sign (DMS) Recommended Practice and Guidance, dated 7/16/2004, can be viewed at the following Internet Web site: *http://mutcd.fhwa.dot.gov/res-memorandum_dms.htm.*

[117] Information about the National Park Service's Uniguide Standards Manual can be obtained from the National Park Service, Harpers Ferry Center, 67 Mather Place, Harpers Ferry, WV 25425, telephone 304–535–5050, Internet Web site *http://www.nps.gov/hfc/products/uniguide.htm.*

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figures within Chapter 2M that show recreational and cultural signs.

296. The FHWA adopts Section 2M.07 Use of Prohibitive Circle and Diagonal Slash for Non-Road Applications (Section 2H.07 in the 2003 MUTCD and Section 2J.07 in the NPA) with revisions to the title and additional clarifying language to describe the appropriate use of the prohibitive circle and diagonal slash. The clarifying language is in addition to the text proposed in the NPA regarding signing for prohibited activities or items in recreational or cultural interest areas when a standard regulatory sign for such a prohibition is not provided in Chapter 2B.

In the NPA, the FHWA proposed to specify that the red diagonal slash be placed behind the symbol, rather than over it, consistent with National Park Service standards. Although a local DOT, MISA, and an NCUTCD member supported this text and the associated images proposed in Figure 2J–11, ATSSA, another NCUTCD member, a State DOT, and three local DOTs opposed the inconsistent use of the slash, as well as all of the sign images in proposed Figure 2J–11. The FHWA agrees with the commenters and does not adopt the language regarding the red diagonal slash in this final rule, thereby making the use of the slash consistent (symbol behind the slash). Also, the FHWA does not adopt Figure 2J–11. The FHWA adopts revised sign images in the figures throughout Chapter 2M to show the slash in front of the symbol.

297. The FHWA adopts Section 2M.08 Placement of Recreational and Cultural Interest Area Symbol Signs (Section 2H.08 of the 2003 MUTCD and Section 2J.08 in the NPA) including the new binoculars symbol, as proposed in the NPA, to denote wildlife viewing areas based on the Sign Synthesis Study,[118] which revealed that several States and the National Park Service were already using this symbol in this manner to design an effective guide sign. The FHWA also adopts the OPTION statement proposed in the NPA, allowing the symbol on the Wildlife Viewing Area sign to be placed to the left or right of the legend, and the arrow to be placed below the symbol. MISA and an NCUTCD member supported this text and the associated symbol, while a State DOT suggested that the symbol on the Wildlife Viewing Area sign should always be placed on the same side, similar to pictographs for street name signs. The FHWA disagrees, and adopts the language as proposed, because flexibility is needed based on whether the associated arrow is pointing to the left or right.

Finally, the FHWA adopts information in the last OPTION statement permitting the use of Advance Turn or Directional Arrow auxiliary signs with white arrows on brown backgrounds with Recreational and Cultural Area Interest symbol guide signs to create Recreational and Cultural Interest Area Directional Assemblies. Although not proposed in the NPA, the FHWA adopts this language in this final rule to provide agencies with the flexibility to create Recreational and Cultural Interest Area Directional Assemblies, similar to other assemblies that are permitted in the MUTCD.

298. The FHWA adopts Section 2M.09 Destination Guide Signs (Section 2H.09 in the 2003 MUTCD and Section 2J.09 in the NPA), and deletes the first sentence of the second STANDARD statement that restricted the use of white on brown destination guide signs on linear parkway-type highways that primarily function as arterial connectors. This change proposed in the NPA is the result of an amended memorandum of understanding that was signed in 2006 by the National Park Service and the FHWA.[119] MISA and an NCUTCD member supported this change.

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299. The FHWA adopts Section 2M.10 Memorial or Dedication Signing (Section 2I.07 Memorial Signing in the NPA), which is comprised primarily of text pertaining to memorial and dedication signs that was in Sections 2D.49 and 2E.08 of the 2003 MUTCD. The FHWA relocates the information on these type of signs to Chapter 2M because they are more appropriately classified as a Recreational and Cultural Interest Area signs, rather than as General Information Signs. The FHWA also revises the background color for Memorial or Dedication Signs from green to brown. The FHWA adopts revised statements within the section, as proposed in the NPA, in order to make the information in this section regarding memorial and dedication signing consistent with Section 2D.53 Signing of Named Highways (Section 2D.49 of the 2003 MUTCD). Although not proposed in the NPA, the FHWA adopts GUIDANCE, STANDARD, and OPTION statements regarding design recommendations, requirements, and options for these signs that are consistent with general signing principles and with provisions for other recreational and cultural interest area signs to address the fact that the information on these signs was relocated from another Chapter.

300. The FHWA adopts Section 2N.03 Evacuation Route Signs (Section 2I.03 of the 2003 MUTCD), with reorganized paragraphs, as proposed in the NPA, to provide a more logical flow. The FHWA also adopts information regarding the design of the new Tsunami Evacuation Route sign, as proposed in the NPA. The design is based on a symbol currently being used in all Pacific Coast States.

The FHWA also adopts the clarification of the use of Advance Turn Arrow (M5 series) and Directional Arrow (M6 series) auxiliary signs with Evacuation Route signs in paragraphs 02 and 03, as proposed in the NPA.

301. The FHWA adopts Section 2N.08 Emergency Aid Center Signs (Section 2I.08 of the 2003 MUTCD), as proposed in the NPA, and adopts an OPTION statement allowing the use of a fluorescent pink background color when Emergency Aid Center signs are used in an incident situation, such as during the aftermath of a nuclear or biological attack. ATSSA and a local DOT supported this change. The FHWA adopts this change, because Emergency Aid Center (EM–6 Series) signs might be useful for incident situations.

302. The FHWA adopts Section 2N.09 Shelter Directional Signs (Section 2I.09 of the 2003 MUTCD), as proposed in the NPA, with an OPTION statement allowing the use of a fluorescent pink background color when Shelter Direction signs are used in an incident situation, such as during the aftermath of a nuclear or biological attack. ATSSA supported this change. The FHWA adopts this change, because Shelter Direction (EM–7 Series) signs may be useful for incident situations.

Discussion of Amendments to Part 3—Pavement Markings—General

303. In the NPA, the FHWA proposed to remove all references to blue raised pavement markers for locating fire hydrants from Part 3 because they are not considered to be traffic control devices. Two local DOTs agreed with the proposal. The NCUTCD, a State DOT, and a traffic control device manufacturer recommended keeping blue raised pavement markers in the MUTCD. Based on the comments, in this final rule the FHWA removes all STANDARD, GUIDANCE, and OPTION statements regarding blue raised pavement markers from the Manual, but adds a new SUPPORT statement in Section 3B.11 stating that blue raised pavement markers are sometimes used

[118] ''Synthesis of Non-MUTCD Traffic Signs,'' FHWA, December 2005, can be viewed at the following Internet Web site: *http://tcd.tamu.edu/documents/rwstc/Signs_Synthesis-Final_Dec2005.pdf.*

[119] This Memorandum of Understanding can be viewed at the following Internet Web site: *http://mutcd.fhwa.dot.gov/res-policy.htm.*

to help emergency personnel locate fire hydrants.

304. Based on a comment from a State DOT, the FHWA adopts the terms ''dotted lane line'' and ''dotted line extension'' instead of ''dotted line'' throughout Part 3 and the rest of the MUTCD to clarify the provisions applicable to each. A ''dotted lane line'' is used to separate a continuing lane from a non-continuing lane, while a ''dotted line extension'' is used to extend a line through an intersection or taper area.

305. As proposed in the NPA, the FHWA adopts the optional use of appropriate route shield pavement marking symbols (including appropriate colors) to assist in guiding road users to their destinations. The NCUTCD commented that colors of State route shield markings should also be allowed and the FHWA agrees. The FHWA includes a figure illustrating several examples of route shield pavement markings.

306. As proposed in the NPA, the FHWA adopts language to clarify that dotted lane lines, rather than broken lane lines, are to be used for non-continuing lanes, including acceleration lanes, deceleration lanes, and auxiliary lanes. Sections 3A.06, 3B.04, 3C.02, and 3D.02 all contain information on the use of dotted lane lines for these uses. The FHWA also adopts revisions to the various figures in Chapter 3B that illustrate the adopted provisions on proper uses of the different types of lines and adds figures where needed to better illustrate the text on the use of dotted lane lines. As documented in NCHRP Synthesis 356,[120] a number of States and other jurisdictions currently follow this practice, which is also the standard practice in Europe and most other developed countries. The FHWA believes that the existing use of a normal broken lane line for these non-continuing lanes does not adequately inform road users of the lack of lane continuity ahead and that the standardized use of dotted lane lines for non-continuing lanes as adopted in this final rule will better serve this important purpose in enhancing safety and uniformity. Sections 3B.04 and 3B.09 below contain further discussion of dotted lane lines.

307. In the NPA, the FHWA proposed to place the information on object markers and barricades in a new chapter titled Chapter 2L Object Markers, Barricades, and Gates. This involved the relocation of Chapter 3C Object Markers and Section 3F.01 Barricades to Part 2 because readers of the MUTCD have difficulty finding object markers in the 2003 MUTCD. In addition, most jurisdictions treat these devices as signs for purposes of inventory and policy. As discussed above in Chapters 2B and 2C, in this final rule, the FHWA relocates the information on barricades to the adopted Section 2B.67 Barricades and the information on object markers to Sections 2C.63, 2C.64, 2C.65, and 2C.66.

308. As proposed in the NPA, the FHWA adopts in this final rule OPTION statements in various sections within Part 3 to allow the use of retroreflective or internally illuminated raised pavement markers in the roadway immediately adjacent to curbed noses of raised medians and curbs of islands, or on top of such curbs, based on recommendations from the Older Driver handbook.[121] This is an effective practice commonly used to aid road users in identifying these channelizing features at night.

Discussion of Amendments Within Chapter 3A

309. In Section 3A.02 Standardization of Application, in the NPA the FHWA proposed revising the OPTION statement about temporary marking of markings. A State DOT expressed concern about the tape being able to match the color of the pavement. The FHWA disagrees with this comment because the NPA wording ''approximately the same color'' allows sufficient flexibility. A toll road operator recommended adding a durability requirement for tape and requiring that the tape be fully maintained. The FHWA disagrees with this comment because the MUTCD does not specify durability times or ''full maintenance'' of any markings. The FHWA adopts the revised OPTION statement in the final rule as proposed in the NPA.

310. In the NPA, the FHWA proposed in Section 3A.05 Colors (numbered Section 3A.04 in the NPA) to limit the use of red raised pavement markers to truck ramps, one-way roadways, and ramps. A toll road operator recommended relocating the text to a section specifically concerning raised pavement markers. The FHWA disagrees because this section provides the STANDARD for the application of red raised pavement markers consistent with the STANDARD for applying other colors. The FHWA received comments from the NCUTCD and two State DOTs recommending that red raised pavement markers be allowed on two-way undivided roadways to indicate wrong-way movement to vehicles. Research conducted by the Texas Transportation Institute[122] supported the use of red raised pavement markers on the left side of two-way undivided roadways to indicate wrong-way movement to vehicles traveling on the wrong side of the center line. The FHWA agrees with the research and in this final rule adopts an expanded paragraph 04 to allow the use of red raised pavement markers on travel lanes where the color red is visible to traffic proceeding in the wrong direction.

The FHWA proposed to add paragraph 06 explaining the use of purple markings to supplement lane line or edge line markings for toll plaza approach lanes that are to be used only by vehicles with registered Electronic Toll Collection (ETC) accounts. The NCUTCD, two State DOTs, and two toll road operators opposed the mention of purple lines because of concerns over visibility and the requirement to use the color purple. The FHWA disagrees with these comments because purple was already established in the 2003 MUTCD for future use, purple as used on both signs and markings is visible at night as a distinct color, and purple is being included for optional, not mandatory, use for markings. A State DOT and four toll road operators agreed with the revision, but recommended removing mention of ETC transponders in regard to allowable use of an ETC lane and, as discussed previously in Chapter 2F, the FHWA agrees and revises the terminology to refer to ETC Account-Only lanes. This new paragraph is consistent with other changes in Part 2 of the MUTCD regarding the use of the color purple for signing to readily identify lanes that are to be used only by vehicles with registered ETC accounts.

311. As proposed in the NPA, the FHWA adopts in Section 3A.06 (numbered Section 3A.05 in the NPA), a change in the title to ''Functions, Widths, and Patterns of Longitudinal Pavement Markings.'' Based on a comment from a toll road operator

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[120] NCHRP Synthesis 356, ''Pavement Markings—Design and Typical Layout Details,'' 2006, can be viewed at the following Internet Web site: *http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_356.pdf.*

[121] ''Guidelines and Recommendations to Accommodate Older Drivers and Pedestrians,'' FHWA Report no. FHWA–RD–01–051, May 2001, can be viewed at the following Internet Web site: *http://www.tfhrc.gov/humanfac/01105/cover.htm.* Recommendations #I.C(2), I.C(4f), and I.F(2).

[122] ''Red Retroreflective Pavement Markings: Driver Understanding of Their Purpose,'' by Jeffrey D. Miles, Paul J. Carlson, Brooke Ullman, and Nada Trout, was published by the Transportation Research Board in Transportation Research Record 2056, 2008, pages 34–42, and can be viewed at the following Internet Web site: *http://trb.metapress.com/content/p006183142152145/fulltext.pdf.*

regarding the general function of a dotted line, the FHWA adopts a revision to the STANDARD statement in paragraph 01 item D to read, ''A dotted line provides guidance or warning of a downstream change in lane function'' in order to more accurately describe the function of the dotted line.

The FHWA received comments from the NCUTCD, a State DOT, and a local DOT recommending removal of the proposed wording ''continuing lane'' and ''non-continuing lane'' in the GUIDANCE statement regarding the lengths of line segments and gaps for dotted lines. The FHWA agrees and in this final rule the proposed phrase concerning separation of a continuing lane and non-continuing lane is removed from paragraph 06. The FHWA received comments from a State DOT and a toll road operator opposed to the existing language recommending 3-foot line segments and 9-foot gaps for dotted lines because they wanted more flexibility. The FHWA disagrees and declines to revise the dimensions in order to encourage increased consistency in the dimensions for dotted lines based on their function, while still allowing flexibility for agencies. The recommended dimensions reflect the most common practice as documented in NCHRP Synthesis 356.[123]

312. In the NPA, the FHWA proposed a new section titled Section 3A.06 Definitions Relating to Pavement Markings, containing definitions of the terms ''neutral area,'' ''physical gore,'' and ''theoretical gore.'' Based on comments from the NCUTCD, three State DOTs, and two local DOTs, the FHWA in this final rule modifies the definitions to enhance accuracy and clarity and relocates the information to Section 1A.13, where all definitions are located.

Discussion of Amendments Within Chapter 3B

313. In the NPA, the FHWA proposed a new STANDARD statement in Section 3B.01 Yellow Center Line Pavement Markings and Warrants to specifically prohibit the use of a single solid yellow line as a center line marking on a two-way roadway. Two State DOTs and a local DOT agreed with the proposal in the NPA. Six commenters, including three local DOTs, two consultants, and a retailer, opposed the revision. The commenters suggested that a single solid yellow center line be allowed on low-speed roads, low-volume roads, school zones, and parking aisles. In addition, several of the commenters mentioned that single solid yellow center lines are sometimes used in Europe and Canada, and that a single line is more cost effective than a double solid yellow center line. The FHWA disagrees with these comments because there have been no studies showing the effectiveness or road user understanding of a single solid yellow center line, especially in regard to passing prohibitions, there is no defined meaning of a single yellow center line in regard to passing or no passing, and this marking has not been allowed by the MUTCD. Some agencies have improperly used a single solid yellow center line because of the lack of a specific prohibition statement. The FHWA adopts paragraph 05 as proposed in the NPA.

The FHWA proposed in the NPA to add SUPPORT paragraph 08, which references sections of the Uniform Vehicle Code (UVC) that contain information regarding left turns across center line no-passing zone markings and paved medians. The NCUTCD and a State DOT supported the revision. Two State DOTs and a consultant disagreed with the revision, stating that the sentence is unnecessary, that the UVC is not readily available without purchase, and that the UVC is not applicable in all States. The FHWA disagrees, because the UVC is the model for State laws and the FHWA supports adoption of the UVC by all States for their motor vehicle laws as a necessary component of traffic control device uniformity, and because the sentence provides clarification. The information was contained in the 1988 MUTCD, and the lack of this information in the 2000 and 2003 Editions of the MUTCD has generated questions and indicates the need to provide the information in this edition. The FHWA adopts the language as proposed in the NPA.

314. In the NPA, the FHWA proposed in Section 3B.02 No-Passing Zone Pavement Markings and Warrants to add an OPTION permitting the use of yellow diagonal markings in the neutral area between the two sets of no-passing zone markings, reflecting common practice for discouraging travel in that area. A local DOT agreed with the revision, but recommended making the paragraph a STANDARD. The FHWA disagrees with the commenter because no studies have been performed to justify making the markings mandatory. The FHWA adopts in this final rule paragraph 13 as proposed in the NPA.

The FHWA received one comment regarding the existing language for minimum taper lengths. A local DOT recommended changing the STANDARD to GUIDANCE to allow more flexibility to practitioners in low-speed urban conditions, such as some traffic calming and parking situations. The FHWA agrees that flexibility is needed, similar to that given in Part 6 for taper lengths at flagger stations and for shifting tapers, and the FHWA can find no recent research basis for the longstanding minimum values for either urban or rural conditions in the STANDARD. Therefore, the FHWA adopts paragraph 16 as GUIDANCE. The value of taper length calculated by the formula remains as the recommended minimum for any given condition of speed and offset.

315. In the NPA, the FHWA proposed in Section 3B.03 Other Yellow Longitudinal Pavement Markings to change the first OPTION to GUIDANCE in order to recommend for certain conditions, rather than just permit, the use of arrows with two-way left-turn lanes. A State DOT asked for guidance on the distance between sets of two-way left-turn lane arrows. The FHWA disagrees that a distance is needed because it depends on several factors, such as speeds, geometry, and intersection spacing. The NCUTCD supported the proposed change, but recommended relocating the text to Section 3B.20. A consultant agreed with the proposal, but made an editorial recommendation. Four State DOTs, five local DOTs, and two NCUTCD members opposed upgrading the paragraph from OPTION to GUIDANCE because of concerns about potential for increased maintenance costs. The FHWA adopts paragraph 04 as GUIDANCE, but relocates the text describing the placement locations for two-way left-turn lane-use arrow pavement markings to Section 3B.20, where it more logically belongs. The NCHRP Synthesis 356[124] highlighted a variety of marking issues for which additional uniformity could be provided to aid road users. The synthesis found that the use of arrows in two-way left-turn lanes at the start of the lane and at other locations along the lane, as needed, is the predominant practice. The FHWA also modifies the figures that contain arrows in two-way left-turn lanes to show when they are recommended and when they are optional.

316. In the NPA, the FHWA proposed in Section 3B.04 White Lane Line Pavement Markings and Warrants a

[123] NCHRP Synthesis 356, ''Pavement Markings—Design and Typical Layout Details,'' 2006, can be viewed at the following Internet Web site: *http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_356.pdf.*

[124] NCHRP Synthesis 356, ''Pavement Markings—Design and Typical Layout Details,'' 2006, can be viewed at the following Internet Web site: *http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_356.pdf.*

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STANDARD specifying that dotted lines are required for acceleration, deceleration, and auxiliary lanes. The NCUTCD, a State DOT, a local DOT, and two citizens agreed with the proposal. Two State DOTs and a local DOT opposed the revision and requested that dotted lines not be required, but did not indicate reasons. The FHWA believes uniformity is needed and adopts in this final rule the language as proposed in the NPA with minor editorial changes.

The FHWA received several comments regarding the proposal in the NPA to require the use of wide dotted white lane lines for lane drops. The NCUTCD, a State DOT, three local DOTs, and a citizen agreed with the proposal, but recommended text revisions for clarity. Three State DOTs, two local DOTs, and a citizen opposed the proposed requirement because they wanted flexibility to use other markings. The FHWA believes uniformity is needed and adopts the required use of lane drop markings as proposed in the NPA with minor editorial changes and adds a sentence to the GUIDANCE to clarify that, for lane drops at intersections, the lane drop marking should begin no closer to the intersection than the furthest upstream regulatory or warning sign associated with the lane drop. The FHWA also adds ''in advance of freeway route splits with dedicated lanes'' as an additional required use for wide dotted white line markings, because this situation is similar to a lane drop.

In this final rule, the FHWA revises the language in paragraph 06 item D for auxiliary lane markings ''between two or more adjacent intersections'' to ''between two adjacent intersections'' based on comments from a State DOT and a local DOT.

Based on the comments discussed above dealing with lane drop markings and auxiliary lane markings, the FHWA adopts three additional drawings to Figure 3B–10 and a new Figure 3B–11 to better illustrate the provisions of the text.

The FHWA received several comments regarding the proposed STANDARD in the NPA requiring the use of dotted white lane lines at entrance ramps with parallel acceleration lanes and the OPTION to extend the dotted lane line to the downstream end of the acceleration taper. The NCUTCD, three State DOTs, and a local DOT agreed with the proposal, but recommended text revisions. Two local DOTs opposed the proposed OPTION to allow the dotted lane line to extend to the downstream end of the acceleration taper because they believe that drivers could be trapped in the lanes that are ending. The FHWA disagrees and notes that extending the dotted white lane line to the downstream end of the acceleration taper is an OPTION and its use in some conditions can help drivers determine the length of the taper during periods of darkness and help drivers avoid trying to merge into heavy traffic prematurely. The FHWA adopts the language as proposed with minor editorial changes.

The FHWA also revises the language for widths of dotted lines throughout Section 3B.04 to provide clarification. A State DOT, two local DOTs, and a citizen expressed confusion concerning the text and associated figures proposed in the NPA. The FHWA adopts language clarifying that wide dotted lines are to be used in advance of lane drops and for auxiliary lanes, which are really just a special case of a lane drop, and that normal width dotted lines are to be used for other dotted lane lines and dotted extensions of lines. The FHWA also updates the figures throughout Part 2 and Part 3 for consistency with the text regarding dotted lane lines.

The FHWA establishes a target compliance date of December 31, 2016 (approximately seven years from the effective date of this final rule), or roadway resurfacing, whichever occurs first, for the replacement of broken white lane lines with dotted white lane lines required to achieve compliance with these provisions at existing locations. The FHWA establishes this target compliance date because of the road user confusion that would likely occur as a result of a long-term mixing of the application of both broken lane lines and dotted lane lines for non-continuing lanes. These locations typically involve merging or lane changing and have a high potential for crashes if road users misunderstand or are confused by the markings. The FHWA believes that, without a specific target compliance date, replacing existing broken lane lines with dotted lane lines under the geometric conditions where dotted lines are required in this final rule might be delayed by some agencies until the existing markings are totally worn off. Most agencies restripe their markings when they are worn to a degree, but well before they are totally absent from the pavement, due to safety issues with unmarked pavement. Further, Portland cement concrete pavements have a very long service life, especially in southern climates, thus making the intervals between resurfacings very long. The FHWA anticipates that the required replacement with the new lane line marking pattern at existing locations will provide safety benefits to road users, and that a seven-year phase-in period is longer than the life of most markings and will allow State and local highway agencies and owners of private roads open to public travel to spread out the work over a reasonable time period and thus minimize any impacts.

317. In Section 3B.05 Other White Longitudinal Pavement Markings, the FHWA proposed language in the NPA to clarify the requirements for channelizing lines in gore areas alongside the ramp and through lanes for exit ramps and entrance ramps in order to improve uniformity in application and to reflect the predominant practice as documented in NCHRP Synthesis 356.[125] The NCUTCD, three State DOTs, and a local DOT agreed with the proposal, but recommended revisions that included only extending the channelization line for entrance ramps with tapered acceleration lanes to a point at least half the distance from the theoretical gore, to more accurately reflect predominant practice to allow earlier merging into the mainline lane. A State DOT opposed the proposal and recommended that the STANDARD be changed to an OPTION. The FHWA disagrees with reducing this to an OPTION, because uniformity is needed to minimize road user confusion, and in this final rule adopts the language as proposed in the NPA but with the suggested change regarding tapered acceleration lanes.

The FHWA also adopts a third drawing to Figure 3B–9 for additional clarification of channelizing line markings for tapered entrance ramps.

318. In Section 3B.08, Extensions Through Intersections or Interchanges, a consultant suggested that the existing GUIDANCE text from the 2003 MUTCD recommending that edge lines should not be extended through major intersections or major driveways as solid lines, be changed to a STANDARD. The FHWA agrees because such a provision is already a STANDARD in Section 3B.06 and adopts paragraph 06 as a STANDARD in this final rule for consistency.

319. In Section 3B.09, Lane-Reduction Transition Markings, the FHWA proposed in the NPA to revise paragraph 08 to recommend that a dotted lane line be used approaching a lane reduction, consistent with the proposed use of dotted lane lines for other conditions in which a lane does not continue ahead. The FHWA received several comments on this

[125] NCHRP Synthesis 356, ''Pavement Markings—Design and Typical Layout Details,'' 2006, can be viewed at the following Internet Web site: *http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_356.pdf.*

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proposal. The NCUTCD, two State DOTs, four local DOTs, two toll road operators, and a citizen agreed with the proposal, but recommended several changes, including changing the sentence to an OPTION, requiring the use of wide dotted white lines instead of normal dotted white lines, and allowing the use of either dotted white lines or broken white lines as lane reduction markings. Four State DOTs and two local DOTs opposed the revision. Although lane-reduction transitions share many characteristics in common with lane drops and auxiliary lanes, the FHWA believes that additional research and experimentation with dotted lane lines on the approach to lane-reduction transitions would be beneficial before adopting the dotted lane line markings for this application. Although the NCUTCD recommended that highway agencies be given the option of using either the current standard markings or the proposed dotted lane line markings for lane-reduction transitions, the FHWA believes that the non-uniformity that would result from having two allowable markings for this application would not be in the best interest of road users. Therefore, the FHWA does not adopt the proposed change in this final rule and retains the text from the 2003 MUTCD for paragraph 08. The FHWA also updates related figures and Section 3B.04 for consistency.

320. In Section 3B.10, Approach Markings for Obstructions, the FHWA proposed language in the NPA to clearly indicate that toll booths at toll plazas are fixed obstructions that shall be marked according to the requirements of this section. The proposal was based on the recommendations from the Toll Plazas Best Practices and Recommendations Report.[126] Based on comments from the NCUTCD, four toll road operators, and two State DOTs, the FHWA adopts in this final rule a SUPPORT statement referencing Chapter 3E Markings for Toll Plazas (Section 3B.29 in the NPA) for additional information on approach markings for toll plaza islands and makes editorial changes to the text.

The FHWA received several comments regarding the existing language in the 2003 MUTCD for minimum taper lengths approaching obstructions. Three toll road operators and a State DOT opposed the statement because some toll plazas cannot accommodate the requirement. Two local DOTs opposed the statement because urban conditions cannot always accommodate the requirement. Consistent with the same change in Section 3B.02, the FHWA in this final rule modifies paragraph 05 from STANDARD to GUIDANCE.

In the NPA, the FHWA proposed to change an existing OPTION to GUIDANCE to recommend, rather than just permit, that where observed speeds exceed posted or statutory speed limits, longer tapers should be used. Two State DOTs and a local DOT opposed the revision. The FHWA in this final rule removes the statement because it is unnecessary, as the formula for taper length based on speed is provided earlier in the section.

321. In Section 3B.11, Raised Pavement Markers—General, the FHWA proposed in the NPA to limit the use of red raised pavement markers to being visible to traffic proceeding in the wrong direction of a one-way roadway or ramp. A State DOT and a local DOT agreed with the proposal. The NCUTCD, a State DOT, and an NCUTCD member recommended allowing the use of red raised pavement markers on divided highways and on the left-hand side of two-way roadways. Consistent with changes as discussed previously in Section 3A.05, the FHWA in this final rule revises paragraph 02 to read, ''The side of a raised pavement marker that is visible to traffic proceeding in the wrong direction may be red (see Section 3A.05).''

Additionally, the FHWA proposed in the NPA to add a GUIDANCE statement near the end of the section that recommends consideration of the use of more closely spaced retroreflective pavement markers where additional emphasis is needed. Based on recommendations from the NCUTCD, three State DOTs, and an NCUTCD member, the FHWA adopts this statement as an OPTION.

322. In Section 3B.13, Raised Pavement Markers Supplementing Other Markings, several commenters made recommendations regarding the existing GUIDANCE from the 2003 MUTCD that raised markers should not supplement right-hand edge line markings. The NCUTCD, two State DOTs, a local DOT, and a toll road operator opposed the existing provision, stating that in many cases there is no bicycle use of the shoulder and the use of raised markers on the right-hand edge line can be very beneficial for delineation on curves and at other locations where extra emphasis of the edge line is needed. Four bicyclist-related organizations recommended leaving the existing provision in place because raised markers can cause bicyclists using the shoulder to lose control if they accidentally drive over the markers. The FHWA believes that there are many locations where raised markers can be used on right-hand edge lines where bicycles are not allowed on a highway and/or to enhance safety overall, without compromising safety for bicyclists. Therefore, in this final rule the FHWA removes the existing GUIDANCE and adopts a new GUIDANCE paragraph 02 that reads as follows: ''Raised pavement markers should not supplement right-hand edge lines unless an engineering study or engineering judgment indicates the benefits of enhanced delineation of a curve or other location would outweigh possible impacts on bicycles using the shoulder, and the spacing of raised pavement markers on the right-hand edge is close enough to avoid misinterpretation as a broken line during wet night conditions.''

323. In Section 3B.14, Raised Pavement Markers Substituting for Pavement Markings, the FHWA proposed in the NPA to change the GUIDANCE to a STANDARD requiring that the color of raised pavement markers shall match the color of the markings for which they substitute, in order to assure uniformity of markings colors. Based on comments from the NCUTCD, a State DOT, a local DOT, and an NCUTCD member, the FHWA in this final rule removes the statement because the information is covered in Section 3B.11.

For consistency with changes discussed above in Section 3B.13 regarding the use of raised pavement markers on right-hand edge lines, the FHWA in this final rule makes comparable changes in Section 3B.14.

324. In Section 3B.15, Transverse Markings, the FHWA relocates the existing second STANDARD statement to Section 3B.20 in the final rule. This STANDARD statement requires pavement marking letters, numerals, arrows, and symbols to be installed in accordance with the SHSM, and is relocated to the section where it more appropriately belongs.

325. In the NPA, the FHWA proposed several changes to Section 3B.16 Stop and Yield Lines to clarify the intended use of these markings. The FHWA proposed to add requirements regarding the use of stop and yield lines, specifically as these relate to locations where YIELD (R1–2) signs or Yield Here to Pedestrians (R1–5 or R1–5a) signs are used. A State DOT and a local DOT agreed with the proposal. Two State DOTs and a local DOT disagreed with the proposal and recommended

[126] ''State of the Practice and Recommendations on Traffic Control Strategies at Toll Plazas,'' June 2006, can be viewed at the following Internet Web site: *http://mutcd.fhwa.dot.gov/rpt/tcstoll/index.htm.*

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allowing stop lines at railroad crossings and other locations that operate under yield control. The FHWA proposed these changes to assure that stop lines are not misused to indicate a yield condition or vice versa. The FHWA adopts the STANDARD proposed in the NPA, which requires that stop lines shall not be used at locations on uncontrolled approaches where drivers are required by State law to yield to pedestrians. This change is in accordance with FHWA's Official Interpretation #3–201(I), dated January 10, 2007.[127]

The FHWA proposed a new STANDARD statement in the NPA that required the use of Yield (Stop) Here to Pedestrian (R1–5 series) signs at a crosswalk that crosses an uncontrolled multi-lane approach when a yield (stop) line is used. A local DOT recommended that the sentence be GUIDANCE instead of a STANDARD. The FHWA disagrees and adopts paragraph 13 for consistency with the requirement in paragraph 01 of Section 2B.11.

326. The FHWA proposed in the NPA to add a new section numbered and titled ''Section 3B.17 Do Not Block Intersection Markings,'' containing OPTION and STANDARD statements regarding the use of markings to indicate that the intersection is not to be blocked and to add a new Figure 3B–17 (Figure 3B–17 in the NPA) showing the options for the Do Not Block Intersection Markings. Four local DOTs and an NCUTCD member approved of the new section. Two local DOTs opposed the new section because of a concern over maintenance in northern States and potential driver confusion over right-of-way. The FHWA believes that Do Not Block Intersection Markings are being used more widely across the country to improve traffic flow through intersections and that uniformity in the use and type of markings is needed to minimize road user confusion. The markings are optional and not mandated for use, but the MUTCD provisions will improve uniformity if markings are used for this purpose. In this final rule the FHWA adopts the section and figure as proposed in the NPA, but with minor editorial revisions.

327. In the NPA, the FHWA proposed in Section 3B.18 Crosswalk Markings, to expand the GUIDANCE regarding the specific placement of crosswalk markings and to add new GUIDANCE regarding the placement of crosswalk markings across uncontrolled approaches, based on engineering judgment and engineering studies. A State DOT and two local DOTs opposed the expanded language on engineering studies. A State DOT and a local DOT agreed with the proposal, but recommended that roundabouts be exempted, and that the study consider the 85th percentile speed in addition to the posted speed. The FHWA believes that an engineering study for crosswalks is appropriate at locations not controlled by a traffic signal, stop sign, or yield sign, including at a roundabout if it does not have a yield sign controlling the entry. The FHWA adopts in this final rule the language proposed in the NPA for the engineering study, but also includes the 85th percentile speed as a consideration in an engineering study. The language reflects the findings of the FHWA report, ''Safety Effects of Marked Versus Unmarked Crosswalks at Uncontrolled Locations.''[128]

The FHWA received comments from the NCUTCD, five State DOTs, four local DOTs, and an NCUTCD member regarding the proposed conditions where marked crosswalks alone should not be installed. A local DOT disagreed with the proposed GUIDANCE and recommended that it be an OPTION because they desire more flexibility. The remaining commenters agreed with the proposal, but recommended editorial changes. The FHWA believes that GUIDANCE is appropriate because of pedestrian safety concerns and adopts the language as proposed in the NPA with editorial changes.

The FHWA also proposed in the NPA to add a GUIDANCE statement recommending that crosswalk markings should be located so that the curb ramps are within the extension of the crosswalk markings. A local DOT opposed the revision and an organization for the blind recommended making the proposal a STANDARD. The FHWA adopts paragraph 17 as proposed in the NPA to be consistent with existing provisions in ADAAG[129] and to provide more consistency for pedestrians as they negotiate the crosswalk and curb ramps.

In the NPA, the FHWA also proposed to add a SUPPORT statement at the end of the section that incorporates information regarding detectable warning surfaces that mark boundaries between pedestrian and vehicular ways where there is no raised curb. The proposed language was in response to requests from the U.S. Access Board, based on ADAAG.[130] Two State DOTs, a local DOT, and an NCUTCD member agreed with the proposal. An organization for the blind requested that the statement be revised to a STANDARD. Two State DOTs and two local DOTs opposed the revision because detectable warning surfaces are not considered traffic control devices and the information is already contained in ADAAG. The FHWA decides to adopt the language as SUPPORT because it merely provides information about provisions in other existing or proposed Federal regulations, but the FHWA revises the proposed text to remove the specifications and dimensions for detectable warning devices and instead reference the ADAAG. For the same reason, the FHWA does not adopt in the final rule the Figure 3B–20 that was proposed in the NPA.

328. In Section 3B.20, the FHWA proposed in the NPA to incorporate the word ''arrow'' in several places to reflect that because arrows are often not thought of as symbols, the provisions of this section are intended to apply to arrows. The FHWA also changes the title of the section to ''Pavement Word, Symbol, and Arrow Markings,'' as proposed in the NPA.

The FHWA includes arrows in the list of items that are to be designed in accordance with the Pavement Markings chapter of the SHSM book. A local DOT requested that the statement be revised to an OPTION to allow local jurisdictions to use different arrow designs. The FHWA believes that uniformity of arrow markings is important and adopts paragraph 04 as a STANDARD.

The FHWA does not adopt Figure 3B–28 or Figure 3B–29 as proposed in the NPA because the same information is provided in other figures in Chapter 2B. References in Chapter 3B are updated to refer to the figures in Part 2 as appropriate.

In the NPA, the FHWA proposed to change an existing OPTION to GUIDANCE in order to recommend, rather than just permit, that the International Symbol of Accessibility parking space marking should be placed in each parking space designated for use

[127] FHWA Official Interpretation #3–201(I), dated January 10, 2007, can be viewed at the following Internet Web site: *http://mutcd.fhwa.dot.gov/resources/interpretations/3_201.htm.*

[128] ''Safety Effects of Marked Versus Unmarked Crosswalks at Uncontrolled Locations,'' FHWA report #HRT–04–100, Charles Zegeer, et al., September 2005, can be viewed at the following Internet Web site: *http://www.tfhrc.gov/safety/pubs/04100/04100.pdf.*

[129] The Americans With Disabilities Accessibility Guidelines (ADAAG) can be viewed at the following Internet Web site: *http://www.access-board.gov/ada-aba/index.htm.*

[130] The Americans With Disabilities Accessibility Guidelines (ADAAG) can be viewed at the following Internet Web site: *http://www.access-board.gov/ada-aba/index.htm.*

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by persons with disabilities, for consistency with the provisions of the Americans with Disabilities Act. A State DOT and an NCUTCD member opposed the change and recommended that it remain GUIDANCE because the marking can become obscured by snow and it can pose a safety hazard for pedestrians when it is wet and slippery. The FHWA adopts the language as proposed in the NPA because many State and local laws and codes require the wheelchair symbol marking and it is the predominant practice. As a GUIDANCE condition, the marking can be omitted based on engineering study or judgment.

In the NPA, the FHWA also proposed to add a new GUIDANCE that describes the use and placement of lane-use arrows in lanes designated for the exclusive use of a turning movement, in turn bays, in lanes from which movements are allowed that are contrary to the normal rules of the road, and where opposing offset channelized left-turn lanes exist. The NCUTCD, three State DOTs, four local DOTs, a toll road operator, and a consultant agreed with the proposal, but recommended that the second arrow in a turn bay be optional. Four State DOTs and a local DOT opposed the change to GUIDANCE and recommended that it remain an OPTION. The FHWA proposed the NPA language to reflect common practice and provide for increased uniformity, as highlighted in the NCHRP Synthesis 356.[131] The FHWA adopts the language proposed in the NPA with editorial changes and, based on the comments, the FHWA adds paragraph 22, which provides an OPTION that the second (downstream) arrow may be omitted based on engineering judgment when arrows are used for a short turn lane.

In addition, the FHWA proposed in the NPA to add a GUIDANCE that recommends the use of ONLY word markings to supplement the required arrow markings where through lanes approaching an intersection become mandatory turn lanes. A local DOT agreed with the proposal. A State DOT and two local DOTs opposed the revision and recommended the statement be revised to an OPTION. The FHWA believes improved uniformity is needed to adequately inform road users of the lane-use restriction at a lane drop and adopts the GUIDANCE as proposed in the NPA.

Also, the FHWA proposed in the NPA to add a GUIDANCE to recommend that lane-reduction arrow markings be used on roadways with a speed limit of 45 mph or above, and to recommend that they be used on roadways with lower speed limits when determined to be appropriate based on engineering judgment. A State DOT and a local DOT agreed with the proposal. Five State DOTs, a local DOT, and an NCUTCD member opposed the proposal and recommended that all lane-reduction arrows remain as an OPTION. A local DOT suggested the statement clarify that an on-ramp merge lane is not a ''lane reduction'' and the FHWA agrees. Based on the information in NCHRP Synthesis 356,[132] the FHWA believes that, for enhanced safety, lane-reduction arrows should be recommended on high-speed roads in order to provide a clear indication that the lane reduction transition is occurring. The FHWA adopts the language as proposed in the NPA, but includes language clarifying that a typical parallel acceleration lane is not a ''lane reduction'' but that lane-reduction arrows may be used in long acceleration lanes based on engineering judgment.

Additionally, to respond to a comment from a consultant, the FHWA adds a new STANDARD that a single-direction lane-use arrow shall not be used in a lane bordered on both sides by yellow two-way left-turn lane longitudinal markings to clarify the existing provisions regarding arrows. A two-way left-turn lane, by definition, has traffic flowing in two directions, so it is inappropriate and potentially very confusing to road users to place a single-direction arrow in a two-way left-turn lane. The unique two-way arrow is the only appropriate type of arrow marking for this application, and thus a specific prohibition of one-direction arrows is necessary because of improper application by some jurisdictions.

Finally, in the NPA the FHWA proposed to add an OPTION allowing the use of lane-use arrows in a dropped lane on the approach to a freeway or expressway exit, reflecting common practice. The FHWA received a comment from the NCUTCD in opposition to the proposed OPTION, stating that normal lane-use arrows are inappropriate for freeways and expressways because the exit ramp typically departs from the mainline at a small angle rather than the 90-degree turn suggested by the shape of normal turn arrows. The NCUTCD suggested that a new style of arrow be developed and added to the MUTCD specifically for dropped lanes at exit ramps. The FHWA disagrees and adopts the OPTION as proposed in the NPA, with editorial changes, because normal lane-use arrows are successfully used at many locations where the angle of turn is much less than 90 degrees, there is no evidence of any problems with these arrows at the many locations where they are currently used in advance of freeway lane drops, and research would be needed to develop and test different style arrows to assure they would be better understood by road users than the existing arrows.

329. The FHWA received several comments regarding the proposal in the NPA to add a new section numbered and titled Section 3B.22 Speed Reduction Markings, containing SUPPORT, STANDARD, and GUIDANCE statements regarding transverse markings that may be placed on the roadway within a lane in a pattern to give drivers the impression that their speed is increasing. The NCUTCD and three State DOTs agreed with the proposed section, but recommended editorial changes. Two local DOTs and an NCUTCD member opposed the proposed section because of a concern that speed reduction markings have not been adequately tested and do not work. The FHWA disagrees because the Traffic Control Devices Pooled Fund Study on speed reduction markings[133] found that these markings can be effective in reducing speeds at certain locations, and because it is necessary to provide a standardized design for such markings in order to provide uniformity. The FHWA adopts the language proposed in the NPA with editorial changes and adds a new GUIDANCE statement to paragraph 02 explaining that speed reduction markings should not be used in areas frequented mainly by local or familiar drivers (*e.g.,* school zones), based on comments citing the above-mentioned Pooled Fund Study research. Five State DOTs, a local DOT, and a citizen requested that a longitudinal spacing table be developed for the speed reduction markings. The FHWA declines adding a longitudinal spacing table at this time because this goes beyond the scope of this rulemaking and would need to be addressed in a future rulemaking.

330. The FHWA adopts in this final rule a new section numbered and titled Section 3B.24 Chevron and Diagonal Crosshatch Markings (numbered Section

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[131] NCHRP Synthesis 356, ''Pavement Markings—Design and Typical Layout Details,'' 2006, pages 7–13, can be viewed at the following Internet Web site: *http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_356.pdf.*

[132] NCHRP Synthesis 356, ''Pavement Markings—Design and Typical Layout Details,'' 2006, page 32, can be viewed at the following Internet Web site: *http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_356.pdf.*

[133] ''Pavement Markings for Speed Reduction,'' December 2004, prepared by Bryan J. Katz for the Traffic Control Devices Pooled Fund Study, can be viewed at the following Internet Web site: *http://www.tfhrc.gov/safety/pubs/04100/04100.pdf.*

3B.26 in the NPA) containing OPTION, STANDARD, and GUIDANCE statements on the use of markings intended to discourage travel on certain paved areas. As proposed in the NPA, the FHWA eliminates the optional use of diagonal markings in gore areas and requires that, if markings are used in the gore, they shall be chevron markings, because gores separate traffic flowing in the same direction and diagonal crosshatching is inappropriate for that condition. Based on a comment from a public utilities commission, the FHWA adopts an OPTION statement that crosshatch markings may also be used at highway-rail and highway-light rail transit grade crossings. While a local DOT agreed with the proposed minimum widths for chevron and diagonal lines, the NCUTCD and two local DOTs recommended that the minimum width for chevron and diagonal lines be less than 12 inches for lower speed roadways. The FHWA agrees with the NCUTCD and adopts the minimum width at 8 inches for roadways with speed limits less than 45 mph. Based on a comment from a State DOT that some agencies use an angle of 36 degrees rather than 45 degrees because a 3–4–5 triangle can be used to easily lay out the crosshatch marking in the field, the FHWA adopts a chevron angle of ''approximately 30 to 45 degrees.''

331. In Section 3B.25 (numbered Section 3B.26 in the 2003 MUTCD) Speed Hump Markings, the FHWA proposed in the NPA to revise the STANDARD to more clearly state that if speed hump markings are to be used on a speed hump or a speed table, the only markings that shall be used are those shown in Figures 3B–29 and 3B–30. Based on comments from a State DOT and an NCUTCD member noting that the existing OPTION and proposed revised STANDARD contained the same information, the FHWA deletes the OPTION in this final rule. The FHWA received several comments regarding the proposed language restricting markings to those in the accompanying figures. A local DOT agreed with the proposal, while a State DOT, two local DOTs, and two consultants opposed the proposal and recommended allowing local variations of speed hump markings. The FHWA disagrees with allowing local variations in speed hump markings because the FHWA believes that additional uniformity will better serve the interests of road users. Because the 2003 MUTCD language is not prescriptive, a wide variety of marking patterns are being used for speed humps and unfamiliar drivers do not recognize the local markings. The FHWA adopts paragraph 01 as proposed in the NPA.

332. In this final rule, the FHWA is moving all of the information from the NPA proposed Section 3B.29 Markings for Toll Plazas to a new adopted Chapter 3E Markings for Toll Plazas (see item 341 below).

Discussion of Amendments Within Chapters 3C Through 3J

333. As proposed in the NPA, the FHWA adopts a new chapter, numbered and titled Chapter 3C Roundabout Markings, to reflect the state of the practice for roundabout markings, especially for multi-lane roundabouts, the safe and efficient operation of which necessitates specific markings to enable road users to choose the proper lane before entering the roundabout. The FHWA also adopts seven sections within the chapter that describe pavement markings at roundabouts, including lane lines, edge lines, yield lines, crosswalk markings, and pavement word, arrow, and symbol markings. The chapter also includes a variety of new figures that illustrate examples of markings for roundabouts of various geometric and lane-use configurations. In the NPA, the FHWA solicited comments on whether it necessary for all of the proposed new figures illustrating roundabout markings to be added to the MUTCD or whether some of those illustrations should be placed in other documents for reference, such as the FHWA Roundabouts Guide,[134] which is in the process of being updated. The FHWA received comments on both sides of the issue. The FHWA believes that, for this edition of the MUTCD, it is important to provide these illustrations of new concepts in markings in one location for ready reference. As practitioners gain more familiarity with these markings, the FHWA will consider the possibility of eliminating some of the figures in a future edition. The FHWA adopts most of the figures in this final rule but, in response to comments, deletes several of the figures and editorially combines the content of the deleted figures with the content of other figures being adopted. The FHWA believes this presents the same information in a more concise manner.

With respect to Section 3C.01 General as proposed in the NPA, the FHWA received several comments about the proposed STANDARD defining roundabouts and requiring pavement markings and signs at roundabouts to present a consistent message to the road user. The comments noted that Section 1A.13 already contains a definition of a roundabout and that consistency of messages between signs and markings is a general requirement applicable to all conditions. The FHWA agrees and replaces the proposed STANDARD with a SUPPORT that provides a more general description of a roundabout and refers to Section 1A.13.

The FHWA received comments from two State DOTs, a local DOT, an NCUTCD member, and a consultant about the proposed OPTION that traffic control signals may be used at roundabouts to facilitate pedestrian crossings or meter traffic. The FHWA agrees with the comments that the use of traffic control signals at any location is governed by provisions in Part 4 rather than Part 3, and the FHWA in this final rule replaces the proposed OPTION with a SUPPORT statement referring to Part 4.

334. In Section 3C.02 White Lane Line Pavement Markings for Roundabouts, the FHWA relocates to Section 9C.04 the STANDARD and GUIDANCE statements about bicycle lane markings in and on the approach to roundabouts that were proposed in the NPA in Section 3C.02, because the information is more appropriately located in Section 9C.04, and adopts a SUPPORT statement in Section 3C.02 referring to Section 9C.04. The FHWA also adopts a STANDARD that a through lane that becomes a dropped lane at a roundabout shall be marked with a dotted white lane line in accordance with Section 3B.04. This statement is necessary to remind users of the requirements of Section 3B.04 that also apply to lane drops when they occur at a roundabout.

335. The FHWA in this final rule revises the title of Section 3C.03 from ''Edge Line Pavement Markings for Roundabouts,'' as proposed in the NPA, to ''Edge Line Pavement Markings for Roundabout Circulatory Roadways,'' in order to more accurately describe the subject of the provisions in the section. The FHWA received a comment from a local DOT suggesting that the recommended use of a white edge line on the outer edge of the circulatory roadway, including the wide dotted edge line extension across the lanes entering the roundabout, be changed to an OPTION. The FHWA disagrees because the edge line markings provide important guidance to road users entering the roundabout and circulating within the roundabout, and this has been found to be successful in practice in Europe and elsewhere. A State DOT

[134] ''Roundabouts: An Informational Guide,'' Report number FHWA–RD–00–67, June, 2000, can be viewed at the following Internet Web site: *http://www.tfhrc.gov/safety/00068.htm.*

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opposed the proposed GUIDANCE recommending that a wide dotted line be used across the entry to a roundabout and requested that a normal dotted line be used, consistent with the 2003 MUTCD. The FHWA disagrees because the wide dotted line provides special emphasis that is recommended for drivers entering the roundabout. The GUIDANCE is adopted as proposed.

336. In the NPA, the FHWA proposed Section 3C.05 Crosswalk Markings at Roundabouts, which provides STANDARD, GUIDANCE, and SUPPORT statements concerning the use of crosswalks at roundabouts. The FHWA received a comment from an organization for the blind suggesting that the proposed GUIDANCE for marked crosswalks if pedestrian facilities are provided be changed to a STANDARD. The FHWA disagrees and notes that there may be some cases where it is not desirable to provide marked crosswalks, such as where overpasses or underpasses are provided. Two local DOTs and a consultant suggested that the recommendation be changed to an OPTION. The FHWA disagrees and adopts the provision as a GUIDANCE statement in this final rule because if at-grade pedestrian crossing activity is present, pedestrians should be provided with crosswalks to indicate the proper places to cross the roundabout approaches.

337. Based on a comment from a State DOT, the FHWA does not adopt Section 3C.07 Example Markings for Roundabouts, which was proposed in the NPA. The FHWA adopts a SUPPORT statement in Section 3C.01 in the final rule that refers to the figures in Chapter 3C that provide examples of pavement markings at roundabouts. The FHWA also renumbers the following section that was proposed in the NPA, Markings for Other Circular Intersections, from 3C.08 to 3C.07 in the final rule.

338. The FHWA adopts a new chapter titled Chapter 3D Markings for Preferential Lanes, that contains information relocated from NPA numbered Section 3B.24 Preferential Lane Word and Symbol Markings and NPA numbered Section 3B.25 Preferential Lane Longitudinal Markings for Motor Vehicles. The FHWA also relocates to Chapter 3D and renumbers Table 3B–2 and Figures 3B–31, 3B–32, 3B–33, and 3B–34 that were proposed in the NPA, which list and show the required longitudinal markings for buffer-separated preferential lanes and counter-flow preferential lanes.

339. In Section 3D.01 (numbered Section 3B.24 in the NPA) Preferential Lane Word and Symbol Markings, the FHWA adopts information regarding markings to be used for ETC preferential lanes in the STANDARD, for consistency with other related changes in Parts 2 and 3 regarding ETC Account-Only lanes. Based on comments from the NCUTCD, a State DOT, and two toll road operators, the FHWA revises paragraph 06 to clarify that preferential lane use word or symbol markings are required when the separation area between a preferential lane and the adjacent general purpose lane can be traversed by motor vehicles.

In the NPA, the FHWA proposed to add a word marking for ETC Account-Only lanes. A State DOT, two toll road operators, and a local DOT opposed the proposed revision because it would reduce the ability to reconfigure plaza lanes. The NCUTCD and a State DOT agreed with the proposal, but recommended adding HOT lanes to the list of types of preferential lanes where word markings are required, and adding an OPTION that allows preferential lane-use markings to be omitted under certain circumstances. The FHWA in this final rule revises paragraph 06 to include HOT lanes along with HOV lanes and adds paragraph 08 to allow preferential lane word or symbol markings to be omitted at toll plazas where physical conditions preclude their use.

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The FHWA had proposed in the NPA adding the word marking TRANSIT ONLY as an alternative to a ''T'' marking for light-rail transit lanes. Instead, based on a comment from the NCUTCD, the FHWA in this final rule adopts the word marking LRT ONLY because the word marking ''TRANSIT'' is too wide to fit in most lanes.

340. In Section 3D.02 (Section 3B.25 in the NPA) Preferential Lane Longitudinal Markings for Motor Vehicles, the FHWA in this final rule edits, expands, and reorganizes the existing section, which corresponds to comparable sections on preferential lanes in Part 2. These changes reflect typical existing practices for the marking of preferential lanes, as documented in various FHWA guidance and handbooks.[135] The FHWA also revises paragraph 03 as proposed in the NPA to match the names of different configurations of preferential lanes that are defined in Section 1A.13.

The FHWA proposed in the NPA to add a new GUIDANCE regarding the use of dotted line markings at direct exits from preferential lane facilities, to reduce the chances of unintended exit maneuvers. A local DOT opposed the use of dotted lines because of a concern that the dotted lines will add to driver confusion. The FHWA disagrees and considers the proposed GUIDANCE as an important best practice, reflecting a recent FHWA policy memorandum.[136] The FHWA adopts paragraph 08 as proposed in the NPA.

341. The FHWA adopts a new chapter, numbered and titled Chapter 3E Markings for Toll Plazas, that contains information relocated from Section 3B.29 Markings for Toll Plazas, which was a new section proposed in the NPA. As adopted in the final rule, Section 3E.01 contains SUPPORT, STANDARD, GUIDANCE, and OPTION statements for the use of pavement markings at toll plazas. The chapter provides uniformity in pavement markings at toll plazas because toll plazas have not been included in previous editions of the MUTCD.

The NCUTCD, a State DOT, and three toll road operators agreed with the NPA proposal that longitudinal markings for Electronic Toll Collection lanes comply with Section 3D.01 (numbered Section 3B.25 in the NPA), but recommended editorial changes. To reflect the comments, the FHWA revises paragraph 02 to require that, for Open Road Tolling lanes that bypass a mainline toll plaza on a separate alignment, the longitudinal markings shall also comply with Section 3D.02, and word markings shall be used in accordance with Section 3D.01 (Section 3B.24 in the NPA) on the approach to the point of divergence from the mainline.

The FHWA received several comments on the proposed GUIDANCE in the NPA recommending that ETC Account-Only lanes be separated from cash payment toll plaza lanes by a physical barrier or pavement markings. The NCUTCD, a State DOT, four toll road operators, and a local DOT agreed with the proposal, but recommended that the statement be changed to an OPTION, that striping alone not be allowed, and that vehicle speed not be used to determine the point of separation between lanes. The FHWA disagrees with the comments because the recommendations are based on the Toll Plazas Best Practices and Recommendations report.[137] The FHWA

[135] Available FHWA guidance and handbooks on preferential lanes can be viewed at the following Internet Web site: *http://ops.fhwa.dot.gov/freewaymgmt/hov.htm.*

[136] The FHWA's August 3, 2007 policy memorandum on ''Traffic Control Devices for Preferential Lane Facilities'' can be viewed at the following Internet Web site: *http://mutcd.fhwa.dot.gov/resources/policy/tcdplfmemo/preferen_lanes_tcd.pdf.*

[137] ''State of the Practice and Recommendations on Traffic Control Strategies at Toll Plazas,'' June

Continued

adopts paragraph 04 as GUIDANCE, but revises the text for clarity.

The FHWA received comments regarding the NPA proposal to allow the use of purple solid longitudinal markings to supplement lane lines. The NCUTCD and a State DOT opposed the use based on recommendations from a toll road task force. As discussed above in Section 3A.05 regarding comments on the use of purple markings, the FHWA disagrees with these comments and adopts the optional use of purple markings A toll road operator and a local DOT agreed with the optional use of purple markings, but recommended that the minimum width of 1 inch for the supplemental purple line be revised. Based on its own experience and observations, the FHWA agrees that 1 inch is too narrow and changes the minimum width of the optional purple supplemental marking to 3 inches and adopts a maximum width to be the same width as the line it supplements.

Finally, based on comments from the NCUTCD and a toll road operator that it is impractical to install edge lines in the constrained space between toll booths, the FHWA adds paragraph 08 that states: ''Longitudinal pavement markings may be omitted alongside toll booth islands between the approach markings and any departure markings.''

342. In Section 3F.02 (Section 3D.02 in the NPA) Delineator Design, the FHWA adopts a SUPPORT paragraph in the final rule to clarify the differences between single delineators, double delineators, and vertically elongated delineators when discussing a series of delineators along a roadway. This editorial clarification is necessary to reduce user confusion over these terms.

343. In Section 3F.03 (Section 3D.03 in the NPA) Delineator Application, the FHWA proposed in the NPA to add a GUIDANCE to recommend that delineators should be used wherever guardrail or other longitudinal barriers are present in order to provide consistency in application. Two local DOTs agreed with the proposal. A local DOT disagreed with the proposal and requested that delineators should be recommended on guardrails based on the lateral distance from the roadway. The FHWA disagrees. Because guardrail and barriers are typically close to the roadway, delineation on these features helps make road users aware of the potential to collide with them during conditions of darkness, and this delineation assists road users with navigating the roadway alignment. A State DOT and a local DOT agreed with the proposal, but requested clarification for the location of the delineators. The FHWA modifies the text of the adopted Section 3F.03 in several places to clarify that delineators are used in a series rather than a single delineator alone.

344. In Section 3F.04 (Section 3D.04 in the NPA) Delineator Placement and Spacing, the FHWA proposed in the NPA to change the GUIDANCE discussing the mounting height of delineators. Based on comments from the NCUTCD and three State DOTs questioning the ability to consistently achieve a precise mounting height of 4 feet, the FHWA in this final rule revises paragraph 01 to describe the recommended mounting height as ''approximately 4 feet.''

345. In the NPA, the FHWA proposed revising Chapter 3G Colored Pavements (Chapter 3E in the NPA and 2003 MUTCD), Section 3G.01 General, in order to provide a more logical flow of information, to better emphasize traffic control device and non-traffic control device colored pavements, and to reflect FHWA's Interpretation 3–169(I) [138] on non-retroreflective colored pavements. The proposed language classified as a traffic control device any retroreflective colored pavement between crosswalk lines and non-retroreflective colored pavement between crosswalk lines that is intended to communicate a regulatory, warning, or guidance message. A State DOT, two local DOTs, and a pedestrian advisory board agreed with the revisions. A citizen opposed the revisions because of concern that the language placed restrictions on the use of stamped concrete for aesthetic measures. The FHWA disagrees with the citizen because the language includes brick patterns in the list of aesthetic treatments that are not considered to be traffic control devices, and the FHWA adopts the text as proposed in the NPA.

346. In Chapter 3H (Chapter 3F in the NPA and 2003 MUTCD), the FHWA revises the title in this final rule to ''Channelizing Devices Used for Emphasis of Pavement Marking Patterns'' based on a comment from the NCUTCD, to more accurately reflect the content. As discussed above in item 107, the section discussing barricades is relocated to Section 2B.67 Barricades.

In Section 3H.01 (numbered Section 3F.01 in the NPA) Channelizing Devices, the FHWA proposed in the NPA to require that the design of channelizing devices, except for color, be consistent with Sections 6F.67, 6F.68, and 6F.69 (as numbered in the NPA). Based on comments from the NCUTCD, a traffic device manufacturer, ATSSA, and a citizen, the FHWA revises the STANDARD to require that the design of channelizing devices, except for color, comply with all of Chapter 6F rather than just three sections in that chapter. The FHWA also revises the OPTION to include additional types of channelizing devices and references specific sections of Chapter 6F for descriptions of the devices.

In addition, the FHWA proposed in the NPA to expand the STANDARD to require that the color of the reflective bands on channelizing devices shall be white, except for bands on channelizing devices that are used to separate traffic flows in opposing directions, which shall be yellow. Two State DOTs, an NCUTCD member, and a consultant opposed the proposed use of yellow banding because, as written, it would apply also to temporary traffic control zones and conflict with provisions in Chapter 6F. Two local DOTs agreed with the proposal. The NCUTCD and a State DOT agreed with the proposal, but recommended editorial changes to clarify that the yellow bands would apply only outside of Temporary Traffic Control (TTC) Zones. The FHWA agrees with the recommended editorial changes and adopts a revised paragraph 04 to clarify the required use of the yellow bands on channelizing devices.

347. In the NPA, the FHWA proposed several revisions to Chapter 3I Islands (Chapter 3G in the NPA and 2003 MUTCD). In Section 3I.01 (Section 3G.01 in the NPA) General, the FHWA proposed to add the purpose of toll collection to the definition of island for traffic control purposes. The NCUTCD opposed the change and recommended the deletion of toll booth plazas from being considered islands. The FHWA disagrees because toll booth plaza islands are located between traffic lanes and do control vehicular movements and share similar characteristics with many other types of islands. The FHWA adopts the language as proposed in the NPA but relocates the revised definition to Section 1A.13 and editorially combines it with similar text in the definition of Island that existed in Section 1A.13 of the 2003 MUTCD.

348. In Section 3I.03 (Section 3G.03 in the NPA) Island Marking Application, the FHWA proposed in the NPA to change a STANDARD discussing pavement markings in the neutral area to a GUIDANCE because it is not always practical or necessary for a jurisdiction to include chevron or diagonal hatching

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2006, can be viewed at the following Internet Web site: *http://mutcd.fhwa.dot.gov/rpt/tcstoll/index.htm.*

[138] FHWA's Official Interpretation 3–169(I), dated September 1, 2004, can be viewed at the following Internet Web site: *http://mutcd.fhwa.dot.gov/documents/pdf/3-169-I-FL-S.pdf.*

in the triangular neutral area for all islands, especially small triangular channelizing islands at intersections. A local DOT agreed with the proposal. Based on a comment from a State DOT, the FHWA revises paragraph 02 editorially and adopts the statement as GUIDANCE.

349. The FHWA deletes Section 3G.05 Island Object Markers, as numbered and titled in the 2003 MUTCD and in the NPA, because object markers have been designated as signs and relocated to Chapter 2C and this text is no longer appropriate in Part 3. The provisions of former Section 3G.05 are addressed by text in Chapter 2C.

350. In Section 3I.05 (Section 3G.06 in the NPA), the FHWA in the final rule revises the title to ''Island Delineation'' and adds an OPTION, repeated from Section 3B.11, that allows the use of raised pavement markers in front of and on top of curbed noses of raised medians and curbs of islands.

351. In the NPA, the FHWA proposed adding a new section at the end of Chapter 3I, numbered and titled Section 3I.06 (numbered Section 3G.07 in the NPA) Pedestrian Islands and Medians, containing SUPPORT statements on the purpose of pedestrian islands and medians as well as the placement of detectable warnings at curb ramps. The information proposed within this section was included in order to assist practitioners with meeting the provisions of ADAAG.[139] Two State DOTs and a local DOT opposed the proposed section because they do not consider pedestrian islands and medians to be traffic control devices and the information is already contained in ADAAG. Two local DOTs agreed with the proposal and an organization for the blind requested that the language be changed to a STANDARD. The FHWA decides to adopt the language as SUPPORT because it merely provides information about provisions in other existing or proposed Federal regulations. However, the FHWA does not adopt in this final rule the details on placement of detectable warning surfaces and Figure 3G–1 that was proposed in the NPA, because the information is contained in ADAAG.

352. In the NPA, the FHWA proposed to add a new chapter to the end of Part 3 that is numbered and titled Chapter 3J Rumble Strip Markings (Chapter 3H in the NPA), which contained two sections that describe the use of markings in conjunction with longitudinal and transverse rumble strips. A local DOT agreed with the proposal, but recommended text changes. A State DOT, a local DOT, four organizations representing bicyclists, and an NCUTCD member opposed the proposed chapter because they do not believe rumble strips are traffic control devices and they feel the inclusion of the chapter will have negative implications for bicyclists. The FHWA has not made a determination on whether or not rumble strips are traffic control devices, but believes that certain types of rumble strips, particularly those that are formed from white or colored strips of pavement marking material, might have characteristics that could potentially make them candidates for future consideration as traffic control devices. Also, because rumble strips have been in use for many years and numerous agencies are considering increased usage as part of their strategic highway safety plans, there is a need to include provisions in the MUTCD for pavement markings that are used with rumble strips. The FHWA adopts the chapter as proposed, but makes revisions to Sections 3J.01 and 3J.02 as described below.

353. In Section 3J.01 (Section 3H.01 in the NPA) Longitudinal Rumble Strip Markings, the FHWA proposed language for the use of rumble stripes (longitudinal lines located over longitudinal rumble strips.) A State DOT asked if rumble strips were being considered as traffic control devices. Based on the comment, the FHWA adds a SUPPORT statement in paragraph 02 to clarify that, ''This Manual contains no provisions regarding the design and placement of longitudinal rumble strips.''

Based on comments from the NCUTCD and an NCUTCD member, the FHWA revises paragraph 04 to reference Section 3A.05 for the color of edge lines or center lines associated with longitudinal rumble stripes. Also, based on a comment from the NCUTCD, the FHWA adds a new STANDARD in paragraph 05 that states that an edge line shall not be used in addition to a rumble stripe that is located along a shoulder. This clarification is needed to preclude the use of a double edge line, which would be in conflict with the defined meanings of double lines in Chapter 3B.

As requested by the NCUTCD and a State DOT, the FHWA adds Figure 3J–1 to illustrate the text in Section 3J.01.

354. In Section 3J.02 (Section 3H.02 in the NPA) Transverse Rumble Strip Markings, the FHWA proposed that the color of a transverse rumble strip shall be the color of the pavement or white. A State DOT opposed the proposal because of concerns that white transverse lines could be confused with stop lines or crosswalks. The FHWA disagrees because there is no evidence of such confusion if properly used and located. Another State DOT asked if rumble strips were being considered as traffic control devices. Based on the comment, the FHWA adds a SUPPORT statement in paragraph 02 to clarify that, ''This Manual contains no provisions regarding the design and placement of transverse rumble strips that approximate the color of the pavement.'' A third State DOT recommended that black be added as an acceptable color for a transverse rumble strip and the FHWA agrees. A consultant recommended that orange be added as an acceptable color in a TTC situation and the FHWA agrees, for consistency with Section 6F.87 (see additional discussion there). The FHWA revises paragraph 03 to read, ''Except as otherwise provided in Section 6F.87 for TTC zones, if the color of a transverse rumble strip used within a travel lane is not the color of the pavement, the color of the transverse rumble strip shall be either black or white.''

Discussion of Amendments to Part 4—Highway Traffic Signals

Discussion of Amendments Within Chapter 4A—General

355. As discussed above under General and Part 1, in this final rule the FHWA relocates all the definitions in Section 4A.02 Definitions Relating to Highway Traffic Signals to Section 1A.13 in order to consolidate all definitions in one place in the MUTCD. Where definitions of the same term exist in both sections, the FHWA retains the most accurate definition or combines the definitions editorially. The FHWA also adopts a SUPPORT statement as the sole text of Section 4A.02, referring to Sections 1A.13 and 1A.14 for definitions and acronyms.

Discussion of Amendments Within Chapter 4B

356. In the NPA, the FHWA proposed in Section 4B.02 Basis of Installation or Removal of Traffic Control Signals to change the OPTION statement (with the exception of the last sentence of item E) to a GUIDANCE, in order to recommend the steps that should be taken to remove a traffic control signal from operation, rather than merely describe steps that may be taken. The FHWA also proposed to add to the remaining sentence of the OPTION statement that only the first two steps (items A and B of the GUIDANCE) need to be completed for

[139] The Americans with Disabilities Act Accessibility Guidelines (ADAAG) can be viewed at the following Internet Web site: *http://www.access-board.gov/ada-aba/index.htm.*

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temporary traffic control signals, because the other steps (items C through E of the GUIDANCE) do not apply to those locations. An NCUTCD member in comments suggested deleting the reference to installing signs in item C because experience has found that signs do not help with citizen awareness of a study and that public notification is more effective through public meetings and/or the media. The FHWA agrees with the commenter and adopts the changes as proposed in the NPA, but with the suggested deletion in item C.

357. In Section 4B.04 Alternatives to Traffic Control Signals, the FHWA proposed in the NPA to add two items (L and H) to the list of less restrictive alternatives that should be considered before a traffic control signal is installed. Item H discusses revising the geometrics at the intersection to add pedestrian median refuge islands and/or curb extensions. Item L discusses the use of a pedestrian hybrid beacon or in-roadway warning lights if pedestrian safety is a major concern at a location. A toll authority, two local DOTs, and a consultant agreed with the addition, and a The FHWA adopts the addition of these items as proposed in the NPA because they are viable potential alternatives to a new traffic control signal.

358. In Section 4B.05 Adequate Roadway Capacity the FHWA proposed in the NPA to add a paragraph to the GUIDANCE clarifying that additional methods for increasing roadway capacity that do not involve widening a signalized intersection should be carefully evaluated. Such methods could include revising pavement markings or lane-use assignments where appropriate. The FHWA proposed this language to recommend that lower-cost options should be considered to increase roadway capacity and operational efficiency at signalized intersections. A local DOT supported this proposal. A State DOT, a local DOT, five associations, an NCUTCD member, and three private citizens agreed with the proposal and suggested adding a statement to consider the needs of bicyclists prior to implementing the alternative methods for increasing capacity. The FHWA agrees with these comments and also adopts in this final rule an additional statement that any impacts to bicyclists should also be considered.

A State DOT agreed with the revision and suggested that the list include other methods such as proper traffic signal timing, optimization, major route priority, truck and transit priority devices, traffic signal coordination, advanced traffic signal signage, and closed loop systems. The FHWA disagrees with this comment and declines to add the suggested items to the list because these measures are adequately addressed elsewhere in Part 4.

A State DOT opposed this revision and suggested removing Section 4B.05 from the MUTCD since adequate roadway capacity is not a traffic control device. The FHWA disagrees because this longstanding section of the MUTCD is necessary because of safety and operational impacts to signalized intersections, and because markings and lane use can significantly affect capacity.

Discussion of Amendments Within Chapter 4C

359. In Section 4C.01 Studies and Factors for Justifying Traffic Control Signals, the FHWA proposed in the NPA to add a second paragraph to the first OPTION statement allowing any four sequential 15-minute periods to be considered as 1 hour in signal warrants that require conditions to be present for a certain number of hours, if the separate 1-hour periods used in the analysis do not overlap each other and both the major and minor street volumes are for the same specific 1-hour periods. The FHWA proposed to add this paragraph to clarify that the 1-hour periods of peak traffic volumes do not necessarily need to correspond to 60 minutes starting at the :00 hour on the clock. A local DOT opposed this revision based on concerns about its potential misuse in litigation. The FHWA disagrees because this revision reflects accepted engineering practice and is an optional practice which presents a viable alternative to agencies that wish to use it. The FHWA adopts in this final rule the language as proposed in the NPA.

360. In Section 4C.04 Warrant 3, Peak Hour, the FHWA proposed in the NPA to add to the OPTION statement that a traffic signal justified only under this warrant may be operated in flashing mode during the hours when the warrant is not met. The FHWA also proposed to add a GUIDANCE statement recommending that such a signal be traffic-actuated. The FHWA proposed these statements to encourage efficient operational strategies, because a traffic signal justified only under the Peak Hour warrant may have very low traffic volumes during much of the day. This language is similar to provisions in Sections 4C.05 (Warrant 4, Pedestrian Volume) and 4C.06 (Warrant 5, School Crossing). A local DOT agreed with the proposals. Two State DOTs and a local DOT opposed the OPTION for flashing operation because they felt that traffic signals should not flash ordinarily, not all drivers understand flashing traffic signals, the number of crashes might increase, and the flashing operation takes away from the operational characteristics of actuated signals. The FHWA disagrees with the commenters because the flashing mode is currently utilized in many jurisdictions and has proven effective for signals with an unusual peak hour scenario. Also, any actuated signal can be operated in flashing mode and the decision should be based on engineering judgment. Therefore, the FHWA adopts in this final rule the language as proposed in the NPA.

361. In Section 4C.05 Warrant 4, Pedestrian Volume, the FHWA proposed in the NPA to revise the STANDARD statement regarding criteria that are to be met in an engineering study for a traffic signal to be considered. The FHWA proposed replacing the existing two criteria with two new criteria based on vehicular and pedestrian volumes, and requiring that only one of the criteria be met. The criteria, and the associated volume curves, are derived from other vehicle-based traffic signal warrants and supplemented with data gathered during a TCRP/NCHRP study.[140] The FHWA received comments from the NCUTCD, a State DOT, three local DOTs, six associations, and three private citizens in support of the NPA revisions. A local DOT and four associations suggested that bicyclists receive equal treatment and be included in all counts and applied to all appropriate warrants. The FHWA disagrees with these comments because consideration of bicyclists in applying signal warrants is adequately covered in Section 4C.01, Studies and Factors for Justifying Traffic Control Signals. A State DOT suggested adding a formula to the warrants. The FHWA disagrees with the commenter since the curves are based on formulas and there is no need to put the precise formula in the text. An association and an NCUTCD member suggested that the warrants also include consideration for the width of the crossing, the number of lanes, the frequency of adequate gaps in traffic, or the presence of one-way versus two-way traffic flows since it is generally easier to cross one-way traffic than two-way traffic. The FHWA concurs that number of lanes contributes to pedestrian

[140] ''Improving Pedestrian Safety at Unsignalized Pedestrian Crossings,'' TCRP Report 112/NCHRP Report 562, Transportation Research Board, 2006, can be viewed at the following Internet Web site: *http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_562.pdf.*

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exposure but disagrees with the suggested revision because issues with crossing distance should be addressed with refuge islands or other geometric treatments, and should not be a warrant for a signal unless the pedestrian and vehicle volumes are present. Additionally, the warrant revisions are based on the NCHRP study,[141] which did not recommend separate curves for different numbers of lanes on the major street. A local DOT opposed the revision of the pedestrian warrant because of concerns that new signalization will be easier to attain since the changes require that only one criterion needs to be met. The commenter suggested that other methods such as signing, pedestrian walkways, and overpasses should be investigated prior to the installation of a new traffic signal. The FHWA disagrees because the criteria still account for both pedestrian volume and major street volume and therefore the attainment of signalization has not been made easier. The FHWA notes that alternatives to signalization are discussed in Section 4B.04, Alternatives to Traffic Control Signals. The FHWA adopts in this final rule the language as proposed in the NPA.

Similar to other traffic signal warrants, the FHWA also proposed in the NPA to add an OPTION statement following the criteria, allowing the use of different volume curves based on the posted or statutory speed limit or the 85th percentile speed, or the location of the intersection. A local DOT suggested adding flexibility to allow the installation of a signal to encourage pedestrians to cross at a safe location, such as a new trail, rather than simply to accommodate them. The FHWA disagrees with the commenter since this warrant can be used at trail crossings, and adopts in this final rule the language as proposed in the NPA.

An NCUTCD member suggested that ''or YIELD'' be added after the proposed ''STOP'' in paragraph 04. The FHWA disagrees with the suggested revision, as a YIELD sign is not a restrictive enough traffic control device to facilitate high pedestrian crossing volumes and should not prevent the installation of a signal for pedestrian crossing if it is warranted. Additionally, the suggested revision would preclude roundabouts within 300 feet of the pedestrian signal.

The FHWA also proposed to revise the OPTION statement to reduce the required pedestrian volumes for this warrant by as much as 50 percent if the 15th percentile crossing speed of pedestrians is less than 3.5 feet/second. A local DOT agreed with this revision, while two State DOTs and two local DOTs were opposed to the revisions based primarily on concerns that the text appears to require a pedestrian speed study and it is impractical to measure the 15th percentile speed of pedestrians. The FHWA disagrees because this is an OPTION and does not require a study. The 15th percentile crossing speed would only be needed if the agency wants to explore a reduction in the pedestrian volume criterion. The FHWA adopts in this final rule the language as proposed in the NPA.

362. In both Section 4C.05 Warrant 4, Pedestrian Volume, and Section 4C.06 Warrant 5, School Crossing, the FHWA proposed in the NPA to add recommendations to the GUIDANCE statement that a traffic signal installed at an intersection or major driveway location, based on the pedestrian warrant or school crossing warrant only, should also control the minor street or driveway. When a traffic control signal is installed at an intersection with STOP signs on the minor street to assist pedestrians in crossing the major street, minor-street traffic can cross and turn left into the major street after stopping during the display of the green on the major street. This violates the expectations of drivers on the major street and compromises the meaning and effectiveness of the green signal indication. The FHWA believes that, even if the volume of traffic on the minor street is low when a signal is justified based on Warrant 4, it is in the best interest of traffic safety that the minor street also be controlled by signals rather than by STOP signs. A local DOT agreed with the proposed GUIDANCE for providing a minimum distance for a pedestrian signal from side streets or driveways. A State DOT opposed the revision and suggested that the minimum distance for a pedestrian signal from side streets or driveways be increased to 300 feet to be consistent with the distance from a traffic signal. The FHWA disagrees as the two distances are for different purposes and reasons. The 100-foot distance is for low volume side streets or driveways that are STOP or YIELD sign controlled, to avoid pedestrian conflicts with side-street turning vehicles; whereas the 300-foot distance is for an adjacent traffic control signal or STOP sign controlling the street to be crossed at a more significant intersection. A consultant suggested that a roundabout should be evaluated as a safer option when crashes reach the point where a signal is warranted. The FHWA agrees but does not modify the MUTCD text in this final rule because roundabouts are discussed in Section 4B.04, Alternatives to Traffic Control Signals, as an alternative to traffic signal control. The FHWA in this final rule adopts the language as proposed in the NPA with editorial revisions.

363. In the NPA, the FHWA proposed a new section following Section 4C.09, numbered and titled Section 4C.10 Warrant 9, Intersection Near a Highway-Rail Grade Crossing, and containing SUPPORT, STANDARD, GUIDANCE, and OPTION statements describing the new warrant, which is intended for use in locations where none of the other eight signal warrants are met, but the proximity of the intersection to a highway-rail grade crossing is the principal reason to consider installing a traffic control signal. The FHWA proposed this new warrant because some stop-controlled approaches to intersections near highway-rail grade crossings contain a stop line that is closer to the track than the length of a large vehicle, and sight distance obstructions might preclude the vehicle from waiting on the approach side of the grade crossing before entering the intersection. Many of these intersections do not meet one of the other warrants in the MUTCD because those warrants use minimum volume thresholds for considering the installation of a traffic signal rather than the proximity of a highway-rail grade crossing. The warrant is based on recommendations from an NCHRP research project.[142]

The NCUTCD, two State DOTs, and two local DOTs agreed with the new warrant in the NPA. A State DOT, a local DOT, and an NCUTCD member opposed the new warrant for a variety of reasons, including concerns that it could add a significant number of unnecessary signals, perceived inconsistency with 23 U.S.C. 130 regarding use of Federal funds, uncertainty as to whether the warrant is practical or feasible since it is based on a research project, and the desire for further review and testing before implementation as a national standard. The FHWA disagrees with these comments because meeting the warrant does not require installation of a signal,

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[141] ''Improving Pedestrian Safety at Unsignalized Pedestrian Crossings,'' TCRP Report 112/NCHRP Report 562, Transportation Research Board, 2006, can be viewed at the following Internet Web site: *http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_562.pdf.*

[142] ''Warranting Traffic Signals on the Basis of Proximity of Railroad Grade Crossings,'' by Elena Shenk Prassas, William R. McShane, Edward Lieberman, and Roeof Engelbrecht, was published by the Transportation Research Board in Transportation Research Record 2030, 2007, pages 59–68, and can be viewed at the following Internet Web site: *http://trb.metapress.com/content/r6856337l2484256/fulltext.pdf.*

the FHWA is not aware of any conflicts with Federal funding under 23 U.S.C. 130, and the consensus of practitioners that was developed by the NCUTCD's processes is that the warrant is needed and should be added to the MUTCD.

A local DOT suggested increasing the minimum threshold volume because a signal could be warranted with only 25 vehicles in the peak one-hour period. The FHWA disagrees with the commenter since the language is based on an NCHRP study and a signal does not have to be installed if the warrant is met.

A State DOT suggested that the warrant should only be invoked when some vehicle operators will have no choice but to stop on the tracks to attain adequate sight distance. The FHWA agrees with commenter that the warrant is intended to prevent vehicles from queuing across a highway-rail grade crossing and becoming trapped in a queue with no means of clearing the tracks. However, the FHWA does not make the suggested revision because this situation does not need to be explicitly stated in the text.

A local DOT suggested that STANDARD Item B be changed to GUIDANCE because rail preemption usually involves numerous signal locations within the rail corridor and the cost of the preemption might exceed the original signal budget. The FHWA disagrees since neither Section 4D.27 nor Section 8C.09 indicates that preemption must be applied to anything other than the one intersection under consideration.

A State DOT suggested that an additional criterion be added to the STANDARD that would address locations where vehicles continuously queue on the crossing and might create a hazardous situation. The FHWA points out that the words ''continuously'' and ''hazardous'' are undefined and too strong for this situation.

A State DOT opposed the requirement for highway-rail grade crossing to have both flashing-light signals and automatic gates if a traffic signal is installed based on this warrant, because there are some crossings at or near intersections where gates might not be practical to install. The FHWA believes that it is possible that locations exist where installing gates might be impractical, but where it is still worthwhile to install a signal at the highway-highway intersection in order to facilitate traffic movements that enable vehicles to move off the tracks prior to the arrival of a train. Gates can discourage additional vehicles from driving onto the tracks during the track clearance phase, but the flashing-light signals and bells should be sufficient where gates are impractical. The FHWA in this finale rule adopts a revised STANDARD in paragraph 09, item C, to require only flashing-light signals and adopts GUIDANCE recommending automatic gates.

The FHWA adopts this new section with revisions noted above in this final rule.

364. The FHWA adopts in this final rule the new Figure 4C–9 Warrant 9, Intersection Near a Highway-Rail Grade Crossing (One Approach Lane at the Track Crossing), Figure 4C–10 Warrant 9, Intersection Near a Highway-Rail Grade Crossing (Two or More Approach Lanes at the Track Crossing), and the associated Tables 4C–2, 4C–3, and 4C–4, as proposed in the NPA but with minor editorial revisions based on comments received.

Discussion of Amendments Within Chapter 4D—General

365. The FHWA in the NPA proposed to reorganize Chapter 4D so that similar subjects are grouped together in adjacent sections, or combined into single sections within the Chapter. While the NCUTCD agreed with the proposed reorganization, an NCUTCD member suggested that the explanations of the meanings and applications of signal indications should precede the explanation of signal face arrangements, so that users could know what the indications mean and how they are to be applied before trying to arrange them into signal faces. The FHWA agrees and in this final rule relocates NPA proposed Sections 4D.09 and 4D.10 to follow Section 4D.03 as Sections 4D.04 and 4D.05, respectively, and renumbers NPA proposed sections 4D.04 through 4D.08 to be Sections 4D.06 through 4D.10.

366. The FHWA proposed in the NPA the addition of flashing yellow arrow and flashing red arrow indications as optional alternatives to a circular green indication for permissive left-turn and right-turn movements in Part 4, which affects many sections within Chapter 4D. The proposed text throughout Chapter 4D incorporated the provisions of the Interim Approval IA–10 [143] for flashing yellow arrows during permissive turn intervals. The Interim Approval and the proposed MUTCD text were are based on research contained in NCHRP Report 493.[144] The research found that the flashing yellow arrow is the best overall alternative to the circular green as the permissive signal display for a left-turn movement, has a high level of understanding and correct response by left-turn drivers and a lower fail-critical rate than the circular green, and the flashing yellow arrow display in a separate signal face for the left-turn movement offers more versatility in field application. It is capable of being operated in any of the various modes of left-turn operation by time of day, and is easily programmed to avoid the ''yellow trap'' associated with some permissive turns at the end of the circular green display. The application of flashing yellow arrow indications for right-turn movements is a logical extension of use for left turns and will provide jurisdictions with a useful tool to effectively control a wide variety of situations involving right turns. Further, the optional use of flashing red arrow indications for permissive left-turn and right-turn applications where each successive vehicle must come to a complete stop before turning permissively provides a useful tool to improve safety and operation of signalized intersections in some circumstances.

The NCUTCD, a State DOT, two local DOTs, an NCUTCD member, an anonymous commenter, and a citizen agreed with adding flashing yellow arrow and flashing red arrow. A State DOT and four local agencies opposed the addition of flashing yellow arrows because of concerns about losing signal display uniformity, cost implications for converting existing signals, possible driver confusion, and public educational campaign requirements. Two State DOTs, five local agencies, an association, and an NCUTCD member opposed the addition of flashing red arrow left-turn faces because of concerns about lack of uniformity for signal faces, and possible driver misinterpretation. A local DOT and an anonymous commenter suggested allowing three-section flashing yellow arrow displays where the flashing yellow arrow and steady yellow arrow are displayed in the same signal section. This configuration was suggested to provide flexibility where there are height restrictions. The FHWA disagrees with these comments because the suggested configuration would reduce uniformity for flashing yellow arrow

[143] FHWA's Interim Approval #IA–10, dated March 20, 2006, can be found at the following Internet Web site: *http://mutcd.fhwa.dot.gov/resources/interim_approval/pdf/ia-10_flashyellarrow.pdf.*

[144] NCHRP Report 493, ''Evaluation of Traffic Signal Displays for Protected/Permissive Left-Turn Control,'' 2003, can be viewed at the following Internet Web site: *http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_493.pdf.*

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displays, it has not been tested, a four-section signal face can be used in the majority of situations, and if vertical clearance is an issue a horizontal face could be used. Two local DOTs agreed with the addition of flashing yellow arrows and flashing red arrows and suggested requiring the use of conflict monitors/malfunction management units (CMs/MMUs) that monitor flashing indications if flashing arrows are used for left-turn control, based on concerns over public safety. The FHWA disagrees with providing additional language about the CMs/MMUs because this information is too detailed in electronic issues for the MUTCD. The FHWA adopts the flashing yellow arrow and flashing red arrow in Part 4, based on the supporting research [145] and the usefulness of these optional displays to address significant safety and operational issues.

The NCUTCD in its comments also recommended revising Sections 4D.17 through 4D.20 (Sections 4D.06 and 4D.07 in the 2003 MUTCD) to eliminate provisions that allow the use of separate left-turn signal faces that include circular green indications for permissive turns. Such separate left-turn faces are those which have been used with signal displays in a configuration known as ''Dallas phasing,'' which uses a separate signal face over the left-turn lane that displays a circular green indication for permissive left turns while the signal faces for adjacent thru lanes display red indications. The NCUTCD stated that signal faces and indications for permissive left turns have been the subject of much research over the past 10 or more years and the results of that research have indicated that a circular green for a permissive left-turn movement located over or in front of a left-turn lane is often misunderstood by drivers. Also, a flashing yellow arrow to indicate a permissive left-turn movement has proved very successful. As a result, the NCUTCD recommended changes that support the optional use of flashing yellow arrows for permissive left turns, as noted above. The changes recommended by the NCUTCD to address the circular green permissive left-turn in a separate signal face also eliminate the need to distinguish between three different types of separate left-turn signal faces (as proposed in the NPA as items B, C, and D of the SUPPORT statement). The FHWA agrees that the available option of using flashing yellow arrow indications has made the circular green displays used with ''Dallas phasing'' obsolete and unneeded, and that the research supports prohibiting ''separate signal faces'' for left turns with circular green indications. The FHWA adopts in this final rule provisions in Sections 4D.17 through 4D.20 that reflect these NCUTCD recommendations. The FHWA also replaces the terms ''flashing yellow arrow signal face'' and ''flashing red arrow signal face'' throughout the MUTCD text and figures with appropriate language, such as ''a separate signal face with a flashing yellow arrow.''

367. A State DOT and an NCUTCD member suggested reducing redundant language in Chapter 4D to provide clear and concise language and using figures within each section to reduce the amount of text. The FHWA agrees and adopts in this final rule appropriate edits and additional figures where needed.

Discussion of Amendments Within Chapter 4D—Specific

368. In Section 4D.01 General, the FHWA adds SUPPORT paragraph 04 as proposed in the NPA, to clarify the condition of a seasonal shutdown. The FHWA adds this information to incorporate clarifications into the MUTCD per Official Interpretation #4–288, dated April 27, 2005.[146] A local DOT agreed with this revision.

The FHWA also relocates a paragraph regarding coordination of traffic control signals within one-half mile of one another from Section 4D.14 of the 2003 MUTCD and adds it to GUIDANCE paragraph 09. The FHWA also adds that coordination for such traffic signals should be considered where a jurisdictional boundary or a boundary between different signal systems falls in between them. The FHWA includes this change to encourage jurisdictions to coordinate traffic signal timing plans across jurisdictional or system boundaries. A local DOT agreed with this revision. The FHWA adds a new SUPPORT statement at the end of this section that contains information regarding traffic signal coordination that was previously in Section 4D.14 of the 2003 MUTCD. A local DOT opposed this revision because they believe the original text was clearer and more consistent with the previous paragraph. The FHWA disagrees because the text is intended to address control sections on different cycle lengths, not across jurisdictional boundaries. In this final rule the FHWA relocates the paragraph as proposed in the NPA and makes editorial revisions.

369. In Section 4D.03 Provisions for Pedestrians, the FHWA proposed in the NPA to revise the first GUIDANCE statement to indicate that accessible pedestrian signals should be provided where deemed appropriate by engineering judgment. A State DOT agreed with the revision. A consultant agreed with the proposed revision and suggested elevating the GUIDANCE to a STANDARD, to be in conformance with the draft Public Rights-of-Way Accessibility Guidelines (PROWAG) which requires accessible pedestrian signals where visual pedestrian signal heads are installed and where pushbuttons are used. The FHWA is waiting for the United States Department of Justice adoption of the anticipated United States Access Board public right of way guidelines before prior to revising the MUTCD on this issue, and therefore the FHWA adopts the in this final rule revised language as proposed in the NPA.

The FHWA also proposed to change the OPTION statement to a GUIDANCE to recommend, rather than merely permit, the use of No Pedestrian Crossing signs at traffic control signal locations where it is necessary or desirable to prohibit certain pedestrian movements, where such movements are not physically prevented by other means. The FHWA proposed this change because if the pedestrian movement is to be prohibited, a prohibitory sign should be used. A local DOT agreed with this revision. A State DOT also agreed and suggested that signs should be used if it is not practical to provide a barrier. The FHWA agrees and adopts in this final rule the language as proposed in the NPA with the suggested revision.

370. In Section 4D.04 (Section 4D.09 in the NPA) Meaning of Vehicular Signal Indications, the FHWA in the NPA proposed to add to item A(1) of the STANDARD statement a requirement that vehicular traffic turning left yield the right-of-way to other vehicles approaching from the opposite direction so closely as to constitute an immediate hazard. The FHWA proposed this change to conform the MUTCD to the Uniform Vehicle Code and to the laws in many States.

In the NPA, the FHWA also proposed editorial changes to item A(2A) of the STANDARD statement. Two local DOTs suggested further revisions to item A(2) to clarify that pedestrians cannot be legally in a crosswalk when there is a

[145] NCHRP Report 493, ''Evaluation of Traffic Signal Displays for Protected/Permissive Left-Turn Control,'' 2003, can be viewed at the following Internet Web site: *http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_493.pdf.*

[146] FHWA's Official Interpretation 4–288, dated April 27, 2005, can be found at the following Internet Web site: *http://mutcd.fhwa.dot.gov/resources/interpretations/pdf/4_288.pdf.*

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green arrow indication. The FHWA disagrees and declines to adopt the suggested revision because the statement is intended to address the situation that there may still be a pedestrian in the crosswalk, finishing his or her crossing, when the green arrow is first displayed.

The FHWA also proposed in the NPA to add a new item A(4) in the STANDARD statement that pedestrians facing a GREEN ARROW signal indication, unless otherwise directed by a pedestrian signal indication or other traffic control device, shall not cross the roadway. A local DOT opposed the proposed item A(4) because the text implies that a pedestrian can have a walk signal for a crosswalk in conflict with a motorist who has a green arrow indication across that same crosswalk. The commenter suggested revising the language to prohibit this conflict. The FHWA disagrees because scenarios exist where a green arrow is displayed that would not be in conflict with the pedestrian movement, such as where a crosswalk is parallel to a straight-through green arrow or where a channelization island is used to separate the pedestrian movement from a right-turn movement on a green arrow.

The FHWA adopts items A(1) through A(4) as proposed in the NPA.

The FHWA also proposed the separation of existing STANDARD item B(1) into two items to more clearly indicate the meaning of a steady circular yellow and a steady yellow arrow to vehicular traffic. As part of this change, the FHWA proposed to add that a steady yellow arrow signal indication warns that the related flashing arrow movement is being terminated. The FHWA proposed this change to provide consistency with the addition of the applications of flashing yellow arrows and flashing red arrows. A local DOT opposed the revision because of concerns that there will be increased driver confusion and rear-end crashes. The commenter notes that motorists traditionally have not been used to interpreting the yellow as described in the NPA proposal because a yellow has always come after a green movement and thus never mandated a stop. The FHWA disagrees because the concerns raised by the commenter have not been an issue where this display sequence has been used. The FHWA adopts in this final rule the language of item B of the STANDARD as proposed in the NPA.

The FHWA proposed in the NPA to revise STANDARD item C(1) to clarify that, where permitted, vehicles making a right turn or a left turn from a one-way street onto another one-way street when a steady circular red indication is displayed shall be governed by the rules applicable to making a stop at a STOP sign. The FHWA proposed this change to clarify the right-of-way rules for turning after stopping on a circular red indication. The FHWA also proposed to revise item C(2) related to a steady red arrow signal indication that is similar in nature, but reflects the different requirements for turning on a red arrow versus on a circular red. The FHWA in this final rule adopts the language of item C of the STANDARD as proposed in the NPA.

In the NPA, the FHWA proposed to delete the information from existing item D of the STANDARD statement and instead describe the meanings of flashing yellow signal indications in a new item E and flashing red signal indications in a new item F, to more specifically clarify their meanings to vehicular traffic, to pedestrians, and when displayed as a beacon. The FHWA also proposed to state in new STANDARD item D that a flashing green indication has no meaning and shall not be used. A State DOT, and four local DOTs agreed with the NPA's proposals. The FHWA in this final rule adopts the language of item D of the STANDARD as proposed in the NPA.

In new item E of the STANDARD statement, the FHWA proposed in the NPA to add an item 2 that describes the use of flashing yellow arrow indications for permissive turning movements in the direction of the arrow. The FHWA proposed this change to allow agencies to use the flashing yellow arrow, as an option to the steady circular green indication, for intersections with permitted turning phases. The effectiveness of the flashing yellow arrow for this purpose has been demonstrated as reported in NCHRP Report 493.[147] A State DOT opposed this change because of concerns that the text ''vehicular traffic shall to yield to pedestrians in the crosswalk'' and ''pedestrians shall yield to vehicles upon activation of the flashing yellow arrow'' is contradicting. The FHWA disagrees because ''vehicular traffic shall to yield to pedestrians in the crosswalk'' is needed to indicate that vehicles moving on flashing yellow arrows must yield to the pedestrians, and ''pedestrians shall yield to vehicles upon activation of the flashing yellow arrow'' is needed to clarify that pedestrians must yield to any vehicles that entered the intersection legally on a previous phase and have not yet fully cleared the intersection when the flashing yellow arrow is first displayed. The FHWA adopts in this final rule the language as proposed in the NPA.

An NCUTCD member opposed the proposed new STANDARD item E (5), which described the meaning of a flashing yellow signal indication that is displayed as a beacon at the approach to or along a curve or other geometric feature because it implied that flashing circular yellow beacons can be used over curves or other geometric features (other than intersections) and would not necessarily have to supplement another traffic control sign or marker. The FHWA agrees with the comment and does not adopt proposed item E(5) in this final rule.

A local DOT opposed proposed new item F(2), which describes the meaning of a flashing red arrow signal indication, because of the belief that the operation might lead drivers to think that the opposing movement also has a flashing red operation and that the intersection is functioning as stop and go on all approaches. The FHWA disagrees because there has been no evidence that drivers have been making this misinterpretation when flashing red arrows have been used, such as during late night or emergency flash operation. The FHWA also notes that a supplementary R10–27 sign could be used to mitigate this concern. The FHWA in this final rule adopts the language as proposed in the NPA.

A local DOT opposed proposed new item F(4) regarding the meaning of flashing circular red signal indications used as beacons supplementing another traffic control device, because of concerns that the text is inconsistent with the MUTCD. The FHWA disagrees because the commenter has misunderstood the intent of this language, which is merely to state what drivers are expected to do when seeing a flashing red Stop Beacon, as described in Chapter 4L, that accompanies a STOP, DO NOT ENTER, or WRONG WAY sign. The FHWA adopts in this final rule the language as proposed in the NPA.

371. In Section 4D.05 Application of Steady Signal Indications (Section 4D.10 in the NPA), the FHWA proposed in the NPA to modify item A(2) in the first STANDARD to exclude the use of a circular red signal indication with a green arrow indication when it is physically impossible for traffic to go straight through the intersection, such as from the stem of a T-intersection. In this final rule, the FHWA does not adopt that proposed language because it

[147] NCHRP Report 493, ''Evaluation of Traffic Signal Displays for Protected/Permissive Left-Turn Control,'' 2003, can be viewed at the following Internet Web site: *http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_493.pdf.*

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would conflict with other provisions adopted in Section 4D.25.

A citizen and two anonymous commenters suggested revising item B(4) to totally ban all yellow trap situations and adding a figure to illustrating the yellow trap. The FHWA did not propose such a total ban in the NPA and believes that it is reasonable to allow for exceptions in rare cases if a warning sign is used, as provided in items B(4)(c) and B(4)(d). The FHWA also notes that there is no need to illustrate yellow trap in the MUTCD because such illustrations exist in other documents such as handbooks published by the Institute of Transportation Engineers.

An anonymous commenter suggested adding a new STANDARD statement after proposed item E(1)(b) to require a steady yellow arrow following a flashing yellow arrow or flashing red arrow in certain situations, and revising proposed item E(2) to reflect the use of flashing yellow arrow and flashing red arrow signal indications for permissive turns, as discussed in Sections 4D.17 and 4D.21. The FHWA agrees and in this final rule adopts a new item E(2) and a revised item E(3) (item E(2) in the NPA) for consistency with other STANDARD statements in Chapter 4D that require these displays.

The FHWA proposed in the NPA a modified item E(4) (item E(3) in the NPA) in the first STANDARD to permit the use of a steady yellow arrow indication to terminate a flashing yellow arrow or a flashing red arrow controlling a permissive left-turn phase. The FHWA proposed this change to provide consistency with the addition of the flashing yellow arrow and flashing red arrow indications for permissive left turns. As documented in NCHRP Report 493,[148] the steady yellow arrow was found to be successful as the change interval display following the flashing yellow arrow permissive interval. A subsequent study by the University of Wisconsin[149] found no evidence to suggest that the flashing yellow arrow permissive indication negatively affects drivers' understanding of the steady yellow change interval indication. No problems with this display have been reported to the FHWA by the dozens of highway agencies that have implemented flashing yellow arrows at several hundred intersections under experimentation or interim approval. The FHWA in this final rule adopts the language as proposed in the NPA.

An anonymous commenter suggested revising STANDARD item E(5)(a) (item E (4)(a) in the NPA) to include preemption situations at railroad crossings when a flashing yellow arrow changes to steady yellow arrow back to a flashing yellow arrow. The FHWA agrees and adopts the suggested revision in this final rule.

In this final rule the FHWA also revises the final STANDARD statement to reflect the elimination of the use of circular red indications in separate left turn signal faces, as discussed below in Section 4D.19, and the elimination of ''Dallas phasing'' signal displays, as discussed above in item 366.

An anonymous commenter suggested revising the last paragraph in the final STANDARD statement to limit the prohibition of both flashing and steady displays in the same signal section to yellow indications, since signal faces are, in some cases, allowed to display both a flashing red and a steady red indication from the same signal section during steady mode operation. The FHWA agrees in concept and adopts in this final rule the language as proposed in the NPA with revisions to address the comment.

372. In Section 4D.06 (Section 4D.18 in the 2003 MUTCD) Signal Indications—Design, Illumination, Color, and Shape, the FHWA proposed in the NPA to revise the first STANDARD statement, which states that letters or numbers shall not be displayed as part of a vehicular signal indication. The FHWA specifically proposed to prohibit vehicular countdown displays because countdown indications on vehicular signal indications, and similar methods of attempting to indicate a ''pre-yellow'' warning, such as a flashing green interval, have been found to lengthen the ''dilemma zone'' and thereby result in increased crash rates.[150] A private citizen opposed this proposed prohibition on vehicular countdown indications because he believes an advance warning of a signal change should be allowed for heavy trucks. The commenter requested the adoption of a new STANDARD for advanced warning system for high-speed roads. The FHWA disagrees because the research supports the ban on vehicular countdown indications and therefore adopts in this final rule the language as proposed in the NPA.

In the NPA, the FHWA also proposed an exception to the prohibition on lettering for toll plaza signals. As discussed below in Chapter 4K, the FHWA is not allowing the use of traffic control signals at toll plazas, so the FHWA does not adopt the exception in this final rule.

The FHWA also proposed in the NPA to add a statement in the first STANDARD that strobes or other flashing displays within or adjacent to red signal indications shall not be used, in order to clarify that strobes within traffic signals are not approved traffic control devices. This would be consistent with FHWA's Official Interpretation 4–263.[151] Although FHWA allowed experimentation with strobes in red traffic signals in the mid-1980s, the FHWA made a determination in 1990 not to approve further experimentations with strobe lights in traffic signals, and to terminate all experimentations with these devices that were in progress at that time. As stated in the Official Interpretation, research conducted as part of the experimentation process showed inconsistent benefits and some significant disadvantages to the use of strobes and similar flashing displays. Any strobes operating within red traffic signals are not in accordance with the MUTCD, and they are not under any approved experimentation. The FHWA received comments from a State DOT and two local DOTs supporting this revision. The NCUTCD, a State DOT, and a local DOT supported the revision and suggested expanding the strobe prohibition to signal indications other than red because a strobe is inappropriate with any traffic signal display. Two State DOTs, a local DOT, and an association supported the revision and suggested clarifying ''flashing displays adjacent to red signal indications'' to allow emergency vehicle preemption (EVP) confirmation lights. Two State DOTs opposed the revision because they believe from anecdotal information the strobes have merit in certain situations and have a positive effect on highway safety. The FHWA believes that such anecdotal information

[148] NCHRP Report 493, ''Evaluation of Traffic Signal Displays for Protected/Permissive Left-Turn Control,'' 2003, can be viewed at the following Internet Web site: *http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_493.pdf.*

[149] An abstract and summary of ''An Evaluation of Driver Comprehension of Solid Yellow Indications Resulting from Implementation of Flashing Yellow Arrow,'' 2007, by Michael A. Knodler, David A. Noyce, Kent C. Kacir, and Chris L. Brehmer, can be viewed at the following Internet Web site: *http://pubsindex.trb.org/document/view/default.asp?lbid=802137.*

[150] ''Safety Evaluation of a Flashing-Green Light in a Traffic Signal,'' by D. Mahalel and D.M. Zaidel, Traffic Engineering + Control magazine, February, 1985, pages 79–81, is available for purchase from Hemming Information Services, 32 Vauxhall Bridge Road, London, SW1V 2SS, England, at the following Internet Web site: *http://www.tecmagazine.com/.*

[151] FHWA's Official Interpretation 4–263, dated July 2, 2003, can be found at the following Internet Web site: *http://mutcd.fhwa.dot.gov/documents/pdf/4–263–I–FL–s.pdf.*

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is insufficient to override the formal studies that have consistently shown no benefit of strobes and disadvantages in some cases. A consultant disagreed with the strobe prohibition because it will prohibit the use of the red strobe above the flashing red signal indication on the STOP/SLOW paddle Automatic Flagger Assistance Devices (AFADs) and suggested revising the text or providing an exception for construction work zone traffic control devices. The flashing red indication of the AFAD is a Stop Beacon as defined in Section 4L.05 and it is a highway traffic signal device so the strobe prohibition would apply. The FHWA is not aware of any documented justification for allowing an exception in construction work zones or AFADs. The FHWA in this final rule adopts the language as proposed in the NPA with editorial revisions to clarify that the strobe prohibition applies to all colors of signal indications and to exclude EVP confirmation lights.

A State DOT and an NCUTCD member suggested prohibiting dual-arrow (green arrow/yellow arrow) indications because they believe that they cause problems for color blind drivers. The FHWA disagrees because dual-arrow indications have been in use for decades with no documented problems and green-yellow color blindness is extremely rare in comparison to red-green color blindness.

373. In the new Figure 4D–1 Example of U-Turn Signal Face that was proposed in the NPA, a State DOT noted that the U-Turn display is not currently manufactured nor is there an ITE specification for it. The FHWA notes that while there is currently no ITE specification, the lens design has been manufactured and is being used in some jurisdictions. The signal indication is not required, but could be used to control a U-turn movement on an approach from which there is no left-turn movement physically possible or the left-turn is prohibited. Four local DOTs opposed the new figure because the U-turn signal display is not common and might not be clear from long distances. The FHWA disagrees because, although not widely used at present, the need for U-turn signal indications is increasing and it is necessary to establish uniform provisions for their design and use. The FHWA also notes that, although the shape of arrow will not be able to be seen from as long a distance as a left-turn or right-turn arrow, vehicles would be decelerating to slower speeds in a U-turn lane, so that distance is not as critical. The FHWA adopts new Figure 4D–1 as proposed in the NPA.

374. In Section 4D.07 (Section 4D.15 in the 2003 MUTCD) Size of Vehicular Signal Indications, the FHWA proposed in the NPA to modify the STANDARD to require 12-inch signal indications for all new signal installations, to reflect the predominant current signal design practice, to reflect the results of studies [152] that have shown the significant safety benefits of using 12-inch indications, and to make signal indications more visible to older drivers. As part of this proposed change, the FHWA would allow existing 8-inch signal indications to be retained for the remainder of their useful life. In the NPA, the FHWA proposed to revise the OPTION statement to allow the use of 8-inch signal indications under three specific circumstances where such use could be advantageous. Three local DOTs and an NCUTCD member agreed with the revisions. The NCUTCD and a State DOT suggested revising the proposed statement permitting existing 8-inch indications to be retained for the remainder of their useful life from STANDARD to OPTION to improve readability. The FHWA agrees and adopts the change in this final rule based on the commenters' recommendation.

The NCUTCD and a State DOT suggested adding additional items in the OPTION to also allow 8-inch signal indications for supplemental near side signal indications and along roadways with speeds less than 30 miles per hour, and where the signal indications are located less than 120 feet from the stop line. Four State DOTs, 15 local agencies, 2 associations, a consultant, a signal equipment supplier, and 5 citizens similarly requested allowing 8-inch signal indications in historic downtown districts, residential districts, central business districts, and suburban town centers, where they believe that 12-inch indications would not be context appropriate. The FHWA agrees and adopts in this final rule a revised OPTION allowing 8-inch circular signal indications for near side supplemental signal indications and for circular indications located less than 120 feet from the stop line on all roadways with a posted or statutory speed limit of 30 miles per hour or less.

A local DOT suggested adding an OPTION allowing 8-inch indications for vehicular signal faces that exclusively control a bicycle movement or bikeway since 12-inch indications might be excessive given the typical speeds and position of bicycles. The FHWA agrees and in this final rule adopts the suggested OPTION.

A State DOT requested allowing 8-inch indications for ramp metering signals where the indications are at eye level with the driver and visibility might not be an issue. The FHWA disagrees and does not adopt this suggestion because ramp metering signals are typically located on ramps and many ramps are relatively high speed. The ramp metering signals are sometimes not anticipated by unfamiliar road users, so prominent signal indications are important.

375. In Section 4D.08 (Section 4D.16 in the 2003 MUTCD) Positions of Signal Indications Within a Signal Face—General, the FHWA proposed in the NPA to add to the STANDARD a statement that unless otherwise stated for a particular application, if a vertical signal face contains a cluster(s), the face shall have at least three vertical positions. The FHWA proposed this change because road users who are color vision deficient identify the illuminated color by its position relative to the other signal sections. An NCUTCD member noted that the proposed clause about clusters belongs in Section 4D.09 (Section 4D.16 in the 2003 MUTCD), which discusses vertical signal faces. The commenter suggested adding an OPTION statement that allows dual red indications in signal faces that do not control turning movements and also suggested adding a GUIDANCE statement to describe how the dual red indications are to be arranged into clusters. The FHWA agrees with the commenter's concerns and adopts in this final rule an OPTION statement in Section 4D.09 allowing clustering of two circular red or two red arrow indications in a vertically-arranged signal face but prohibiting clustering of two identical green arrows because that display can incorrectly imply that a two-lane turn movement is allowed. The FHWA also adopts references in Section 4D.09 to Figure 4D–2 and certain other figures to illustrate examples of clusters. A local DOT suggested adding an OPTION to allow the use of a single-section signal at approaches controlled by a flashing or steady circular red signal for minor driveways at signalized intersections. The FHWA disagrees because a single-section flashing circular red indication is a stop beacon and is discussed in Section 4L.05. If the

[152] These studies are summarized and documented in the FHWA report "Making Intersections Safer: A Toolbox of Engineering Countermeasures to Reduce Red-Light Running," pages 22–23, which can be viewed at the following Internet Web site: *http://safety.fhwa.dot.gov/intersections/docs/rlrbook.pdf* and in "Signalized Intersections: Informational Guide", FHWA publication number FHWA–HRT–04–091, August 2004, page 283, which can be viewed at the following Internet Web site: *http://www.tfhrc.gov/safety/pubs/04091/*.

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circular red indication alternates between flashing red and steady red, then a single section is not appropriate because a change in position is needed and a change interval is also required.

The FHWA also proposed in the NPA to add requirements to the STANDARD statement for the position of U-turn arrow signal sections in a signal face. The FHWA proposed this change to accommodate the new U-turn arrows as described previously in item 373. A local DOT and an NCUTCD member agreed with the revision and suggested removing the reference to U-turns to the right because they are rare and a circular indication can be used. The FHWA disagrees because U-turns to the right can be used for frontage roads and removing the text might result in possible misapplication. The FHWA adopts in this final rule the language as proposed in the NPA.

376. In new Section 4D.09 (Section 4D.07 in the NPA) Positions of Signal Indications within a Vertical Signal Face, the NCUTCD, a State DOT, a consultant, an NCUTCD member, and two anonymous commenters made suggestions regarding the text proposed in the NPA to incorporate signal faces using a flashing yellow arrow or flashing red arrow for permissive turn indications. The FHWA agrees and deletes the term ''immediately'' from the second paragraph of the first STANDARD adopted in this final rule and also revises the list of relative positions to include steady and/or flashing yellow arrow and red arrow sections. Similarly, the FHWA also adopts a revised Section 4D.10 (Section 4D.08 in the NPA) Positions of Signal Indications within a Horizontal Signal Face with similar revisions to the list of relative positions, based on the commenters' suggestions.

A State DOT suggested adding a figure to illustrate clusters. An anonymous commenter also suggested clarifying the last STANDARD to accommodate specific provisions in Section 4D.25 for the use of dual-arrow signal indications. The FHWA agrees and adopts in this final rule a revised second STANDARD, containing clarifications based on the commenters' suggestions, and also adopts a reference to various figures that illustrate clusters in vertical signal faces.

An anonymous commenter suggested clarifying the positioning for flashing red arrow and steady red arrow signal indications because of concern for color-blind drivers. The FHWA agrees with the commenter and adopts in this final rule a revised STANDARD paragraph 03 that effectively prohibits two adjacent red arrow sections in a vertical face unless they are clustered side-by-side, to address the color blindness issue. This is necessary to avoid the safety consequences of a colorblind road user being confused by the signal display when two red arrows are in line with each other vertically.

377. In Section 4D.11 Number of Signal Faces on an Approach, the FHWA proposed in the NPA to revise item A of the STANDARD to clarify that two primary signal faces are required for a straight-through movement if such movement exists at a location, even if it is not the major movement, and to require two primary signal faces for the major signalized turning movement if no straight-through movement exists, such as on the stem of a T-intersection. The FHWA proposed this change to ensure that the straight-through movement, or major signalized turning movement in absence of a straight-through movement, contains redundant primary signal faces in case one of the signal faces fails, and to incorporate the FHWA's Official Interpretation number 4–295(I).[153] Two State DOTs and a local DOT opposed the revision because they would prefer to retain the flexibility to provide a single signal face for specific conditions. An NCUTCD member agreed with the revision. The FHWA agrees with the NCUTCD member that two primary signal faces shall be provided for the through movement and adopts in this final rule the language as proposed in the NPA with editorial revisions.

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The FHWA also proposed in the NPA to add an OPTION allowing a single section green arrow signal when there is never a conflicting movement at an intersection. This single section signal may be used for a through movement at a T-intersection if appropriate geometrics and signing are placed according to an engineering study to allow for free flow of traffic where there are no conflicting movements. The FHWA proposed this change to incorporate Official Interpretation 4–255(I) into the MUTCD.[154] A local DOT agreed with the revision. The FHWA in this final rule adopts the language as proposed in the NPA.

In the NPA, the FHWA proposed adding a GUIDANCE statement at the end of the section that outlines the recommendations for providing and locating signal faces at intersections where the posted or statutory speed limit or the 85th percentile speed on an approach exceeds 40 mph. As documented in two FHWA reports, ''Making Intersections Safer: A Toolbox of Engineering Countermeasures to Reduce Red-Light Running'' [155] and ''Signalized Intersections: Informational Guide,'' [156] numerous studies have found significant safety benefits from locating signal faces overhead rather than at the roadside, providing one overhead signal face per through lane when there is more than one through lane, providing supplemental near-side and/or far-side post-mounted faces for added visibility, and including backplates on the signal faces. A study [157] of intersections in British Columbia, Canada, also found statistically significant collision reductions in the range of 10 to 45 percent when signal displays were upgraded from a single overhead signal face to two overhead faces. Additionally, two recent studies, by the URS Corporation [158] and by Bradley University,[159] found that reconfiguring diagonal signal spans to box spans or mast arm layouts with far-side signal face locations produced significant reductions in the number of red light violations and entries into the intersection late in the yellow change interval. The FHWA proposed the addition of this GUIDANCE to reflect modern signal design practices and to enhance the safety of signalized intersections along higher-speed roadways, where the potential benefits are greatest. For the same reasons, the FHWA also proposed that this GUIDANCE also be considered for any major urban or suburban arterial street with four or more lanes. A citizen agreed with the revision. The NCUTCD and a local DOT agreed but suggested

[153] FHWA's Official Interpretation 4–295(I), dated October 19, 2005, can be viewed at the following Internet Web site: *http://mutcd.fhwa.dot.gov/resources/interpretations/4_297.htm.*

[154] FHWA's Official Interpretation 4–255(I), dated February 19, 2003, can be viewed at the following Internet Web site: *http://mutcd.fhwa.dot.gov/documents/pdf/4-255-I-NE-s.pdf.*

[155] Pages 17–27 of this report can be viewed at the following Internet Web site: *http://safety.fhwa.dot.gov/intersections/docs/rlrbook.pdf.*

[156] ''Signalized Intersections: Informational Guide'', FHWA publication number FHWA–HRT–04–091, August 2004, pages 73–75 and 281–282, can be viewed at the following Internet Web site: *http://www.tfhrc.gov/safety/pubs/04091/.*

[157] ''Safety Benefits of Additional Primary Signal Heads,'' March, 1998, by Emmanuel Felipe and Dragana Mitic, can be obtained from G.D. Hamilton Associates, 1199 Hastings Street West, Suite 900, Vancouver, BC, V6E 3T5, Canada.

[158] Details on this study, ''Far-Side Signals vs. Diagonal Span Behavioral Research,'' project number 12937724, February 2006, can be obtained from URS Corporation, 3950 Sparks Drive, SE., Grand Rapids, MI 49546–2420.

[159] Evaluation of Signal Mounting Configurations at Urban Signalized Intersections in Michigan and Illinois'' by Kerrie L. Schattler, Matthew T. Christ, Deborah McAvoy, and Collette M. Glauber, August 1, 2007, can be obtained from the Department of Civil Engineering and Construction, Bradley University, 1501 West Bradley Avenue, Peoria, IL 61625.

revising the speed threshold value to 45 miles per hour or higher to eliminate a potentially ambiguous situation where 85th percentile speeds are between 40 and 45 miles per hour and neither the posted nor the statutory speed exceed 40 miles per hour. The FHWA agrees and adopts in this final rule the language as proposed in the NPA with the suggested revision.

A large city DOT opposed the proposed new GUIDANCE statements because of concerns that providing one signal face per through lane is too extreme and will place an unnecessary financial hardship on agencies. The commenter said the collision data and red light running data in that city does not support the NPA recommendation and suggested replacing the GUIDANCE with a new statement that would recommend practices similar to those used in California. The NCUTCD and a State DOT agreed with the general concepts of the NPA proposal but suggested replacing GUIDANCE items A and B with a table to list the recommended number of signal heads for various lane and speed combinations, including certain speed ranges below 45 mph, and recommended fewer overhead signal faces than one signal per through lane in some cases. A State DOT agreed with the new GUIDANCE, but suggested that it be lowered to an OPTION. Three State DOTs, 13 local agencies, an NCUTCD member, a consultant, and a citizen opposed GUIDANCE item B regarding locating a signal face over the center of each through lane because of concerns about the cost for agencies, aesthetics, increased energy usage, shortening of the operating time for battery backups, liability issues, lack of effectiveness for increased visibility, and lack of design flexibility for engineers.

In consideration of the comments received, the FHWA adopts in this final rule a revised GUIDANCE that references a new Table 4D–2 ''Recommended Minimum Number of Primary Signal Faces for Through Traffic on Approaches with Posted, Statutory, or 85th Percentile Speed of 45 mph or Higher'' in this final rule. The adopted text and table recommend that all primary faces should be located on the far side, that the total number of overhead and/or post-mounted far side primary signal faces should equal the number of through lanes on approaches with two or more through lanes, and that certain minimum numbers of those total signal faces should be located overhead on the far side of the intersection. A note in the table also indicates that, if practical, all of the recommended total number of primary through signal faces should be located overhead. The revised GUIDANCE indicates that it applies only to new or reconstructed signal installations. The FHWA believes that the adopted GUIDANCE and the associated table will enhance safety as new and reconstructed signals are installed on higher-speed approaches as well as accommodate older existing signals for the remainder of their service life. However, the FHWA disagrees with the NCUTCD's suggestion for adding specific guidance on the number and location of signal faces for approaches with speeds less than 45 mph, because such a provision was not proposed in the NPA and should be subject to the review and comment process of a future rulemaking. The FHWA adopts the language as proposed in the NPA that merely recommends that the same layouts as for higher speed approaches be considered for any major urban or suburban arterial street with four or more lanes and other approaches with speeds less than 45 mph.

A State DOT and four local agencies opposed the proposed GUIDANCE item C recommending that separate signal faces controlling exclusive turn lanes should be located overhead, approximately over the center of the turn lane, because of concerns about the lengths of mast arms that will be needed. The FHWA disagrees with the commenters because the proposed GUIDANCE is based on best practices currently in use in many jurisdictions and therefore adopts in this final rule the GUIDANCE as proposed in the NPA.

Three State DOTs supported GUIDANCE item E (item D in the NPA) about supplemental signal faces, with editorial comments. The FHWA adopts in this final rule the language as proposed in the NPA with editorial changes.

Two State DOTs, two local agencies, and an NCUCTD member agreed with GUIDANCE item F (item E in the NPA) about backplates but suggested making exceptions for pole-mounted, supplemental, and cluster signals because of concerns about needing larger pole foundations and their opinion that the need for backplates is not critical on supplemental or pole-mounted signals. A State DOT and five local agencies opposed item E because of concerns about additional wind loading and they believe mast arms provide contrast with the signal head. The FHWA disagrees and adopts in this final rule item F because on high speed approaches the need for contrast is very important for all signal faces.

The FHWA also adopts the proposed Figure 4D–3, retitled Recommended Vehicular Signal Faces for Approaches with Posted, Statutory, or 85th Percentile Speed of 45 mph or Higher, with revisions to reflect adopted revisions in the text of Section 4D.11.

378. In Section 4D.12 (Section 4D.17 in the 2003 MUTCD) Visibility, Aiming, and Shielding of Signal Faces, the FHWA proposed in the NPA a revised 4th paragraph of the first GUIDANCE statement to add that signal backplates should be used on all of the signal faces that face an approach with a posted or statutory speed limit or 85th percentile speed is 45 mph or higher, and that signal backplates should be considered when the speeds are less than 45 mph. The FHWA proposed this change to reflect modern signal design practices to enhance safety by increasing the visibility of signal faces on higher-speed approaches, especially for older drivers, to reflect safety studies as documented in the FHWA reports ''Signalized Intersection: Informational Guide'' [160] and ''Making Intersections Safer: Toolbox of Engineering Countermeasures to Reduce Red Light Running,'' [161] as well as recommendations from the Older Driver handbook.[162] Two local DOTs agreed with the revision. The FHWA also received comments about providing exceptions to the backplate recommendations and in opposition to backplates similar to comments received in Section 4D.11. The FHWA in this final rule adopts the language as proposed in the NPA.

The FHWA also proposed an OPTION statement allowing the use of yellow retroreflective strips along the perimeter of a signal face backplate. The FHWA proposed this change to increase the conspicuity of the signal face at night, and to add language to the MUTCD in accordance with Interim Approval IA–1, dated February 2, 2004.[163] A local DOT agreed with the revision. Another local DOT also agreed but suggested that the minimum width be changed to zero. The FHWA notes that the use of the

[160] ''Signalized Intersections: Informational Guide,'' FHWA publication number FHWA–HRT–04–091, August 2004, pages 288–290, can be viewed at the following Internet Web site: *http://www.tfhrc.gov/safety/pubs/04091/.*

[161] Page 26 of this report can be viewed at the following Internet Web site: *http://safety.fhwa.dot.gov/intersections/docs/rlrbook.pdf.*

[162] ''Guidelines and Recommendations to Accommodate Older Drivers and Pedestrians,'' FHWA Report no. FHWA–RD–01–051, May 2001, can be viewed at the following Internet Web site: *http://www.tfhrc.gov/humanfac/01105/cover.htm.* Recommendation #I.N(3)

[163] The Interim Approval for Use of Retroreflective Border on Signal Backplates, number IA–1, dated February 6, 2004, can be viewed at the following Internet Web site: *http://mutcd.fhwa.dot.gov/pdfs/ia_retroborder.pdf.*

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retroreflective strip is optional and any width less than an inch would provide limited benefit. The FHWA in this final rule adopts the language as proposed in the NPA.

In this final rule, the FHWA also editorially revises the order in which the paragraphs of Section 4D.12 appear, to more logically group like topics together.

379. In Figure 4D–4 (Figure 4D–2 in the 2003 MUTCD) Lateral and Longitudinal Location of Primary Signal Faces, a local DOT suggested deleting this figure because the MUTCD proposed to mandate 12-inch indications for all new installations. The FHWA disagrees that the figure is obsolete, since it illustrates the 20-degree ''cone of vision'' provisions that are still in effect and since 8-inch lenses will still be allowed for certain situations. The FHWA adopts Figure 4D–4 as proposed in the NPA but with revisions to reflect adopted revisions in the text of Chapter 4D.

380. In new Section 4D.13 Lateral Positioning of Signal Faces, the FHWA proposed in the NPA a STANDARD requiring that overhead-mounted turn signal faces of certain types for exclusive turn lanes shall be located directly over the turn lane. The FHWA proposed this statement to ensure that drivers associate the proper turn signal face with the exclusive turn lane and because the research documented in NCHRP Report 493 [164] found that this location produced the best driver understanding and correct behavior. A local DOT agreed with the revision. Two State DOTs also agreed but suggested reducing the STANDARD to GUIDANCE because there are numerous existing signals that do not meet the criteria because of short mast arms. A State DOT and two local DOTs opposed the new STANDARD predominantly because of cost to upgrade existing signals and concerns about long masts arms in high wind areas. The FHWA disagrees because the state of the art for both guide signing and signals is to provide specific traffic control/movement information to each lane to reduce driver confusion, especially at complex intersections, and the research validates this practice for turn signals. The FHWA in this final rule adopts the language as proposed in the NPA.

In the NPA the FHWA also proposed to add a GUIDANCE statement that, for new or reconstructed signals, on an approach with an exclusive left-turn lane(s) and opposing vehicular traffic where a circular green signal indication is used for permissive left turns, signal faces containing a circular green signal indication should not be post-mounted on the far side median or located overhead above an exclusive left-turn lane or the extension of the lane. The FHWA proposed this change because NCHRP Report 493 [165] found that the circular green permissive left-turn indication is confusing to some left-turn drivers who assume it provides right-of-way during the permissive interval. The FHWA believes that placement of the circular green indication directly above or in line with an exclusive left-turn lane exacerbates the safety issues with this display. Research[166] found that found that displaying a circular green signal indication directly over an exclusive left-turn lane led to a higher left-turn crash rate than ''shared'' displays placed over the lane line between the left-turn lane and the adjacent through lane or to the right of that line. Placing the shared signal display over the lane line or to the right of it helps to promote the idea that the signal display with the circular green indication is being shared by the left-turn and through lanes. This can help reduce the infrequent but very dangerous occurrence of the circular green permissive indication being misunderstood as a protected ''go'' indication by left-turn drivers. The NCUTCD and a local DOT agreed with the proposed revision. A State DOT also agreed and recommended elevating the GUIDANCE to STANDARD to prohibit the use of circular green indications. A State DOT agreed and suggested revising the language to clarify that the GUIDANCE applies to all situations, not only where a permissive left turn opposes a protected left turn. Two local DOTs agreed with the revision but suggested an exception when the circular green indication is accompanied by an R10–12 sign. Six State DOTs, nine local agencies, an NCUTCD member, and a citizen opposed the new GUIDANCE based on their local experience and concerns about prohibiting variable mode left-turn phasing, and additional costs to agencies to modify existing signals. The FHWA disagrees because the FHWA believes the research supports the new GUIDANCE, because the FHWA did not propose it as a STANDARD, and because the GUIDANCE only applies to new and reconstructed signals. The FHWA in this final rule adopts the language as proposed in the NPA with minor editorial revisions.

381. The FHWA adopts the provisions in Section 4D.17 through 4D.20 (Sections 4D.06 and 4D.07 in the 2003 MUTCD) and elsewhere in Chapter 4D, as proposed in the NPA, that allow the use of flashing yellow arrow and flashing red arrow indications. The FHWA also adopts the NCUTCD recommendation to eliminate separate left-turn signal faces that include circular green indications for permissive left turns. Both changes are discussed above in item 366.

382. In Section 4D.17 (Section 4D.06 in the 2003 MUTCD) Signal Indications for Left-Turn Movements—General, a State DOT agreed with the proposed addition of flashing yellow arrows and also suggested allowing a four-signal indication display for protected/permissive left-turn mode with green arrow, steady yellow arrow, flashing red arrow, and steady red arrow in a ''T'' configuration so that the agency can retrofit existing signals with flashing red arrows. The FHWA disagrees and notes that the configuration suggested by the commenter is prohibited because a change interval must be displayed after the flashing red arrow and before the steady red arrow. Sections 4D.17 through 4D.20 require a steady yellow arrow change interval because the change from flashing red arrow to steady red arrow would not necessarily be noticed by road users and makes violators of those who enter the intersection on steady red arrow during the timed change interval.

A consultant suggested revising the definition of variable left-turn mode in paragraph 02, item D, so as to not imply that the service type must change during the day and as a result preclude the use of varying left-turn modes on specific days or for construction activities. The FHWA agrees and in this final rule adds ''or as traffic conditions change'' to this item D and also to comparable text in STANDARD paragraph 08. The FHWA also adopts similar changes for variable right-turn mode in Section 4D.20.

The FHWA in the NPA proposed a STANDARD statement specifying the requirements for signal indications on the opposing approach and for conflicting pedestrian movements during permissive and protected left-turn movements. The FHWA proposed this addition for consistency with other

[164] NCHRP Report 493, ''Evaluation of Traffic Signal Displays for Protected/Permissive Left-Turn Control,'' 2003, can be viewed at the following Internet Web site: *http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_493.pdf.*

[165] NCHRP Report 493, ''Evaluation of Traffic Signal Displays for Protected/Permissive Left-Turn Control,'' 2003, page 57, can be viewed at the following Internet Web site: *http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_493.pdf.*

[166] ''An Evaluation of Permissive Left-Turn Signal Phasing,'' by Kenneth R. Agent, ITE Journal, Vol. 51, No. 12, December 1981, pages 16–20, may be obtained from the Institute of Transportation Engineers at the following Web site: http://*www.ite.org.*

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requirements in Part 4. A local DOT agreed with the addition, but suggested allowing an exemption for a green display for one direction only during preemption. In the commenter's jurisdiction a flashing UPRAISED HAND is shown during preemption and therefore it is not possible to display a green left-turn arrow because it conflicts with that pedestrian signal display. The FHWA notes that the NPA proposed provisions do not preclude the commenter's operation as long as a yellow trap is not created. A consultant agreed with the addition and suggested revising the language to emphasize how the provision may be used to avoid the yellow trap. The FHWA notes that similar provisions are provided in Section 4D.05 (NPA Section 4D.10) regarding the yellow trap and therefore, in this final rule adopts the language as proposed in the NPA.

In the NPA, the FHWA also proposed a STANDARD prohibiting the use of a protected-only mode left-turn phase which begins or ends at a different time than the adjacent through movements unless an exclusive left-turn lane is provided. The FHWA proposed this change because, without an exclusive left-turn lane, the operation of a protected-only mode left-turn phase forces left-turning vehicles to wait the display of the protected green arrow while stopped in a lane used by through vehicles, causing many approaching through vehicles to abruptly change lanes to avoid delays, which can result in inefficient operations and rear-end and sideswipe type crashes.[167] If an exclusive left-turn lane is not present and a protected only mode is needed for the left-turn movement, ''split-phasing,'' in which the protected left-turn movement always begins and ends at the same times in the signal cycle as the adjacent through movement, can be used. The NCUTCD and a State DOT supported the prohibition, recognizing this is an unacceptable practice. Two State DOTs and four local agencies disagreed and suggested deleting the STANDARD or reducing it to GUIDANCE or OPTION because their experience has shown that this operation provides operational benefits in special circumstances. The FHWA disagrees, because this prohibition addresses the issue of unsafe last-second lane changing and the commenters have not provided supporting data to justify reducing the statement from a STANDARD. Accordingly, in this final rule the STANDARD is adopted as proposed in the NPA.

An NCUTCD member noted that a SUPPORT paragraph proposed in the NPA did not contain SUPPORT language. The FHWA agrees that the existing language can only be interpreted as prohibitory in nature and in this final rule adopts this statement as a STANDARD with editorial revisions. The intent of the language is to prohibit the display of the yellow change interval when the left-turn operation is changing from permissive mode to protected mode, consistent with other STANDARD provisions elsewhere in Chapter 4D.

383. The FHWA adopts in this final rule the NPA proposed new Section 4D.18 Signal Indications for Permissive Only Mode Left-Turn Movements with revisions to prohibit circular green indications for permissive left-turn movements in separate left-turn signal faces, as previously discussed in item 366. A State DOT suggested adding an OPTION to allow a circular red signal indication as a replacement to the red arrow for permissive only mode left turns as allowed by Interim Approval IA–10, Section 2, Signal Face Arrangement, item b. The FHWA disagrees because the Interim Approval allowed the option of circular red since at the time the Interim Approval was issued, the 2003 MUTCD allowed that option for separate left-turn signal faces and there are a few States where red arrows have not been used. As discussed below regarding Section 4D.19, the FHWA eliminates the circular red in this final rule for separate left-turn faces and therefore declines to add it as an OPTION.

An anonymous commenter suggested adding a new STANDARD item permitting a ''Left Turn Yield on Flashing Yellow'' sign with the flashing yellow arrow signal face. The FHWA disagrees because the research[168] found that such a sign is not needed and therefore the FHWA does not want to encourage the use of a sign, but the FHWA also notes that Chapter 2B allows agencies to develop their own word message signs.

384. The FHWA proposed in the NPA a new Section 4D.19 Signal Indications for Protected Only Mode Left-Turn Movements. An NCUTCD member suggested deleting STANDARD item D because the shared protected-only left-turn face can only be used when the through and left-turn indications begin and terminate at the same time. The FHWA disagrees because this provision is necessary for intersections that have variable lane uses and signal phasing by time of day. The FHWA in this final rule adopts the language as proposed in the NPA.

An anonymous commenter suggested revising STANDARD paragraph 01 to allow a vertical green arrow for situations where a shared signal face is used for the protected only left-turn mode. The FHWA agrees and also adopts in this final rule an OPTION to allow a vertical arrow in place of the circular green display where right turns are not allowed. The FHWA also adopts a similar revision in the comparable paragraph regarding right turns in Section 4D.23.

The FHWA in the NPA proposed to eliminate the STANDARD allowing the use of protected-only mode signal faces with the combination of circular red, left-turn yellow arrow, and left-turn green arrow. The FHWA proposed this change to enhance uniformity by requiring States and municipal agencies to use a left-turn red arrow instead of a circular red for protected-only mode left-turn signals. Red arrow signal indications have been in use for over 35 years, are extensively implemented for protected turn movements in the majority of States, are well understood by road users, present an unequivocal message regarding what movement is prohibited when the red indication is displayed, and eliminate the need for the use of a supplemental R10–10 LEFT TURN SIGNAL sign. A local DOT agreed with the revision. An anonymous commenter suggested allowing a circular red indication for protected-only left turns from a one-way street onto another, at intersection approaches that have a gentle left turn with a 45-degree green arrow indication, such as single-point urban interchanges, and at approaches with shared left-turn/right-turn lanes and no through movements to be consistent with Section 4D.25. The FHWA disagrees because an R10–17a sign can be used with the red left arrow, the red arrow must match the green and yellow arrows for uniformity and consistency, and the T-intersection described does not apply to Section 4D.25, which addresses only the case of T-intersections with a shared left-turn/right-turn lane without a through movement. A State DOT opposed the revision and suggested adding an OPTION to allow the use of the circular red signal with a supplemental R10–10 sign because they believe the circular red signal provides better visibility and it allows agencies to stock one type of

[167] ''Signalized Intersections: Informational Guide'', FHWA publication number FHWA–HRT–04–091, August 2004, page 307, can be viewed at the following Internet Web site: *http://www.tfhrc.gov/safety/pubs/04091/.*

[168] NCHRP Report 493, ''Evaluation of Traffic Signal Displays for Protected/Permissive Left-Turn Control,'' 2003, can be viewed at the following Internet Web site: *http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_493.pdf.*

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red signal display. The FHWA disagrees because allowing the option would be inconsistent with the MUTCD uniformity goals.

Two local DOTs suggested providing an OPTION to allow variable mode left-turn phasing, to be consistent with Section 4D.18. The NCUTCD also suggested adding OPTION statements to allow separate left-turn signal faces with a flashing left-turn yellow arrow and signal faces with flashing left-turn red arrows to operate in a variable turn mode. The FHWA agrees and adopts in this final rule the OPTION statements as recommended.

385. In new Section 4D.20 Signal Indications for Protected/Permissive Mode Left-Turn Movements, the FHWA adopts text as proposed in the NPA, but with revisions comparable to and consistent with those adopted in Sections 4D.17 through 4D.19.

A State DOT suggested revising the first STANDARD item A for shared signal faces to require terminating a green arrow and circular green indication with a combination steady yellow arrow and circular yellow. The FHWA disagrees because the proposed language is not applicable in a four-section signal face where no yellow arrow is provided. Also, the provision states that the yellow arrow ''shall not be required'' and therefore agencies can choose to display both the circular yellow and steady yellow arrow during the change interval. A State DOT suggested editorial revisions to STANDARD items A, B, C, and E for shared signal faces to consolidate the text, but the FHWA declines to make the changes because, although there is some overlap, all four items state different ideas.

In item C of the first STANDARD, the FHWA revises the text in this final rule to state that when the left-turn GREEN ARROW and CIRCULAR GREEN signal indications are being terminated together, the required display following the left-turn GREEN ARROW signal indication shall be either the display of a CIRCULAR YELLOW signal indication alone or the simultaneous display of the CIRCULAR YELLOW and left-turn YELLOW ARROW signal indications. This revision provides additional flexibility to jurisdictions to display both the steady yellow arrow and steady circular yellow simultaneously and reflects a common practice. The FHWA makes a similar revision in this final rule to comparable text for right turns in Section 4D.24.

An anonymous commenter suggested revising the second STANDARD item H for separate left-turn faces with a flashing yellow arrow to allow a three-section signal face where there are horizontal spacing limitations. The FHWA agrees and adopts in this final rule revised STANDARD text to allow lateral positioning limitations for horizontally-mounted signal faces and additional text to allow the same three-section face to include a dual-arrow section capable of alternately displaying steady green and flashing yellow arrows. The FHWA adopts a comparable change in similar provisions in Section 4D.24.

A local DOT opposed the proposed 2nd STANDARD item I for separate left-turn signal faces with a flashing yellow arrow because the language would suppress further research of viable and efficient ways to implement the flashing yellow arrow at protected only left-turn intersections. The commenter also stated that there is no research showing the prohibited method is unsafe or otherwise ineffective and that the new hybrid beacon allows this in the yellow signal. The FHWA disagrees because there has not been sufficient research or experimentation to justify allowing the displays suggested by the commenters.

An anonymous commenter agreed with the proposed 3rd STANDARD items E and F for separate left-turn signal faces with a flashing red arrow. The same commenter expressed concerns about requiring the display of flashing red arrow and steady red arrow signal indications in the same signal section because of color-blind driver concerns. The FHWA agrees with the commenter regarding the color blindness issue and adopts in this final rule an OPTION allowing side-by-side clustering of two red left arrows, one steady and one flashing. The FHWA also adopts this OPTION for comparable provisions in Section 4D.24.

386. In the NPA the FHWA proposed a new Section 4D.21 Signal Indications for Right-Turn Movements—General. The FHWA proposed revising the provisions to prohibit the display of a circular green for a permissive right-turn movement in a separate right-turn signal face over or in front of a right-turn lane to parallel the NCUTCD recommendation for separate left-turn signal faces. The FHWA proposal noted that this would not disallow the common use of a five-section face over the right turn lane, typically for a ''right turn overlap'' situation, as the five-section would be considered a ''shared face.'' Similarly, a three-section face over a right-turn lane, with all circular indications that always display the same color circular indications as the adjacent through signal faces would also be a ''shared'' face and would not be prohibited.

A local DOT suggested that the displays of right-turn indications with u-turn signal indications should be further clarified. The FHWA agrees and adopts in this final rule a new STANDARD paragraph to address the U-turn arrow signal indications.

The FHWA also proposed to add a STANDARD statement specifying the requirements for left-turn signal indications on the opposing approach and for conflicting pedestrian movements during permissive and protected right-turn movements. The FHWA proposed this addition for consistency with other requirements in Part 4. The FHWA proposal would also prohibit the use of a protected-only mode right-turn phase which begins or ends at a different time than the adjacent through movements unless an exclusive right-turn lane is provided. Similar to item 382 above for left turns, the FHWA proposed this change because, without an exclusive right-turn lane, the operation of a protected-only mode right-turn phase forces right-turning vehicles to await the display of the protected green arrow while stopped in a lane used by through vehicles, causing many approaching through vehicles to abruptly change lanes to avoid delays, and this can result in inefficient operations and rear-end and sideswipe type crashes. A local DOT and an anonymous commenter agreed. Two local DOTs suggested adding an exception to STANDARD paragraph 03 for applications where there is raised or painted channelization that prevents conflicts with opposing left-turn vehicles. The FHWA agrees with commenters if the right-turn movement and the opposing left-turn movement can depart from the intersection in their own dedicated lanes without conflict as described in Section 4D.05 (NPA Section 4D.10). The FHWA adopts in this final rule a reference to Section 4D.05 to clarify the protected right-turn operation.

377. In the NPA the FHWA proposed a new Section 4D.22 Signal Indications for Permissive Only Mode Right-Turn Movements with revisions prohibiting the use of circular green in a separate right turn signal face operating in permissive mode as previously discussed in item 366.

An anonymous commenter suggested deleting ''and the opposing right-turn signal faces display right-turn green arrow signal indications for a protected right-turn movement'' in STANDARD item E for separate right-turn signal faces with a flashing red arrow to clarify that the opposing right turn is not relevant in this situation. The FHWA agrees and in this final rule deletes the

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phrase from the adopted item E as suggested.

388. In new Section 4D.23 Signal Indications for Protected-Only Mode Right-Turn Movements, the FHWA proposed in the NPA to retain the provision located in Section 4D.07 of the 2003 MUTCD that allows the use of protected only mode right-turn signal faces with the combination of circular red, right-turn yellow arrow, and right-turn green arrow. Although the use of circular red indications for protected-only mode left-turns has been eliminated for left-turn signal faces in item 384 above, the FHWA believes that circular red should be retained for use with protected-only mode right-turn movements because of the different meanings of the circular red and the right-turn red arrow signal indications regarding right-turn-on-red after stop. Circular red would be used in a protected-only mode right turn signal face if it is intended to allow right turns on red after stopping. The FHWA also proposed to add STANDARD statements for the use of flashing yellow arrow and flashing red arrow signal indications for protected only mode right-turn movements. The FHWA adopts in this final rule the language as proposed in the NPA with revisions incorporating the NCUTCD's recommendations in Section 4D.17 about consolidating all text regarding ''separate'' signal faces.

389. In new Section 4D.24 Signal Indications for Protected/Permissive Mode Right-Turn Movements, the FHWA adopts the text as proposed in the NPA, but with revisions for consistency with adopted text in Sections 4D.21 through 4D.22.

390. The FHWA also adopts several new figures that illustrate positioning and arrangements of signal sections in left turn signal faces (Figures 4D–6 to 4D–12) and right turn signal faces (Figures 4D–13 to 4D–19). The FHWA adopts these new figures in order to enhance understanding and correct application of the relatively complex requirements and options for turn signals. In this final rule, the FHWA adopts minor revisions to these figures to reflect changes in applicable text.

391. The FHWA adopts Section 4D.25 Signal Indications for Approaches With a Shared Left-Turn/Right-Turn Lane and No Through Movement, as proposed in the NPA but with editorial revisions for clarity. This new section contains SUPPORT, STANDARD, and OPTION statements regarding this type of lane that is shared by left-turn and right-turn movements on an approach that has no through movement, such as the stem of a T-intersection or where the opposite approach is a one-way roadway in the opposing direction. The FHWA includes this new section to provide explicit information regarding shared left-turn/right-turn lanes, which has not previously been included in the MUTCD, and to enhance uniformity of displays for this application. A local DOT agreed.

Another local DOT suggested allowing the use of a four-section signal face where a steady circular yellow follows both left-turn and right-turn green arrows instead of the five-section signal face, because this might save space in certain applications. The FHWA disagrees because the suggested signal display will require a yellow change interval that requires two different yellows being displayed simultaneously.

The commenter also suggested allowing for the option of a flashing left-turn yellow arrow and flashing right-turn yellow arrow being displayed simultaneously ''when the lack of vehicular conflict is because a red signal indication is being displayed to traffic on the opposing approach'' when there is a conflicting vehicular or pedestrian movement. The commenter believes this would serve to reinforce the DO NOT ENTER condition when a two-way street intersects a one-way street with the use of the two turn arrows as well as provide notice to motorists that they must yield when making either turn. The FHWA disagrees because the provisions require a five-section shared face with two steady yellow arrows, one for right turns and one for left turns. A single circular yellow would not be consistent with the steady yellow arrows used for the change interval in the faces for the exclusive turn lane(s) on the approach.

A State DOT and an anonymous commenter suggested adding figures to illustrate potential signal head configurations, particularly for situations with pedestrian accommodations because the text is difficult to interpret. The FHWA agrees and adopts a new Figure 4D–20 in this final rule.

An anonymous commenter noted that the provisions of this Section are an exception to the STANDARD in Section 4D.19 that requires the use of a red arrow indication for a protected only left-turn movement that is for a separately-controlled protected only left turn. The FHWA agrees and in this final rule adopts text indicating that the circular red displays required in Section 4D.25 are an exception to what would otherwise be required by Chapter 4D.

392. In Section 4D.26 (Section 4D.10 in the 2003 MUTCD) Yellow Change and Red Clearance Intervals, the FHWA proposed in the NPA to revise the first STANDARD regarding yellow change intervals to account for the introduction of the flashing yellow arrow and flashing red arrow for permissive turn phases. A State DOT and two local DOTs suggested revising the text to allow a green arrow to follow a flashing yellow arrow to be consistent with Section 4D.20. A local DOT also suggested exempting the change interval when going from the flashing red arrow to a green arrow. The FHWA agrees with the commenters and adopts in this final rule a revision in the 1st STANDARD to exempt the change interval between the permissive interval and the lagging protected interval in turn signals.

In the NPA, the FHWA proposed changing the first OPTION statement to a GUIDANCE, to recommend, rather than merely permit, that a yellow change interval should be followed by a red clearance interval to provide additional time before conflicting movements are released, when indicated by the application of engineering practices as discussed below. The FHWA proposed this change based on safety studies indicating the positive effect on safety of providing a red clearance interval and surveys indicating that use of a red clearance interval is a predominant practice by jurisdictions, as documented in the FHWA report ''Making Intersections Safer: Toolbox of Engineering Countermeasures to Reduce Red Light Running.'' [169] A State DOT agreed with the revision. Another State DOT and five local agencies opposed the revision because of concerns that there is a lack of evidence to support elevating this provision to GUIDANCE, laws about change intervals vary by State, and the GUIDANCE does not provide flexibility to use engineering judgment. The FHWA notes that the proposed text does not recommend red clearance intervals for all signals, only to provide them when it is indicated by the application of engineering practices, such as the ITE formulas. The FHWA disagrees with the commenters because studies [170] have shown safety benefits when yellow and red clearance times are used per the ITE

[169] Pages 35–36 of this report can be viewed at the following Internet Web site: *http://safety.fhwa.dot.gov/intersections/docs/rlrbook.pdf.*

[170] NCHRP Research Results Digest 299, November 2005, can be viewed at the following Internet Web site: *http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rrd_299.pdf.* This digest includes data from the study ''Changes in Crash Risk Following Retiming of the Traffic Signal Change Intervals,'' by R.A. Retting, J.F. Chapline, and A.F. Williams, as published in Accident Analysis and Prevention, Volume 34, number 2, pages 215–220, available from Pergamon Press, Oxford, NY.

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formulas. The FHWA adopts this final rule the language as proposed in the NPA.

The FHWA also proposed in the NPA to revise the second STANDARD statement to indicate that the durations of the yellow change interval and, when used, the red clearance interval, shall be determined using engineering practices, and also proposed to add a new SUPPORT statement to indicate that engineering practices for determining the durations of these intervals can be found in two publications from the ITE. The FHWA proposed this to enhance safety at signalized intersections by requiring that accepted engineering methods be used to determine the durations of these critical intervals rather than random or ''rule of thumb'' settings, and by recommending the provision of a red clearance interval when such accepted engineering practices indicate that a red clearance interval is needed. As documented in the FHWA report ''Signalized Intersections: Informational Guide,'' [171] a variety of studies from 1985 through 2002 have found significant safety benefits from using accepted engineering practices to determine the durations of yellow change and red clearance intervals. Recent safety studies [172] have further documented significant major reductions in crashes when jurisdictions have revised the durations of the yellow change and red clearance intervals using the accepted engineering practices. A State DOT and two local DOTs opposed the revision because their agencies have other methods for calculating red intervals and do not believe the ITE methods to be superior. The FHWA disagrees because the studies have shown significant safety benefits when red clearance times are provided per the ITE methods and therefore, adopts in this final rule the language as proposed in the NPA.

The FHWA also establishes a target compliance date of December 31, 2014 (approximately 5 years from the effective date of this final rule) or when timing adjustments are made to the individual intersection and/or corridor, whichever occurs first, for the durations of yellow change intervals and red clearance intervals at existing locations to be based on engineering practices. The FHWA establishes this target compliance date because of the demonstrated safety benefits, as discussed above, of proper engineering-based timing of these critical signal intervals. Traffic signals and signal control equipment have a very long service life (30 to 50 years is not uncommon) and very long intervals between signal retiming are typical at many traffic signal locations in many jurisdictions. The FHWA believes that relying on systematic upgrading provisions (23 CFR 655.603(d)(1)), based on service life, to achieve compliance with this critical timing need would take an inordinately long time, to the detriment of road user safety. State and local highway agencies and owners of private roads open to public travel can minimize any impact of this signal timing requirement by adopting a policy for determining durations of yellow change and red clearance intervals that is based on engineering practices as discussed in Section 4D.26 and then by applying that policy whenever an existing individual signal location or system of interconnected locations is being checked or adjusted for any reason, such as investigation of citizen complaints or routine maintenance.

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The FHWA also proposed in the NPA to add a new STANDARD statement that requires the duration of the yellow change and red clearance intervals to be within the technical capabilities of the signal controller, and that they be consistent from cycle to cycle in the same timing plan. The FHWA proposed this change to accommodate the inherent limitations of some older mechanical controllers, but provide for consistency of interval timing. Two State DOTs suggested allowing red clearance interval extensions when a vehicle violating the red signal is detected entering the intersection on red. The FHWA agrees and adopts text in this final rule to allow a red clearance interval extension when a red light runner is detected.

Two local DOTs suggested adding an exception to allow red clearance intervals longer than 6 seconds for exceptionally large intersections such as at a single point urban interchange. The FHWA agrees and adopts in this final rule an exception for exceptionally large intersections

Finally, the FHWA proposed in the NPA to add a new STANDARD statement at the end of the section that prohibits the use at a signalized location of flashing green indications, countdown vehicular signals, or similar displays intended to provide a ''pre-yellow warning'' interval. Flashing beacons on advance warning signs on the approach to a signalized location are exempted from the prohibition. The FHWA proposed this change to make the MUTCD consistent with FHWA Official Interpretation #4–246.[173] The FHWA notes that it did not intend to include pedestrian countdown signals in the provision and therefore adopts in this final rule revised language to add ''vehicular'' before ''signal displays'' in order to exclude pedestrian countdown signals.

393. In Section 4D.27 (Section 4D.13 in the 2003 MUTCD) Preemption and Priority Control of Traffic Control Signals, the FHWA proposed in the NPA to add a GUIDANCE statement recommending that agencies provide back-up power supplies for signals with railroad preemption or that are coordinated with flashing-light signal systems, with the exception of traffic control signals interconnected with light rail transit systems. The FHWA proposed this change to ensure that the primary functions of the interconnected signal systems still function in a safe manner in the event of a power failure. Four State DOTs and a local DOT agreed with the addition. A State DOT and two local DOTs opposed the GUIDANCE because of concerns about the increased cost for installation and maintenance and that the large cabinet sizes might impact the right-of-way and their ability to meet ADA requirements. The FHWA disagrees and adopts in this final rule the language as proposed in the NPA because of the important safety benefits provided by back-up power at such locations.

In addition, the FHWA also adopts the proposed new OPTION allowing light rail transit signal indications to control preemption or priority control movements for public transit buses in ''queue jumper'' lanes or bus rapid transit in semi-exclusive or mixed-use alignments. The FHWA adopts this to incorporate clarification into the MUTCD consistent with FHWA Official Interpretation #10–59(I) and #10–66(I), and to provide additional flexibility to agencies seeking to reduce driver confusion with traffic signal indications intended to control only mass transit vehicles.[174] A local DOT agreed.

[171] ''Signalized Intersections: Informational Guide'', FHWA publication number FHWA–HRT–04–091, August 2004, pages 209–211, can be viewed at the following Internet Web site: *http://www.tfhrc.gov/safety/pubs/04091/.*

[172] NCHRP Research Results Digest 299, November 2005, can be viewed at the following Internet Web site: *http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rrd_299.pdf.* This digest includes data from the study ''Changes in Crash Risk Following Retiming of the Traffic Signal Change Intervals,'' by R.A. Retting, J.F. Chapline, and A.F. Williams, as published in Accident Analysis and Prevention, Volume 34, number 2, pages 215–220, available from Pergamon Press, Oxford, NY.

[173] Official Interpretation 4–246 can be viewed at the following Internet Web site: *http://mutcd.fhwa.dot.gov/documents/pdf/4-246-I-NY-S.pdf.*

[174] FHWA's Official Interpretations 10–59(I), dated April 16, 2003, and 10–66(I), dated October

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394. In Section 4D.28 Flashing Operation of Traffic Control Signals—General, the FHWA adopts the proposed new OPTION allowing traffic control signals to be operated in flashing mode on a scheduled basis during one or more periods of the day. The FHWA includes this change because more efficient operations might be achieved if the signal is set to flashing mode when steady mode (stop and go) operation is not needed. This change is consistent with a similar change in Section 4C.04 discussed in item 360 above.

395. In Section 4D.30 Flashing Operation—Signal Indications During Flashing Mode, the FHWA proposed in the NPA to include a paragraph in the STANDARD statement that prohibits green signal indications from being displayed when a traffic control signal is operated in the flashing mode, except for single-section green arrow signal indications as noted elsewhere in the section. The FHWA proposed including this paragraph to clarify proper displays during flashing mode. A State DOT requested clarification for pedestrian signal indications during flashing operation. The FHWA notes that this information is provided in Chapter 4E and adds a new reference in this final rule.

396. In Section 4D.31 Flashing Operation—Transition Out of Flashing Mode, a local DOT suggested adding a new provision to allow the signal operation to change from flashing mode to steady (stop-and-go) mode by servicing the minor street before the major street to go back into the coordinated cycle. The FHWA disagrees because this violates the existing MUTCD and no justification was provided to add the provision. The FHWA adopts Section 4D.31 as proposed in the NPA.

397. In Section 4D.34 (Section 4D.19 in the 2003) Use of Signs at Signalized Locations, the FHWA proposed in the NPA to add to the GUIDANCE statement a recommendation to use overhead lane control signs where lane drops, multiple-lane turns, shared through and turn lanes, or other lane-use regulations that might be unexpected by unfamiliar road users are present. The FHWA in this final rule does not adopt the proposed additional GUIDANCE text and instead adopts a reference to Section 2B.19, where the appropriate text is located.

6, 2006, can be viewed at the following Internet Web sites: *http://mutcd.fhwa.dot.gov/resources/interpretations/10_59.htm* and *http://mutcd.fhwa.dot.gov/resources/interpretations/10_66.htm.*

Discussion of Amendments Within Chapter 4E—General

398. The FHWA in this final rule is adopting a reorganization of the existing and NPA proposed content of Section 4E.06 Accessible Pedestrian Signals and Section 4E.09 Accessible Pedestrian Detectors. In doing so, the FHWA eliminates overlapping text and cross-references and consolidates the provisions into a clearer and more logical flow of the information, without changing its meaning. This reorganization is based on comments from an organization for the blind noting that accessible pedestrian signals require the use of pushbutton-integrated devices and having the various features of accessible pedestrian signals (APS) described piecemeal in two different sections can lead to confusion in installation. The FHWA agrees with this comment and believes that placing the material in one location with a more accurate grouping of features and functions of pushbutton-integrated APS will improve understanding by users of the MUTCD. The text of this consolidated content is reorganized into five new sections, Section 4E.09 Accessible Pedestrian Signals and Detectors—General, Section 4E.10 Accessible Pedestrian Signals and Detectors—Location, Section 4E.11 Accessible Pedestrian Signals and Detectors—Walk Indications, Section 4E.12 Accessible Pedestrian Signals and Detectors—Tactile Arrows and Locator Tones, and Section 4E.13 Accessible Pedestrian Signals and Detectors—Extended Pushbutton Press Features. The new sections also include adopted revisions to the text of former Sections 4E.06 and 4E.09, as discussed below.

399. The FHWA in this final rule is relocating Section 4E.10 in the 2003 MUTCD to a new Section 4E.06 because the content of this section, pedestrian intervals and signal phases, more appropriately follows the content of Sections 4E.04 and 4E.05 and should precede the information on countdown pedestrian signals, pedestrian detectors, and accessible pedestrian signals and detectors.

Discussion of Amendments Within Chapter 4E—Specific

400. In Section 4E.02 Meaning of Pedestrian Signal Head Indications, the FHWA proposed in the NPA to revise item B of the STANDARD that defines the meaning of the flashing UPRAISED HAND pedestrian signal indication to allow pedestrians that entered the intersection on a steady WALKING PERSON indication to proceed to the far side of the traveled way, unless otherwise directed by signs or signals to proceed only to a median or pedestrian refuge area. The FHWA proposed this change to allow pedestrians to cross an entire divided highway and not have to stop at the median if the signal has been timed to provide sufficient clearance time for pedestrians to cross the entire highway. In cases where the signal timing only provides enough time for pedestrians to cross to the median, signs or signals are required to be provided to direct pedestrians accordingly. The NCUTCD agreed with this change and also suggested an editorial revision, which the FHWA agrees with and adopts in this final rule. The FHWA also adopts revisions to Section 4E.06 (see item 403 below) for consistency with this change.

In the NPA, the FHWA proposed a second change in the meaning of the flashing orange UPRAISED HAND, to allow pedestrians to enter the intersection when a countdown pedestrian signal indication is shown with the flashing UPRAISED HAND if they are able to travel to the far side of the traveled way or to a median by the time the countdown display reaches zero. The FHWA proposed this change because many pedestrians walk faster than the walking speeds used to calculate the length of the pedestrian change interval; therefore, many pedestrians are easily able to begin their crossing after the flashing UPRAISED HAND and countdown period has started and complete their crossing during the displayed countdown period. In the NPA, the FHWA stated the belief that pedestrians should be permitted to make their own determination of whether or not they have sufficient time to begin and complete their crossing during the remaining pedestrian clearance time. The FHWA received comments agreeing with this proposed change from the NCUTCD, two local DOTs, a toll road authority, a local pedestrian advisory board, and a consultant. However, the FHWA received comments in opposition to this change from 4 State DOTs, 12 local DOTs, an NCUTCD member, a regional section of ITE, and a retired traffic engineer. The opponents expressed concerns that there would be two different meanings of the flashing UPRAISED HAND depending on whether or not a countdown display is present, and that this would be difficult to teach to young schoolchildren. The FHWA understands the concerns expressed about two meanings for the same indication and, as a result the FHWA does not adopt in this final rule the second proposed change in the

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meaning of flashing UPRAISED HAND. However, the FHWA believes that ultimately countdown pedestrian displays will be nearly ubiquitous and that the countdown information does provide pedestrians with the information they need to make individual judgments on whether to start crossing during the countdown, based on their individual walking speeds. The FHWA encourages additional research and experimentation to evaluate the feasibility of removing the flashing UPRAISED HAND indication completely as the pedestrian clearance display and instead just displaying the countdown.

401. In the NPA the FHWA proposed minor editorial revisions to Section 4E.03 Application of Pedestrian Signal Heads. A local DOT agreed with the proposed revisions to Section 4E.03, but commented that there are conditions where pedestrian signal heads can be used that are not covered by any of the conditions for which this section either requires or recommends the use of pedestrian signal heads. The FHWA agrees and adopts in this final rule an OPTION statement after the GUIDANCE, indicating that pedestrian signal heads may be used under other conditions based on engineering judgment.

The FHWA proposed in the NPA to add a 2nd STANDARD statement at the end of the section to explicitly require a steady or flashing red signal indication to be shown to any conflicting vehicular movement perpendicular to a crosswalk with an associated pedestrian signal head displaying either a steady WALKING PERSON or flashing UPRAISED HAND indication, to reflect sound engineering practice. The NCUTCD agreed with this addition but suggested a minor editorial change. The FHWA adopts in this final rule this additional STANDARD statement with the minor editorial change suggested by the NCUTCD, but relocates this statement to Section 4E.06 Pedestrian Intervals and Signal Phases (Section 4E.10 in the 2003 MUTCD), because the subject matter is more logically located there.

402. In Section 4E.04 Size, Design, and Illumination of Pedestrian Signal Head Indications, the FHWA in the NPA proposed to revise the first STANDARD statement to allow the use of a one-section pedestrian signal head with the WALKING PERSON and UPRAISED HAND symbols overlaid upon each other or side by side. The FHWA proposed this change to reflect the Official Interpretation #4–303,[175] dated February 3, 2006, which provides that the light sources comprising the indications may be overlaid on each other, as long as the pedestrian signal head properly displays the individual indications, visible as distinctly separate indications that meet all other requirements, such as color, shape, and luminous intensity, etc. A State DOT opposed overlaid symbols on pedestrian signal heads, citing false indications from sun glare in some pedestrian signal units. The FHWA disagrees because pedestrian signal heads with overlaid symbols are in widespread use in many States and the FHWA is unaware of any significant issues with false indications from sun glare when compared to side-by-side symbols. Further, the use of overlaid symbols is optional and any highway agency can choose not to use them. The FHWA adopts in this final rule the revision to the first STANDARD statement and also adopts a revised Figure 4E–1 Typical Pedestrian Signal Indications to reflect this change. Further, based on comments about the figure from the NCUTCD, four State DOTs, and a consultant, the FHWA adopts additional illustrations to Figure 4E–1 to show a one-section unit with overlaid symbols and countdown numerals and a two-section unit with overlaid symbols in the top section and countdown numerals in the bottom section.

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The FHWA also proposed in the NPA to add a paragraph to the GUIDANCE statement recommending that some form of automatic dimming be used to reduce the brilliance of the pedestrian signal indication if the indication is so bright as to cause excessive glare in nighttime conditions. The FHWA proposed this new recommendation to avoid glare conditions, which can reduce the visibility of the indications at night, similar to the existing GUIDANCE for vehicular signal indications in Chapter 4D. The NCUTCD agreed with this revision and suggested minor editorial changes for clarity, which the FHWA adopts in this final rule. An organization for the blind also agreed in concept with this revision, but suggested that it be a STANDARD rather than GUIDANCE, requiring pedestrian signal indications to be responsive to ambient light, brighter in bright conditions and dimmer in low light conditions. The FHWA disagrees because supporting data for such a mandatory requirement is not documented in any studies. A State DOT opposed the proposed GUIDANCE recommending dimming because of concern about operational and risk management problems. The FHWA disagrees because similar language regarding dimming of vehicular signal indications has been in the MUTCD for many decades and the FHWA is unaware of any significant issues with dimming of vehicular signals.

403. In Section 4E.06 Pedestrian Intervals and Signal Phases (Section 4E.10 in the 2003 MUTCD), the FHWA proposed in the NPA to revise the first STANDARD statement to require the steady UPRAISED HAND indication to be displayed during the yellow change interval and the red clearance interval if those intervals are used as part of the pedestrian clearance time, to be consistent with the change that was proposed in Section 4E.07 to require countdown pedestrian signal displays. The NPA also proposed revisions to the first OPTION statement that would allow both the vehicular yellow change interval time and the red clearance time to be used to satisfy the calculated duration of the pedestrian clearance time. The FHWA received comments from a city, a consultant, and a citizen opposing the allowable use of the red clearance time for this purpose because it results in the lack of any safety "buffer" for pedestrians before conflicting traffic receives a green signal indication. Also, the NCUTCD submitted a comment noting that there are significant disconnects and inconsistencies between the timing of pedestrian intervals and vehicular intervals, especially with the introduction of pedestrian countdown displays, that must be addressed in order to resolve inconsistency and present a logical and consistent message to pedestrians. The NCUTCD recommended that there should always be a minimum interval of at least 3 seconds between the end of the flashing UPRAISED HAND display (which coincides with the end of the pedestrian countdown display) and the release of any vehicular traffic that might be in conflict with the terminating pedestrian interval, and recommended calling this the pedestrian buffer interval. The NCUTCD recommended that a minimum rather than a fixed buffer interval be specified because vehicle actuated sequences and certain combinations of vehicle and pedestrian displays can result in buffer interval lengths that are determined by factors other than pedestrian considerations. The NCUTCD further recommended that the sum of the pedestrian change interval and the buffer interval must equal or exceed the calculated pedestrian clearance time. The FHWA

[175] Official Interpretation #4–303 can be viewed at the following Internet Web site: *http://mutcd.fhwa.dot.gov/resources/interpretations/pdf/4_303.pdf.*

agrees that this required buffer interval provides a margin of safety that allows a pedestrian who underestimates the time he or she needs to cross a roadway, with or without a countdown display, to better avoid a conflict with vehicles. The FHWA adopts in this final rule a revised section that incorporates the NCUTCD's recommendations.

As also recommended by NCUTCD, the FHWA also adopts an OPTION to allow the countdown pedestrian display with flashing UPRAISED HAND to extend into the yellow change interval, but terminate within the yellow change interval and be followed by a steady UPRAISED HAND and zero (followed by blank) countdown display for the remainder of the yellow change interval. This minimizes disruption of vehicular traffic, and also makes the pedestrian change interval more closely approximate the pedestrian clearance time. While the functionality of some current controller equipment might result in the UPRAISED HAND and countdown being displayed until the end of the yellow change interval, that would not be required by the adopted OPTION. The FHWA believes that future controller software will incorporate a timed pedestrian buffer interval between the end of the flashing UPRAISED HAND/countdown zero interval and the release of conflicting vehicular traffic, that the pedestrian buffer interval timing value will be a part of the pedestrian interval series of controller data inputs, and that the controller logic will be designed to implement the intention of the interval without any other data input. The FHWA also adopts a new Figure 4E–2 Pedestrian Intervals in this final rule to illustrate the pedestrian buffer interval and its relationship to other pedestrian and vehicular intervals, to enhance clarity and understanding. The subsequent figure numbering in Chapter 4E is changed accordingly.

The FHWA establishes a target compliance date of December 31, 2014 (approximately 5 years from the effective date of this final rule) or when timing adjustments are made to the individual intersection and/or corridor, whichever occurs first, for the display and timing of the pedestrian change interval as per the adopted text of Section 4E.06 at existing locations. The FHWA establishes this target compliance date because of the demonstrated safety issues associated with pedestrian crossings at traffic signals, the need for consistent display of signal indications for pedestrians, and the pedestrian confusion that would likely occur as a result of a long-term mixing of a variety of pedestrian signal displays associated with the pedestrian clearance interval. Traffic signals and signal control equipment have a very long service life (30 to 50 years is not uncommon) and very long intervals between signal retiming are typical at many traffic signal locations in many jurisdictions. The FHWA believes that relying on the systematic upgrading provisions of Section 655.603(d)(1) of title 23, Code of Federal Regulations, based on service life, to achieve compliance with this critical timing need would take an inordinately long time, to the detriment of pedestrian safety. State and local highway agencies and owners of private roads open to public travel can minimize any impact of this signal timing requirement by adopting a policy for timing and display of pedestrian change intervals in relation to vehicular intervals as discussed in Section 4E.06 and then by applying that policy whenever an existing individual signal location or system of interconnected locations is being checked or adjusted for any reason, such as investigation of citizen complaints or routine maintenance.

The FHWA also adopts revisions to the first GUIDANCE statement, as proposed in the NPA, to reduce the recommended walking speed for calculating pedestrian clearance times to 3.5 feet per second, except where extended pushbutton presses or passive pedestrian detection has been installed for slower pedestrians to request additional crossing time as noted in the OPTION. In this final rule, the FHWA also adds an OPTION paragraph to clarify that if crossing time is to be added based on an extended pushbutton press, it may be added to either the walk interval or the pedestrian change interval. The FHWA adopts these provisions to provide enhanced pedestrian safety, based on recent research [176] regarding pedestrian walking speeds. In addition, based on the same research, the FHWA adopts an additional GUIDANCE statement, as proposed in the NPA, recommending that the total of the walk phase and pedestrian clearance time should be long enough to allow a pedestrian to walk from the pedestrian detector to the opposite edge of the traveled way at a speed of 3 feet per second. The FHWA adopts this guidance to ensure that slower pedestrians can be accommodated at longer crosswalks if they start crossing at the beginning of the walk phase. The FHWA received comments in support of these changes in walking speed from four cities, a local DOT, several associations representing visually disabled pedestrians and pedestrians in general, a regional planning commission, a consultant, and many citizens. Some of these comments also requested that the GUIDANCE on walking speed be strengthened to a STANDARD. The FHWA disagrees with making this a STANDARD because the walking speed used to calculate pedestrian clearance time for signals has always been in the form of GUIDANCE, allowing highway agencies some flexibility in unusual circumstances and the FHWA believes that it is appropriate for such flexibility to be continued. Therefore, in this final rule the FHWA adopts the walking speeds as GUIDANCE.

The FHWA also received comments in opposition to some or all of the provisions for reduced walking speeds from 6 State DOTs, 21 cities, 3 counties, a regional signal system manager, and several citizens. The comments in opposition centered on impacts on signal timing that might reduce the vehicular capacity of intersections, where longer pedestrian intervals would reduce the available green time for vehicles or could necessitate using a longer cycle length, which in turn could impact numerous intersections in a coordinated signal system and could require considerable effort to implement in large systems. The FHWA recognizes that the recommended use of slower walking speeds in calculating pedestrian intervals will, in some cases, slightly reduce vehicular capacity and, for highway agencies with large numbers of signalized intersections, will require considerable time and effort to retime signals. However, the FHWA believes that the research has clearly demonstrated the need to reduce walking speeds to accommodate a larger percentage of the walking public and that the safety needs of pedestrians for adequate crossing time must outweigh potential vehicular capacity impacts. Further, this adopted section provides agencies with various optional ways to mitigate the impacts, such as by using the extended button press feature to only provide the longer time when it is called for by a pedestrian who needs it. The FHWA also believes that agencies can reduce the efforts needed to implement retiming of pedestrian

[176] Pedestrian walking speed research was included in ''Improving Pedestrian Safety at Unsignalized Pedestrian Crossings,'' TCRP Report 112/NCHRP Report 562, Transportation Research Board, 2006, which can be viewed at the following Internet Web site: *http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_562.pdf.* Also see the article ''The Continuing Evolution of Pedestrian Walking Speed Assumptions,'' by LaPlante and Kaeser, ITE Journal, September 2004, pages 32–40, available from the Institute of Transportation Engineers Web site: *http://www.ite.org.*

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intervals by doing so in conjunction with regularly scheduled periodic reviews of all signal timings and operations at their signalized intersections, a practice that has long been recommended in many traffic engineering handbooks and publications.

The FHWA also adopts the NPA proposed revision of the existing GUIDANCE to a STANDARD, in order to require, rather than merely recommend, that median-mounted pedestrian signals, signing, and pushbuttons (if actuated) be provided when the pedestrian clearance time is sufficient only for crossing from the curb or shoulder to a median of sufficient width for a pedestrian to wait. The FHWA adopts this standard to assure that pedestrians who must wait on a median or island are provided with the means to actuate a pedestrian phase to complete the second half of their crossing. The FHWA received a comment from an organization for the blind agreeing with this change and also recommending that this STANDARD also require the provision of APS, because persons with low or no vision need this information as well. The FHWA does not agree with making APS a requirement under these conditions, but, for consistency with other sections in Chapter 4E that recommend APS for various conditions, the FHWA adds GUIDANCE that APS should be considered for this condition.

The FHWA also adopts in this final rule the proposed OPTION statement that allows a leading pedestrian interval when a high volume of pedestrians and turning vehicles are present. As indicated in the FHWA report ''Signalized Intersections: Informational Guide,'' [177] several studies have demonstrated that leading pedestrian intervals can significantly reduce conflicts for pedestrians. In the NPA, the FHWA also proposed a GUIDANCE statement that gives a recommended minimum length of the leading pedestrian interval, reflecting recommendations from the Older Driver handbook,[178] and the traffic control devices that should be used to prevent turning vehicles from crossing the path of pedestrians during this leading interval. The FHWA received several comments from the NCUTCD and others about the needs of blind pedestrians, including concerns about the proposed recommendation that the leading interval should be timed to allow pedestrians to cross at least one lane of traffic before turning traffic is released, and concerns about the proposed recommendations on the methods that should be used to prohibit turns across the crosswalk during the leading interval. Based on these comments, the FHWA adopts the proposed GUIDANCE statement in this final rule but with clarifying revisions to recommend that: (1) When a leading pedestrian interval is used, the use of an APS should be considered; and, (2) in the case of a large corner radius, the leading pedestrian interval should be timed to allow pedestrians to establish their position ahead of turning traffic before it is released. The FHWA also removes the text about various specific methods of prohibiting turns and replaces it with a more general recommendation that consideration should be given to prohibiting turns across the crosswalk during a leading pedestrian interval, to give agencies more flexibility in how they implement such turn prohibitions.

In the NPA the FHWA proposed adding an OPTION statement to permit the green time for the concurrent vehicular movement to be set longer than the pedestrian change interval in order to allow vehicles to complete turns after the pedestrian phase. This treatment is used by many jurisdictions, and is recommended by the Older Driver handbook [179] to reduce conflicts between pedestrians and turning motor vehicles. Based on comments from the NCUTCD, the FHWA in this final rule revises the proposed OPTION statement to a SUPPORT statement.

404. In Section 4E.07 Countdown Pedestrian Signals, in the NPA the FHWA proposed changing the option of using pedestrian countdown displays to a requirement for new installations of pedestrian signals where the duration of the pedestrian change interval is more than 3 seconds. The FHWA proposed this to provide enhanced pedestrian safety because a multi-year research project involving crash data for hundreds of locations in San Francisco [180] showed significant overall safety benefits and substantial reductions in the number of pedestrian-vehicle crashes when countdown signals are used, as compared to locations that did not have the countdowns.

The FHWA received comments from the NCUTCD, a State DOT, a local DOT, a regional council of governments, a city pedestrian advisory board, a consultant, and a private citizen agreeing with this requirement, while five State DOTs, three cities, two counties, and a citizen agreed in concept, but requested that it be a recommendation, rather than a requirement. The FHWA received comments in opposition to anything more restrictive than an OPTION from six State DOTs, six cities, three counties, a consultant, and a citizen. Most of the comments in opposition centered on concerns about impacts on controller operation, drivers of vehicles using the pedestrian countdown information to decide to speed up when approaching the intersection, and financial impacts. The FHWA disagrees because pedestrian countdowns have been operating successfully with a wide variety of control equipment without significant problems, studies have found that drivers use the pedestrian countdown information to make better choices (*i.e.,* to start slowing to a stop, rather than speed up), and the safety benefits of pedestrian countdowns justify the requirement that they be used with new pedestrian signal installations. The FHWA does not adopt in this final rule the proposed sentence in this section that would have required highway agencies to add pedestrian countdown displays to all existing pedestrian signal heads within 10 years. As a result, existing pedestrian signals without the countdown displays can generally remain in place until the end of their useful service life under the systematic upgrading provisions of Section 655.603(d)(1) of title 23, Code of Federal Regulations, thus minimizing any impacts to highway agencies.

The FHWA also received comments from the NCUTCD, two State DOTs and two local DOTs recommending an increase in the threshold of the pedestrian change interval above which the countdown displays would be required, from more than 3 seconds (as proposed in the NPA) to more than 7 seconds, because countdowns of 7 seconds or less are so short that they could be missed. The FHWA agrees and adopts in this final rule the proposed increase in the threshold duration. Crosswalks needing a pedestrian clearance interval of 7 seconds or less are likely to be across relatively narrow streets where the countdown information is of less value to

[177] ''Signalized Intersections: Informational Guide'', FHWA publication number FHWA–HRT–04–091, August 2004, pages 197–198, can be viewed at the following Internet Web site: *http://www.tfhrc.gov/safety/pubs/04091/.*

[178] ''Guidelines and Recommendations to Accommodate Older Drivers and Pedestrians,'' FHWA Report no. FHWA–RD–01–051, May 2001, can be viewed at the following Internet Web site: *http://www.tfhrc.gov/humanfac/01105/cover.htm.* Recommendation I.P(6).

[179] This 2001 report can be viewed at the following Internet Web site: *http://www.tfhrc.gov/humanfac/01105/01-051.pdf.*

[180] ''Pedestrian Countdown Signals: Experience With an Extensive Pilot Installation,'' by Markowitz, Sciortino, Fleck, and Yee, published in ITE Journal, January 2006, pages 43–48, is available from the Institute of Transportation Engineers at the following Internet Web site: *http://www.ite.org.*

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pedestrians. The NCUTCD also recommended, and the FHWA agrees, to adopt in this final rule an OPTION statement allowing pedestrian countdown displays to be used with pedestrian change intervals of 7 seconds or less, to provide flexibility to highway agencies.

A comment from the NCUTCD recommended the addition of a sentence in the first STANDARD statement that when countdown pedestrian signals are used, the countdown shall always be displayed simultaneously with the flashing UPRAISED HAND signal indication displayed for that crosswalk. The FHWA agrees that this sentence, which reiterates existing requirements elsewhere in Chapter 4E, helps clarify the operation of the countdown and the FHWA adopts this requirement in this final rule.

The FHWA adopts in this final rule a revision the second sentence of STANDARD paragraph 06 to prohibit the pedestrian countdown display during the red clearance interval, rather than during the yellow change interval. This revision is necessary to be consistent with revisions adopted in Section 4E.06 Pedestrian Intervals and Signal Phases (Section 4E.10 in the 2003 MUTCD) regarding the display of pedestrian countdown displays during certain vehicular signal intervals. It also provides agencies more flexibility to extend the display of the flashing UPRAISED HAND and the accompanying countdown into the yellow interval, which would not have been allowed under the NPA language.

In the NPA, the FHWA proposed adding a new STANDARD after the first paragraph of the GUIDANCE to require that a pedestrian countdown signal be dark when the duration of the green interval for a concurrent vehicular movement has intentionally been set to continue beyond the end of the pedestrian change interval. The FHWA received comments from the NCUTCD noting that pedestrian countdown displays are required by other provisions in Chapter 4E to display the countdown only in conjunction with the flashing UPRAISED HAND indication and they are to be dark at all other times. The FHWA agrees and in this final rule does not adopt that proposed new STANDARD and the removes the existing last sentence of the first GUIDANCE paragraph.

405. Both the Rehabilitation Act of 1973 (Section 504) and the Americans with Disabilities Act of 1990 require that facilities, programs and services be accessible to persons with disabilities. The FHWA in this final rule revises various sections in Chapter 4E of the MUTCD regarding communication of pedestrian signal information to pedestrians with vision, vision and hearing, or cognitive disabilities to reflect research [181] conducted under NCHRP 3–62, Accessible Pedestrian Signals, and a 5-year project on Blind Pedestrians' Access to Complex Intersections [182] sponsored by the National Eye Institute of the National Institutes of Health, that has demonstrated that certain techniques most accurately communicate information. The changes also result in making accessible pedestrian detectors easy to locate and actuate by persons with visual or mobility impairments. Significant changes to existing material are described below.

406. In Section 4E.08 Pedestrian Detectors, the FHWA proposed in the NPA to change the first GUIDANCE statement regarding the location of a pedestrian pushbutton to a STANDARD and to add criteria that would be required to be met for the location of pushbuttons, in order to make pedestrian pushbuttons more accessible to disabled pedestrians and to pedestrians in general. The FHWA received comments in favor of the proposal from many citizens, a consultant, a local DOT, and several associations representing visually disabled pedestrians and pedestrians in general. However, the FHWA received comments opposed to the proposal in general or to certain items of the pushbutton location criteria from a State DOT, 11 cities, and a county. The objections generally cited the cost impacts of moving pedestrian detectors and the inflexibility of a STANDARD under conditions that can sometimes make it impractical to meet the requirements. The FHWA believes that some of the concerns are valid and adopts the pushbutton location criteria as GUIDANCE in this final rule. This will still provide for improved accessibility of pushbuttons for all pedestrians while providing some latitude for engineering judgment to address unusual conditions.

The FHWA also adopts in this final rule the NPA proposed STANDARD, GUIDANCE, and OPTION statements that contain additional information for locations where physical constraints make meeting some of the criteria impractical. The FHWA also adopts the change of a GUIDANCE statement to a STANDARD to require that the positioning of the pushbuttons and legends on the signs clearly indicate which crosswalk signal is activated by which pushbutton. The FHWA adopts this change to eliminate ambiguity regarding which pushbutton a pedestrian must activate to cross a particular street. The FHWA also adopts the addition to the existing last STANDARD statement that a when a pilot light is used at an accessible pedestrian signal location, each actuation shall be accompanied by the speech message ''wait.'' The FHWA adopts this change to ensure that the activation confirmation is available to pedestrians with impaired vision.

The FHWA received comments from two manufacturers of pedestrian pushbuttons and two citizens in opposition to the existing provision that, if a pilot light is used with a pushbutton, once the button is actuated the pilot light shall remain illuminated until the walk signal or green indication is displayed. The comments generally cited the inability of certain brands of pushbutton equipment to meet the standard without expensive redesign. The FHWA did not propose a change in the NPA to this existing provision. The reason for keeping the pilot light illuminated after it is pushed is to mirror what people experience with elevator call buttons. If the pilot light goes off after the button is pushed, the pedestrian might feel that the call has been dropped and might be induced to cross without waiting for the walk signal. The FHWA declines to revise this provision in this final rule.

Finally, the FHWA adopts in this final rule a STANDARD statement at the end of the section requiring a sign if an extended pushbutton press will always provide additional crossing time, to ensure that pedestrians receive instructions of the use of this feature and are made aware of the feature's existence. In the NPA, the legend of this sign was proposed to be ''FOR MORE CROSSING TIME HOLD BUTTON DOWN FOR 2 SECONDS.'' The FHWA received a comment from the NCUTCD agreeing with the requirement for a sign but recommending that the legend be changed to ''PUSH BUTTON FOR 2 SECONDS FOR EXTRA CROSSING TIME'' because the button is not held down, as in with force applied toward the ground, it is pressed. The FHWA agrees and adopts the provision with the revised sign legend.

407. In new Section 4E.10 Accessible Pedestrian Signals and Detectors—Location, the FHWA adopts in this final rule the addition of a STANDARD, proposed in the NPA for Section 4E.09,

[181] Research reports on this topic can be viewed at the U.S. Access Board's Internet Web site at: *http://www.access-board.gov/research/aps.htm.*

[182] Information on this research can be viewed at the following Internet Web site: *http://www.eric.ed.gov/ERICDocs/data/ericdocs2sql/content_storage_01/0000019b/80/2a/26/bb.pdf.*

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that requires locator tones, tactile arrows, speech walk messages, and a speech pushbutton informational message when two accessible pedestrian pushbuttons are placed less than 10 feet apart or on the same pole. The proposal was supported by the NCUTCD but opposed by a State DOT because of concerns about information overload. As noted above, the provision is supported by research and the FHWA adopts it as proposed. Additionally, the FHWA adopts the change from an existing GUIDANCE to a STANDARD, as proposed in the NPA for Section 4E.10, that if the clearance time is sufficient to only cross to the median of a divided highway, an accessible pedestrian detector shall, rather than should, be provided on the median. This change was supported by a consulting firm and the FHWA received no comments in opposition.

408. In new Section 4E.11 Accessible Pedestrian Signals and Detectors—Walk Indications, the FHWA adopts several changes based on NPA proposed revisions in Section 4E.06. The FHWA proposed to require both audible and vibrotactile walk indications, to add requirements on how audible and vibrotactile walk indications are to be provided, and to add language prohibiting audible indications during the pedestrian change interval because research [183] has found that visually disabled pedestrians need to concentrate on the sounds of traffic movement while they are crossing and audible indications of the flashing UPRAISED HAND interval would be distracting from that task. The FHWA received comments in opposition to the some or all of these changes from the two State DOTs, six cities, two manufacturers, and a few citizens, generally citing insufficient research. The FHWA disagrees with the comments in opposition because the changes are based on sound research, as discussed above. The FHWA received comments in favor of these changes from a city, a State DOT, a local DOT, a consultant, several organizations representing visually disabled pedestrians and pedestrians in general, and many citizens. Most of these comments also requested that APS be required for all locations where pedestrian signals are provided. The FHWA did not propose such a requirement in the NPA and declines to adopt it in this final rule. The U.S. Access Board is considering initiating proposed rulemaking to consider adopting Public Right of Way Accessibility Guidelines (PROWAG) that could possibly mandate APS at all new or renovated pedestrian signal locations. Once the United States Department of Justice has adopted any future Access Board public right of way guidelines as a standard, the FHWA will reconsider the matter for future revisions of the MUTCD.

The FHWA received comments from the NCUTCD and an organization for the blind recommending changes to some of the proposed requirements regarding how audible and vibrotactile walk indications are to be provided and operated, and to make the text clearer and consistent with other provisions. The FHWA agrees with these comments, which also address comments from others about inconsistencies in the text, and adopts in this final rule revisions to the second STANDARD statement of former Section 4E.06.

The FHWA also adopts the proposed addition to the STANDARD that an accessible walk signal shall have the same duration as the pedestrian walk signal unless the pedestrian signal rests in the walk interval and adopts subsequent GUIDANCE regarding the recommended duration and operation of the accessible walk signal if the pedestrian signal rests in the walk interval. The FHWA adopts this change to clarify that the duration of the accessible walk signal is dependent on whether the signal controller is set to rest in walk or steady don't walk in the absence of conflicting demands.

The FHWA also proposed in the NPA to change to a STANDARD the 4th GUIDANCE statements in former Section 4E.06 and former Section 4E.09 regarding the loudness of audible pedestrian walk signals and to base the loudness of an audible pedestrian walk signal on the ambient sound level and provide for louder volume adjustment in response to an extended pushbutton press. The FHWA proposed adopting these changes to allow the audible pedestrian walk signals to be heard over the ambient sound level, and to allow pedestrians with hearing impairments to receive a louder audible walk signal. The FHWA received comments from two manufacturers of APS equipment and from a local DOT opposing making the maximum loudness a STANDARD and citing technical problems with measurement of sound levels that make it impractical to comply precisely. The FHWA agrees and in this final rule revises the sentences about maximum loudness value for walk indications and pushbutton locator tones to GUIDANCE.

The FHWA also adopts added GUIDANCE, OPTION, and SUPPORT statements regarding the duration, tone, and speech messages of audible walk indications, as proposed in the NPA in Sections 4E.06 and 4E.09, in order to clarify their use and application. Further, the FHWA adopts the modifications (proposed in Section 4E.06) to the existing STANDARD to require that speech walk messages only be used where it is technically infeasible to install two accessible pedestrian signals at one corner with the minimum required separation. The STANDARD also contains requirements for what information is allowed in speech messages. The FHWA also adopts the addition of a GUIDANCE statement (proposed in Section 4E.06) that recommends that the speech messages not state or imply a command. The FHWA is adopting these changes to clarify when and under what circumstances speech walk messages are to be used.

409. In new Section 4E.12 Accessible Pedestrian Signals and Detectors—Tactile Arrows and Locator Tones the FHWA adopts in this final rule several changes based on the NPA proposed revisions to Section 4E.09. The FHWA adopts the proposed change to the first paragraph of the existing first GUIDANCE statement regarding tactile arrows to a STANDARD, relocates it within the section, and modifies the remainder of the GUIDANCE statement to reduce redundancy.

The FHWA proposed modifying the second STANDARD in former Section 4E.09, to require pushbutton locator tones at accessible pedestrian signals, and also proposed changing the following GUIDANCE statement to a STANDARD regarding locator tones. Based on comments from APS manufacturers and others, as discussed above, the FHWA adopts the proposed changes. The FHWA also received a comment from a city that the STANDARD sentence requiring locator tones to be deactivated when the signal is operating in a flashing mode is too restrictive in regard to traffic control signals or pedestrian hybrid beacons that are activated from a flashing or dark mode to a stop-and-go mode by pedestrian actuations. The FHWA agrees and adopts in this final rule a sentence exempting these situations from the STANDARD requirement.

410. In new Section 4E.13 Accessible Pedestrian Signals and Detectors—Extended Pushbutton Press Features the FHWA adopts in this final rule the NPA proposed changes to Section 4E.09. The FHWA adopts the addition of a paragraph to the existing 3rd OPTION statement allowing the use of an extended pushbutton press to activate

[183] Research reports on this topic can be viewed at the U.S. Access Board's Internet Web site at: *http://www.access-board.gov/research/aps.htm.*

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additional accessible features at a pedestrian crosswalk and the addition of a new STANDARD statement to follow this new paragraph that sets requirements for the amount of time a pushbutton shall be pressed to activate the extra features.

The FHWA does not adopt in this final rule the last SUPPORT, STANDARD, and GUIDANCE statements from Section 4E.06 as proposed in the NPA, and replaces these with SUPPORT, GUIDANCE, OPTION, and STANDARD text regarding the use of audible beaconing and other additional features that may be provided as a result of an extended pushbutton press. The FHWA adopts this information, because while audible beaconing features can be valuable, activating audible beaconing features at multiple crosswalks at the same intersection can be confusing to visually disabled pedestrians, and therefore audible beaconing should be activated only when needed. The FHWA received comments from two local DOTs in opposition to the use of an extended pushbutton press to call for added crossing time because of concerns about misuse by pedestrians and impacts on signal controllers and pedestrian countdown operation. The FHWA declines to remove the ability of highway agencies to use this option but does recognize that adding time to the pedestrian change interval via an extended pushbutton press could result in some issues with countdown displays until signal controller manufacturers incorporate countdown timing into their equipment and software.

The FHWA adopts the NPA proposed addition of a STANDARD statement at the end of the section requiring that speech pushbutton information messages only play when the walk interval is not timing. Requirements regarding the content of these messages are also contained in this new STANDARD. The FHWA adopts this change to promote uniformity in the content of speech messages. The FHWA received no significant comments on these proposals.

411. The FHWA received comments regarding the NPA proposed revision of Figure 4E–3 (Figure 4E–2 in the 2003 MUTCD) to show a general layout of recommended pushbutton locations from the NCUTCD and a consultant, suggesting that the title of the figure be revised to ''Pushbutton Location Area'' and that other editorial changes to the figure be made for consistency with the MUTCD text. The FHWA agrees and adopts in this final rule the figure with the suggested revisions, and with other minor editorial changes to address other comments on this figure.

412. The FHWA adopts in this final rule the proposed new ''Figure 4E–4 Typical Pushbutton Locations'' (Figure 4E–3 in the NPA) that shows eight examples of pushbutton locations for various sidewalk, ramp, and corner configurations, to help clarify appropriate locations under different geometric conditions. Based on comments received, the FHWA makes editorial revisions to this figure to improve clarity and accuracy.

Discussion of Amendments Within Chapters 4F Through 4L

413. The FHWA adopts in this final rule the NPA proposed addition of a new Chapter to Part 4, numbered and titled Chapter 4F Pedestrian Hybrid Beacons, with three sections that describe the application, design, and operation of pedestrian hybrid beacons, and with three new figures. Figures 4F–1 and 4F–2 contain guidelines for the justification of installation of pedestrian hybrid beacons on low-speed and high-speed roadways, respectively. Figure 4F–3 shows the sequence of intervals for a pedestrian hybrid beacon. The remaining Chapters in Part 4 are re-lettered accordingly. The FHWA adopts these sections to give agencies additional flexibility by providing an alternative method for control of pedestrian crosswalks that has been found by research[184] to be highly effective. This type of device offers significant benefits for providing enhanced safety of pedestrian crossings where normal traffic control signals would not be warranted.

The FHWA received comments in favor of adding the pedestrian hybrid beacon from a State DOT, eight cities, the NCUTCD, an organization for the blind, several organizations representing pedestrians, and many citizens. The FHWA also received comments in opposition to the addition of pedestrian hybrid beacons from five State DOTs, four cities, a county, a toll road authority, and some others. However, most of the objections related to the name for the device that was proposed in the NPA (pedestrian hybrid signal) and the concern that, because the device is dark between actuations, drivers would treat it as a 4-way stop in States where laws require such driver behavior at dark traffic signals. As discussed earlier in Section 1A.13 Definitions, based on these and other comments, the FHWA adopts pedestrian hybrid beacon as the revised name for the device. Many beacons are dark between activations and drivers are not required by laws to stop at dark beacons. Further, the unique arrangement of the hybrid beacon's indications make it appear very different from a normal traffic control signal, and the experiences of Tucson, AZ and the many other highway agencies that have successfully experimented with pedestrian hybrid beacons have not resulted in any adverse safety issues being brought to the FHWA's attention.

414. In Section 4F.01 Application of Pedestrian Hybrid Beacons, based on a comment from a city, in this final rule the FHWA does not adopt the first paragraph of the GUIDANCE statement that was proposed in the NPA and instead adds to the OPTION statement that a pedestrian hybrid beacon may, rather than should, be considered for a location that meets the pedestrian crossing or school crossing warrant for a traffic control signal but a decision is made to not install a traffic control signal.

415. In Section 4F.02 Design of Pedestrian Hybrid Beacons, in this final rule the FHWA adopts in the GUIDANCE statement a requirement that pedestrian hybrid beacons should be installed at least 100 feet from side streets or driveways that are controlled by STOP or YIELD signs, and does not adopt the final STANDARD paragraph of the section that was proposed in the NPA. The FHWA received several comments noting that Chapters 4C and 4D contain GUIDANCE that traffic signals justified by a pedestrian crossing or school crossing should be installed at least 100 feet from intersections with minor side streets or driveways controlled by STOP or YIELD signs and expressing concerns that pedestrian hybrid beacons should be subject to the same guidance. Because a traffic control signal and a pedestrian hybrid beacon both stop traffic on the major street to enable pedestrians to cross, if installed at an intersection, both of these types of devices generate the same issues involving the STOP or YIELD controlled side street traffic that caused the FHWA to prohibit ''half-signals'' several decades ago and that resulted in the recommendations adopted in Chapter 4C and 4D. Side street drivers controlled by only a STOP or YIELD sign often encounter delays because of high major street traffic volumes and they typically use the pedestrian-activated stoppage of major street traffic as their opportunity to turn onto or cross the major street. When doing so, these drivers often do

[184] ''Improving Pedestrian Safety at Unsignalized Pedestrian Crossings,'' TCRP Report 112/NCHRP Report 562, Transportation Research Board, 2006, can be viewed at the following Internet Web site: *http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_562.pdf.*

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not give adequate attention to pedestrians in their path. Because the purpose of a pedestrian hybrid beacon is to enhance the safety of pedestrian crossings, and because of similar provisions in Chapters 4C and 4D, the FHWA believes it is also inappropriate for pedestrian hybrid beacons to be used at or within 100 feet of intersections with STOP or YIELD sign controlled side streets, and the FHWA adopts the new GUIDANCE.

416. In Section 4F.03 Operation of Pedestrian Hybrid Beacons, the FHWA received several comments about flashing red indications proposed to be displayed by the hybrid beacon during the flashing UPRAISED HAND pedestrian change interval. Some comments expressed concern about drivers being allowed to proceed while a pedestrian could still be in the street. Experimentations with the hybrid beacon in Tucson and many other jurisdictions have not revealed any significant safety issues with the flashing red operation. Further, allowing drivers to proceed, after a full stop, if the pedestrian traffic has already cleared their half of the roadway is the major advantage of this device over a midblock pedestrian traffic control signal. The FHWA in this final rule declines to remove the proposed text on the flashing red operation for hybrid beacons.

The FHWA also received comments from the NCUTCD, five State DOTs, two cities, a county, and an NCUTCD member requesting that the alternating (''wig-wag'') pattern of the two flashing red indications that was proposed to be specified for the pedestrian hybrid beacon be changed to a simultaneous flashing of the two reds, because of concerns that the alternating flashing reds might be mistaken by drivers as the flashing-light signals used at highway-rail grade crossings, or that such use could diminish the impact of the flashing-light signals at grade crossings. However, the FHWA also received comments from a consultant and a State DOT in support of the alternating flashing reds for hybrid beacons, noting that there has been no research or experimentation with pedestrian hybrid beacons using simultaneous flashing reds, and therefore it is unknown whether the device would be as effective as it has been shown to be in the experimentations with the alternating flashing reds. The comments also noted that there has been no research indicating that drivers associate the alternating flashing red pattern as being unique to grade crossings. The consultant also pointed out that with simultaneous flashing reds, the display goes from double steady red to dark for a split second, before the flashing starts. With a wig-wag display, one of the red signals is always lit. Since motorists would see a dark signal for a moment, it might lead them to think that the signal has returned to its ''rest'' phase of being dark and this could result in less safety. Additionally, the FHWA believes that, because of context and a completely different sequence of signal displays, there is an extremely low possibility of the alternate flashing reds of the pedestrian hybrid beacon being mistaken as flashing-light signals of a highway-rail grade crossing or that it will diminish the impact or respect for those flashing-light signals. At a grade crossing, the flashing-light signals come on immediately from a dark condition when a train is detected as approaching the crossing. At a pedestrian hybrid beacon, the indications go from dark to flashing yellow for several seconds, followed by steady yellow for several seconds, and then to steady red for a typical duration of seven seconds, before the alternating flashing red display begins. In view of these factors, the FHWA agrees that alternating flashing red is appropriate for pedestrian hybrid beacons and adopts that provision in this final rule rather than changing it to simultaneous flashing.

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417. The FHWA adopts in this final rule a change in the title of Chapter 4G proposed in the NPA to ''Traffic Control Signals and Hybrid Beacons for Emergency Vehicle Access'' in order to reflect the addition of hybrid beacons to this chapter. Additionally, in Section 4G.01 Application of Emergency-Vehicle Traffic Control Signals and Hybrid Beacons, the FHWA adopts the proposed addition of a paragraph to the OPTION statement to allow an emergency-vehicle hybrid beacon to be installed in place of an emergency-vehicle traffic control signal under the conditions described in Section 4G.04. The FHWA received no substantive comments other than those discussed below under Section 4G.04.

418. The FHWA adopts in this final rule the proposed new Section 4G.04 Emergency-Vehicle Hybrid Beacons containing provisions for this type of beacon for optional use in conjunction with signs to warn and control traffic at an unsignalized location where emergency vehicles enter or cross the street or highway and adopts new Figure 4G–1 illustrating the Emergency-Vehicle Hybrid Beacon.

The FHWA received some comments opposed to certain aspects of this device, for similar reasons as the comments opposed to the Pedestrian Hybrid Beacon (Chapter 4F). As discussed above regarding Chapter 4F and Sections 4F.01 through 4F.03, the change in name of the device to use the phrase ''hybrid beacon'' rather than ''hybrid signal'' addresses concerns about State laws requiring drivers to treat a dark signal as a 4-way stop. Also, similar to Section 4F.03, in the Section 4G.04 adopted in this final rule the FHWA adds to the GUIDANCE a statement that an emergency-vehicle hybrid beacon should not be installed at locations that are less than 100 feet from a side street or driveway that is controlled by STOP or YIELD signs. Some of the comments on Section 4G.04 concerned the issue of alternating versus simultaneous flashing red indications. For a discussion of this issue, see above under Section 4F.03. The FHWA also received a comment from a State DOT suggesting that an OPTION be added to Section 4G.04 allowing the use of a steady red clearance interval after the steady yellow interval and before the alternating flashing red interval. The FHWA agrees and adopts the additional OPTION in this final rule.

419. In Section 4I.02 Design of Freeway Entrance Ramp Control Signals (Section 4H.02 in the 2003 MUTCD), the FHWA proposed in the NPA to require the use of at least two signal faces per separately-controlled lane on a multiple lane ramp where green signal indications are not always displayed simultaneously to all of the lanes. The FHWA received comments from the NCUTCD, a State DOT, and a local DOT in opposition to this proposed requirement. The objections centered on physical challenges involving signal face mountings, especially when there are three or more separately-controlled lanes. A State DOT commented that, unlike a traffic signal at an intersection, there is little if any conflict or danger if a motorist inadvertently violates a red signal because of a burned-out lamp and the risk of burned-out lamp is low because of the common use of LED indications and the fact that ramp control signals typically operate only 3 hours a day. The commenter further stated that on metered ramps of two lanes or more they use overhead signal faces mounted directly in line with the lane that they control and thus the signals are highly visible to motorists. The NCUTCD commented that a single signal face per separately-controlled lane provides sufficient indications and permits installation location flexibility in these cases. The FHWA agrees with these comments and adopts in this final

rule Section 4I.02 with a revised STANDARD statement to require one signal face located over the approximate center of each separately-controlled lane when there are two or more separately-controlled lanes on the ramp. The FHWA also adopts a GUIDANCE statement that additional side-mounted signal faces should be considered for ramps with two or more separately-controlled lanes.

420. The FHWA adopts in this final rule a new Section 4I.03 (Section 4H.03 proposed in the NPA) Operation of Freeway Entrance Ramp Control Signals containing GUIDANCE recommending the operational strategies for ramp control signals. Based on comments on this section as well as on comparable text in Section 2C.37 the FHWA revises the GUIDANCE adopted in this final rule regarding the use of RAMP METERED WHEN FLASHING (W3–7) signs to be consistent with Section 2C.37.

421. The FHWA adopts in this final rule revisions to Section 4J.02 Design and Location of Movable Bridge Signals and Gates (Section 4I.02 in the 2003 MUTCD) and 4J.03 Operation of Movable Bridge Signals and Gates (Section 4I.03 in the 2003 MUTCD), as proposed in the NPA. The FHWA received no significant comments on these sections.

422. The FHWA adopts in this final rule a new chapter to Part 4 titled Chapter 4K Highway Traffic Signals at Toll Plazas, containing three sections. In the NPA, only Section 4K.01 was proposed to be included in Chapter 4K, dealing with traffic signals used at toll plazas to indicate a requirement to stop and pay a toll or to go after paying the toll, or to indicate a low account balance in electronic toll collection lanes. The FHWA received comments from the NCUTCD, a State DOT, and many toll road operators opposing the details regarding traffic signals at toll plazas. The NCUTCD recommended that the NPA text for Section 4K.01 Traffic Signals at Toll Plazas be deleted and be replaced with a STANDARD statement prohibiting the use of traffic control signals and devices that resemble traffic control devices with red or green circular indications at toll plazas. The NCUTCD stated that, although many toll facility operators currently use these types of indications at toll plazas, there are a variety of other devices, such as changeable message signs or other displays that do not resemble traffic signals that are also being successfully used by toll agencies for these purposes. The FHWA agrees that since other methods of communicating the desired messages are available and traffic control signals should be reserved for other more critical uses, the use of devices resembling traffic signals is inappropriate at toll plazas. The FHWA adopts Section 4K.01 in this final rule with a STANDARD statement prohibiting the use of traffic control signals and devices that resemble traffic control devices with red or green circular indications at toll plazas to indicate the open or closed status of a toll lane, and a GUIDANCE statement recommending that traffic control signals and devices that resemble traffic control devices with red or green circular indications should not be used for new or reconstructed installations at toll plazas to indicate the success or failure of electronic toll payments or to alternately direct drivers making cash toll payments to stop and then proceed.

423. The FHWA also adopts in Chapter 4K an additional section titled Section 4K.02 Lane-Use Control Signals at Toll Plazas, containing text on lane-use control signals at toll plazas that was proposed in the NPA as a part of Sections 4M.01 and 4M.03, but incorporating revisions based on comments on the material proposed in the NPA. In regard to the requirement to use lane-use control signals to indicate the open or closed status of toll plaza lanes, the FHWA received comments from two toll authorities in opposition to the requirement because of their longstanding use of circular traffic control signal indications for this purpose. The FHWA also received comments from the NCUTCD and three toll authorities agreeing with the requirement. The FHWA adopts the requirement because lane-use control signals have long been required by the MUTCD for all cases of indicating open-closed status of any lane and this standard display is appropriately extended to lanes at toll plazas.

The FHWA also received comments from two toll authorities stating that the use of lane-control signals to indicate the open or closed status of an Open Road Tolling lane is not appropriate unless it is in conjunction with other devices (such as signs, cones, other channelizing devices, and arrow boards) that are used to close a high-speed lane. The FHWA agrees and also notes that some freeways have or will have systems of successive lane-control signals along the freeway corridor and that ORT lanes might be established along such corridors. The FHWA in this final rule modifies the proposed OPTION statement to allow the use of lane-control signals to indicate the open or closed status of an Open Road Tolling lane in conjunction with other devices (such as signs, cones, other channelizing devices, and arrow boards) that are used to close a high-speed lane.

424. The FHWA also adopts in Chapter 4K an additional section titled Section 4K.03 Warning Beacons at Toll Plazas, containing text on warning beacons at toll plazas that was proposed in the NPA as Section 4L.03, but incorporating revisions based on comments on the material proposed. The FHWA received comments from two toll road operators requesting that warning beacons mounted on toll plaza islands or impact attenuators associated with such islands be allowed to operate in a steady rather than flashing yellow mode, to act as an enhanced conspicuity marker. The FHWA disagrees and declines to make the requested change in this final rule because all warning beacons are circular and operate only in a flashing mode, and because a steady circular yellow indication has a defined meaning for traffic signals that is not appropriate in the context of a toll booth island or attenuator.

425. In Section 4L.02 Intersection Control Beacon, the FHWA adopts the proposed addition to the STANDARD statement that two horizontally aligned red signal indications in an Intersection Control Beacon shall be flashed simultaneously, and two vertically aligned red signal indications shall be flashed alternately, to be consistent with the existing requirement for stop beacons in Section 4L.05.

426. The FHWA adopts in this final rule revisions to Section 4L.03 Warning Beacon as proposed in the NPA, except that the FHWA relocates toll plaza related text to Section 4K.03 (as discussed above) and further revises item D in the SUPPORT statement of Section 4L.03 to include WRONG WAY as an additional regulatory sign for which a warning beacon is not an appropriate supplement, for consistency with Section 4L.05.

427. The FHWA adopts Section 4L.05 Stop Beacon as proposed in the NPA, with minor editorial changes for clarity.

428. The FHWA adopts revisions to Section 4M.01 Application of Lane-Use Control Signals and Section 4M.03 Design of Lane-Use Control Signals as proposed in the NPA, except that the FHWA relocates toll plaza related text to Section 4K.02 (as discussed above) and makes minor editorial changes for clarity.

429. In Section 4N.01 Application of In-Roadway Lights, the FHWA adopts in this final rule the additions to the STANDARD statement proposed in the NPA that In-Roadway Lights shall only be used for applications described in this chapter and that In-Roadway Lights shall be flashed and not steadily

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illuminated. The FHWA includes these changes to preclude the use of In-Roadway Lights for any purpose not included in this chapter because such uses have not yet been sufficiently tested to confirm their effectiveness and because steadily illuminated lights could be confused with internally illuminated raised pavement markings. The FHWA received comments from a device manufacturer and a transit agency requesting that in-roadway lights be allowed for use at highway-rail grade crossings and highway-light rail transit grade crossings. The FHWA disagrees and declines to adopt such an optional use, because there has been insufficient reported research showing the effectiveness of such uses at grade crossings.

430. The FHWA adopts revisions to Section 4N.02 In-Roadway Warning Lights at Crosswalks as proposed in the NPA, except that the FHWA also adopts an additional OPTION statement at the beginning of the section to indicate that in-roadway lights may be installed at certain marked crosswalks, based on an engineering study or engineering judgment, to provide additional warning to road users. The FHWA received a comment from a city recommending this text because there is no existing statement indicating that the use of in-roadway lights is optional. The FHWA agrees and also adopts the OPTION text.

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

431. In Section 5A.01 Function, the FHWA proposed in the NPA to prohibit classifying a residential street in a neighborhood as a low-volume road for the purposes of Part 5 of the MUTCD. Two local DOTs agreed with the proposal. A State DOT and local DOT opposed the revision because many residential streets have lower ADT and operating speeds than some rural roads. The FHWA disagrees with the comment, because the change to paragraph 01 item B provides consistency with paragraph 01 item A, which states that low-volume roads shall be facilities lying outside the built-up areas of cities, towns, and communities. The FHWA adopts in this final rule the language as proposed in the NPA.

432. The FHWA received several comments regarding Table 5A–1 Sign and Plaque Sizes on Low-Volume Roads as proposed in the NPA. The NCUTCD recommended making the typical sign sizes the same size as for Conventional Roads, making the minimum sign sizes the next smaller size than Conventional Roads, and making the oversized sign sizes the next larger size than Conventional Roads. The Conventional Road sign sizes are based on Tables 2B–1, 2C–2, 6F–1, and 8B–1. The minimum and oversized sizes are based on the SHSM book. The FHWA agrees with the NCUTCD recommendations and adopts in this final rule revisions to Table 5A–1.

433. In Section 5B.04 Traffic Movement and Prohibition Signs, the FHWA proposed in the NPA to change an existing OPTION, which discusses the usefulness of these signs, to SUPPORT. A State DOT opposed the change and the FHWA agrees that this text is more appropriately stated as an OPTION. Accordingly, the FHWA does not adopt the proposed change in this final rule and retains paragraph 04 as an OPTION, as in the 2003 MUTCD.

434. As proposed in the NPA, the FHWA adopts in this final rule new Section 5C.14 Object Markers and Barricades to replace 2003 MUTCD Section 5E.05 Object Markers. The FHWA moves the information in order to locate the subject material with other sections in Part 5 that deal with signs. This change coincides with the adopted relocation of object markers and barricades from Part 3 to Part 2 of the MUTCD.

435. Although not proposed in the NPA, in Section 5C.02 Center Line Markings, the FHWA adopts in this final rule a new OPTION in paragraph 03 that permits center line markings to be placed on highways with or without edge line markings, based on a comment from a State DOT for consistency with Part 3. In addition, the FHWA adopts a modified GUIDANCE in paragraph 02 to clarify the application of center line markings for low-volume roads.

436. In Section 5F.02, the FHWA changes the title to ''Grade Crossing (Crossbuck) Sign and Number of Tracks Plaque,'' in the final rule. As proposed in the NPA, the FHWA revises the STANDARD in paragraph 04 to clarify that the strip of retroreflective material on each sign support at passive highway-rail grade crossings is measured from the Crossbuck sign or the Number of Tracks plaque to within 2 feet of the ground. The NCUTCD recommended additional text consisting of a SUPPORT statement and a minor revision to the existing STANDARD statement to make Part 5 consistent with revisions being made to Part 8. The FHWA agrees and adopts revisions to Section 5F.02 in this final rule to provide consistency with Part 8 as adopted herein.

437. In Section 5F.03 Grade Crossing Advance Warning Signs, the FHWA proposed in the NPA to require that a supplemental plaque describing the type of traffic control at a highway-rail grade crossing shall be used on all low-volume roads in advance of every crossing. Two State DOTs and a local DOT opposed the revision because the supplemental plaques are not necessary on low volume roads with familiar motorists. The FHWA agrees and does not adopt in this final rule the proposed requirement for the use of supplemental plaques, which is consistent with similar revisions being adopted in Part 8.

438. In Section 5F.04 STOP and YIELD Signs, the FHWA proposed in the NPA several changes regarding the use and application of STOP signs or YIELD signs at highway-rail grade crossings. A State DOT and a consultant opposed the proposal to require the placement of STOP or YIELD signs at all highway-rail grade crossings that are not equipped with automatic traffic control devices. The FHWA disagrees and adopts the STANDARD in paragraph 01 to be consistent with requirements adopted in Part 8. The NCUTCD and a State DOT opposed the proposed removal of the STANDARD requiring the use of STOP AHEAD and YIELD AHEAD signs in certain situations. The FHWA agrees and in this final rule restores paragraph 02 to be consistent with the requirements in Chapter 2C.

439. In Section 5G.02 Applications, as proposed in the NPA, the FHWA revises paragraph 02 from an OPTION to SUPPORT, which states that maintenance activities might not require extensive TTC if the traffic volumes and speeds are low. Based on recommendations from the NCUTCD and a State DOT, the FHWA also adds a SUPPORT statement referring to Table 6H–3, which provides the recommended distances between signs shown in the Typical Applications drawings in Part 6. The FHWA also adds an OPTION statement to specifically allow a reduced advance placement distance for traffic control devices on low-volume roadways that have speeds of less than or equal to 30 miles per hour. The FHWA adopts these revisions for consistency with provisions in Part 6.

440. The FHWA adopts a new chapter, numbered and titled Chapter 5H Traffic Control for School Areas, in the final rule. The NCUTCD and a State DOT recommended adding a new chapter to cover traffic control for low volume roads adjacent to schools, since schools do exist on low-volume rural roads and there is a need to refer readers of Part 5 to the applicable provisions of Part 7. The FHWA agrees and adds the new chapter, which consists of a SUPPORT paragraph that refers users to

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Part 7 for more information and a STANDARD paragraph that merely requires compliance with applicable provisions in Part 7.

Discussion of Amendments to Part 6—Temporary Traffic Control—General

441. As proposed in the NPA, the FHWA revises the Code of Federal Regulations to delete title 23 CFR part 634 regarding Worker Visibility, in order to incorporate the provisions into the MUTCD, which is applicable to all public roads. As such, title 23 CFR part 634 is no longer needed because its requirements for high visibility garments are incorporated into the MUTCD in Sections 6D.03 and 6E.02 and are therefore applicable to all roads open to public travel in accordance with title 23 CFR part 655, not just applicable to Federal-aid highways.

442. The FHWA in this final rule updates the figures throughout Part 6 to reflect new or revised signs adopted in Part 2 that are applicable to Temporary Traffic Control Zones.

Discussion of Amendments Within Chapters 6A Through 6E

443. In Section 6B.01 Fundamental Principles of Temporary Traffic Control, the FHWA proposed in the NPA to modify the GUIDANCE in paragraph 07 item 2.C to recommend that provisions should be made for the continuous operation of work on roadways. The NCUTCD and four State DOTs opposed the use of the word ''continuous.'' The FHWA agrees and in this final rule revises item 2.C to recommend that provisions should be made to minimize the need for lane closures.

A State DOT suggested rewording the existing GUIDANCE in item 2.D that recommended that road users should use alternative routes that do not include TTC zones. The FHWA agrees and adopts in this final rule a revised item 2.D that also considers roadway capacity and type of roadway.

The FHWA proposed in the NPA to modify item 2.F in the GUIDANCE to recommend that roadway occupancy for TTC should be scheduled during off-peak hours ''on high-volume streets and highways'' to provide agencies with more flexibility in time periods for work on local residential streets and low-volume streets. A State DOT agreed with the proposal, but recommended additional language that included the removal of the term ''roadway occupancy.'' The FHWA agrees in part with the recommended modifications and adopts in this final rule a revised item 2.F that uses the term ''lane closures'' instead of ''roadway occupancy,'' recommends that lane closures on high-volume streets and highways should be scheduled during off-peak hours ''if work operations permit,'' and recommends that night work should be considered ''if the work can be accomplished with a series of short-term operations.''

444. In Section 6C.04 Advance Warning Area, the FHWA proposed in the NPA to add a new GUIDANCE regarding sign spacing that reinforced that the distances contained in Table 6C–1 are for guidance purposes and should be considered minimums. A local DOT agreed with the proposal. The NCUTCD, three State DOTs, and a transportation research institute recommended that the distances in Table 6C–1 be referred to as ''approximate'' and that shorter distances be allowed based on field conditions. The FHWA agrees with the comments and adopts in this final rule a modified paragraph 06 to recommend that the distances in Table 6C–1 should be adjusted for field conditions by increasing or decreasing the recommended distances.

445. In Section 6C.05 Transition Area, the FHWA proposed in the NPA an OPTION that stated that vehicle-mounted traffic control devices may be used instead of channelizing devices to establish a transition area. The NCUTCD opposed the proposal, while a State DOT and two local DOTs agreed with the proposal. A State DOT and a transportation research institute recommended that the statement be upgraded to GUIDANCE. The FHWA disagrees with changing this provision to GUIDANCE at this time but might consider proposing it for a future rulemaking. The FHWA in this final rule adopts paragraph 03 as an OPTION to allow the use of vehicle-mounted traffic control devices to establish a transition area because portable devices can be more practical for mobile operations.

446. In Section 6C.07 Termination Area, the FHWA proposed in the NPA to revise the STANDARD to clarify the use of a termination area. A State DOT and a transportation research institute opposed the existing STANDARD requiring that termination areas be used, because they are not required in all instances. The FHWA agrees with the comment and in this final rule changes the STANDARD to SUPPORT, because the termination area is not specific and is not used in all cases.

447. In Section 6C.08 Tapers, the FHWA proposed in the NPA to add GUIDANCE to recommend that the length of a short taper used with flagger operations should be a minimum of 50 feet. While a local DOT agreed with the revision, a State DOT opposed the change and suggested no set minimum taper length, in order to allow more flexibility on low-volume and low-speed local roads. The FHWA believes that a taper shorter than 50 feet long does not provide any guidance information to approaching road users, and therefore in this final rule adopts the proposed GUIDANCE in paragraph 15. The FHWA also adopts a recommended minimum taper length of 50 feet for one-lane, two-way traffic tapers in Table 6C–3 and illustrates the recommended minimum taper length in several figures in Part 6.

In addition, the FHWA proposed in the NPA to add GUIDANCE that a downstream taper with a length of approximately 100 feet should be used to guide traffic back into their original lane. Two State DOTs opposed the proposal because they believe a downstream taper is not always necessary. The FHWA notes that the statement only applies to flagger operations and this taper is very important to provide positive guidance to vehicles after they pass the lane closure. Based on comments from ATSSA, a State DOT, and a transportation research institute, the FHWA adopts a revised GUIDANCE in this final rule that does not include the word ''approximately'' as indicated above and recommends that a length of 100 feet should be used for a downstream taper.

448. In Section 6C.10 One-Lane, Two-Way Traffic Control, the FHWA proposed in the NPA to add an OPTION to explicitly allow for the movement of traffic to be self-regulating through a one-lane, two-way constriction, provided that the work space is short and is on a low-volume street or road, and that road users from both directions are able to see the traffic approaching from the opposite direction through and beyond the work site. The FHWA proposed this change to provide practitioners with more flexibility on low-volume, low-speed roads. While two local DOTs opposed the change, four State DOTs, a local DOT, and a transportation research institute agreed with the proposal. The FHWA adopts this proposal in this final rule, but acknowledges that, since this is an OPTION, an agency may prohibit the use of this OPTION within its jurisdiction. Based on comments from a State DOT and a transportation research institute, the FHWA also deletes a SUPPORT statement that was in the 2003 MUTCD because it is no longer necessary with the new OPTION adopted in paragraph 05.

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449. In the NPA, the FHWA proposed to relocate the STANDARD in Section 6F.54 of the 2003 MUTCD regarding the PILOT CAR FOLLOW ME Sign and flaggers in activity areas where a pilot car is being used, to Section 6C.13 Pilot Car Method of One-Lane, Two-Way Traffic Control. In response to a comment from a State DOT, the FHWA adopts in this final rule a revised paragraph 04 to require that a flagger shall be stationed ''to control'' rather than ''to stop'' vehicular traffic until the pilot vehicle is available. The FHWA also retains Section 6F.58 PILOT CAR FOLLOW ME Sign in this final rule with the first sentence of the existing STANDARD and a reference to Section 6C.13, as discussed in item 475 below.

450. As proposed in the NPA, the FHWA in this final rule relocates several paragraphs related to accessible pedestrian facilities from Section 6D.01 Pedestrian Considerations to Section 6D.02 Accessibility Considerations, in order to consolidate related information into one section.

Based on a comment from the NCUTCD, the FHWA relocates an existing GUIDANCE from Section 6D.02 to Section 6D.01 that list the pedestrian considerations that should be addressed when temporary pedestrian pathways in TTC zones are designed or modified, in order to consolidate pedestrian consideration information into one section. In this final rule, paragraph 11 in Section 6D.01 contains the relocated GUIDANCE.

451. In Section 6D.01 Pedestrian Considerations, the FHWA proposed in the NPA to relocate a statement from Section 6G.11 of the 2003 MUTCD that accessibility and detectability shall be maintained along an alternate pedestrian route if a TTC zone affects an accessible and detectable pedestrian facility. This is an existing provision of the ADAAG.[185] The FHWA in this final rule adopts the proposed relocation. Based on a comment from the NCUTCD, the FHWA also retains the first sentence of paragraph 04, which states that adequate pedestrian access and walkways shall be provided if the TTC zone affects the movement of pedestrians.

452. In Section 6D.03 Worker Safety Considerations, the FHWA proposed in the NPA a new STANDARD to incorporate into the MUTCD the provisions of title 23 CFR part 634 regarding the use of high-visibility safety apparel by workers within the public right-of-way. The NCUTCD recommended revising paragraph 04 to clarify that the required use of high-visibility apparel also applied to emergency responders and that exposure of workers to ''work vehicles'' within the TTC zone also requires the use of high-visibility safety apparel. In this final rule, the FHWA adopts a revised STANDARD that incorporates into the MUTCD the provisions of title 23 CFR part 634 that were published as a Final Rule in the **Federal Register** on June 15, 2009[186] and the recommended revisions by the NCUTCD. The FHWA also adopts a new OPTION as proposed in the NPA in paragraph 05 that allows first responders and law enforcement personnel to use safety apparel meeting a newly-developed American National Standards Institute (ANSI) standard for ''public safety vests,'' because this type of vest will better meet the special needs of these personnel. In the NPA, the FHWA referenced the provisions of title 23 CFR part 634 that were published in the **Federal Register** on November 24, 2006.[187] The NCUTCD, five State DOTs, two local DOTs, two fire departments, and a transportation research institute agreed with the proposal, but recommended modifications. Numerous firefighting associations and organizations, police associations, and citizens opposed the proposed change, primarily because of a concern that the safety apparel would have to be worn over turn-out gear during emergency operations that involve exposure to flame, fire, or other hazards. The 2006 **Federal Register** notice was amended with a Final Rule on June 15, 2009, to exempt firefighters from the requirement to use high-visibility safety apparel when they are exposed to hazardous conditions where the use of the apparel might increase the risk of injury to firefighter personnel. In this final rule, the FHWA revises the STANDARD in paragraph 07 and adds an OPTION in paragraph 08 that describes the exemption for firefighters from the requirement to use high-visibility safety apparel in certain conditions. The FHWA establishes a target compliance date of December 31, 2011 (approximately two years from the effective date of this final rule) for worker apparel on non-Federal-aid highways, which is consistent with the two-year compliance period that was provided for Federal-aid highways in title 23 CFR part 634. Required compliance of apparel for workers, including law enforcement officers, on Federal-aid highways has been in effect since November 24, 2008, pursuant to title 23 CFR part 634.

453. In Section 6E.02 High-Visibility Safety Apparel, the FHWA proposed in the NPA several changes regarding the use of high-visibility safety apparel by flaggers during daytime and nighttime activity, as well as by law enforcement personnel within a TTC zone, to reflect the provisions of title 23 CFR part 634 (see items 441 and 452 above). The NCUTCD and a local DOT recommended revising the reference to the ANSI 107 publication throughout the section to remove ''or equivalent revisions.'' The FHWA agrees and adopts in this final rule the reference to the ANSI 107–2004 publication, which is the latest version of the of the ANSI 107 standard. Based on a comment from a State DOT, the FHWA revises paragraph 01 to include a combination of orange-red and fluorescent yellow-green as an approved apparel background material color combination. The FHWA establishes a target compliance date of December 31, 2011 (approximately two years from the effective date of this final rule) for flagger apparel on non-Federal-aid highways. Required compliance of apparel for workers, including law enforcement officers, on Federal-aid highways has been in effect since November 24, 2008, pursuant to title 23 CFR part 634.

454. In Section 6E.03 Hand-Signaling Devices, the FHWA proposed in the NPA to add SUPPORT and GUIDANCE statements to clarify that it is recommended to place a STOP/SLOW paddle on a rigid staff, with a minimum length of 7 feet, in order to display a STOP or SLOW message that is stable and high enough to be seen by approaching or stopped traffic. A State DOT, three local DOTs, and a traffic control device manufacturer agreed with the proposal. The NCUTCD, ATSSA, 11 State DOTs, a transportation research institute, and an NCUTCD member opposed the proposed minimum recommended height, citing concerns about the ability of a flagger to control the paddle on such a long staff, especially in windy conditions. The FHWA agrees with these concerns and does not adopt in this final rule the proposed GUIDANCE that included a

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[185] The Americans with Disabilities Accessibility Guidelines (ADAAG) can be viewed at the following Internet Web site: *http://www.access-board.gov/ada-aba/index.htm.*

[186] The **Federal Register** Notice for the Final Rule, dated June 15, 2009 (Volume 74, Number 113, Page 28160–28161) can be viewed at the following Internet Web site: *http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=2009_register&docid=fr15jn09-7.pdf.*

[187] The **Federal Register** Notice for the Final Rule, dated November 24, 2006 (Volume 71, Number 226, Page 67792–67800) can be viewed at the following Internet Web site: *http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=2006_register&docid=E6-19910.pdf.*

recommended specific minimum height of 7 feet. The FHWA adopts a SUPPORT in paragraph 04 to note that the optimum method of displaying a STOP or SLOW message is to place the STOP/SLOW paddle on a rigid staff that is tall enough to be seen by approaching or stopped traffic.

A contractor noted that flags for TTC are normally sold in a red/orange color instead of the red color that is required in the 2003 MUTCD. Based on the comment, the FHWA adopts a revised STANDARD in paragraph 09 that includes red or fluorescent orange/red as acceptable colors for flags.

The FHWA also proposed in the NPA an OPTION to allow the use of a flashlight with a red glow cone at night to supplement the STOP/SLOW paddle or flags. A State DOT opposed the proposal because of concerns that glow cones do not give positive guidance at night. A State DOT and a transportation research institute recommended revising the statement to specify that the flashlight is only to be used at night in an emergency operation when the flagger station is not illuminated. The FHWA agrees with the commenters and in this final rule adopts a revised paragraph 12, as recommended by the commenters. A State DOT and a transportation research institute recommended new language to describe methods of signaling with a flashlight in an emergency when the flagger station is not illuminated. The FHWA agrees and in this final rule adopts a new STANDARD with three methods of signaling with a flashlight to provide consistency with the other commonly used flagging procedures using other hand signaling devices. Signaling with a flashlight is an optional flagging procedure, but if a highway agency chooses to allow it, the FHWA believes that it is critical to include uniform methods of flashlight signaling so that road users are not confused in work zone flagging operations. The flashlight signaling methods are those that are in common use.

455. In the NPA, the FHWA proposed to add three new sections following Section 6E.03: Section 6E.04 Automated Flagger Assistance Devices, Section 6E.05 STOP/SLOW Automated Flagger Assistance Devices, and Section 6E.06 Red/Yellow Lens Automated Flagger Assistance Devices. Automated Flagger Assistance Devices (AFADs) are optional devices that enable a flagger(s) to be positioned out of the lane of traffic and are used to control road users through TTC zones. Four State DOTs, two local DOTs, ATSSA, and three construction-related companies agreed with the proposed addition of AFADs to the MUTCD. A State DOT, a local DOT, and an NCUTCD member opposed the inclusion of AFADs in the MUTCD because of a lack of experimentation and reliability. The FHWA disagrees and notes that this device has been used with an Interim Approval in many jurisdictions for approximately five years and no operational problems have ever been reported. The FHWA adopts in this final rule the AFAD sections into the MUTCD, based on FHWA's revised Interim Approval, dated January 28, 2005.[188]

456. In Section 6E.04 Automated Flagger Assistance Devices, the FHWA in the NPA proposed to allow the use of AFADs. The NCUTCD opposed the proposal to allow AFADs that use red and yellow lenses. Two State DOTs, a highway safety institute, eight construction-related companies, and an NCUTCD member recommended allowing AFADs that use red and yellow lenses and the FHWA agrees. Both types of AFADs have been used with the FHWA's revised Interim Approval, dated January 28, 2005,[189] and no operational problems have been reported with either device. The FHWA adopts the section including both types of AFADs into the MUTCD in this final rule.

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The FHWA in this final rule does not adopt the NPA proposed GUIDANCE that recommended that AFADs should only be used after an engineering study determines they are appropriate. The NCUTCD, four State DOTs, a local DOT, and ATSSA recommended the removal of the statement and the FHWA agrees that an engineering study is not necessary for each individual use of AFADs.

The FHWA in the NPA proposed a STANDARD prohibiting AFADs from being a substitute for or a replacement for a continuously operating temporary traffic control signal. The NCUTCD opposed the proposed STANDARD. The FHWA disagrees and adopts the proposal in this final rule because it believes that paragraph 07 emphasizes the point that AFADs are to assist the flagger and not to be operated independently.

The FHWA does not adopt in this final rule the NPA proposed condition that AFADs be less than 800 feet apart to allow a single flagger to simultaneously operate two AFADs or simultaneously operate a single AFAD at one end while being a flagger at the other end of the TTC zone. A State DOT, ATSSA, and a construction-related company recommended that the distance be increased to 1,500 feet apart based on successful tests. The NCUTCD recommended that the proposed distance limitation be deleted. The FHWA disagrees with increasing the maximum distance to 1,500 feet because documentation of effects from such an increase has not been provided. However, the FHWA agrees with the NCUTCD that there is also no reason to have a specific number of feet as a maximum distance, because there is a wide variability of conditions under which AFADs are used and engineering judgment can suffice. Therefore, the FHWA adopts paragraph 14 without the item C that was proposed in the NPA.

The FHWA does not adopt in this final rule the NPA proposed GUIDANCE recommending that an AFAD be removed from its normal operating position when not in use. The NCUTCD and three State DOTs recommended that the statement be upgraded to a STANDARD. The FHWA notes that there is a STANDARD in Section 6B.01 that requires that TTC devices be removed or covered when work is suspended for short periods of time.

The FHWA proposed in the NPA to recommend that a State or local agency that elects to use AFADS should adopt a policy governing AFAD applications. Based on comments from the NCUTCD and a local DOT, the FHWA in this final rule adopts a revised paragraph 17 to add the phrase ''based on engineering judgment'' to recommend that a State or local agency that elects to use AFADs should adopt a policy, based on engineering judgment, governing AFAD applications.

457. In Section 6E.05 STOP/SLOW Automated Flagger Assistance Devices, the FHWA proposed in the NPA to provide STANDARDS and GUIDANCE for the use of a remotely controlled STOP/SLOW sign on either a trailer or a movable cart system and a gate arm. One flagging company opposed the STOP/SLOW variety of AFAD because it could present problematic situations. The FHWA disagrees and notes that this device has been used with an Interim Approval (as discussed above) for approximately five years and no operational problems have been reported. The FHWA adopts the section concerning the STOP/SLOW AFAD in the MUTCD in this final rule.

Four State DOTs commented on the proposed height of 6 feet to the bottom of the STOP/SLOW sign and recommended that it match the proposed height of 7 feet for the flagger paddle. As discussed above in item 454,

[188] The Revised Interim Approval notice can be viewed at the following Internet Web site: *http://mutcd.fhwa.dot.gov/pdfs/ia_afads012705.pdf.*

[189] The Revised Interim Approval notice can be viewed at the following Internet Web site: *http://mutcd.fhwa.dot.gov/pdfs/ia_afads012705.pdf.*

the FHWA does not adopt in this final rule a specific height for the flagger paddle, so consistency is no longer an issue. The FHWA adopts paragraph 02 as proposed in the NPA.

The NCUTCD and a State DOT recommended removing the Stop Beacon from the proposed list of active conspicuity devices that shall supplement the AFAD's STOP/SLOW sign. The FHWA disagrees and notes that the decision was made to keep the Stop Beacon rather than change to a steady burn red indication because the Stop Beacon is appropriate for use with a STOP sign, which is the sign used in this variety of AFAD. In this final rule, the FHWA adopts the Stop Beacon in the list of supplemental active conspicuity devices in paragraph 04 item B as proposed in the NPA.

In the NPA, the FHWA proposed a STANDARD to require that a gate arm, if used, shall be covered with alternating red and white retroreflective stripes at 6-inch intervals. The NCUTCD and four State DOTs recommended changes to the NPA proposed language for gate arms that should accompany the STOP/SLOW AFAD. Based on these comments, the FHWA adopts in this final rule a revised paragraph 11 to require that gate arms, if used, shall be fully retroreflectorized on both sides and that the retroreflective stripes shall be spaced at 16-inch intervals. Similar changes are also adopted in Section 6E.06.

458. In Section 6E.06 Red/Yellow Lens Automated Flagger Assistance Devices, the FHWA in the NPA proposed a new section allowing the use of remotely controlled red and yellow lenses with a gate arm. The NCUTCD and an NCUTCD member opposed the proposed red/yellow lens type of AFADs. The FHWA disagrees and notes that this device has been used with an Interim Approval (as discussed above) for approximately five years and no operational problems have ever been reported. The FHWA adopts in this final rule the new section as proposed in the NPA with editorial changes.

459. In Section 6E.07 Flagger Procedures, the FHWA proposed in the NPA to add a STANDARD that flaggers shall use a STOP/SLOW paddle, flag, or an AFAD to control road users approaching a TTC zone, and that the use of hand movements alone is prohibited. This additional language was proposed to protect the safety of workers and road users, and reinforces that hand movements alone are not an acceptable flagging method. The NCUTCD and a local DOT opposed the reference to AFADs in the proposal. The FHWA notes that with the addition of AFADs to the MUTCD, an AFAD is an acceptable device for a flagger. Two local DOTs agreed with the prohibition of hand movements alone for flaggers. Four State DOTs, three local DOTs, a member of the U.S. House of Representatives, and an NCUTCD member opposed the prohibition of the use of hand movements alone and recommended an exemption for law enforcement and emergency situations. The FHWA in this final rule adopts a modified paragraph 02 that prohibits the use of hand movements alone, but establishes an exception for law enforcement personnel or emergency responders at incident scenes.

The FHWA also proposed in the NPA to revise a GUIDANCE to recommend that a flagger should stand alone, away from other workers. Based on a comment from a State DOT and for consistency with normal work zone worker safety practices, the FHWA in the final rule adopts paragraph 06 to also recommend that flaggers should stand away from work vehicles or equipment.

460. In Section 6E.08 Flagger Stations, the FHWA proposed in the NPA to add to the GUIDANCE that an escape route for flaggers should be identified. Based on comments from two State DOTs, the FHWA adopts in this final rule a revised paragraph 03 to state that the flagger should identify an escape route for protection from errant vehicles to clarify why the escape route is necessary.

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Discussion of Amendments Within Chapter 6F

461. In Table 6F–1 Temporary Traffic Control Zone Sign and Plaque Sizes, the FHWA proposed in the NPA to adopt revised sign sizes in the Freeway or Expressway column and in the Minimum column for several signs. A State DOT, ATSSA, and a transportation research institute recommended additional sign size changes to make the signs more legible for drivers with 20/40 visual acuity and to assure that the signs are large enough to use for TTC on high-speed freeways. The FHWA agrees and in this final rule adopts the changes for consistency with the adopted sign sizes in Part 2.

A State DOT and a transportation research institute also recommended adding to the Freeway or Expressway column a sign size of 48 inches for the Stop sign and 24 inches for the Stop sign on a Stop/Slow Paddle because there are applications for Stop signs in freeway/expressway TTC applications. The FHWA agrees that this is appropriate and consistent with provisions in Chapter 2B and revises the table in this final rule.

462. In Section 6F.02 General Characteristics of Signs, the FHWA proposed in the NPA to expand a STANDARD to require that the minimum sign sizes shown in Table 6F–1 shall only be used on local streets or roadways where the 85th percentile speed or posted speed limit is less than 35 mph. A State DOT agreed with the change. A local DOT recommended that the 85th percentile speed be used exclusively. The FHWA disagrees because relying only on the 85th percentile speed would require an agency to do a speed study on all streets and roadways, which is impractical. The FHWA adopts in this final rule paragraph 09 as proposed in the NPA.

463. In Section 6F.03 Sign Placement, the FHWA proposed in the NPA to add additional language discussing the minimum mounting heights for TTC signs. A State DOT, two local DOTs, and an NCUTCD member questioned why the mounting height requirements were not consistent with Part 2. Based on the comments, the FHWA in this final rule adopts revisions to paragraphs 04, 05, and 06 to match the language from Section 2A.18 for consistency.

464. In Section 6F.04 Sign Maintenance, a State DOT and a consultant recommended that the existing STANDARD statement be revised to GUIDANCE to be consistent with Section 2A.22 and that Section 2A.08 be referenced concerning minimum retroreflectivity. The FHWA agrees and adopts paragraphs 01 and 02 as GUIDANCE and adds a SUPPORT that references Section 2A.08 in this final rule.

465. The FHWA proposed in the NPA a new section numbered and titled Section 6F.12 Work Zone and Higher Fines Signs and Plaques, which describes the use of the plaques supplementing a Speed Limit sign to emphasize that a reduced speed limit is in effect within a TTC zone and that increased fines are imposed for traffic violations within the TTC zone. Based on comments from two State DOTs, the FHWA revises one of the proposed OPTIONS to a GUIDANCE to recommend, rather than merely allow, that a BEGIN HIGHER FINES ZONE sign should be installed at the upstream end of a work zone where increased fines are imposed for traffic violations and an END HIGHER FINES ZONE sign should be installed at the downstream end of the work zone. The FHWA adopts this language in this final rule consistent with the language adopted in Sections 2B.17 and 7B.10.

466. In Section 6F.23 CENTER LANE CLOSED AHEAD Sign, a State DOT and a transportation research institute

recommended removing the existing Center Lane Closed Ahead (W9–3a) symbol sign because the symbol sign was confusing in its meaning. Although this was not proposed in the NPA, the FHWA agrees and in this final rule removes the OPTION for using the sign and revises the title of the section. This symbol has not undergone human factors testing to confirm that its meaning can be comprehended by road users. The FHWA also removes the symbol sign from Figures 6F–4 and 6H–38 in this final rule.

467. In the NPA, the FHWA proposed to add a new section numbered and titled Section 6F.30 NEW TRAFFIC PATTERN AHEAD Sign, which describes the optional use of the NEW TRAFFIC PATTERN AHEAD sign to provide advance warning of a change in traffic patterns, such as revised lane usage, roadway geometry, or signal phasing. A local DOT and ATSSA supported the addition of the new sign. A State DOT and a consultant opposed the new sign and preferred signs that are more descriptive. The FHWA disagrees and notes that a more specific word message can be used if appropriate. The FHWA in this final rule adopts the proposed OPTION in paragraph 01. Based on comments from two DOTs that a maximum time limit on display of the sign is needed, the FHWA adopts in this final rule a new GUIDANCE in paragraph 02 to recommend that, in order to retain its effectiveness, the sign should be displayed for up to 2 weeks and then be removed.

468. In Section 6F.31 Flagger Signs, the FHWA proposed in the NPA to add an OPTION to allow Flagger signs to remain displayed to road users for up to 15 minutes when flagging operations are not occurring under certain circumstances. While two State DOTs and a local DOT agreed with the proposal, three other State DOTs and another local DOT opposed the proposal. In addition, a State DOT, ATSSA, and a transportation research institute recommended that the proposed 15-minute time period should be increased to 30 minutes. The FHWA decides not to adopt the proposed OPTION in this final rule and also deletes an existing STANDARD that stated that the Flagger sign shall be removed, covered, or turned away from road users when the flagging operations are not occurring. The FHWA notes that this sign is no different from other TTC signs and there is an existing provision in Section 6B.01 that addresses removal of signs that are no longer applicable.

469. In Section 6F.44 Shoulder Signs and Plaque, the FHWA proposed in the NPA a Shoulder Drop-Off symbol (W8–17) sign with a SHOULDER DROP-OFF (W8–17p) supplemental plaque. Consistent with the adopted changes to Chapter 2C, the FHWA in this final rule adopts the W8–17 symbol sign as the Shoulder Drop-Off warning sign with a SHOULDER DROP-OFF (W8–17p) supplemental plaque and deletes the SHOULDER DROP-OFF word message sign (W8–9a in the 2003 MUTCD).

470. In Section 6F.45 UNEVEN LANES Sign, the FHWA proposed in the NPA an optional Shoulder Drop-Off symbol sign (W8–17) with an UNEVEN LANES supplemental plaque that could be used instead of the UNEVEN LANES word sign. Two State DOTs, a local DOT, and ATSSA agreed with the proposal. Three other State DOTs, three local DOTs, and an NCUTCD member opposed the new sign because the meaning was unclear. Consistent with the adopted changes to Chapter 2C, the FHWA in this final rule adopts the W8–17 symbol sign as the Shoulder Drop-Off warning sign. The FHWA in this final rule does not adopt the UNEVEN LANES (W8–11p) supplemental plaque that was proposed in the NPA, and retains the existing W8–11 UNEVEN LANES word message sign.

471. The FHWA proposed in the NPA to add a new STEEL PLATE ON PAVEMENT (W8–24) sign in Section 6F.45. A State DOT recommended that a separate section be added specifically for this sign. The FHWA agrees and in this final rule renames the sign and relocates the text to a new section, numbered and titled Section 6F.46 STEEL PLATE AHEAD Sign.

472. In Section 6F.47 NO CENTER LINE Sign (numbered Section 6F.46 in the NPA), a State DOT recommended revising the existing title and sign name from NO CENTER STRIPE to NO CENTER LINE to better describe what the sign is used for. The FHWA agrees and adopts a revised name for the title and sign, for consistency with similar adopted changes in Chapter 2C. The FHWA also adopts revisions to the sign in Figure 6F–4.

473. In the NPA the FHWA proposed a new section, numbered and titled Section 6F.48 Reverse Curve Signs (numbered Section 6F.47 in the NPA), that contained OPTION and STANDARD statements describing the use of the Reverse Curve signs to give road users advance notice of a lane shift. The NCUTCD, five State DOTs, two local DOTs, a transportation research institute, and three NCUTCD members recommended changes to the proposed section, including changing the proposed STANDARD to GUIDANCE, and limiting the number of lanes displayed on the multi-lane versions of the sign. Based on the comments, the FHWA adopts in this final rule the proposed section, adds an OPTION to allow the use of a new ALL LANES (W24–1cP) plaque with the W1–4 sign, and adds an OPTION to allow a rectangular version of the multi-lane sign if there are more than three lanes being shifted. The FHWA also adopts a new GUIDANCE that recommends the Reverse Turn (W1–3) sign if the design speed of the curve is 30 mph or less to be consistent with the existing GUIDANCE for Typical Applications in Chapter 6H. The FHWA in this final rule also adopts revised language in Section 6F.49 Double Reverse Curve Signs that match the adopted language in Section 6F.48. The FHWA revises Figure 6F–4 to include the new ALL LANES plaque.

474. In Figure 6F–4 Warning Signs in Temporary Traffic Control Zones, the FHWA adopts in the final rule revisions to warning signs and plaques in the figure based on adopted changes to Chapter 6F and Part 2.

475. In the NPA, the FHWA proposed to relocate all of the information from Section 6F.58 PILOT CAR FOLLOW ME Sign (numbered Section 6F.54 in the 2003 MUTCD), to Section 6C.13, because the information is related specifically to pilot cars, which are covered in Section 6C.13. A State DOT opposed the proposed deletion of the section from Chapter 6F. In this final rule, the FHWA retains the first sentence of the existing STANDARD in Section 6F.58 and adds a reference to Section 6C.13 for details on the usage of this sign.

476. In Section 6F.60 Portable Changeable Message Signs (numbered Section 6F.57 in the NPA) the FHWA proposed in the NPA to change paragraph 01 from STANDARD to SUPPORT because this statement just provides information, rather than requirements. The FHWA proposed to change paragraph 07 from GUIDANCE to STANDARD in order to require that Portable Changeable Message signs comply with specific chapters and tables in the MUTCD. The FHWA proposed to revise several GUIDANCE paragraphs to clarify the recommendations for messages and phases, and to clarify that Portable Changeable Message signs should be placed off the shoulder of the roadway and behind a traffic barrier. The FHWA also proposed to delete the existing OPTION allowing smaller letter sizes on Portable Changeable Message signs and multiple signs to display an entire message because the proposed GUIDANCE updates this information. The FHWA proposed a new

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STANDARD in the NPA, but adopts it as GUIDANCE in paragraph 17 in this final rule to recommend, rather than require, the number of phases and number of lines, placement of message within each line, techniques for message display, and interaction between signs if more than one is simultaneously visible to road users. The FHWA adopts the other changes proposed for this section in the NPA in this final rule to be consistent with the adopted changes for permanent Changeable Message signs in new Chapter 2L, but with differences to suit the special nature of Portable Changeable Message Signs. These changes are based on extensive research on changeable message sign legibility, messaging, and operations conducted over a period of many years by the Texas Transportation Institute.[190] The FHWA did not receive any comments on the proposed changes to this section.

477. In Section 6F.61 Arrow Boards (numbered Section 6F.58 in the NPA), the FHWA proposed to revise the GUIDANCE in paragraph 09 to clarify the measurement for the minimum mounting height of an arrow board. A State DOT recommended replacing the word ''panel'' with ''board.'' The FHWA agrees and in this final rule replaces the word ''panel'' with ''board'' throughout the section, including in the title because the device is most commonly known by that term and because ''panel'' is defined in the adopted definitions in Section 1A.13 as applying to static signs.

A local DOT recommended revising the existing STANDARD that prohibited the use of arrow boards from being used to laterally shift traffic because the existing language is confusing. The FHWA agrees and adopts in this final rule a modified paragraph 25 to require that arrow boards shall only be used to indicate a lane closure and that they shall not be used for lane shifts, for consistency with other requirements.

A State DOT requested that the ''Alternating Diamond'' mode be added to the approved list of mode selections on an arrow board for consistency with the addition of this type of display in Figure 6F–6, as discussed below. The FHWA agrees and adopts a modified paragraph 16 item C to include the Alternating Diamond mode.

478. In Figure 6F–6 Advance Warning Arrow Board Display Specifications, the FHWA proposed in the NPA the Alternating Diamond display as one of the options for a Flashing Caution display. Two State DOTs and a local DOT agreed with the proposal. A State DOT and a local DOT opposed the proposed change because they believe the display could cause driver confusion and because the symbol is already used for HOV facilities and could create an inconsistent message. The FHWA disagrees and notes that experimentation did not identify this issue as a problem and that it is only an option for an agency to use. The FHWA adopts the Alternating Diamond in this final rule as an option for a Flashing Caution display.

479. In Section 6F.63 Channelizing Devices (numbered Section 6F.60 in the NPA), the FHWA proposed in the NPA to add a STANDARD in paragraph 01 that all channelizing devices shall be crashworthy. A local DOT agreed with the change. The FHWA adopts in this final rule the STANDARD as proposed in the NPA. Based on a comment from a State DOT and a transportation research institute, the FHWA also deletes an existing GUIDANCE stating that channelizing devices should be crashworthy because it would be contradictory to the new STANDARD.

The NCUTCD, two State DOTs, and an NCUTCD member suggesting revised language for the STANDARD in paragraph 05 concerning channelizing devices used to channelize pedestrians to be consistent with the STANDARD proposed in Section 6F.68. Another State DOT commented that the proposed text in paragraph 05 on channelizing pedestrians was ambiguous. The NCUTCD, a State DOT, and an NCUTCD member also recommended retaining an existing OPTION in Section 6F.60, which the FHWA proposed in the NPA to relocate to Section 6F.68, regarding the height of the gap between the bottom rail and the ground surface that may be used to facilitate drainage in the section, and recommended revising the allowable gap from 6 inches to 2 inches. The FHWA agrees with all of these comments and in this final rule adopts a revised paragraph 05 that relocates to Section 6F.63 the STANDARD that was proposed in Section 6F.68 to simplify the requirements for the placement of channelizing devices for channelizing pedestrians. The FHWA also adopts a revised OPTION that allows a gap of up to 2 inches to comply with Section 6F.74 and relocates to Section 6F.63 the OPTION that was proposed in Section 6F.68.

480. In Section 6F.64 Cones (numbered Section 6F.61 in the NPA), the NCUTCD recommended deleting the existing GUIDANCE concerning the use of cones for pedestrian channelization or pedestrian barriers in TTC zones, to be consistent with adopted language in Section 6D.01. The FHWA agrees and removes the GUIDANCE in this final rule.

481. In Section 6F.65 Tubular Markers (Section 6F.62 in the NPA), the FHWA in the NPA proposed to revise the STANDARD in paragraph 03 to expand the requirements for reflectorization bands on tubular markers. The NCUTCD and a State DOT suggested increasing the maximum distance from the orange band to the top of the tubular marker from 4 inches to 6 inches to be consistent with the requirement for retroreflective stripes on drums. The FHWA agrees and adopts in this final rule a revised STANDARD to be consistent with the retroreflective striping of other devices.

The NCUTCD recommended deleting the existing GUIDANCE concerning the use of tubular markers for pedestrian channelization or as pedestrian barriers in TTC zones, to be consistent with the language adopted in Section 6D.01. The FHWA agrees and deletes the GUIDANCE in this final rule.

A State DOT suggested deleting the existing STANDARD that described the use of a noncylindrical tubular marker, because it was redundant and conflicted with the previous STANDARD. The FHWA agrees and in this final rule removes the paragraph as suggested.

482. In Section 6F.66 Vertical Panels (Section 6F.63 in the NPA), the FHWA proposed in the NPA to require that the dimensions listed in the section refer to the ''retroreflective material'' on the vertical panels. The FHWA adopts the STANDARDS in the final rule with additional revisions that better clarify the intent of the section.

In the NPA, the FHWA proposed to change an OPTION to a STANDARD to require, rather than merely permit, a panel stripe width of 4 inches to be used where the height of the reflective material on a vertical panel is 36 inches or less. Based on comments from a State DOT and an NCUTCD member that the proposed requirement was too restrictive, the FHWA in this final rule maintains the use of 4-inch wide panel stripes as an OPTION for vertical panels that are 36 inches in height or less.

483. In Section 6F.67 Drums (numbered Section 6F.64 in the NPA), the FHWA proposed in the NPA to change a GUIDANCE to a STANDARD to prohibit weighting drums with sand, water, or any material to the extent that would make them hazardous to road users or workers when struck. As part of this change, the FHWA also proposed to delete another GUIDANCE discussing the use of drain holes to prevent water

[190] Information on the many research projects on changeable message signs conducted by the Texas Transportation Institute (TTI) can be accessed via TTI's Internet Web site at: *http://tti.tamu.edu/*.

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from accumulating and freezing. This recommendation is not necessary since there is a STANDARD that requires drums to have a closed top, thus reducing the possibility of any water actually accumulating in the device. A local DOT supported the proposal. Two State DOTs, five local DOTs, and a consultant opposed the proposed changes because the word ''hazardous'' is too subjective for a STANDARD statement. The FHWA in this final rule retains the existing text from the 2003 MUTCD in paragraph 04 and does not adopt the proposed changes. Based on a comment from the NCUTCD, the FHWA deletes an existing GUIDANCE concerning the use of drums for pedestrian channelization or pedestrian barriers in TTC zones, to be consistent with language adopted in Section 6D.01.

484. In Section 6F.68 Type 1, 2, or 3 Barricades (Section 6F.65 in the NPA), the FHWA proposed in the NPA a new STANDARD requiring continuous detectible bottom and top rails with no gaps on barricades that are used to channelize pedestrians. The FHWA also proposed to relocate an OPTION from Section 6F.63 to allow a gap of up to 6 inches between the bottom rail and the ground surface to facilitate drainage. Based on comments from a State DOT and a transportation research institute, the FHWA in this final rule revises the allowable gap in the OPTION to 2 inches to comply with Section 6F.74. Based on comments from the NCUTCD and a State DOT, the FHWA adopts and relocates the proposed STANDARD and OPTION statements to Section 6F.63, as described in item 479 above.

The NCUTCD, two State DOTs, a transportation research institute, and two local DOTs opposed the proposed STANDARD regarding barricade placement in conformance with application and installation requirements. The FHWA agrees and in this final rule does not adopt the proposed statement.

Based on comments from the NCUTCD and a State DOT, the FHWA in this final rule deletes an existing STANDARD and does not adopt the proposed GUIDANCE that discussed the use of ballasts. The FHWA agrees with the commenters that the information is already adequately covered elsewhere in Chapter 6F and does not need to be repeated in this section.

485. In Section 6F.70 Temporary Traffic Barriers as Channelizing Devices (numbered Section 6F.67 in the NPA), the FHWA proposed in the NPA to delete the STANDARD requiring that temporary traffic barriers be supplemented with delineation, pavement markings, or channelizing devices. A State DOT and a transportation research institute opposed the revision because the temporary barrier will be difficult to see at night without those traffic control devices. The FHWA agrees and in this final rule retains the existing provision.

In the NPA, the FHWA proposed to change a GUIDANCE to a STANDARD in order to prohibit, rather than discourage, the use of temporary traffic barriers for a merging taper, except in low-speed urban areas. The FHWA proposed this change to provide consistency on the use of temporary traffic barriers within this section. A State DOT opposed the proposed change. The FHWA agrees and retains the provision as GUIDANCE in this final rule due to inconsistency with other provisions. The FHWA notes that this section allows temporary traffic barriers to be used for a merging taper in low-speed urban conditions or for a constricted/restricted TTC zone.

The FHWA also proposed to add a new STANDARD that temporary traffic barriers shall be placed in conformance with the application and installation requirements for the specific device being used. The NCUTCD, two State DOTs, and a transportation research institute commented that this statement is not needed because if a device is not in compliance with the application, then it is not in compliance with the MUTCD. The FHWA believes that the statement does not add anything to the meaning of the section and does not adopt the proposal in this final rule.

The FHWA proposed a new STANDARD statement requiring that temporary traffic barriers that are used to channelize pedestrians meet specific criteria that aid pedestrians with visual disabilities, to be consistent with requirements elsewhere in Part 6. The NCUTCD and a State DOT suggested deleting this provision because it is repetitive of Section 6F.74 while ATSSA suggested revising the provision to be consistent with Section 6F.74. The FHWA does not adopt proposed STANDARD in this final rule because it is repetitive of the language in Section 6F.74.

486. As proposed in the NPA, the FHWA in this final rule retitles Section 6F.71 (numbered Section 6F.68 in the NPA) to ''Longitudinal Channelizing Devices,'' to expand the section to include additional devices besides barricades that serve this purpose. The FHWA proposed in the NPA to remove an OPTION that allowed the devices to be hollow and filled with water as ballast. The NCUTCD, a State DOT, and six traffic control device companies opposed the proposed change because these devices are water filled devices. The FHWA agrees and in this final rule maintains the OPTION statement in the Manual.

The NCUTCD, two State DOTs, and a transportation research institute opposed a proposed STANDARD requiring that longitudinal channelizing devices be placed in compliance with the application and installation requirements of the device. Similar to the same issue discussed above in Section 6F.70, the FHWA does not adopt the proposed STANDARD because the FHWA decides that the proposed statement does not add any meaningful information to the section.

A State DOT and a transportation research institute recommended revising an existing statement to require, instead of recommend, that channelizing devices be interlocked if used for pedestrian control. The FHWA agrees and revises paragraph 07 from GUIDANCE to STANDARD in this final rule to be consistent with the adopted language in Section 6F.63.

Based on a comment from a State DOT, the FHWA adopts in the final rule paragraph 03 to recommend the use of retroreflective material or delineation on longitudinal channelizing devices when used to channelize vehicular traffic at night, consistent with similar provisions elsewhere in Part 6.

487. In the NPA, the FHWA proposed to add a new section, numbered and titled Section 6F.72 Temporary Lane Separators (numbered Section 6F.70 in the NPA), which describes the use of these optional devices that may be used to channelize road users, to divide opposing vehicular traffic lanes, to divide lanes when two or more lanes are open in the same direction, and to provide continuous pedestrian channelization. ATSSA and a traffic control device manufacturer agreed with the proposal. A State DOT, two local DOTs, a pedestrian/bicyclist organization, an NCUTCD member, and three citizens opposed the proposed section because they believe that temporary lane separators are not compatible with bicycle travel. The FHWA disagrees with the comments and notes that the device is optional and the agencies should determine whether or not to use it if there are problems with bicycle interaction. The FHWA adopts the proposed text in this final rule and relocates this section to be Section 6F.72, so it will precede Section 6F.73 Other Channelizing Devices (numbered Section 6F.69 in the NPA) for better organization of the chapter.

The FHWA also proposed in the NPA a STANDARD to restrict temporary lane separators to a maximum of 4 inches in

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height and 1 foot in width. A local DOT agreed with the proposal. The NCUTCD, a State DOT, and an NCUTCD member recommended a minimum height of 2.5 inches for the devices. A traffic control device manufacturer opposed the recommendation from the NCUTCD and agreed with the NPA proposal. The FHWA decides to adopt in this final rule paragraph 02 as proposed in the NPA and notes that no reasoning was given for the proposed minimum height, which could eliminate devices currently in use.

The FHWA also proposed an OPTION to allow the use of approved channelizing devices to supplement temporary lane dividers. ATSSA recommended this statement be upgraded to GUIDANCE. A State DOT, a transportation research institute, and a traffic device manufacturer recommended this statement be upgraded to a STANDARD. The FHWA disagrees and notes that paragraph 03 addresses the visibility of temporary lane separators if supplemental channelizing devices are not used. The FHWA adopts the OPTION as proposed in the NPA.

A State DOT and a transportation research institute recommended a new STANDARD to require an opening in temporary lane dividers at pedestrian crossing locations. The FHWA agrees and adds paragraph 06 for consistency with ADAAG, which requires at least a 60-inch wide pathway for the crossing pedestrian.

488. In Section 6F.75 Temporary Raised Islands (numbered Section 6F.72 in the NPA), the FHWA proposed in the NPA to change the recommended width of temporary raised islands from at least 18 inches to at least 12 inches. This change facilitates the use of existing devices that have been successfully used in many applications. The NCUTCD recommended a width of 10 inches. The FHWA disagrees because no reasoning was provided for a smaller width than 12 inches. The FHWA adopts in this final rule the change to paragraph 04 as proposed in the NPA.

489. In Section 6F.77 Pavement Markings (numbered Section 6F.74 in the 2003 NPA), the FHWA proposed in the NPA to differentiate the usage of pavement markings in long-term stationary temporary traffic control zones from those used in intermediate-term and short-term temporary traffic control zones. For long-term stationary operations, the FHWA proposed to revise the existing STANDARD in paragraph 04 to require that obliteration of markings in the temporary traveled way that are no longer applicable shall remove ''all of the non-applicable pavement marking material, and the obliteration method(s) shall minimize pavement scarring.'' The NCUTCD and an NCUTCD member opposed the proposed change and recommended the statement be changed to GUIDANCE. The FHWA disagrees with the commenters and believes that removal of conflicting markings is essential for safety and that the NPA language is easier to understand. A State DOT opposed the use of the words ''all of'' because it is not practical. The FHWA agrees with the State DOT and in this final rule adopts the revised STANDARD in paragraph 04 as proposed in the NPA, with the exception of the words ''all of,'' which the FHWA does not adopt in this final rule.

490. In Section 6F.78 Temporary Markings (Section 6F.75 in the NPA), the FHWA proposed in the NPA in paragraph 02 to recommend that temporary pavement markings should not remain in place for more than 14 days after the application of the pavement surface treatment or the construction of the final pavement surface on new roadways or over existing pavements unless justified by an engineering study. Based on comments from the NCUTCD, two State DOTs, and an NCUTCD member, the FHWA replaces ''an engineering study'' with ''engineering judgment'' in the GUIDANCE adopted in this final rule to allow more flexibility.

In the NPA, the FHWA proposed to relocate an existing STANDARD from Section 6F.77 to Section 6F.78 that requires that all pavement markings and devices used to delineate road user paths shall be carefully reviewed during daytime and nighttime periods. The NCUTCD and an NCUTCD member recommended changing the STANDARD to GUIDANCE and removing the word ''carefully'' from the statement. The FHWA agrees that mandatory language is too restrictive in this case and adopts paragraph 06 in this final rule as GUIDANCE and removes the word ''carefully'' from the statement.

Based on a comment from a State DOT, the FHWA adopts a new GUIDANCE statement that recommends that the NO CENTER LINE sign, if used, should be placed in accordance with Section 6F.47. The FHWA adds paragraph 10 in this final rule to be consistent with the adopted GUIDANCE in Section 6F.47 that recommends the placement of the NO CENTER LINE sign at the beginning of the TTC zone and repeated at 2-mile intervals in long TTC zones when the work obliterates the center line pavement markings.

491. In Section 6F.79 Temporary Raised Pavement Markers (numbered Section 6F.76 in the NPA), the FHWA in the NPA proposed to add new STANDARD and GUIDANCE requiring the color of the raised pavement markers to simulate the color of the markings for which they substitute and that the pattern of the raised pavement markers should simulate the pattern of the markings for which they substitute. A local DOT agreed with the proposal. In this final rule, the FHWA adopts the two statements as a combined STANDARD in paragraph 02 to require that the color and pattern of the raised pavement markers to simulate the color and pattern of the markings for which they substitute, for consistency with similar provisions in Chapter 3B.

In the NPA, the FHWA proposed a STANDARD to describe the use of temporary raised pavement markers as a substitute for solid lines. The NCUTCD opposed the revision. The FHWA disagrees and believes that the proposed STANDARD in paragraph 04 improves clarity and in this final rule adopts the language as proposed in the NPA.

In the NPA, the FHWA proposed to allow the optional use of a less expensive pattern of raised pavement markers to substitute for a broken line marking and recommend that temporary raised pavement markers should not be in place for more than 14 days. A local DOT agreed with the proposal. The NCUTCD opposed the proposed OPTION. The FHWA disagrees and notes that the statement was removed from an existing STANDARD to make it an optional exception to the requirements of the STANDARD. A State DOT opposed the proposed GUIDANCE recommending a limit of 14 days for the devices. The FHWA disagrees and notes that it is consistent with the adopted language in Section 6F.78. The FHWA adopts in this final rule paragraphs 05 and 06 as proposed in the NPA.

492. In the NPA, the FHWA proposed to delete Section 6F.82 Floodlights (numbered Section 6F.76 in the 2003 MUTCD), because the FHWA believes that floodlights are not traffic control devices. Although a local DOT agreed with the proposal, the NCUTCD, three State DOTs, ATSSA, and a transportation research institute opposed the proposed deletion of the section because they believe the section provides useful information to the practitioner. The FHWA agrees to leave these types of devices in the MUTCD until a clear definition of traffic control devices is established in a future edition and in this final rule maintains the section as Section 6F.82 Floodlights,

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with the same text from the 2003 MUTCD.

493. As proposed in the NPA, the FHWA in this final rule deletes Section 6F.77 (as numbered in the 2003 MUTCD) Flashing Warning Beacons. Two State DOTs and ATSSA opposed the proposal because they did not want the language regarding the device to be removed from the Manual. The FHWA disagrees with the commenters and notes that the material is already covered in Chapter 4L and does not need to be repeated in Part 6.

494. In Section 6F.83 Warning Lights (numbered Section 6F.79 in the NPA), the FHWA proposed in the NPA to revise a STANDARD to require that the 30-inch minimum mounting height for warning lights be measured vertically from the bottom of the lens to the elevation of the near edge of the pavement. Two State DOTs and a transportation research institute opposed the change because it would preclude the use of warning lights on drums. The FHWA agrees and in this final rule retains paragraph 11 with the language from the 2003 MUTCD.

495. The FHWA in this final rule deletes Section 6F.79 (as numbered in the 2003 MUTCD) Steady-Burn Electric Lamps, as proposed in the NPA. A local DOT agreed with the change. A State DOT and a transportation research institute opposed the change because the device has appropriate applications. The FHWA disagrees and notes that the only difference between other warning lights and the steady burn electric lamp is the power source and that it is not necessary to include both in the Manual.

496. In Section 6F.84 Temporary Traffic Control Signals (numbered Section 6F.80 in the NPA), the FHWA proposed in the NPA a new STANDARD requiring temporary traffic signals placed within 200 feet of a highway-rail grade crossing or a highway-light rail transit grade crossing to have preemption unless arrangements are made to prevent traffic from queuing across the tracks. A State DOT and a local DOT supported the proposal. Based on comments from a State DOT, a transportation research institute, a local DOT, and an NCUTCD member, the FHWA in this final rule adopts a modified paragraph 13 to require that a uniformed officer or flagger shall be required at the crossing to prevent vehicles from stopping within the crossing if the temporary traffic control signal is not provided with preemption.

497. The FHWA proposed in the NPA to delete Section 6F.86 Crash Cushions (numbered Section 6F.82 in the 2003 MUTCD) because the FHWA believes that crash cushions are not traffic control devices and that adequate and appropriate guidance on crash cushions and vehicle arresting systems is readily available in a variety of FHWA, AASHTO, ITE, and industry publications and Web sites. A local DOT agreed with the proposal. The NCUTCD, five State DOTs, ATSSA, and a transportation research institute opposed the deletion of the section because they believe it provides important information on the topic. The FHWA agrees to leave these types of devices in the MUTCD until a clear definition of traffic control devices is established in a future edition and in this final rule maintains the section as Section 6F.86 Crash Cushions with the 2003 MUTCD text.

498. As proposed in the NPA, the FHWA in this final rule deletes Section 6F.83 (as numbered in the 2003 MUTCD) Vehicle Arresting Systems because they are not traffic control devices. A local DOT agreed with the proposal. The NCUTCD, a State DOT, ATSSA, and a local DOT opposed the deletion of the section because they did not want the information removed from the Manual. The FHWA disagrees and believes that the section does not provide any useful traffic control device information for practitioners.

499. The FHWA proposed in the NPA to delete Section 6F.88 Screens (numbered Section 6F.85 in the 2003 MUTCD), because the FHWA believes that glare screens are not traffic control devices. A local DOT agreed with the proposal. The NCUTCD, four State DOTs, a local DOT, a transportation research institute, a consultant, and a citizen opposed the deletion of the section because it provides information about screens that is not provided elsewhere. The FHWA agrees to leave these types of devices in the MUTCD until a clear definition of traffic control devices is established in a future edition and in this final rule maintains the section as Section 6F.88 Screens with the text from the 2003 MUTCD.

500. As proposed in the NPA, the FHWA in this final rule deletes Section 6F.86 (as numbered in the 2003 MUTCD) Future and Experimental Devices, because such devices are already covered in Part 1. The NCUTCD agreed with the change. A State DOT, a local DOT, and a transportation research institute opposed the change because the public needs to understand that new TTC devices must go through an experimentation process before being used. The FHWA disagrees and notes that the information is already contained in Section 1A.10.

Discussion of Final Rule Amendments Within Chapters 6G Through 6I

501. In Section 6G.01 Typical Applications, the FHWA proposed in the NPA to add GUIDANCE in paragraph 04 recommending that a TTC plan should be developed for all planned special events in conjunction with and approved by the highway agency or agencies having jurisdiction over the affected roadways. The NCUTCD and a local DOT supported the language as proposed. A State DOT and four other local DOTs noted that law enforcement agencies approve traffic control plans in their area. To address this concern, the FHWA adopts in this final rule revised language that removes the specification that ''highway'' agencies approve TTC plans, leaving it flexible to have the appropriate agency having jurisdiction approve TTC plans. Two State DOTs, two local DOTs, an NCUTCD member, a transportation research institute, a pedestrian/bicyclist association, and three citizens opposed the language proposed in the NPA requiring that ''all'' special planned events have TTC plans. The commenters suggested that such language was too inclusive and should be limited only to those events affecting traffic operations. The FHWA agrees in part and adopts revised language in this final rule accordingly. For those events that will not have traffic impacts, the TCC plan will be minimal. The FHWA adopts these changes to help assure that proper traffic controls are installed when planned special events, such as parades, street fairs, farmers' markets, etc., impact traffic, and to respond to a National Transportation Safety Board (NTSB) report on this subject.[191]

502. In Section 6G.02 Work Duration, a State DOT requested clarification of the existing STANDARD and OPTION paragraphs on the treatments of mobile operations at speeds between 3 mph and 20 mph because it is unclear if the existing language applies to these speeds. The FHWA agrees that clarification is necessary and in this final rule revises the STANDARD in paragraph 22 to apply to the treatments of mobile operations for all speeds and deletes the last two OPTION paragraphs in the 2003 MUTCD.

503. In Section 6G.04 Modifications to Fulfill Special Needs, the FHWA proposed to remove the last GUIDANCE statement recommending that typical

[191] NTSB Report HAR–04/04, ''Rear End Collision and Subsequent Vehicle Intrusion into Pedestrian Space at Certified Farmers' Market, Santa Monica, California, July 16, 2003,'' dated August 3, 2004, can be viewed at the following Internet Web site: *http://ntsb.gov/publictn/2004/HAR0404.pdf.*

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applications be modified where pedestrian or bicycle usage is high. A State DOT opposed the revision because it is a good reminder regarding accommodation of bicyclists and pedestrians. The FHWA agrees and in this final rule adopts revisions to the GUIDANCE in paragraph 03 to include pedestrian routes as item F and bicycle diversions as item G in the list of conditions when typical applications should be modified.

504. In Section 6G.11 Work Within the Traveled Way of Urban Streets, the FHWA proposed to relocate the first paragraph of the first STANDARD in the 2003 MUTCD to Section 6D.01 because the information about maintaining accessibility and detectability along pedestrian routes is most appropriately covered in Section 6D.01. The FHWA adopts the proposed relocation in this final rule.

A State DOT recommended modifying the existing STANDARD in paragraph 05 to require that both pedestrian and vehicular access be provided to transit stops that are affected and relocated because of work activity. The FHWA adopts this change in this final rule to clarify and reiterate that full accessibility to transit stops is required during work activity, consistent with provisions in Chapter 6D.

505. In Section 6G.12 Work Within the Traveled Way of Multi-Lane, Non-Access Controlled Highways, a State DOT recommended a new OPTION to allow a single continuous taper to be used where operating speeds are 40 mph or less and the space approaching the work area does not permit moving traffic over one lane at a time. The FHWA agrees that this flexibility is needed and can be appropriately applied in lower speed conditions and in this final rule adopts the new OPTION in paragraph 13.

506. In Section 6G.13 Work Within the Traveled Way at an Intersection, the FHWA proposed in the NPA to modify the existing GUIDANCE in paragraph 04 to recommend, among other things, the relocation of signal heads to provide improved visibility. The NCUTCD and an NCUTCD member recommended changing ''improved'' to ''adequate'' visibility, for consistency with the other conditions in the sentence. The FHWA agrees and in this final rule adopts the proposed revision and also references Part 4 for the description of adequate visibility for signal heads.

507. In the NPA, the FHWA proposed to reverse the order of Chapters 6H and 6I of the 2003 MUTCD so that Chapter 6H would be Control of Traffic Through Traffic Incident Management Areas and Chapter 6I would be Typical Applications. The FHWA proposed this change so that the numerous Typical Application diagrams would be at the end of Part 6 and to place the text and figures on incident management closer to the other sections in Part 6. The NCUTCD, ATSSA, and two State DOTs opposed this change, primarily because they believe Chapter 6I is best left as the designated chapter for Incident Management, in part because it is referred to in a number of important documents. The FHWA agrees and in this final rule retains the Typical Application diagrams in Chapter 6H and retains Chapter 6I as Incident Management, consistent with the 2003 MUTCD.

508. The FHWA received several general comments and suggestions on Chapter 6H Typical Applications (numbered Chapter 6I in the NPA). A State DOT, a local DOT, five bicyclist-related associations, an NCUTCD member, and two citizens suggested adding an OPTION to use the adopted Bicycles May Use Full Lane (R4–11) sign and adding a reference to Section 9B.06 in all Typical Applications where the lanes are narrowed to 10 feet in TTC zones to remind MUTCD users to consider bicyclists. The FHWA disagrees with the suggested addition because narrow lane widths are allowed in many permanent conditions, so it is not unrealistic to allow it in TTC situations. An agency can address specific bicycle accommodations in a project's TTC plan.

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509. In Table 6H–3 Meaning of Letter Codes on Typical Application Diagrams (numbered Table 6I–3 in the NPA), a State DOT and a transportation research institute suggested adding a fifth road type classification ''Local (very low speed)'' with a suggested sign spacing of 100 feet. The FHWA disagrees and notes that the suggested spacing is already indicated for ''Urban (low speed)''. If an agency wants to use the shorter spacing for signs on rural low-speed facilities, they can apply the low-speed criteria and use the same values as the Urban. The commenters also suggested increasing the sign spacing for Urban (low speed) to 200 feet because the existing 100-foot spacing is inadequate on a 35 mph street. The FHWA disagrees and notes that the 100-foot spacing is usually adequate for urban low-speed applications and allows more signs to be located between city blocks, thereby eliminating the need for duplication. The FHWA adopts Table 6H–3 in this final rule as proposed in the NPA.

510. In Section 6H.01 Typical Applications, the FHWA adopts in this final rule the SUPPORT, as proposed in the NPA, that, except for the notes (which are clearly classified using headings as being Standard, Guidance, Option, or Support), the information presented in the typical applications can generally be regarded as Guidance. The FHWA also adopts in this final rule changes in the Typical Applications to reflect the changes to all parts of the MUTCD with particular reference to Part 6 text and figure changes.

Additionally, the FHWA adopts the figures and corresponding notes proposed in the NPA with the following changes and responses to comments received:

a. Notes for Figure 6H–4: In the NPA, the FHWA proposed to add a new note 4 allowing stationary signs to be omitted if the work is mobile because the use of such signs is often not practical with mobile operations. Two local DOTs agreed with the proposed revision. The FHWA in this final rule adopts a revised note 4 to read ''Stationary warning signs may be omitted for short duration or mobile operations if the work vehicle displays high-intensity rotating, flashing, oscillating, or strobe lights,'' to be consistent with Section 6G.02. The FHWA also deletes existing note 5 (as numbered in the NPA) because the information is incorporated in the adopted note 4. In the NPA, the FHWA proposed a new STANDARD note stating that vehicle-mounted signs shall be mounted in a manner not obscured by equipment or supplies, and that sign legends on vehicle-mounted signs shall be covered or turned from view when work is not in progress, for consistency with similar provisions in the Notes for Figure 6H–17. A local DOT agreed with the revision and the FHWA adopts note 8 in this final rule as proposed in the NPA. A State DOT suggested adding new GUIDANCE to describe when a shadow vehicle should be used. The FHWA disagrees since the suggested information is contained in Section 6F.03.

b. In Figure 6H–4, a State DOT suggested revisions to the existing figure, including removing the leading truck, making the trailing truck optional, making the SHOULDER WORK sign optional, and allowing reduced traffic control requirements for short duration operations less than 60 minutes. The FHWA disagrees because the existing provisions are consistent with other Typical Applications for Mobile Operations and Section 6G.02. The FHWA in this final rule adds a ''Work Vehicle'' tag to the lead truck for clarification.

c. In Figure 6H–5, a State DOT suggested revisions to the existing figure, including adding a lateral

clearance marker at the barrier angle point and an object marker at the nose of the attenuator. The FHWA disagrees because the use of channelizing devices to close the lane should provide delineation for the barrier. An agency can add additional devices if they believe conditions warrant it.

d. In the Notes for Figure 6H–6, a State DOT and a transportation research institute suggested adding two new STANDARDS describing the requirements for the mounting of vehicle-mounted signs and the display of high-intensity lights on shadow and work vehicles. The FHWA agrees and adds notes 11 and 12 as STANDARDS in this final rule, which are identical to existing adopted STANDARDS from the Notes for Figure 6H–17.

e. In the Notes for Figure 6H–7, the FHWA proposed in the NPA to reword note 3 to clarify that required pavement markings no longer applicable shall be removed or obliterated as soon as practical. A State DOT and a transportation research institute suggested revising the note to remove the word ''practical'' and instead require that the pavement markings that are no longer applicable be removed once the TTC diversion is complete. The FHWA agrees with the comment and in this final rule revises note 3 to read ''Pavement markings no longer applicable to the traffic pattern of the roadway shall be removed or obliterated before any new traffic patterns are open to traffic.''

f. In Figure 6H–7, a local DOT suggested revising the existing figure to delete the ROAD CLOSED sign because it might imply that travel is not possible in that direction. The FHWA agrees and deletes the sign in this final rule. A State DOT asked what NCHRP 350 approved sign assembly is available to accommodate the warning sign with supplemental plaque shown in the figure on a portable sign stand and still maintain the 5-foot minimum sign height to the lowest sign. The FHWA responds that this Typical Application would not typically be used for periods of less than three days, thus signs would not be on portable mountings and therefore no revisions to the figure are necessary.

g. In Notes for Figure 6H–9, an NCUTCD member suggested revising existing GUIDANCE note 3 to include YIELD signs. The FHWA agrees that this is appropriate for consistency with Part 2 and adopts in this final rule a revised note 3 that recommends that STOP or YIELD signs displayed to side roads should be installed as needed along the temporary route.

h. In Figure 6H–10, the FHWA proposed in the NPA to revise the upstream taper dimension from ''100 ft MAX'' to ''50 to 100 ft.'' A State DOT opposed the proposed revision and recommended that the upstream taper dimension remain as a maximum of 100 feet and also recommended deleting the 50-foot minimum. The FHWA disagrees because adopted Section 6C.08 includes a minimum taper length of 50 feet and the figure reflects this change. The FHWA also proposed in the NPA to revise the downstream taper dimension from ''100 ft MAX'' to ''50 to 100 ft.'' A State DOT and a transportation research institute suggested retaining the existing ''100 ft MAX'' dimension for the downstream taper in order to comply with Figure 6C–3 and suggested deleting the existing note about buffer space because the information is contained in note 4 of the accompanying Notes section. The FHWA agrees with the comments and adopts the suggested revisions in this final rule.

i. In Figure 6H–12, the FHWA proposed in the NPA to revise the maximum distance between the nearest signal face for each approach and the stop line from 150 feet to 180 feet, for consistency with provisions of Part 4. A State DOT suggested revising the figure to include a dimension between the end of the downstream taper and the location of the opposing temporary signal because the distance is critical to provide enough distance for traffic to return to its own lane prior to the stop line for the opposing traffic. The FHWA notes the concern of the commenter, but declines to revise the figure because this dimension is left up to the agency to determine based upon the geometrics of the project and design speed through the TTC zone. The FHWA adopts in this final rule Figure 6H–12 as proposed in the NPA. The FHWA also adopts in this final rule the same revision to the maximum distance in Figure 6H–14, as proposed in the NPA.

j. In Figure 6H–13, a State DOT and a transportation research institute suggested revising the existing figure to make the BE PREPARED TO STOP sign mandatory instead of optional. The FHWA disagrees because the use of the sign should be dictated by the conditions for the project, such as volume and speed of traffic, length, and frequency of closure.

k. In Figure 6H–14, the FHWA proposed in the NPA to add a note that the maximum distance from the stop line to signal indication is 150 feet if 8-inch signal indications are used. A State DOT and a transportation research institute suggested deleting the asterisked note because the use of 8-inch signal displays should not be suggested since additional traffic control emphasis is needed in temporary traffic control applications. The FHWA agrees with the comment and also notes that the adopted revisions to Part 4 only allow the use of 8-inch indications for very low speed roads, and therefore the FHWA in this final rule removes the note. An NCUTCD member suggested replacing the existing symbolic DO NOT PASS sign with the word message sign, for clarity. The FHWA agrees and adopts in this final rule the suggested revision for this figure and throughout Chapter 6H, for consistency with adopted text in Chapter 2B.

l. In Notes for Figure 6H–15, the FHWA proposed in the NPA to change an existing GUIDANCE to a STANDARD, to require, instead of recommend, that workers in the roadway shall wear high-visibility safety apparel as described in Section 6D.03. A State DOT and a transportation research institute suggested deleting the proposed STANDARD because the statement is now unnecessary as a result of the adopted changes in Section 6D.03. The FHWA agrees and in this final rule deletes the statement from Notes for Figure 6H–15 and from Notes for Figure 6H–16. As described in Section 6D.03, workers within the public right-of-way are now required to wear high-visibility safety apparel, except for firefighters exposed to hazardous heat conditions and law enforcement personnel when performing non-traffic related activities. The commenters also suggested revising this and other Typical Applications for low-volume roads to also apply to low-speed roads. The FHWA disagrees because there have been no other comments received noting problems with this operation and agencies have the option to require additional measures for these situations.

m. In Notes for Figure 6H–16, the FHWA proposed in the NPA to add a new note 1 to the GUIDANCE indicating that all lanes should be a minimum of 10 feet in width, to be consistent with guidance in other applications. A local DOT agreed with the proposal, while the NCUTCD opposed the proposal but did not provide a reason for the objection. The FHWA adopts in this final rule the proposed note because the text is consistent with existing GUIDANCE in Notes for Figure 6H–6.

n. In Figure 6H–16, the FHWA proposed in the NPA to include a dimension showing a 10-foot minimum width for all lanes. A State DOT asked if traffic can be moved to the shoulder in this Typical Application. The FHWA responds that this Typical Application

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should allow shoulder use if necessary and adopts in this final rule a revised note in Figure 6H–16 identical to the adopted note in Figure 6H–15 that indicates a 10-foot minimum width to the edge of pavement or outside edge of paved shoulder.

o. In Figure 6H–20, a State DOT and a transportation institute recommended revisions to the existing figure to add NO LEFT TURN signs, NO RIGHT TURN signs, and Main Street South Detour signs to provide guidance for drivers arriving from the east and west. The FHWA agrees and adopts a revised Figure 6H–20 that incorporates the recommended signs for added clarification because the intent is to provide guidance to road users on all approaches to the work zone.

p. In Figure 6H–23, a State DOT and a transportation research institute suggested revisions to the existing figure to add channelization devices along the double yellow center line to be consistent with adopted provisions in Section 6G.12. The FHWA agrees and adopts the suggested revision in this final rule. An NCUTCD member suggested deleting the LEFT LANE MUST TURN LEFT sign outside of the curb. The FHWA disagrees with the comment because this sign complies with provisions in Chapter 2H and the sign needs to be displayed to inform road users of the temporary left-turn lane established by closing the left lane.

q. In Notes for Figure 6H–27, a State DOT and a transportation research institute suggested elevating existing note 4 (as numbered in the NPA) from OPTION to GUIDANCE to recommend that ONE LANE ROAD AHEAD signs be used to provide adequate advance warning for this Typical Application. The FHWA agrees that the signs should be used in this situation, and in this final rule changes the statement to GUIDANCE and renumbers the statement as note 8. The FHWA adopts the change for consistency with other Typical Applications that indicate that the ONE LANE ROAD sign should be used when one lane of a two-lane roadway is closed. The commenters also recommended that the ONE LANE ROAD AHEAD sign be added to each approach in Figure 6H–27. The FHWA agrees and adopts in this final rule the suggested revisions to Figure 6H–27.

r. In Figure 6H–28, a State DOT and a transportation research institute suggested revising the existing figure to replace the symbols for channelization devices because Type 3 barricades should not be used for channelization between road users and pedestrians. The FHWA agrees and adopts a new symbol to represent a longitudinal channelizing device and revises Figure 6H–28 and Table 6H–2 accordingly.

s. In Figure 6H–29, a State DOT and a transportation research institute suggested revising the existing figure to remove the ''(optional)'' note from the ROAD WORK AHEAD sign so that the sign is a recommendation and not an option. The FHWA agrees and adopts the suggested revision in this final rule to be consistent with all other Typical Applications that recommend the ROAD WORK AHEAD sign whenever work is occurring within the roadway. The commenters also suggested replacing the cones used to close the sidewalk with a Type 3 channelizing device. The FHWA agrees and adopts the suggested revision in this final rule.

t. In Notes for Figure 6H–32, a State DOT and a transportation research institute suggested revising existing GUIDANCE note 4 because the figure and text were not consistent for the placement of the Reverse Curve signs. The FHWA agrees and adopts in this final rule a revised note 4 to match Figure 6H–32. The commenters also asked why existing note 9 (as numbered in the NPA) was not a STANDARD similar to provisions in the Notes for Figure 6H–46. The FHWA in this final rule removes notes 6, 7, 8, and 9 (as numbered in the NPA) because the provisions regarding road crossings are addressed in Figure 6H–46 and do not need to be repeated in the Notes for Figure 6H–32. The FHWA also renumbers note 10 (as numbered in the NPA) as note 6 in this final rule.

u. In Figure 6H–32, a State DOT and a transportation research institute suggested revising the second warning sign distance measurements from miles to feet in the figure since the illustration does not depict a freeway application and the measurements in feet are more practical than miles. The FHWA agrees and in this final rule revises Figure 6H–32 to modify the legend on the second warning sign on each approach from ''XX MILES'' to ''XX FT.''

v. In Notes for Figure 6H–33, a State DOT and a transportation research institute suggested adding a new STANDARD requiring arrow boards for each lane of a freeway lane closure. The FHWA agrees and adopts in this final rule a new STANDARD note 6 identical to the adopted language in other Typical Applications involving multi-lane freeway lane closures (see item 510.z. below).

w. In Figure 6H–34, a State DOT and a transportation research institute suggested revising the existing figure to remove the ''(optional)'' label for the shoulder taper to comply with GUIDANCE note 3 of the Notes for Figure 6H–33. The FHWA agrees and adopts the suggested revision in this final rule.

x. In Notes for Figure 6H–35, a State DOT and a transportation research institute suggested adding two new STANDARDS describing the requirements for the mounting of vehicle-mounted signs and the display of high-intensity lights on shadow and work vehicles. The FHWA agrees and adds notes 2 and 3 as STANDARDS in this final rule, which are identical to existing adopted STANDARDS from Notes for Figure 6H–17 The FHWA also adopts a revised GUIDANCE note 5 to remove ''high-intensity rotating, flashing, oscillating, or strobe lights'' since they are included in the new STANDARD note 3. The commenters also suggested adding a new STANDARD requiring arrow boards for each lane of a freeway lane closure. The FHWA agrees and adopts in this final rule a new STANDARD note 4 identical to the adopted language in other Typical Applications involving multi-lane freeway lane closures (see item 510.z. below.)

y. In Notes for Figure 6H–36, the FHWA proposed in the NPA to add a STANDARD describing the use of the Reverse Curve signs and also delete the OPTION regarding the ALL LANES THRU supplemental plaque because the Reverse Curve signs graphically indicate that message. A State DOT suggested reducing the proposed STANDARD to GUIDANCE. The FHWA disagrees and adopts the proposed STANDARD as note 7 in this final rule to be consistent with the STANDARD adopted in Section 6F.48 Reverse Curve Signs. The FHWA also adopts in this final rule two new OPTIONS as notes 8 and 9 that are identical to adopted OPTIONS in Section 6F.48 that describe signs that may be used when multiple lanes are being shifted. A State DOT and a transportation research institute suggested adding a new STANDARD prohibiting the use of barriers along the shifting taper. The FHWA agrees and adopts the recommended STANDARD in the Notes for Figure 6H–36 and in the Notes for Figure 6H–38 to be consistent with the adopted STANDARD in the Notes for Figure 6H–34. A State DOT and a transportation research institute suggested revising existing note 12 in the NPA from OPTION to GUIDANCE to recommend that trucks should be directed to use the travel lanes if the shoulder cannot adequately accommodate trucks. The FHWA agrees and adopts the suggested revision as GUIDANCE note 15 in this final rule. An agency can make the determination whether or not the shoulder has

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adequate structural capacity to handle trucks and that an agency is not being required to alter their procedures with this GUIDANCE.

z. In Notes for Figures 6H–37, 6H–38, 6H–39, 6H–42, and 6H–44, the FHWA proposed in the NPA to add a STANDARD note to require that an arrow board be used on all freeway lane closures, and that a separate arrow board be used for each closed lane when more than one freeway lane is closed. The FHWA believes that an arrow board is essential for safety at all lane closures on freeways because of the high speeds. A local DOT agreed with the proposed STANDARD. A second local DOT suggested reducing the statement to GUIDANCE because it might not always be feasible to have an arrow board available depending on the amount of time the roadway is closed, if it is scheduled or emergency, and how many work zones are underway at the same time. The FHWA disagrees because the safety benefit of using an arrow board on freeway lane closures warrants this provision as a STANDARD. The FHWA adopts in this final rule the new STANDARD note as proposed in the NPA.

aa. In Notes for Figure 6H–37 and Notes for Figure 6H–38, a State DOT and a transportation research institute suggested elevating an existing OPTION to GUIDANCE to recommend that trucks should be directed to use the travel lanes if the shoulder cannot adequately accommodate trucks. The FHWA agrees and adopts the suggested revision in this final rule as GUIDANCE note 6 in Notes for Figure 6H–37 and GUIDANCE note 14 in Notes for Figure 6H–38 to be consistent with the adopted change to Notes for Figure 6H–36 (see item 510.z. below).

bb. In Notes for Figure 6H–38, a State DOT and a transportation research institute suggested adding a new STANDARD to require removing existing conflicting pavement markings and installing temporary markings before traffic patterns are changed. The FHWA agrees and adopts new STANDARD note 4 in this final rule for consistency with multiple figures in Chapter 6H that show temporary markings and pavement markings that should be removed for a long-term project. The commenters also suggested elevating OPTION note 7 (as numbered in the NPA) to GUIDANCE because of concern about creating driver confusion with two arrow boards that are visible at the same time. The FHWA agrees that a consistent application of the devices in this Typical Application is needed and in this final rule deletes the OPTION and replaces it with new GUIDANCE note 7 to recommend that the 2L distance between the end of the merging taper and beginning of the shifting taper should be extended so that road users can focus on one arrow board at a time if the two arrow boards create confusion.

cc. In Notes for Figure 6H–45, the NCUTCD suggested adding three OPTIONS to allow a work vehicle or shadow vehicle to be equipped with a truck-mounted attenuator, to allow a longitudinal buffer space to be used to separate opposing vehicular traffic, and to allow the reversible lane to be changed between the peak periods of vehicular traffic, to be consistent with Figure 6H–31. The NCUTCD also suggested a STANDARD requiring arrow boards for each lane of a freeway lane closure, to be consistent with the adopted STANDARD in Figure 6H–37. The FHWA agrees and adopts the suggested OPTIONS and STANDARD in this final rule. These provisions are identical to existing language in the Notes for Figures 6H–31 and 6H–37.

511. As discussed previously, the FHWA proposed in the NPA to renumber Chapter 6I as Chapter 6H. Based on comments, the FHWA in this final rule decides not to adopt the proposed renumbering of the chapters and therefore retains the same numbering for the two chapters as in the 2003 MUTCD.

512. In Section 6I.01 General, the FHWA proposed in the NPA to add a STANDARD that the Incident Command System (ICS) as required by the National Incident Management System (NIMS) be implemented in traffic incident management areas. The FHWA proposed including this language because the Department of Homeland Security and Presidential Directives (DHSPD) #5 and #8 [192] require the adoption of the National Incident Management System and the Incident Command System by all Federal, State, tribal, and local governments. These two systems are required for all planned and unplanned incidents in the United States. Although a local DOT supported this language, a State DOT and an NCUTCD member opposed the requirement, stating that the NIMS/ICS are not directly related to traffic control devices, and therefore it is inappropriate that MUTCD text require their use. The FHWA agrees and does not adopt the STANDARD in this final rule, and instead adopts information about NIMS/ICS in a SUPPORT in paragraph 01.

In the NPA, the FHWA proposed to expand existing GUIDANCE regarding TTC practices for on-scene responders and add new GUIDANCE regarding TTC practices for placement of emergency vehicles. A local DOT agreed with the proposal. Two State DOTs, a local DOT, ATSSA, and an NCUTCD member suggested revised language, including adding that on-scene responder organizations should train their personnel in the requirements for traffic incident management and revising the GUIDANCE on positioning of emergency vehicles to optimize traffic flow through the incident scene. The FHWA agrees with the comments in part and adopts in this final rule a revised GUIDANCE in paragraph 07 to recommend that on-scene responder organizations should train their personnel ''in the requirements for traffic incident management contained in this Manual'' and also adopts a revised GUIDANCE in paragraph 08 to recommend that emergency vehicles be safe-positioned such that traffic flow through the incident scene is optimized.

Finally, a State DOT and a local DOT recommended deleting the existing GUIDANCE of the 15-minute time provision for responders arriving on-scene at a traffic incident to estimate the magnitude of the traffic incident, the expected time duration of the traffic incident, and the expected vehicle queue length, and to set up the appropriate temporary traffic controls based on these estimates. The FHWA agrees that 15 minutes is unrealistic in some circumstances and deletes the phrase ''within 15 minutes of arrival on-scene'' in this final rule.

513. In Section 6I.02 Major Traffic Incidents and Section 6I.03 Intermediate Traffic Incidents, the FHWA proposed to revise a GUIDANCE related to when flares are used to initiate TTC at traffic incidents and add a new OPTION related to the use of light sticks to initiate TTC at traffic incidents. The FHWA proposed the OPTION to reflect the increasingly common use of light sticks by emergency responders as a more convenient and effective device than flares. A local DOT agreed with the proposal. Three State DOTs, ATSSA, and an NCUTCD member recommended several changes, including rewording the language to remove the word ''initiate'' and allowing flares to supplement instead of replace channelizing devices as TTC. The FHWA agrees with the comments in part and adopts in this final rule a revised GUIDANCE in paragraph 11 of Section 6I.02 and paragraph 07 of

[192] The Department of Homeland Security and Presidential Directives (DHSPD) #5 and 8 can be viewed at the following Internet Web site addresses: *http://www.whitehouse.gov/news/releases/2003/02/20030228–9.html* and *http://www.whitehouse.gov/news/releases/2003/12/20031217–6.html.*

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Section 6I.03 to recommend that ''when lights sticks or flares are used to establish the initial traffic control at incident scenes, channelizing devices should be installed as soon thereafter as practical.'' The FHWA also adopts a revised OPTION in each section that follows the GUIDANCE, which allows light sticks or flares to remain in place if they are being used to supplement the channelizing devices.

A State DOT recommended revising an existing GUIDANCE to also encourage early diversion to an appropriate route as a reason for TTC at a traffic incident. The FHWA agrees that this is appropriate and highly useful to road users and adds ''to encourage early diversion to an appropriate alternate route'' as a reason for TTC at a traffic incident to paragraph 07 in Section 6I.02 and paragraph 03 in Section 6I.03 in this final rule.

514. The NCUTCD, ATSSA, two State DOTs, a local DOT, and an NCUTCD member suggested that FHWA include Typical Incident Management Application (TIMA) illustrations in Chapter 6I, similar to those provided in Chapter 6H for TTC. The FHWA did not propose including TIMAs in the NPA. The commenters recommended that the illustrations, which were developed with input from the National Traffic Incident Management Coalition, AASHTO, and ATSSA, under the oversight of the NCUTCD, be included because many incident management responders are already using parts of the TIMAs, and these illustrations should be made available to all incident management responders. The International Association of Police Chiefs and a local police department submitted letters opposing placing TIMAs in the MUTCD, because they felt that the TIMAs should be used voluntarily, rather than included in the MUTCD where they conceivably could be interpreted as standards, rather than practices. The FHWA agrees that requiring these specific TIMAs for incidents, which are, by nature, unique, could have significant negative consequences. The FHWA and practitioners need to educate and partner with law enforcement to achieve the goal of increasing the appropriate use of the typical applications, rather than establishing requirements at this time without having a clear understanding of all of the issues involved.

Discussion of Amendments to Part 7—Traffic Controls for School Areas

Discussion of Amendments Within Part 7—General

515. As proposed in the NPA, the FHWA deletes in this final rule Sections 7A.05 through 7A.10 of the 2003 MUTCD. The subjects of those sections are already covered in other parts of the Manual. In their place, the FHWA adopts paragraph 02 in Section 7A.04, which provides cross-references to the appropriate sections.

516. In Chapter 7C Markings, the FHWA in this final rule deletes the text in Sections 7C.02 through 7C.06 of the 2003 MUTCD that was repetitive of comparable sections in Chapter 3B, and instead adopts references to the appropriate sections in Chapter 3B. As a result, the FHWA adopts Chapter 7C with only three sections, Section 7C.01 Functions and Limitations, Section 7C.02 Crosswalk Markings, and Section 7C.03 Pavement Word, Symbol, and Arrow Markings.

Discussion of Amendments Within Part 7—Specific

517. In the NPA, the FHWA proposed to move all of the information from Chapter 7F Grade-Separated Crossings in the 2003 MUTCD to a new section numbered and titled Section 7A.05 Grade-Separated School Crossings. The proposed section contained a SUPPORT statement regarding the use of grade-separated crossings for school pedestrian traffic. A local DOT agreed with the proposal. The NCUTCD, a State DOT, and an NCUTCD member disagreed with the proposed section because it did not address traffic control devices. A local DOT opposed the listed preference of overpasses to underpasses for grade-separated school crossings. The FHWA agrees that grade-separated school crossings are not traffic control devices and in this final rule does not adopt Section 7A.05 as proposed in the NPA. The FHWA also removes Chapter 7F, as numbered in the 2003 MUTCD, from the Manual and removes the reference to grade-separated crossings from STANDARD paragraph 01 in Section 7A.04.

518. In Section 7B.01 Size of School Signs, the FHWA proposed in the NPA to revise the STANDARD in paragraph 03 to require that speeds be less than 35 mph in order to use the minimum sign sizes. The NCUTCD, two State DOTs, and a local DOT commented on the proposed wording of the STANDARD. The FHWA in this final rule adopts a revised paragraph 03 based on the comments, to clarify that the application of the minimum sizes to the identified signs is only where there are low traffic volumes and speeds are 30 mph or lower. Based on a recommendation from a State DOT, the FHWA adopts paragraphs 05 and 06 to provide GUIDANCE and OPTION statements, respectively, on the use of oversized school signs, for consistency with provisions in Part 2 for sizes of regulatory and warning signs on multilane roadways.

519. The NCUTCD, a State DOT, and a school district recommended changes to the NPA proposed Table 7B–1 to include three additional plaques that can be used with school area signs. The NCUTCD also recommended that the minimum sign sizes for multi-lane conventional roads be based on the Conventional Road sign size. The FHWA agrees with the comments and adopts in this final rule the recommended changes to Table 7B–1 for consistency with Part 2 provisions.

520. In Section 7B.03 Position of Signs, the NCUTCD, a State DOT, and an NCUTCD member recommended the deletion of existing text that was a repeat of information in Part 2. The FHWA agrees and in this final rule deletes the GUIDANCE and OPTION statements of the 2003 MUTCD. The FHWA also adopts two SUPPORT statements that reference sections in Chapter 2A for information regarding the placement and location of signs. As proposed in the NPA, the FHWA adopts an OPTION that states that in-roadway signs for school traffic control areas may be used consistent with the requirement of Sections 2B.12, 7B.08, and 7B.12.

521. In Section 7B.07 Sign Color for School Warning Signs, the FHWA proposed in the NPA to require, instead of merely allow, the use of fluorescent yellow-green as the background color for all school warning signs and plaques. A State DOT, ATSSA, and a local DOT agreed with the proposal. Four State DOTs, a local DOT, two NCUTCD members, and a citizen opposed the required use of fluorescent yellow-green and recommended that the fluorescent yellow-green color be an OPTION or GUIDANCE because of the increased cost over the yellow background and a lack of research showing additional benefit. The FHWA proposed these changes because the use of fluorescent yellow-green has become the predominant practice in most jurisdictions. Fluorescent yellow-green provides enhanced conspicuity for these critical signs, especially in dusk and dawn periods, and the FHWA believes that uniform use of this background color for all school warning signs and plaques will enhance safety and road user recognition. Consistent with Part 2

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as adopted in this final rule, the FHWA adopts the required use of fluorescent yellow-green for school warning signs and plaques as proposed in the NPA.

522. As proposed in the NPA, the FHWA in this final rule adopts a new section numbered and titled Section 7B.08 School Sign and Plaques, which replaces 2003 MUTCD Section 7B.08 School Advance Warning Assembly. A local DOT opposed the introduction of the term ''school area'' proposed in the NPA because it could lead to confusion. A local school district requested clarification on the use of signs in school areas versus school zones. A State DOT and a local DOT recommended changes to the proposed list of applications for the School Sign. Based on the comments, and in concert with the adopted definition of ''school zone'' as discussed in Section 1A.13, the FHWA adopts an expanded paragraph 02 to clarify the four specific applications of the School Sign (S1–1) (School Area, School Zone, School Advance Crossing, and School Crossing) in order to provide flexibility to States and local governments in applying standard school signing in accordance with their State laws and local ordinances. For consistency with the adopted OPTION described in item 513 below, the FHWA also adopts paragraph 03 in this final rule which allows the use of a School sign with a supplemental arrow plaque to be provided on a cross street in close proximity to the intersection within a school area.

523. The FHWA in this final rule adopts a new section numbered and titled Section 7B.09 School Zone Sign and Plaques and END SCHOOL ZONE Sign. The FHWA in the NPA proposed language permitting the use of a supplemental arrow plaque on a School (S1–1) sign at locations where a school zone is located on a cross street less than 125 feet from the edge of a street or highway. The FHWA proposed the change to provide jurisdictions with flexibility for installing signs where there is not sufficient distance for advance signing. A local DOT agreed with the proposal. The NCUTCD agreed with the proposal, but recommended that a specific maximum distance be removed from the statement. The FHWA agrees with the NCUTCD and in this final rule adopts a modified paragraph 05 to allow the use of the School sign with a supplemental arrow plaque on a cross street ''in close proximity to the intersection.'' The FHWA also modifies Figure 7B–3 to demonstrate typical cross street signage for a School Zone sign with a supplemental arrow plaque.

The FHWA also adopts a new plaque, ''ALL YEAR'' (S4–7P) that may be used to supplement the School Zone Sign (S1–1), based on comments from an NCUTCD member. The FHWA adopts paragraph 03 in Section 7B.09 to describe the optional use and modifies Figure 7B–1 and Table 7B–1 to include the new plaque.

524. The FHWA in this final rule adopts a new section numbered and titled Section 7B.10 Higher Fines Zone Signs and Plaques, and relocates to this section applicable information that was proposed in the NPA for Section 7B.09 School Area or School Zone Sign and Section 7B.16 END SCHOOL ZONE Sign. The FHWA also adopts the BEGIN HIGHER FINES ZONE (R2–10) sign, END HIGHER FINES ZONE (R2–11) sign, and FINES HIGHER (R2–6P) plaque and incorporates these signs into Figure 7B–1 and Table 7B–1.

To illustrate the use of the signs in Section 7B.10, the FHWA in this final rule revises the title of Figure 7B–2, as proposed in the NPA, to ''Example of Signing for a Higher Fines School Zone without a School Crossing'' and adopts a new figure, numbered and titled ''Figure 7B–5 Example of Signing for a Higher Fines School Zone with a School Speed Limit.''

525. The FHWA in this final rule revises the title of Figure 7B–3 to ''Example of Signing for a School Crossing Outside of a School Zone'' and Figure 7B–4 to ''Example of Signing for a School Zone with a School Speed Limit and a School Crossing.'' The NCUTCD and a State DOT recommended the changes to the titles for clarification and the FHWA agrees. The FHWA also makes editorial changes to the NPA proposed figures based on recommendations from several commenters.

526. In Section 7B.11 School Advance Crossing Assembly (numbered Section 7B.10 in the NPA) the FHWA in this final rule adopts revisions to the section proposed in the NPA. Consistent with a similar change discussed in item 523 above, the FHWA adopts a modified paragraph 04 to allow the use of the School Advance Crossing assembly on a street when a school crosswalk is located on the cross street in close proximity to an intersection.

527. In Section 7B.12 School Crossing Assembly (numbered Section 7B.11 in the NPA), the FHWA proposed in the NPA to remove a statement recommending the School Crossing assembly at marked crosswalks including signalized locations. A local school district opposed the revision and requested that the signs still be allowed at signalized intersections. Two State DOTs recommended that language be added to prohibit the use of the School Crossing assembly at signalized intersections. The FHWA notes that the School Crossing assembly is still allowed at school crossings, including those that are signal controlled, but is not allowed on stop or yield controlled approaches. The FHWA adopts in this final rule the language as proposed in the NPA.

A local DOT recommended that the School Crossing assembly be prohibited on approaches controlled by a YIELD sign in addition to those controlled by a STOP sign. The FHWA agrees that this is necessary to provide consistency with the final rule for STOP and YIELD sign applications in Section 2B.04 Right-of-Way at Intersections. Accordingly, the FHWA adopts in this final rule a modified paragraph 03 to prohibit the School Crossing assembly on approaches controlled by a STOP or YIELD sign.

528. In Section 7B.13 School Bus Stop Ahead Sign (numbered Section 7B.12 in the NPA), the FHWA proposed in the NPA to revise the GUIDANCE statement by removing the specific distance of 500 feet that a stopped school bus should be visible to road users, and in its place proposed inserting a reference to distances given in Table 2C–4. A State DOT and two local DOTs agreed with the proposal. The NCUTCD, a local DOT, and a consultant opposed the reference to Table 2C–4. The FHWA agrees with the NCUTCD that using Table 2C–4 is unnecessary for this particular sign because the visibility of the high mounted red flashers located at the top of the rear of the school bus are much more readily visible for the School Bus Stop Ahead (S3–1) sign than for a bus with no flashers activated for the SCHOOL BUS TURN AHEAD (S3–2) sign. The FHWA in this final rule adopts a modified paragraph 01 to recommend the use of the School Bus Stop Ahead sign when a stopped school bus is not visible to road users for ''an adequate distance.''

The FHWA proposed in the NPA to replace the existing School Bus Stop Ahead (S3–1) word message sign with a symbol sign as shown in Figure 7B–1. The FHWA proposed this new sign based on positive experiences in West Virginia, where a symbol sign for this message has been used for 25 to 30 years [193] and in Canada, where it has

[193] For additional information on West Virginia's successful experience with this symbol sign, contact Mr. Ray Lewis, Staff Engineer—Traffic Research and Special Projects Traffic Engineering Division, West Virginia DOT, Division of Highways, phone: 304–558–8912, e-mail: *lewisr@dot.state.wv.us.*

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also been used since the 1970s. The FHWA proposed to use a symbol that is similar to the Canadian MUTCD[194] standard WC–9 symbol. The proposed symbol featured a school bus with a depiction of red flashing lights, a bus-mounted STOP sign, and students getting on or off the bus. ATSSA and a local DOT agreed with the proposal. A State DOT recommended changing the symbols of the children to be consistent with the symbols of children used in the School (S1–1) sign and the FHWA agrees. The NCUTCD, two State DOTs, and a citizen agreed with the proposal, but recommended various changes in the design of the sign. The FHWA declines to incorporate the commenters' recommended changes, because a recent human factors evaluation[195] of the symbol proposed in the NPA along with three alternative symbol designs and the current word version warning sign found that the understanding of the meaning of the symbol design as proposed in the NPA was equal to that of two alternative symbol designs tested. The study also found that the NPA symbol design has a greater legibility distance than the other symbol alternatives evaluated and equal legibility distance to the existing word version design. Seven State DOTs, six local DOTs, an NCUTCD member, and a citizen opposed the proposed symbol sign, primarily because of anticipated confusion over the symbolic representation. The FHWA disagrees with the comments and adopts in this final rule the sign as proposed in the NPA but with a minor adjustment to the symbols of children to make them consistent with those in the S1–1 sign. As noted above, the study found that the symbol sign was clearly understood by the vast majority of the test subjects. The FHWA believes that the replacement of selected word message signs with well-designed symbol signs will improve safety in view of increasing globalization and the number of non-English speaking road users in the United States.

529. The FHWA adopts in this final rule a new section numbered and titled Section 7B.14 SCHOOL BUS TURN AHEAD Sign (numbered Section 7B.13 in the NPA.) This new section contains the NPA proposed OPTION statement about the use of this new sign that can be installed in advance of locations where there is a school bus turn around on a roadway at a location not visible to approaching users for a distance as determined in Table 2C–4. The NCUTCD, three State DOTs, and a local DOT agreed with the proposal, but recommended changes to the proposed language, including the reference to Table 2C–4. A local DOT opposed the section and questioned the need for the proposed sign. A State DOT, a local DOT, and a consultant opposed the use of Table 2C–4. The FHWA disagrees with the objection to the use of Table 2C–4 and notes that Condition B does provide adequate stopping distances, especially considering that a school bus is a taller vehicle that can be seen for a greater distance away than a normal passenger vehicle. The FHWA adopts the language as proposed in the NPA.

The FHWA illustrated the proposed new sign, SCHOOL BUS TURN AHEAD (S3–2), in Figure 7B–1 of the NPA. ATSSA and a local DOT agreed with the proposed sign. A State DOT opposed the proposed sign. Four State DOTs, three local DOTs, and two citizens recommended modifications to the proposed sign, including changing the name of the sign to ''SCHOOL BUS TURN AROUND'' and changing the color to yellow instead of fluorescent yellow-green. The FHWA disagrees with the proposed changes and adopts the new sign as proposed in the NPA. This new sign provides a standard sign for applications that fit this need, with a legend that is appropriate for the condition.

530. In Section 7B.15 (numbered Section 7B.14 in the NPA), the FHWA changes the title to ''School Speed Limit Assembly and END SCHOOL SPEED LIMIT Sign'' in this final rule to reflect the addition of a new sign, END SCHOOL SPEED LIMIT (S5–3), which is illustrated in Figure 7B–1. The FHWA adopts this sign, which clarifies the location that a reduced speed limit for a school zone is concluded, consistent with comparable provisions for other reduced speed limits in Chapter 2B.

The FHWA in this final rule relocates one of the STANDARD statements proposed in the NPA from Section 7B.09 to Section 7B.15 because the content regarding reduced speed zones is more appropriate in that section. A local DOT supported the NPA proposal to require the use of the School (S1–1) sign in advance of a reduced speed zone for a school area, while a different local DOT opposed the proposal. The FHWA adopts in this final rule paragraph 02 requiring the use of the School sign in advance of a reduced speed zone for a school area. The FHWA also clarifies the application of higher fines zones in school speed limit zones by adding paragraph 03 that is consistent with the adopted Chapter 2B.

Numerous agencies opposed the proposed requirement (in Section 7B.16 of the NPA) to clarify that the end of a designated school zone shall be marked with both an END SCHOOL ZONE sign and a Speed Limit sign for the section of highway that follows. The FHWA in this final rule retains the requirement but relocates it to Section 7B.15. It is important and sometimes legally necessary to mark the end points of designated school zones. The use of a Speed Limit sign showing the speed limit for the following section of highway is required by existing language in Section 2B.13. In response to comments, the FHWA also adds an OPTION statement to provide flexibility in mounting the END SCHOOL ZONE sign when a Speed Limit sign or END HIGHER FINES sign is also required at the same location.

Two State DOTs and a consultant opposed the existing GUIDANCE that the reduced speed zone should begin either 200 feet from the crosswalk or 100 feet from the school property line. The FHWA in this final rule revises paragraph 07 to recommend that the beginning point of a reduced school speed limit zone should be at least 200 feet in advance of the school grounds, a school crossing, or other school related activities. The FHWA also recommends that the 200-foot distance should be increased where the school speed limit is 30 mph or higher. These changes are based on recently published research[196] by the Texas Transportation Institute concerning speeds in school zones. The FHWA notes that the distances are recommendations that can be adjusted based on State law and local ordinances.

The FHWA also proposed in the NPA to require, rather than merely permit, fluorescent yellow-green pixels to be used when the ''SCHOOL'' message is displayed on a changeable message sign for a school speed limit. Two State DOTs and two local DOTs recommended the statement be changed to GUIDANCE. Three State DOTs and three traffic control device manufacturers opposed the proposal and recommended the statement remain as an OPTION because the requirement

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[194] The Manual of Uniform Traffic Control Devices for Canada, 4th Edition, is available for purchase from the Transportation Association of Canada, 2323 St. Laurent Boulevard, Ottawa, Ontario K1G 4J8 Canada, Web site *http://www.tac-atc.ca.*

[195] ''Design and Evaluations of Symbol Signs,'' Final Report, May, 2008, conducted by Bryan Katz, Gene Hawkins, Jason Kennedy, and Heather Rigdon Howard, for the Traffic Control Devices Pooled Fund Study, can be viewed at the following Internet Web site: *http://www.pooledfund.org/documents/TPF-5_065/symbol_sign_report_final.pdf.*

[196] ''Speeds in School Zones,'' Report number FHWA/TX–09/0–5470–1, February, 2009, by Kay Fitzpatrick, et al., Texas Transportation Institute, can be viewed at the following Internet Web site: *http://tti.tamu.edu/documents/0-5470-1.pdf.*

will make obsolete many of the existing changeable message signs. The FHWA disagrees with the commenters and notes that the fluorescent yellow-green color is required for consistency with the general requirements for colors used on changeable message signs in Chapters 2A and 2L and for school area warning signs in Section 7B.07. The STANDARD is adopted in this final rule as proposed in the NPA.

The NCUTCD and a State DOT recommended removal of the existing OPTION statement that allows the use of the signal indications of the Speed Limit Sign Beacon to be positioned within the face of the School Speed Limit (S5–1) sign. This statement mirrors a similar OPTION in Section 4L.04 Speed Limit Sign Beacon. This sign is the only instance where beacons are allowed within a sign face. Under certain light and weather conditions, the flashing beacon causes halation that obscures the sign message. The FHWA agrees that this is an obsolete practice but declines to remove the option at this time. The FHWA might consider this for a future rulemaking. However, the FHWA removes the OPTION from Section 7B.15 and instead provides a cross-reference to Section 4L.04 in this final rule.

531. The FHWA does not adopt Section 7B.16 END SCHOOL ZONE Sign that was proposed in the NPA, but maintains the existing END SCHOOL ZONE Sign (S5–2) and requirements for its use, as discussed above in Section 7B.15.

532. In Section 7B.16 (Section 7B.15 in the NPA) Reduced School Speed Limit Ahead Sign, in this final rule the FHWA revises the OPTION statement to a GUIDANCE statement to recommend, rather than merely allow, the use of this sign where the speed limit is being reduced by more than 10 mph, or where engineering judgment indicates that advance notice would be appropriate. The FHWA makes this change for consistency with similar GUIDANCE for advance warning of other reduced speed limits as adopted in Sections 2B.13 and 2C.38

533. In Section 7C.02 Crosswalk Markings (numbered Section 7C.03 in the NPA), the FHWA proposed in the NPA to add a GUIDANCE statement recommending that warning signs be installed for marked crosswalks at nonintersection locations, and that adequate visibility for students be provided by implementing parking prohibitions. A State DOT recommended changing the statement to a STANDARD. The FHWA disagrees because some flexibility is needed and mandatory language is not appropriate in this case. The NCUTCD recommended adding ''or other appropriate measures'' in addition to implementing parking prohibitions to provide adequate visibility of students. The FHWA agrees and adopts in this final rule a modified paragraph 03 as GUIDANCE.

Two local DOTs opposed the NPA proposal to change the word ''pedestrian'' to ''student'' when discussing conflicting movements with motorists and bicyclists. The commenters noted that students are not the only people to use a crosswalk. The FHWA disagrees with the comment because the crosswalk markings discussed in Part 7 are for school crossings. The FHWA adopts in this final rule the change as proposed in the NPA.

534. The FHWA in this final rule removes Chapter 7D Signals of the 2003 MUTCD, because it is a small chapter whose only purpose was to provide references to Part 4 and Section 4C.06. The FHWA incorporates the references in Section 7A.04 instead.

535. In the NPA, the FHWA proposed to delete the information pertaining to student patrols from the MUTCD except for a SUPPORT statement in Section 7D.01 Types of Crossing Supervision which acknowledged the use of student patrols and referenced the ''AAA School Safety Patrol Operations Manual.'' [197] Two State DOTs and a local DOT opposed the deletion of all the material on student patrols. The FHWA disagrees with the commenters. The FHWA believes that student patrols do not control vehicular traffic and provisions relating to student patrols are not appropriate for the MUTCD. The FHWA in this final rule removes the mention of student patrols in Section 7D.04. The FHWA also removes Sections 7E.07, 7E.08, and 7E.09 that were in the 2003 MUTCD because these sections pertained to student patrols, and removes the reference to student patrols from STANDARD paragraph 01 in Section 7A.04.

536. In Section 7D.03 Qualifications of Adult Crossing Guards, the FHWA proposed in the NPA to revise the GUIDANCE statement to indicate that the list represents the minimum qualifications of adult crossing guards. The FHWA proposed three additional qualifications (items C, D, and E in paragraph 02) that are similar to applicable provisions in Section 6E.01 for flaggers. Three State DOTs and an NCUTCD member recommended substantive revisions to the language. The FHWA adopts the text as proposed in the NPA. The FHWA might consider the suggested revisions in a future rulemaking.

537. In Section 7D.04 Uniform of Adult Crossing Guards, the FHWA adopts in this final rule a revised paragraph 01 to reflect that law enforcement officers performing school crossing supervision shall use high-visibility safety apparel labeled as ANSI 107–2004. This change incorporates into the MUTCD the provisions of 23 CFR part 634 that were published in the **Federal Register** on November 24, 2006.[198] The NCUTCD and a State DOT recommended editorial changes to the proposed statement and the FHWA agrees and adopts a revised STANDARD. The FHWA establishes a target compliance date of December 31, 2011 (approximately two years from the effective date of this final rule) for adult crossing guard apparel on non-Federal-aid highways. Required compliance of apparel for workers, including law enforcement officers, on Federal-aid highways has been in effect since November 24, 2008, pursuant to 23 CFR part 634.

538. In Section 7D.05 Operating Procedures for Adult Crossing Guards, the FHWA proposed in the NPA to require rather than recommend, that adult crossing guards shall not direct traffic but rather select opportune times to create a sufficient gap in the traffic flow and stand in the roadway to indicate that pedestrians are about to use or are using the crosswalk and that all vehicular traffic must stop. Two State DOTs, a local DOT, and an NCUTCD member opposed the proposed change because they believe that adult crossing guards do have some traffic control powers and the new language could increase the likelihood of litigation. The FHWA disagrees with the commenters because the laws of many States do not grant police power to direct traffic to school crossing guards. Because the safety of school children is paramount, it is important that adult crossing guards follow specific requirements when controlling traffic for the purpose of assisting schoolchildren, to minimize the exposure of schoolchildren to vehicles that fail to stop. Therefore, the FHWA adopts in this final rule paragraph 01 as proposed in the NPA.

[197] This 2004 publication can be viewed at the following Internet Web site: *http://www.aaa.com/aaa/049/PublicAffairs/SSPManual.pdf.*

[198] The **Federal Register** Notice was published in the **Federal Register** on November 24, 2006 (Volume 71, Number 226, Pages 67792–67800) and can be viewed at the following Internet Web site: *http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=2006_register&docid=E6-19910.pdf.*

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In addition, the FHWA proposed to require, rather than recommend, that adult crossing guards use a STOP paddle. A State DOT opposed the change because it would prohibit the use of flags. The FHWA adopts the change to paragraph 02 as proposed in the NPA to increase the level of consistency for motorists approaching school crosswalks.

Discussion of Amendments to Part 8—Traffic Controls for Railroad and Light Rail Transit (LRT) Grade Crossings

539. Although it was not proposed in the NPA, the FHWA relocates the information contained in Part 10 of the 2003 MUTCD and the revisions thereto proposed in the NPA and editorially combines it with Part 8 into the retitled Part 8 Traffic Control for Railroad and Light Rail Transit (LRT) Grade Crossings. The FHWA combines the information because of the similarities between the topics, to reduce the amount of redundant material and cross-referencing, and based on comments received by a State DOT and an NCUTCD member. In most cases Parts 8 and 10 of the 2003 MUTCD and the proposed revisions to those Parts in the NPA contained virtually identical provisions. In combining the two Parts, the FHWA identifies all provisions from former Part 10 that are specifically applicable only to light-rail transit grade crossings, identifies all provisions that are specifically applicable only to railroad grade crossings, and uses the generic term ''grade crossing'' for provisions that are applicable to both railroad grade crossings and light-rail grade crossings. The FHWA also adopts ''LRT'' as a new abbreviation for light-rail transit since this is a common industry abbreviation and it will reduce the amount of text in the MUTCD.

540. In Section 8A.01 Introduction, in this final rule the FHWA relocates light-rail transit grade crossing information contained in Section 10A.01 in the 2003 MUTCD to Section 8A.01 with revisions to the language as proposed in the NPA. The FHWA also adds definitions of various terms as proposed in the NPA for Sections 8A.01 and 10A.01, but relocates them to Section 1A.13, as previously discussed.

A State DOT suggested revising the proposed ''Constant Warning Time Train Detection'' definition to add ''track circuitry'' and ''determines the time of arrival of a train at a crossing'' and suggested other editorial revisions. The FHWA disagrees because the suggested language does not include important elements including ''uniform waiting time'' and ''not accelerating or decelerating'' and therefore the FHWA adopts the definition as proposed in the NPA and relocates it to Section 1A.13.

The FHWA received comments suggesting removing the ''Diagnostic Team'' definition and the use of the term ''diagnostic team'' from the MUTCD because it may inadvertently increase the scope of the MUTCD and this term is provided in other reference materials. The FHWA agrees and deletes the proposed ''Diagnostic Team'' definition and deletes the use of ''diagnostic team'' in the various places that it had been proposed to be added in Part 8.

A State DOT also suggested removing the terms ''train whistle,'' ''locomotive whistle,'' and ''train horn'' from the NPA proposed ''Locomotive Horn'' definition to promote uniformity. The FHWA agrees that the terms should not be used interchangeably in the MUTCD. The FHWA believes that the most appropriate term to consistently use in the MUTCD is ''locomotive horn'' to be consistent with Federal Railroad Administration (FRA) terminology, and the FHWA adopts the use of that term in this final rule.

An NCUTCD member suggested revising the existing ''pre-signal'' definition to clarify that supplemental near-side traffic control signal faces for the highway-highway intersection are not considered pre-signal and that pre-signals are typically used where the clear storage distance is insufficient to store one or more design vehicles. The FHWA agrees and adopts the definition as suggested by the commenter with editorial revisions in this final rule.

A State railroad operator suggested revising the existing ''Vehicle Intrusion Detection Devices'' definition to replace ''Intrusion'' with ''Presence'' because the highway industry typically refers to devices that detect automobiles along the roadways as vehicle presence detectors. The FHWA notes that the term is used only once in the MUTCD and therefore a definition is not needed. The FHWA deletes the existing definition and relocates the elements of the definition to the text in Section 8C.06.

A State DOT opposed the proposed new ''Wayside Horn'' definition in the NPA because it is not beneficial for motorists, only for pedestrians. The FHWA disagrees because the horns can be made loud enough to be heard by occupants of motor vehicles. The NCUTCD suggested revising the proposed ''Wayside Horn'' definition by replacing the term ''oncoming motorist'' with ''road users'' and to include the whole wayside horn system, not just the horns. The FWHA agrees because the wayside horns are a part of the wayside horn system and the FHWA adopts the NCUTCD suggested revisions to the proposed definition in the NPA in this final rule.

The NCUTCD also suggested adding new definitions for ''Entrance Gate'' and ''Exit Gate.'' The FHWA agrees because the suggested new definitions clarify existing terms used in the MUTCD and adds the new definitions recommended by the NCUTCD in Section 1A.13 with editorial revisions.

The NCUTCD and a State railroad operator suggested adding a new definition for ''Swing Gate'' since it is mentioned in several locations in the MUTCD. The FHWA disagrees because Section 8C.13 already covers the characteristics of a swing gate and adding a definition would be repetitive and unnecessary.

541. In Section 8A.02, Use of Standard Devices, Systems, and Practices at Highway-Rail Grade Crossings, a State DOT opposed the NPA proposed revisions to the GUIDANCE because the term ''road user'' gives too much weight to pedestrians and the commenter believes that pedestrians should not be in the road. The FHWA disagrees because the devices described in Part 8 also control pedestrians and bicyclists, so ''road user'' is the appropriate term and therefore in this final rule adopts the language as proposed in the NPA.

542. The FHWA relocates Section 10A.02 of the 2003 MUTCD, with revisions as proposed in the NPA, to new Section 8A.03 Use of Standard Devices, Systems, and Practices at Highway-LRT Grade Crossings in this final rule. This new section contains provisions specifically applicable only to light-rail grade crossings.

543. In Section 8A.04, Uniform Provisions (Section 8A.03 in the 2003 MUTCD), a State DOT suggested revising the existing 2nd STANDARD statement to remove a conflict with AASHTO guidance on crash cushions. The commenter notes that when placing a crash cushion in front of the sign or signal, AASHTO recommends that there not be a curb in front of the crash cushion for high speeds. The commenter suggested changing the language to require either a raised island or a crash cushion to protect a center mounted sign or signal. The FHWA agrees and adopts the suggested revision to the existing provision in this final rule. This revision provides agencies with more flexibility in the placement of signs and signals and provides consistency with AASHTO guidance.

544. The FHWA adopts a new Section 8A.06 Illumination at Grade Crossings (section 8A.05 in the NPA) containing

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information previously included in Chapter 8C of the 2003 MUTCD in this final rule. The FHWA adopts the text in this section as SUPPORT statements as proposed in the NPA because illumination is not a traffic control device and thus should not be regulated by GUIDANCE and OPTION statements. The FHWA believes that adequate and appropriate guidance on illumination of highway-rail grade crossings is readily available from other sources, such as the ANSI's Practice for Roadway Lighting RP–8, available from the Illuminating Engineering Society of North America.[199] The NCUTCD and two State DOTs agreed and suggested editorial text revisions for clarification. The FHWA adopts the language as proposed in the NPA with editorial revisions recommended by the commenters.

545. The FHWA adopts a new Section 8A.07 (Chapter 8D in the NPA) Quiet Zone Treatments at Highway-Rail Grade Crossings. The FHWA adopts the contents of NPA proposed Chapter 8D in a new Section 8A.07 based on recommendations from a State DOT and a city. The purpose of this new section is to add language to support and directly refer to regulations adopted by Federal Railroad Administration regarding quiet zones established in conjunction with restrictions on locomotive horns at certain highway-rail grade crossings (49 CFR part 222).[200] The NCUTCD, two State DOTs, a railroad operator, an NCUTCD member, and a vendor opposed the proposed language because they believe it fails to provide the guidance necessary to implement the installation of required traffic control devices in quiet zones. The NCUTCD suggested including new STANDARD, GUIDANCE, and SUPPORT text. The FHWA disagrees because there has been no confusion on the part of practitioners on how to install the traffic control devices for quiet zones, even though the FRA regulation has been in effect for three years without any specific treatments or procedures specified in the MUTCD. Provisions regarding the traffic control devices that might be used in a quiet zone have been available in the 2003 MUTCD without any advice on how to specifically apply these in a quiet zone.

In the NPA, the FHWA proposed language in Chapter 10E regarding Quiet Zone treatments at light-rail transit grade crossings, comparable to that proposed in Part 8 for railroad grade crossings. The NCUTCD and a State railroad operator opposed the new language because Quiet Zones do not apply to light rail transit crossings in the FRA regulations. The FHWA agrees with the commenters and in this final rule deletes the language that was proposed in Chapter 10E in the NPA.

546. In Section 8A.08 (Section 8A.05 in the 2003 MUTCD), Temporary Traffic Control Zones, a State railroad operator suggested adding a new cross reference to Figure 6H–46, which shows an example of a temporary traffic control zone at a highway-rail grade crossing. Although not proposed in the NPA, the FHWA agrees and in this final rule adopts the suggested change as a SUPPORT statement that also clarifies that the example is only one of many situations that might be encountered. The FHWA also combines information contained in Section 10A.05 in the 2003 MUTCD into Section 8A.08 in this final rule, with editorial revisions to the language as proposed in the NPA.

547. The FHWA adopts several NPA proposed changes throughout Chapter 8B Signs and Markings in this final rule, to require the installation of a YIELD sign or STOP sign at all passive highway-rail grade crossings. The FHWA adopts this change to incorporate information into the MUTCD from FHWA's Policy Memorandum, ''Guidance for Use of YIELD or STOP Signs with the Crossbuck Sign at Passive Highway-Rail Grade Crossings,''[201] dated March 17, 2006. The FHWA adopts the language as a STANDARD in the MUTCD to require, rather than merely recommend as in the Policy Memorandum, the use of YIELD or STOP signs in conjunction with the Crossbuck sign at all passive crossings. While the Crossbuck sign is in fact a regulatory sign that requires vehicles to yield to trains and stop if necessary, recent research[202] indicates insufficient road user understanding of and compliance with that regulatory requirement when just the Crossbuck sign is present at passive crossings.

A local DOT and ATSSA agreed with the proposed new STANDARD requiring a STOP or YIELD sign. The NCUTCD also agreed and suggested revising the exception for situations ''where an authorized person on the ground directs road users not to enter the crossing prior to a train occupying the crossing.'' A State DOT suggested deleting the exception. The FHWA disagrees with deleting the exception because there is no need for the additional YIELD or STOP sign at a crossing where road users are always given clear instructions as to when it is not safe to cross the track. Nine State DOTs, 12 local agencies, 3 associations, the University of Kansas, an NCUTCD member, a former NCUTCD member, and 3 consultants opposed the proposed new STANDARD because of concerns that the STOP or YIELD signs will be redundant to the Crossbuck regulatory sign and will result in confusion about the installation and maintenance responsibilities between agencies and railroad companies, sign clutter, potential for increased rear-end crashes, the adoption in most crossings of a STOP sign instead of YIELD, lack of respect for the new signs by drivers, and additional expense for sign installation. The commenters also indicated the lack of field research studies supporting the adoption of these signs. Several of the commenters suggested retaining the 2003 MUTCD text or making the proposed STANDARD statement an OPTION. The FHWA responds to the commenters by noting that the requirement of a YIELD or STOP sign in conjunction with the Crossbuck sign at passive grade crossings resulted from research[203] that showed that road users do not fully comprehend the message being communicated by a Crossbuck sign alone. The same Crossbuck sign is used at active and passive grade crossings. At active grade crossings, road users perceive the Crossbuck sign to be marking the location of the grade crossing and the gates and lights as the traffic control devices that control their actions. At passive grade crossings, road users sometimes think that the Crossbuck sign merely marks the location of the grade crossing, when in fact it also needs to convey the regulatory message of ''yield to trains.'' Furthermore, the Crossbuck sign design,

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[199] Information on obtaining this publication can be viewed on the following Internet Web site: *https://www.iesna.org/.*

[200] The **Federal Register** Notice was published on December 18, 2003 (Volume 68, Number 243, Page 70586–70687) and can be viewed at the following Internet Web site: *http://www.fra.dot.gov/downloads/Safety/train_horn_rule/fed_reg_trainhorns_final.pdf.*

[201] FHWA's Policy Memorandum, ''Guidance for Use of YIELD or STOP Signs with the Crossbuck Sign at Passive Highway-Rail Grade Crossings,'' dated March 17, 2006, can be viewed at the following Internet Web site: *http://mutcd.fhwa.dot.gov/resources/policy/yieldstop_guidememo/yieldstop_policy.htm.*

[202] National Cooperative Highway Research Report 470 titled ''Traffic Control Devices for Passive Railroad-Highway Grade Crossings,'' Transportation Research Board, 2002, can be viewed at the following Internet Web site: *http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_470-a.pdf.*

[203] National Cooperative Highway Research Report 470 titled ''Traffic Control Devices for Passive Railroad-Highway Grade Crossings,'' Transportation Research Board, 2002, can be viewed at the following Internet Web site: *http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_470-a.pdf.*

although unique in shape, does not always sufficiently attract the attention of road users, especially at night and when they are turning onto the grade crossing from a street that is parallel to the track. The use of a YIELD sign (and occasionally a STOP sign when justified by an engineering study) can improve the safety of passive grade crossings without requiring any action by road users beyond that which is already required of them. The FHWA adopts the language as proposed in the NPA with editorial revisions suggested by the NCUTCD in this final rule.

A railroad operator and a railroad association suggested revising the proposed requirement to allow the use of engineering judgment instead of an engineering study to determine when STOP signs should be used at passive grade crossings. The FHWA disagrees and believes that the decision to stop all vehicles that approach a grade crossing is so important that it should be documented in a study. The NCUTCD suggested adding text to the STANDARD that the determination to include a STOP sign in a Crossbuck Assembly shall be made by the regulatory agency or highway authority having jurisdiction over the roadway approach. The FHWA agrees because the decision to stop all vehicles should be made by the highway authority and not the railroad or light-rail transit authority. The FHWA adopts the NCUTCD suggested revision to clarify the proposed STANDARD statement in this final rule.

A railroad association suggested allowing an exception for requiring an engineering study for existing highway rail grade crossings with STOP signs. The FHWA disagrees because if a STOP sign is in place at a crossing and an engineering study justifying its use is already on file, then a new study would not be necessary. However, if no such study is on file because it was lost or because engineering judgment was used to determine the need for the STOP sign, then a new study should be conducted and placed in the file. If the new study does not justify the STOP sign, then the STOP sign should be replaced with a YIELD sign.

The FHWA establishes a target compliance date of December 31, 2019 (approximately 10 years from the effective date of this final rule) or when adjustments are made to the individual grade crossing and/or corridor, whichever occurs first, for implementing the new requirements for YIELD or STOP signs at existing passive crossings. The FHWA establishes this target compliance date to promote increased safety at passive grade crossings, especially during nighttime hours. Because the new requirements involve conducting engineering studies and installing signs that do not currently exist at existing grade crossings, the FHWA believes that relying on the systematic upgrading processes that highway agencies typically use to replace existing signs at the end of their service lives would result in an excessively long time period for installation of YIELD or STOP signs at existing passive grade crossings. The FHWA anticipates that installation of the required additional signs at existing locations will provide significant safety benefits to road users.

548. In Section 8B.01 Purpose, the FHWA relocates existing SUPPORT and STANDARD statements from Section 10C.01 of the 2003 MUTCD with editorial revisions as proposed in the NPA in this final rule.

549. In retitled Table 8B–1 Grade Crossing Sign and Plaque Minimum Sizes, the NCUTCD suggested reducing the existing dimension for the I–13 sign (I–13a in the 2003 MUTCD) to 12 inches x 9 inches. The FHWA decides to delete the size information for the I–13 sign from Table 8B–1, to eliminate any potential inconsistencies with an anticipated future rulemaking for this item by the FRA.

A consultant questioned why the W10–14P, W10–14aP, and W10–15P plaques were proposed to increase in size from 24 inches x 18 inches to 30 inches x 24 inches, noting that sign sizes for other plaques (W10–5P, W10–9P, and proposed W10–10P) remained at 24 inches x 18 inches size. The FHWA in this final rule adopts increases in the size of the W10–5P and W10–9P plaques to 30 inches x 24 inches to provide consistency with the other adopted revisions that increase the lettering height to 5 inches for all railroad crossing warning plaques, to assure adequate legibility for drivers with 20/40 visual acuity.

550. In retitled Section 8B.03 Grade Crossing (Crossbuck) Sign (R15–1) and Number of Tracks Plaque (R15–2P) at Active and Passive Grade Crossings, the FHWA proposed in the NPA an OPTION statement that allowed the Crossbuck sign at non-signalized crossings to have reflectorized red lettering, rather than the standard black lettering. While a local DOT agreed with the proposal, five State DOTs, three local agencies, ATSSA, an NCUTCD member, and a consultant opposed it because of concerns that the red letters will fade quickly, the need for uniformity, and the red color might imply that a vehicle needs to stop. The FHWA agrees with these comments and does not adopt the proposed OPTION in this final rule, in order to promote uniformity.

Two State DOTs suggested revising the proposed SUPPORT statement to note that the Crossbuck sign functions similar to a YIELD sign. The FHWA agrees and in this final rule adopts the revisions to the SUPPORT statement proposed by the commenters. The FHWA also revises the SUPPORT to state that Crossbuck signs function similar to a YIELD sign ''in most States'' based on information provided by the FRA.

The FHWA also relocates to this section the existing OPTION from Section 10C.02 in the 2003 MUTCD to use a Crossbuck sign on a highway approach to a highway-light rail transit grade crossing on a semi-exclusive or mixed-use alignment.

A State railroad operator suggested revising the existing STANDARD statement to require the R15–2P plaque at all multi-track crossings, not just at crossings without automatic gates, based on concerns about the potential for second train incidents. These concerns are present at multi-track crossings, independent of whether gate arms are installed. The FHWA notes this comment and might consider including this suggestion in a future NPA.

The NCUTCD suggested adding the word ''vertical'' to the existing STANDARD in Section 8B.03 to clarify the orientation of the retroreflective white strip material on the support for a YIELD or STOP sign. The FHWA agrees and makes the suggested revision and relocates the language to Section 8B.04.

551. The FHWA adopts the retitled Figure 8B–1 (Figure 8B–3 in the 2003 MUTCD) Regulatory Signs and Plaques for Grade Crossings in this final rule, which combines Figure 8B–3 and Figure 10C–2 in the 2003 MUTCD and incorporates the NPA proposed R8–10a and R10–6a signs. ATSSA supported the new signs while an NCUTCD member opposed them stating that these smaller signs were not necessary. The FHWA disagrees because the smaller alternate signs are needed for situations when vertical space is limited.

A State railroad operator and local DOT suggested using the symbolic turn restriction blank-out signs instead of the text messages for the R3–1a and R3–2a signs, similar to the California MUTCD provisions. The FHWA notes that the Section 8B.08 text does not prevent blank-out symbolic signs from being used. The text gives the OPTION of using the word message signs for this purpose; the text does not mandate only

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the use of the word message signs for this situation.

552. The FHWA also adopts the revised Section 8B.04 (Section 8B.08 in the 2003 MUTCD) Crossbuck Assemblies with YIELD or STOP Signs at Passive Grade Crossings in this final rule. The FHWA replaces all of the existing text with new STANDARD, GUIDANCE, SUPPORT, and OPTION statements proposed in Section 8B.05 the NPA combined with new language proposed in Section 10C.02 in the NPA that describes the use of STOP and YIELD signs at passive grade crossings. The FHWA also relocates a STANDARD from Section 8B.03 and makes several editorial revisions to the language as proposed in the NPA to remove inconsistencies and redundancies with Section 8B.03 based on several comments received. The remaining sections are renumbered accordingly.

The FHWA also adopts the NPA proposed deletion from the STANDARD statement of the requirement that Crossbuck signs be used on each highway approach to every highway-light rail transit grade crossing on a semi-exclusive alignment. The FHWA adopts this change to reflect the standard practice of most light rail transit agencies in the nation. Crossbuck signs are not typically used at grade crossings controlled by traffic signals, particularly in downtown areas. Grade crossings within highway-highway intersections in urban areas with train speeds of 35 mph or less are typically controlled by traffic signals and Crossbuck signs are not used. Crossbuck signs are not appropriate for light rail transit grade crossings in downtown areas or at intersections controlled by traffic signals, since they are believed to be ineffective and create sign clutter. A city agreed with the deletion while a State DOT opposed it.

The NCUTCD and a State DOT suggested adding a requirement in Section 8B.04 that the mounting height for the STOP or YIELD sign should be at least 5 feet for new installations while another State DOT suggested a 4-foot mounting height for new installations. The FHWA adopts a minimum mounting height of 4 feet but agrees that a higher mounting height might be needed for new installations and might consider proposing this in a future NPA.

The FHWA also proposed in Section 8B.03 of the NPA to revise the STANDARD statement, and the associated figure, to indicate that the measurement for the retroreflective strip that is placed on the front and back of the support for the Crossbuck sign is to be from the ground, rather than the roadway. The FHWA proposed this change because there might be some cases where the ground level at the base of the sign is higher than the edge of the roadway. The FHWA adopts the proposed change in Section 8B.04 in this final rule but does not adopt the requirement for the retroreflective strip on the back of the support. A State DOT suggested revising the text to add the word ''back'' to the existing STANDARD statement to specify where not to install white strips on Crossbuck supports for one-way streets. The FHWA agrees and adopts the suggested revision in this final rule and changes this statement to an OPTION rather than stating it in a STANDARD text as an exception.

Two State DOTs and a city opposed the STANDARD statement proposed in Section 8B.05 in the NPA for the use of STOP AHEAD and YIELD AHEAD warning signs because installing the signs might not always be feasible because of space limitations, the signs might conflict with advance railroad warning signs, and drivers might start ignoring these signs if too many are installed. The FHWA disagrees with the commenter because there will not be an over-proliferation of these signs if they are installed only when the criteria in Section 2C.35 are met. The FHWA adopts this proposed STANDARD paragraph in this final rule, but reverses the order of the W3–1 and W3–2 signs to improve consistency. The FHWA also adds a YIELD AHEAD and STOP AHEAD warning sign to Figure 8B–6.

A county and a consultant suggested revising the NPA proposed GUIDANCE recommending using yield lines at highway-rail crossings in order to reference Section 3B.16 and to remove the words ''transverse line'' since it might be confused with a stop line. The FHWA disagrees with removing ''transverse line'' because Section 3B.16 in the 2003 MUTCD makes it clear that yield lines are transverse lines. The FHWA does not adopt the proposed GUIDANCE and instead adopts a reference to Section 8B.28 in a new SUPPORT statement for the proper use of stop lines and yield lines.

A State DOT suggested providing an OPTION allowing a ''Goal Post'' or ''U''-mounted assembly for the placement of the Yield or Stop sign on a Crossbuck Assembly to maintain proper sign mounting height for crashworthiness of the sign assembly. The commenter also notes that these can be used as an alternative where the roadway shoulder area is limited. The FHWA notes that the text does not prevent an agency from using a U-mounted assembly. Figure 8B–2 shows the YIELD or STOP sign below the Crossbuck and Number of Tracks signs, but does not prohibit other arrangements and therefore no revisions are necessary to accommodate the commenter's request.

A State railroad operator suggested adding a STANDARD to require the railroad company to be responsible for the entire Crossbuck Assembly (which the language in the NPA defines to include the YIELD or STOP sign), unless the roadway authority has agreed to place and maintain a separate YIELD or STOP sign for the crossing. The commenter stated that typically railroad companies prohibit roadway authorities from altering or otherwise modifying Crossbuck Assemblies at their grade crossings, and STOP and YIELD signs placed in conjunction with Crossbuck Assemblies should ideally be located on the same post, and therefore maintained by the railroad. The commenter said that the responsibilities of the roadway authority and railroad should be stated. The FHWA disagrees because responsibility the installation and maintenance of the YIELD or STOP sign on the Crossbuck support will vary from State to State. To clarify this situation, the FHWA adds a cross reference to Sections 8A.02 and 8A.03, which discusses the general responsibilities of highway agencies and railroad companies.

553. The FHWA relocates Section 10C.04 in the 2003 MUTCD to Section 8B.05 and retitles the section as ''Use of STOP (R1–1) or YIELD (R1–2) Signs without Crossbuck Signs at Highway-Light Rail Grade Crossings,'' with editorial revisions, as proposed in the NPA, in this final rule.

554. The FHWA combines the light-rail transit grade crossing information from Section 10C.15 as proposed in the NPA into new Section 8B.06 (Section 8B.04 in the 2003 MUTCD) Grade Crossing Advance Warning Signs (W10 Series) and also adopts the NPA proposed revisions for Section 8B.06. The FHWA proposed to add to the first STANDARD statement a requirement that a supplemental plaque describing the type of traffic control at the highway-rail grade crossing shall be used with the Grade Crossing Advance Warning sign (W10–1). As part of this proposal, the FHWA also proposed requiring the use of a new No Signal (W10–10P) supplemental plaque in advance of a crossing that does not have active traffic control devices, and the use of a new Signal Ahead (W10–16P) plaque in advance of a crossing that does have active traffic control devices. While ATSSA agreed, numerous commenters opposed the use of the No Signal plaque because it is obvious what control is at an active crossing and because of concerns over the cost of

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implementation, sign clutter, and lack of research and justification for their use. The FHWA acknowledges that the SIGNAL AHEAD plaque message is not needed or particularly helpful in advance of active crossings. There is already a NO GATES OR LIGHTS (W10–13P) plaque that can be used in advance of passive crossings, so a new NO SIGNAL plaque is unnecessary. Using a separate YIELD AHEAD or STOP AHEAD plaque will not convey this message, as road users might think that it refers to a highway-highway intersection beyond the grade crossing. Because this final rule adopts a requirement that a retroreflective YIELD or STOP sign be used at every passive crossing, which will have an effect on how much in advance (especially at night) a road user becomes aware of the presence of a grade crossing, there is no need to require or even recommend that this plaque be used at all passive crossings. As a result of the comments, the FHWA does not adopt the proposed STANDARD requiring supplemental plaques under advance warning signs at active and passive crossings, and the two proposed plaque designs.

A State DOT suggested providing an OPTION for situations where two grade crossings are spaced closely together where one grade crossing has signals and the other crossing does not. The FHWA disagrees with the need for this OPTION because in this unusual case lights and gates will have to also be installed at the passive grade crossing or the placement of the signs and plaques will have to be carefully designed to minimize any potential confusion. A State DOT recommended changing the reference from the W10–1 sign to the W10 series since there will be instances where the NO TRAIN HORN plaque is used and there will not be a W10–1 sign. The FHWA agrees and adopts the suggested revision.

The FHWA also proposed in the NPA to add at the end of the 1st STANDARD a statement that a YIELD AHEAD or a STOP AHEAD advance warning sign shall also be installed if criteria are met, along with information regarding the distance between signs in advance of a highway-rail grade crossing, to emphasize existing requirements in Part 2. Two State DOTs, five local agencies, an association, and a consultant opposed the new STANDARD because of concerns about sign redundancy with other advance warning signage, increases burdens on public agencies resulting from sign clutter and operations costs in typical urban environments, and will likely not change road user behavior. A city suggested reducing the STANDARD to GUIDANCE. The FHWA disagrees because the use of STOP AHEAD or YIELD AHEAD signs are required for non-grade crossing applications in Section 2C.35 when the criteria is met and their use should also be required in this section. Therefore, the FHWA adopts in this final rule the language as proposed in the NPA.

555. The FHWA adopts the NPA proposed new Figure 8B–3 Crossbuck Assembly with a YIELD or STOP Sign on a Separate Sign Support to reflect the adopted new requirement to install a YIELD sign or STOP sign at all passive highway-rail grade crossings, except crossings where road users are directed by an authorized person on the ground to not enter the crossing at all times that an approaching train is about to occupy the crossing. The remaining existing Figures in Chapter 8B are renumbered accordingly.

556. The FHWA combines light-rail transit grade crossing information from Section 10C.10 in the NPA into retitled Section 8B.07 (Section 8B.05 in the 2003 MUTCD) EXEMPT Grade Crossings Plaques (R15–3P, W10–1aP). A State DOT suggested revising the existing provisions to clarify the placement of an exempt plaque in relation to a Crossbuck sign, warning sign, or other plaque. The FHWA disagrees because Section 8B.07 has existing text that says that the EXEMPT plaque is installed below the advance warning sign.

557. In retitled Figure 8B–4 (Figure 8B–2 in the 2003 MUTCD) Warning Signs and Plaques for Grade Crossings, the FHWA proposed in the NPA to add the light rail transit signs and plaques from Figure 10C–3 in the 2003 MUTCD. The FHWA proposed revising the symbol shown on the W10–7 sign to use the same symbol of a light rail transit vehicle as that used on the I–12 sign. The light rail transit vehicle symbol on the existing W10–7 sign was an inadvertent error that the FHWA wanted to correct so that the symbols will be consistent. A city and ATSSA agreed with the proposed revision. The NCUTCD suggested adding a note that signs can be modified for geometrics to allow a curved line for a roundabout and railroad tracks. The FHWA agrees and adopts the proposed revision with the suggested note and editorial revisions.

558. With respect to the NPA proposed Figure 8B–6 Example of Placement of Warning Signs and Pavement Markings at Grade Crossings, the NCUTCD suggested adding the words ''If transverse lines are used at the grade crossing'' to the note about the yield line. The FHWA agrees and adopts the suggested change in this final rule. A State DOT opposed the use of yield lines. The commenter suggested showing an illustration of the yield line if this requirement is retained. The FHWA notes that if a YIELD sign is used at a passive crossing, then a yield or stop line may be used per Section 8B.28, as discussed below. The FHWA does not add an illustration of a yield line since the note on Figure 8B–6 is sufficient. The NCUTCD opposed moving the W10–1 sign in reference to the railroad crossing pavement markings and suggested retaining the location as shown in the 2003 MUTCD. The FHWA agrees and maintains the placement of the W10–1 and pavement markings as shown in the 2003 MUTCD. An NCUTCD member suggested illustrating the use of the W10–10P and W10–16P plaques for passive and active grade crossings, respectively. The FHWA notes that the supplemental plaques will not be required and therefore does not add them to the figure.

559. In Section 8B.08 Turn Restrictions During Preemption (Section 8B.06 in the 2003 MUTCD) and in Section 8B.09 DO NOT STOP ON TRACKS Sign (R8–8) (Section 8B.07 in the 2003 MUTCD) the FHWA combines the proposed language with appropriate text from Sections 10C.09 and 10C.05, respectively, in the 2003 MUTCD for light rail transit grade crossings, and adopts editorial revisions as proposed in the NPA in this final rule.

560. In Section 8B.10 TRACKS OUT OF SERVICE Sign (R8–9) (Section 8B.09 in the 2003 MUTCD) the FHWA combines the existing language with appropriate text from Section 10C.06 in the 2003 MUTCD for light rail transit grade crossings in this final rule. A local agency suggested revising the existing OPTION statement to clarify that the R8–9 sign replaces the Crossbuck assembly. The FHWA agrees and adopts the suggested revision in this final rule.

561. In retitled Section 8B.11 STOP HERE WHEN FLASHING Sign (R8–10, R8–10a) the FHWA combines the existing language with appropriate text from Section 10C.08 in the 2003 MUTCD for light rail transit grade crossings.

562. In retitled Section 8B.12 STOP HERE ON RED Sign (R10–6, R10–6a) the FHWA combines the existing language with appropriate text from Section 10C.07 in the 2003 MUTCD for light rail transit grade crossings.

563. In Section 8B.17 LOOK Sign (R15–8) (Section 8B.16 in the 2003 MUTCD), the FHWA proposed in the NPA to remove the option of mounting the LOOK sign on the Crossbuck support. Two State DOTs opposed this

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revision because there are situations where this option is beneficial. Based on the comments received, the FHWA does not adopt the proposed change. However, the FHWA adopts a new GUIDANCE statement recommending that the LOOK sign should not be mounted on a Crossbuck Assembly that has a STOP or YIELD sign because there would be insufficient space for the LOOK sign and there would be too many signs for the driver to process. A State railroad operator suggested removing the phrase ''on a separate post'' from the proposed revision in the NPA to allow other possible mounting locations, such as on a pedestrian swing gate or on a wall adjacent to the crossing. The FHWA notes that the NPA proposal intended to prohibit the mounting of the LOOK sign on the Crossbuck support, and the option suggested by the commenter would be allowed with the adopted text. The FHWA also combines language with appropriate text from Section 10C.03 in the 2003 MUTCD for light rail transit grade crossings.

564. The FHWA proposed to rewrite Section 8B.18 (Section 8B.12 in the 2003 MUTCD) Emergency Notification Sign (I–13) and combine it with the information in Section 10C.21 in the NPA. The proposed new text included STANDARD statements that specify the minimum amount of information to be placed on Emergency Notification signs, sign placement, and the sign color of a white legend and border on a blue background. A GUIDANCE statement with additional information on sign retroreflectivity, sign placement, and sign size was also proposed. To illustrate the proposed changes, FHWA proposed to revise Figure 8B–5 and Table 8B–1 accordingly. The FHWA proposed these changes to simplify the requirements for these signs and to assure that the appropriate information is displayed on these signs that provide valuable information to roadway users in the event of an emergency or signal malfunction requiring notification to the railroad or light rail transit agency. A city and ATSSA agreed with the revisions proposed in the NPA. Two State DOTs suggested revisions to allow different letter heights. A city also opposed the proposed revision because in urban areas where the highway-light rail transit grade crossing is at a named intersection there should not be a need for a unique grade crossing identifier. The FHWA adopts the revisions as proposed in the NPA but removes specific references to letter heights and design details since this information will be addressed by an anticipated future rulemaking by the Federal Railway Administration.

A State DOT, six local agencies, an association, an NCUTCD member, and a consultant suggested adding a new provision that the railroad company is responsible for the installation and maintenance of the I–13 sign. The FHWA disagrees and notes that this specific responsibility might vary from State to State and Sections 8A.02 and 8A.03 discuss the general responsibilities of highway agencies and railroad companies.

565. With respect to the NPA proposals for retitled Figure 8B–5, (Figure 8B–4 in the 2003 MUTCD) Example of Emergency Notification Sign, the NCUTCD suggested revising the crossing number on the I–13 sign (I–13a in the 2003 MUTCD) to be consistent with the DOT format. The FHWA agrees with showing a realistic number in the figure and adopts the sign with a revised legend in this final rule. An NCUTCD member suggested deleting the emergency notification sign and figure from the MUTCD because he believes that it is the railroad company's responsibility to provide the sign. The FHWA disagrees because there are situations where highway agencies install and maintain these signs and therefore the signs remained to promote uniformity.

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566. In retitled Section 8B.21 (Section 8B.15 in the NPA) NO TRAIN HORN Sign or Plaque (W10–9, W10–9P), the FHWA proposed in the NPA to change the existing NO TRAIN HORN sign to a supplemental plaque. The FHWA also proposed to revise the STANDARD to clarify that the plaque should be mounted directly below the W10–1 sign. Two State DOTs and a State railroad operator suggested revising the NPA proposed STANDARD to include a reference to 49 CFR part 222 to be in conformity with the quiet zone definition noted earlier in the MUTCD. The FHWA agrees and adopts the suggested change in this final rule. The NCUTCD and a State DOT suggested allowing the NO TRAIN HORN plaque to also be used with the W10–2, W10–3, and W10–4 signs. The FHWA agrees that such use is appropriate and adopts the suggested revision. A State DOT also suggested requiring the NO TRAIN HORN plaque below the Number of Tracks Plaque, if used, otherwise mounted under the Crossbuck sign. The FHWA disagrees because the suggested revision would allow the placement of the NO TRAIN HORN sign at the crossing rather than in advance of the crossing where it is needed. The FHWA does not adopt the removal of the existing NO TRAIN HORN W10–9 sign as proposed in the NPA, and instead allows either the W10–9 sign or W10–9P plaque to be used.

567. In the NPA, the FHWA proposed deleting existing Section 8B.15 and relocating the information to other sections. The FHWA retains the section as Section 8.22 NO GATES OR LIGHTS Plaque (W10–13P) in this final rule. The FHWA deletes the NO SIGNAL Sign from the MUTCD based on comments received in Section 8B.06. See item 554 above.

568. The FHWA adopts Section 8B.23 Low Ground Clearance Grade Crossing Sign (W10–5) (Section 8B.17 in the 2003 MUTCD) in this final rule, which combines the existing language with the existing language in Section 10C.16 in the 2003 MUTCD for light rail transit grade crossings.

569. In Section 8B.24 (Section 8B.18 in the 2003 MUTCD) Storage Space Signs (W10–11, W10–11a, W10–11b), the FHWA combines appropriate text from Section 10C.18 in the 2003 MUTCD with NPA proposed Section 8B.18 in this final rule. A railroad operator suggested requiring the NO TRAIN HORN plaque (W10–9P) be placed above the W10–11aP or W10–11bP plaque. The FHWA disagrees and retains the existing text because the NO TRAIN HORN plaque needs to be placed on the same support as the advance warning sign, not the same support as the storage distance sign.

570. In Section 8B.25 Skewed Crossing Sign (W10–12) (Section 8B.19 in the 2003 MUTCD), the FHWA combines the existing language with appropriate text from Section 10C.19 in the 2003 MUTCD for light rail transit grade crossings.

571. In Section 8B.27 (Section 8B.20 in the 2003 MUTCD) Pavement Markings, the FHWA combines the existing language and proposed revisions with appropriate text from Section 10C.23 in the 2003 MUTCD for light rail transit grade crossings in this final rule. A State DOT opposed the NPA proposed revision to the 4th STANDARD statement in section 8B.20 which proposed removing the requirement for railroad pavement markings on roads with speeds less than 40 mph. The commenter believes that the pavement markings are important for safety and the revision would apply to thousands of crossings in the commenter's jurisdiction. The FHWA addresses the commenter's concern by revising the wording so that an engineering study is required to omit pavement markings on roads with speeds less than 40 mph.

The NCUTCD, two DOTs, two local agencies, an NCUTCD member, and a

consultant opposed the NPA proposed revisions to the GUIDANCE regarding the location of the advanced warning sign in relation to the pavement marking and suggested retaining the 2003 MUTCD text. The FHWA agrees and maintains the text as in the 2003 MUTCD and revises Figure 8B–6 to be consistent with this action.

572. In retitled Section 8B.28 (Section 8B.21 in the 2003 MUTCD) Stop and Yield Lines, the FHWA proposed in the NPA to add a STANDARD statement requiring the use of stop lines on paved roadways at highway-rail grade crossings that are equipped with active control devices. This requirement is currently implied by the existing language in Section 8B.21 of the 2003 MUTCD and illustrated in Figure 8B–6. A local DOT agreed. The FHWA adopts this specific requirement for clarification and because the stop line provides road users with a clear indication of the point behind which they are required to stop when the traffic control devices are activated.

The FHWA also proposed relocating GUIDANCE statements from Section 8B.05 in the NPA recommending stop lines when a STOP sign is used with the Crossbuck sign and adding yield lines when a YIELD sign is used with the Crossbuck sign. A city suggested adding a requirement for stop lines at passive crossings because stop lines are more important in those situations. A State DOT opposed using yield lines because their practice is to use stop lines at all highway rail crossings. Based on the comments received, the FHWA adds an OPTION to allow stop lines at passive grade crossings where a YIELD sign is installed. While the stop line is preferred in this situation for consistency, the new OPTION will improve safety by improving nighttime visibility at grade crossings with the retroreflective stop lines. The FHWA also combines the existing language with appropriate text from Section 10C.24 in the 2003 MUTCD for light rail transit grade crossings.

A city opposed the proposed revision in Section 8B.21 of the NPA to require a stop line at every active grade crossing because of the belief that this would provide a small benefit for a large cost and a State DOT suggested reducing the STANDARD to GUIDANCE. The FHWA disagrees with the commenters because the requirement is only for paved active crossings and the FHWA believes the safety benefits will outweigh the disadvantages. A State railroad operator suggested providing GUIDANCE regarding the appropriate placement of the stop line where tracks are within or adjacent to an intersection. The FHWA declines to add the suggested statement because engineering judgment should dictate stop line placement in those situations due to the wide variety of situations where tracks are within or immediately adjacent to the intersection. The FHWA adopts the language as proposed in the NPA and the new OPTION to install a stop line at a grade crossing with a YIELD sign in this final rule.

573. In Section 8B.29 (Section 8B.22 in the 2003 MUTCD) Dynamic Envelope Markings, the FHWA adopts the proposed NPA revision to Section 8B.22 in the 2003 MUTCD and relocates the SUPPORT, GUIDANCE, and OPTION statements from Section 10C.24 as proposed in the NPA. The FHWA deletes the existing OPTION statement in Section 8B.22 of the 2003 MUTCD in this final rule based on a comment received from a State railroad operator which suggested that the provision is subjective. The FHWA agrees that the OPTION is not needed because adopted paragraph 02 adequately addresses the subject.

574. In retitled Figure 8B–8 Example of Train Dynamic Envelope Pavement Markings at Grade Crossings, a State DOT suggested providing a new note on the existing figure that the dynamic envelope markings are optional. The FHWA agrees because the text of Section 8B.29 clearly describes these markings as optional. The FHWA adds ''optional'' prior to ''white pavement marking'' in the bottom right-hand corner of the drawing. The FHWA also adds the illustration from Figure 8A–1 in the 2003 MUTCD to this figure.

575. The FHWA in this final rule adopts the NPA proposed deletion of Chapter 8C Illumination in the 2003 MUTCD and places the information from this chapter in a new section numbered and titled Section 8A.06 Illumination at Grade Crossings. See item 544 above. The remaining chapters in Part 8 are re-lettered accordingly.

576. The FHWA relocates to Section 8C.01 (Section 8D.01 in the 2003 MUTCD) Introduction, the SUPPORT and GUIDANCE statements regarding light-rail transit grade crossings from Section 10D.01 in the NPA in this final rule. The FHWA proposed in the NPA to change the OPTION statement in Section 10D.01 to a STANDARD statement, which will require audible devices to be provided and operated in conjunction with flashing-light signals or traffic control signals where they are operated at a light rail transit grade crossing that is used by pedestrians. The FHWA proposed this change because light rail transit vehicles are often nearly silent, and blind pedestrians cannot see flashing lights. Requiring the use of an audible warning device would assure that information about the approach of a light rail transit vehicle is available to persons with visual disabilities. Two cities and a State railroad operator opposed the revision, in part because it might create conflicts with pedestrian crosswalk audible indications. The FHWA disagrees because it is essential that an audible device be available for blind pedestrians because of the quiet operation of light rail transit vehicles and light rail transit is generally located in urban areas where pedestrians are prevalent. The FHWA also notes that if conventional pedestrian signals are used at a traffic control signal, the accessible pedestrian features would be sufficient provided that pedestrians are always directed to not be in the crosswalk when a light-rail vehicle is approaching or occupying the crosswalk location and therefore text revisions are not necessary to accommodate pedestrian crosswalk audible indications. The FHWA believes the safety benefits outweigh the costs associated with the new requirement. The FHWA adopts the language as proposed in the NPA but relocates the statement to Section 8C.10.

The NCUTCD suggested adding new GUIDANCE that the top of the signal foundation should be no more than 4 inches above the surface of the ground. The NCUTCD stated that the top of the foundation should be at the same elevation as the crown of the roadway to permit use of standardized traffic control devices that meet the vertical clearances shown in Figure 8C–1 (Figure 8D–1 in the 2003 MUTCD). The NCUTCD also indicated that where site conditions require the top of the foundation to be at different elevation than the crown of the roadway, then the shoulder side slope should be re-graded or the height of the signal mast should be adjusted to maintain the vertical clearance requirements of Figure 8C–1. The FHWA agrees and adopts the suggested revision in this final rule.

577. In Figure 8C–1 (Figure 8D–1 in the 2003 MUTCD), Composite Drawing of Active Traffic Control Devices for Highway-Rail Grade Crossings Showing Clearances, the FHWA proposed to change gate arm stripes from diagonal to vertical. The FHWA received no comments and therefore adopts the revisions as proposed in the NPA in this final rule. A local DOT suggested clarifying the existing note above the gate that says, ''Dimension A–B–C and length for appropriate approaching traffic.'' The FHWA notes that the quantitative dimensions for A, B, and C are intentionally not specified because these dimensions vary from one location

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to another based on the geometry of the approach lanes. The text in Section 8C.04 requires at least three lights on the gate arm. These lights should be positioned to have the maximum impact on drivers approaching the gate. The FHWA deletes the existing dimensions and revises the note to say, ''Minimum of three red lights positioned as appropriate for approaching traffic'' in this final rule.

578. In retitled Section 8C.02 (Section 8D.02 and 8D.03 in the 2003 MUTCD) Flashing-Light Signals, the FHWA adopts the editorial revisions as proposed in Section 8C.02 the NPA in this final rule. A State railroad operator suggested adding a new SUPPORT statement similar to Section 4D.06 to allow for the use of industry-standard technology such as light-emitting-diode (LED) signals which might not use optical lenses. Although not included in the NPA, the FHWA agrees and adopts a new SUPPORT statement that is similar to the text in Section 4D.06 in this final rule.

The FHWA also combines the OPTION and STANDARD statements contained in NPA Section 8C.03 into Section 8C.02 and adopts the new STANDARD as proposed in the NPA.

579. In Section 8C.04 (Section 8D.04 in the 2003 MUTCD) Automatic Gates the FHWA proposed in the NPA to revise the 4th paragraph of the STANDARD statement to indicate that the stripes on gate arms shall be vertical, rather than 45-degree diagonal. The FHWA also proposed changes to the stripes on Figures 8C–1, 8C–5, and 8C–6 accordingly. The diagonal stripes might encourage road users to drive around the gates because diagonal stripes are used on other devices such as barricades, object markers, etc. to indicate the side of the device that road users are required to use when they travel past the device. A State DOT, a city, ATSSA, and a railroad operator agreed with the revision. The railroad operator also suggested adding GUIDANCE allowing a crossing to have one gate with vertical stripes and one gate with diagonal stripes during the implementation period. Two State DOTs and a citizen opposed the proposed revisions because the change is too subtle for the driver to notice and the lack of research supporting the revision. The FHWA disagrees and believes that this revision is worth making because of its potential to improve safety. The FHWA adopts the language as proposed in the NPA and adds a SUPPORT statement cross referencing paragraph 24 of the MUTCD Introduction, which describes two situations when a non-serviceable device that is non-compliant may be replaced in kind.

The FHWA adopts into this section the existing OPTION and GUIDANCE statements regarding light rail transit grade crossings from Section 10D.03 in the 2003 MUTCD.

580. In Section 8C.06 Four Quadrant Gate Systems (Section 8D.05 in the 2003 MUTCD), the FHWA adopts the editorial revisions proposed in the NPA in this final rule. The FHWA also combines the existing language with appropriate text from Section 10D.04 in the 2003 MUTCD for light rail transit grade crossings.

581. The FHWA proposed a new Section 8C.06 Wayside Horn Systems in the NPA. This new section as proposed in the NPA contained OPTION, STANDARD, and GUIDANCE statements regarding the use of wayside horn systems to provide directional audible warning at highway-rail grade crossings pursuant to the Interim Approval for the Use of Wayside Horn Systems, which was issued on August 2, 2004.[204] The Interim Approval and the proposed new MUTCD text support the regulation adopted by Federal Railroad Administration mandating the sounding of locomotive horns at highway-rail grade crossings (49 CFR part 222).[205] A State DOT opposed the proposed new section because they believe that a wayside horn system is not a traffic control device. The FHWA disagrees because a wayside horn system provides warning to traffic and is important to include in the MUTCD to assure uniform messages.

The NCUTCD suggested requiring the location and operating characteristics of the wayside horns to be determined by a diagnostic team. Based on item 539 above, the NPA proposed definition and proposed use of diagnostic team term has been removed from the MUTCD. An NCUTCD member opposed the STANDARD regarding wayside horn systems being directed towards approaching road users because traffic facing a STOP sign has no additional obligation to wait for clearance of the train than traffic waiting at a Crossbuck sign only and traffic controlled by a signal is obligated to wait until allowed by the signal to proceed. A local DOT also noted a conflict between the NPA proposed STANDARD in Section 8C.06 which states that the wayside horn systems shall be directed towards approaching road users, but provides an exception for movements that are controlled by a STOP sign or traffic control signal, and the NPA proposed GUIDANCE which states that wayside horn systems should be installed for each roadway approach. To clarify the new provisions and to be consistent with FRA regulations, the FHWA revises the proposed OPTION, STANDARD, and GUIDANCE statements in the NPA with references to 49 CFR part 222 and removes the specific requirements and recommendations in this final rule. This information does not need to be repeated in the MUTCD.

582. In Section 8C.09 (Section 8D.07 in the 2003 MUTCD) Traffic Control Signals at or Near Highway-Rail Grade Crossings, the FHWA proposed in the NPA to add a 3rd paragraph to the GUIDANCE statement recommending that back-up power be supplied to traffic control signals that have railroad preemption or that are coordinated with flashing-light signal systems at a highway-rail grade crossing. The FHWA proposed this recommendation because railroad flashing-light signals are typically provided with standby power supply to ensure their operation during power outages and it is important that traffic signals at or near the crossings also be provided with standby power during power outages to help prevent vehicles from queuing on approaches that cross the tracks. Two State DOTs suggested elevating the GUIDANCE to STANDARD. The City of Phoenix, AZ, suggested reducing the statement to an OPTION because of concerns about installation cost and the additional battery waste. Furthermore, they mentioned that Arizona's state laws require signals with power outages to be treated as four-way stop control. The FHWA notes that the proposed paragraph was identical to the new paragraph adopted in Section 4D.27. In this final rule the FHWA replaces the proposed GUIDANCE statement with a new SUPPORT statement referencing Section 4D.27 to eliminate redundancy.

In addition, the FHWA proposed in the NPA to add to the 4th paragraph of the GUIDANCE a statement consistent with Section 8A.01, which states that the highway agency or authority with jurisdiction and the regulatory agency with statutory authority jointly determine the need and selection of devices at a highway-rail grade crossing. A State DOT and a city opposed the proposed deletion of the words ''and the railroad company'' because they believe it is imperative that the railroad be

[204] The Interim Approval can be viewed at the following Internet Web site: *http://mutcd.fhwa.dot.gov/res-ia_waysidehorns.htm.*

[205] The **Federal Register** Notice was published on December 18, 2003, (Volume 68, Number 243, Page 70586–70687) and can be viewed at the following Internet Web site: *http://www.fra.dot.gov/downloads/Safety/train_horn_rule/fed_reg_trainhorns_final.pdf.*

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involved in the timing requirements of a signal system. The FHWA disagrees because of the need for consistency with Section 8A.01 and adopts the language as proposed in the NPA in this final rule.

In conjunction with that change, the FHWA adopts the proposed new STANDARD statement in this final rule that requires that the timing parameters must be furnished by the jurisdiction so that the railroad will be able to design the train detection circuitry.

583. In retitled Section 8C.10 Traffic Control Signals at or Near Highway-LRT Grade Crossings (Section 10D.06 in the NPA), the FHWA combines the existing language with editorial revisions proposed in the NPA with existing language with proposed editorial revisions in Section 10D.07 in the NPA for highway traffic signal preemption turning restrictions.

584. In Section 8C.11 (relocated from Section 10D.08 in the NPA) Use of Traffic Control Signals for Control of LRT Vehicles at Grade Crossings, the FHWA adopts the revisions as proposed in the NPA in this final rule. A city questioned why the existing 2nd GUIDANCE statement is included in the MUTCD because it describes the type of signals used to control light rail transit vehicles. They believe that this is only useful for train operators. The FHWA disagrees because even though trained light rail transit operators are the only persons who are directly responding to these special signals, they are able to be viewed by other road users who begin to understand their meanings as they watch what light rail transit operators do in response to them. This is especially true as these signals are also beginning to be used for exclusive bus lanes. Traffic safety is improved by making these special signals uniform. The FHWA declines to remove the provision in this final rule.

585. The FHWA adopts the NPA proposed new Section 8C.12 Grade Crossing(s) Within or In Close Proximity to Circular Intersections in this final rule. This new section contains SUPPORT and STANDARD statements that clarify the need for active traffic control devices where grade crossings are within or in close proximity to roundabouts, traffic circles, or circular intersections. Where circular intersections include or are within 200 feet of a grade crossing, an engineering study is now required to be performed to determine if queuing could impact the grade crossing. A State DOT and a consulting firm agreed with the proposed new Section. A State railroad operator opposed the proposed new Section because of opposition to roundabouts being constructed adjacent to grade crossings due to grade crossing safety concerns. The FHWA agrees that when possible, it is better not to install roundabouts in close proximity to existing grade crossings because of the difficulty encountered when trying to clear the tracks as a train is approaching. When it is unavoidable, this section includes provisions that are intended to minimize any operational or safety issues.

A city suggested revising the STANDARD to allow engineering judgment to determine if queuing could impact a grade crossing. The FHWA disagrees and retains the requirement for an engineering study because this situation requires data collection and analysis in order to make sound judgment. The FHWA in this final rule replaces the words ''within close proximity'' with ''200 feet of'' in the new STANDARD to give a quantitative dimension in this final rule.

The FHWA establishes a target compliance date of December 31, 2014 (approximately 5 years from the effective date of this final rule) for the required traffic study at existing locations. The FHWA establishes this target compliance date because it is important that these studies be conducted in a timely manner. Because the new requirements involve conducting engineering studies at existing grade crossings, the FHWA believes that relying on the systematic upgrading processes that highway agencies typically use to replace existing signs at the end of their service lives would not be appropriate, given the safety implications of not having any means of clearing the track of stopped motor vehicles when rail traffic is approaching. The FHWA anticipates that the required traffic studies at existing locations will provide significant safety benefits to road users.

A State DOT suggested adding lights and gates to the proposed GUIDANCE list that should be considered for keeping the crossing clear of traffic or for clearing traffic. The FHWA agrees and in this final rule revises item C ''Grade crossing regulatory and warning devices'' to include gates, lights, and regulatory signs. A city opposed the proposed GUIDANCE because the information is related to intersection design. The FHWA disagrees because the statement provides valuable suggestions that agencies can implement to keep the grade crossing clear of traffic or to clear traffic from the grade crossing prior to the arrival of rail traffic.

586. In retitled Section 8C.13 (relocated from Section 10D.08 in the 2003 MUTCD) Pedestrian and Bicycle Signals and Crossings at LRT Grade Crossings, the FHWA proposed in the NPA to add to the GUIDANCE a statement that an audible device should be installed, in addition to a Crossbuck sign, at pedestrian and bicycle crossings where determined by an engineering study. The FHWA also proposed to recommend that the LOOK sign and/or pedestrian gates should be considered if an engineering study shows that flashing-light signals with a Crossbuck sign and an audible device would not provide sufficient notice of an approaching light rail transit vehicle. The FHWA proposed these changes to provide consistency with changes in Section 8C.01 in the NPA in item 576 above. A city agreed with the proposed revisions. The NCUTCD and a State railroad operator suggested moving all the text in this section to Chapter 8D Pathway Grade Crossing. The FHWA disagrees because Chapter 8D pertains only to pathways, not to sidewalks. The FHWA adopts the revisions as proposed in the NPA in this final rule.

587. In Figure 8C–6 (Figure 10D–4 in the 2003 MUTCD) Example of a Separate Pedestrian Gate, the NCUTCD suggested adding a new illustration showing a stand-alone pedestrian gate. The FHWA agrees and adopts a figure that shows a stand-alone pedestrian gate.

588. The FHWA adopts the proposed new Chapter 8D (Chapter 8E in the NPA) Pathway Grade Crossings, including Sections 8D.01 through 8D.06 in this final rule. The purpose of this new Chapter is to provide information for traffic control devices used at pathway-rail grade crossings. Shared-use paths and other similar facilities sometimes cross railroad or light rail transit tracks at grade and it is important that suitable traffic control devices be used to provide for safe and effective operation of such crossings. The FHWA also adopts and incorporates into Chapter 8D material from proposed Chapter 10F regarding pathway-light rail transit grade crossings.

589. In new Section 8D.03 retitled Pathway Grade Crossing Signs and Markings, the FHWA adopts the text as proposed in the NPA and also incorporates material regarding pathway-light rail transit grade crossings from Section 10F.03, as proposed in the NPA, in this final rule. A city opposed the STANDARD that requires post mounted signs to have a minimum mounting height of 4 feet and suggested it be reduced to a GUIDANCE statement because there are signs such as object marker signs that should be mounted lower. The FHWA disagrees because Sections 8D.03 and 9B.01 both

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contain a similar 4-foot minimum mounting height requirement for signs posted for pathways and shared-use paths.

590. The FHWA adopts the proposed new Section 8D.04 (Section 8E.04 in the NPA) Stop Lines, Edge Lines, and Detectable Warnings in this final rule. In the NPA, the FHWA proposed to add new GUIDANCE on the use of stop lines and detectable warning surfaces. A local DOT and a city suggested revising the 1st GUIDANCE statement as proposed in the NPA to increase the minimum 2 foot distance between the stop line and gate or counterweight. The FHWA notes that the GUIDANCE wording uses the term ''at least'' meaning that there is flexibility to set the stop line farther back and therefore declines to make the suggested revision.

A local DOT suggested reducing the requirement to place the stop lines and detectable warning surfaces a minimum of 12 feet from the nearest rail because the distance does not allow a user of the crossing to view the approaching trains. The FHWA disagrees because pedestrians and bicyclists should be able to see approaching trains from a distance of 12 feet back from the nearest rail.

A consulting firm agreed with the 2nd GUIDANCE statement while a State DOT opposed it because it believed that detectable warnings are not a traffic control device and do not belong in the MUTCD. A State railroad operator suggested revising the GUIDANCE to add the words ''at least'' before the 2-foot detectable warning surface width to allow a 3-foot wide detectable surface to be consistent with California design guidelines, replace the ''upstream'' and ''downstream'' terminology with ''edge nearest the tracks'' to clarify placement of detectable surfaces on sidewalks where exit gates or off-quadrant flashing light signals are used, to reference the placement to the flashing light signals, and to delete the phrase ''and no closer than the stop line'' to remove the conflict with the 2-foot placement. For consistency with other Parts in the MUTCD, the FHWA reduces the proposed GUIDANCE statement for detectable warnings to SUPPORT and references ADAAG for design and placement of detectable warnings in this final rule.

The NCUTCD suggested adding an OPTION allowing the use of edge lines on an approach to and across the tracks at a pathway-light rail transit grade crossing, a station crossing, or sidewalk at a highway-light rail transit grade crossing. The NCUTCD also suggested adding a SUPPORT statement about edge lines at skew track angle or multiple track intersections. The FHWA agrees and adopts the suggested OPTION and SUPPORT, as information about these optional practices already allowed by provisions of Part 3 is useful.

591. The FHWA adopts the proposed new Section 8D.05 (Section 8E.05 in the NPA) Passive Devices for Pathway Grade Crossing in this final rule. In the NPA, the FHWA proposed STANDARD, OPTION, and GUIDANCE statements for passive devices and incorporates the light-rail grade crossing provisions from proposed Section 10F.05 in the NPA. The FHWA does not adopt the proposed GUIDANCE statement regarding the placement of fencing in this final rule based on comments received and because fences are not traffic control devices. The FHWA also proposed an OPTION in Section 10F.05 in the NPA allowing refuge areas at light rail transit grade crossings. The FHWA does not adopt the proposed OPTION in this final rule based on the NCUTCD recommendation and because refuge islands are not traffic control devices.

592. The FHWA adopts the proposed new Section 8D.06 (Section 8E.06 in the NPA) Active Traffic Control Systems for Pathway Grade Crossings, with the revisions discussed herein, in this final rule. The FHWA also incorporates into Section 8D.06 pathway-light rail transit crossing material from Section 10F.06 in the NPA. The NCUTCD agreed with the new text and suggested several editorial revisions which the FHWA adopts in this final rule.

A local DOT suggested revising the STANDARD to increase the 1-foot minimum height for the flashing red lights between the tracks to 4 feet because the 1-foot minimum will present a tripping hazard for users. The FHWA disagrees and notes that this was based on a recommendation provided by the NCUTCD and because pedestrians tend to look down as they step across tracks rather than look straight ahead.

A State railroad operator suggested revising the last STANDARD to replace ''active traffic control devices'' with ''a gate arm that extends across the sidewalk and into the roadway'' because the term ''active traffic control devices'' is too broad, as it could refer to a predestrian-specific device such as a separate automatic gate. The recommended language would prevent the placement of separate automatic gates on the outside of a sidewalk. The FHWA agrees and adopts the suggested revision in this final rule.

The NCUTCD suggested revising GUIDANCE regarding the height of separate automatic gates used for sidewalks so that the minimum height of the gate arm when lowered is reduced from the proposed value of 3 feet to 2.5 feet and to add a maximum height of 4 feet. A State railroad operator and a city also suggested adding a maximum height in the provision. The FHWA agrees that a maximum height should also be specified so that the gate will not be so high as to be ineffective for shorter persons and children. The FHWA adopts in this final rule a revised minimum height of 2.5 feet and a maximum height of 4 feet.

The NCUTCD and a local DOT suggested deleting, or revising to an OPTION, GUIDANCE paragraph 11 regarding a separate gate mechanism for sidewalk gates from the roadway gates and making other editorial changes. The FHWA disagrees and adopts the language as proposed in the NPA in this final rule, because it is important that pedestrians be prevented from raising the vehicular gate.

A local DOT suggested adding to the proposed GUIDANCE that a combination of automatic gates and swing gates could be used to provide full width coverage of the crossing. The FHWA agrees and adopts the suggested revision to the GUIDANCE in this final rule.

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Discussion of Amendments to Part 9—Traffic Controls for Bicycle Facilities

593. In Section 9A.03 Definitions Relating to Bicycles, the FHWA proposed in the NPA to change the definition of ''bicycle lane'' to indicate that a bicycle lane is to be designated by pavement markings, and that signs may be used to supplement the markings designating a bicycle lane, but they are not required. While two cities and one association agreed with this change, a State DOT opposed this change, indicating that they preferred to use signs and pavement markings. Another State DOT questioned whether the use of pavement markings alone was consistent with the function of pavement markings in Part 3, which indicates that in most cases pavement markings are used to supplement signs. Because markings can sometimes be used alone to effectively convey regulations, guidance, or warnings, such as in the case of no-passing zone markings, the FHWA believes that bicycle lanes can be effectively designated by markings alone. States may supplement bicycle lane markings with signs if they choose to do so. The FHWA adopts in this final rule the proposed change to the definition and relocates this definition to Section 1A.13 to consolidate all definitions in one place.

594. In Section 9B.01 Application and Placement of Signs, the FHWA proposed in the NPA to revise the STANDARD statement to indicate that no portion of a sign or its support shall be placed less than 2 feet laterally from the near edge of the path, or less than 8 feet vertically over the entire width of the shared-use path. As part of this change, the FHWA proposed to remove the requirement that signs be placed a maximum of 6 feet from the near edge of a path. ATSSA, an NCUTCD member, and a citizen supported this change, while two State DOTs opposed this change. One of the commenters opposed this change, in part, because the change would cause the MUTCD to be in conflict with AASHTO guidance on bicycle facilities.[206] The FHWA believes that the AASHTO guide, which is currently undergoing revision, will be changed to reflect changes in the MUTCD. The FHWA adopts the proposed changes in this final rule to be more consistent with Part 2 and to respond to feedback from practitioners that the existing MUTCD standards for sign height and offset can restrict the ability of agencies to effectively install signs on many shared-use path locations. The FHWA also modifies Figure 9B–1 to illustrate the minimum vertical offset information for overhead signs.

595. In Section 9B.04, retitled Bike Lane Signs and Plaques (R3–17, R3–17aP, R3–17bP), the FHWA in this final rule revises the STANDARD and GUIDANCE statements to clarify that Bike Lane signs are not required along bicycle lanes, and to give recommendations on the placement of Bike Lane signs and plaques when they are used. A city, an NCUTCD member, and a citizen agreed with the revisions as proposed in the NPA, while a State DOT and a city preferred that bike lane signs remain mandatory. Whether the presence or absence of the Bicycle Lane sign provides a clearly measurable benefit in indicating a designated bicycle lane has not been conclusively demonstrated. Amending the MUTCD to make the use of Bicycle Lane signs with marked bicycle lanes an optional, rather than a mandatory, condition provides flexibility for jurisdictions that do not desire to use the Bicycle Lane sign, without restricting the ability of jurisdictions that prefer to use the signs to continue to do so. These changes are consistent with the changes to the definition of ''bicycle lane'' as discussed in item 593 above.

596. The FHWA adopts in this final rule the NPA proposed new Section 9B.06 Bicycles May Use Full Lane Sign (R4–11). This Section includes OPTION and SUPPORT statements regarding the use of this sign, which is illustrated in Figure 9B–2. While two State DOTs, ATTSA, three bicycle associations, two cities, and several citizens supported the proposed new sign, two State DOTs and an NCUTCD member opposed it, stating that the application of the design should be restricted to locations with speeds of less than 40 mph and that less experienced cyclists will likely misunderstand the meaning of the message. Other commenters suggested modifications to the sign design. The FHWA adopts this new sign as proposed in the NPA and accompanying text and figure, to provide jurisdictions with a consistent sign design, along with application information, for locations where it is important to inform road users that the travel lanes are too narrow for bicyclists and motor vehicles to operate side by side.

597. In Section 9B.09 Selective Exclusion Signs (numbered and titled in the 2003 MUTCD as Section 9B.08 No Bicycles Sign (R5–6)''), the FHWA in this final rule adopts new text regarding the exclusion of various designated types of traffic from using particular roadways or facilities. As part of the change, the FHWA adopts No Skaters (R9–13) and No Equestrians (R9–14) signs to the text and to Figure 9B–2. While the NCUTCD and ATSSA both agreed with the changes as proposed in the NPA, a State DOT suggested that the GUIDANCE be changed to an OPTION statement. The NCUTCD and another State DOT suggested that the section be organized to be consistent with the comparable section in Chapter 2B. The FHWA agrees with the reorganization suggestion and incorporates those changes into the language adopted in this final rule.

598. In retitled Section 9B.11 Bicycle Regulatory Signs (R9–5, R9–6, R10–4, R10–24, R10–25, and R10–26) (numbered Section 9B.10 in the 2003 MUTCD) the FHWA in this final rule is adopting information about three new signs for bicycle pushbuttons, consistent with similar text adopted in Chapter 2B. The FHWA received a comment from the NCUTCD in support of this change as proposed in the NPA, but suggesting that paragraph 4 be expanded to allow the use of the PUSH BUTTON TO TURN ON WARNING LIGHTS (with pushbutton symbol) (R10–25) sign in other appropriate locations where other types of beacons or lights are used for traffic control for bicyclists, such as beacons at path-roadway crossings, tunnels, or other locations. The FHWA agrees and in this final rule adopts this new OPTION based on the NCUTCD's suggestion.

599. In Section 9B.18 Bicycle Warning and Combined Bicycle/Pedestrian Signs (W11–1 and W11–15) (numbered and titled in the 2003 MUTCD as Section 9B.17 Bicycle Warning Sign (W11–1),) the FHWA in this final rule adopts the NPA proposed OPTION statement permitting the use of the Combined Bicycle/Pedestrian (W11–15) sign where both bicyclists and pedestrians might be crossing the roadway, such as at an intersection with a shared-use path. Based on comments from the NCUTCD, several DOTs and others, the design of the sign adopted in this final rule is changed from what was proposed in the NPA. Further discussion of this sign can be found above in the discussion of Chapter 2C.

The FHWA also proposed in the NPA to permit a TRAIL X–ING (W11–15P) supplemental plaque to be mounted below the W11–15 sign. A State DOT commented that they use a TRAIL CROSSING word message warning sign (with the word ''crossing'' spelled out rather than abbreviated). The FHWA does not adopt this word message sign in this final rule, but notes that agencies are permitted to use word message warning signs that they feel are most appropriate for their situation. A transportation consultant suggested that the supplemental plaque should be allowed to be placed above or below the W11–15 sign. The FHWA disagrees, because Section 2C.53 requires supplemental warning plaques to be mounted below the primary sign unless otherwise allowed, and there is no documented reason to allow it to be above the W11–15 sign. Therefore the FHWA adopts the text as proposed in the NPA. The FHWA adopts the proposed illustrations of the W11–15 sign and W11–15P supplemental plaque configuration in Figure 9B–3. These changes are consistent with Chapter 2C.

Finally, in the NPA the FHWA proposed changing paragraph 06 to a GUIDANCE to recommend, rather than merely allow, that the W11–15 sign and W11–15P supplemental plaques have a fluorescent yellow-green background color with a black legend and border. The FHWA received comments from a State DOT, a city, and a member of the NCUTCD opposed to this proposed recommendation, because either the agency reserves the use of the fluorescent yellow-green background color for school-related uses or because they feel that the research does not

[206] ''Guide for the Development of Bicycle Facilities'', 1999, by the American Association of State Highway and Transportation Officials (AASHTO), is available for purchase from AASHTO at the following Internet Web site: *https://bookstore.transportation.org/*.

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support safety or operational benefits to support the making of fluorescent yellow-green background colors a recommended condition. As a result of these comments, along with comments regarding similar issues in Part 2, the FHWA adopts this paragraph as an OPTION for consistency with Section 2C.03

600. In Section 9B.19 Other Bicycle Warning Signs (Section 9B.18 in the 2003 MUTCD), the FHWA adopts in this final rule the NPA proposed change in the legend on the W5–4a sign from ''BIKEWAY NARROWS'' to ''PATH NARROWS.'' The FHWA adopts this change because shared-use paths are the only bikeway type on which the W5–4a sign is used, therefore, use on other types of bikeways would be inappropriate or confusing, and should not be encouraged. An NCUTCD member and a citizen agreed with this proposed change. In conjunction with this change in the text, the FHWA adopts appropriate changes in Table 9B–1.

601. In Section 9B.20 Bicycle Guide Signs (D1–1b, D1–1c, D1–2b, D1–2c, D1–3b, D1–3c, D11–1, D11–1c) (numbered and titled in the 2003 MUTCD as Section 9B.19 Bicycle Route Guide Signs (D11–1),) the FHWA proposed in the NPA to add several new signs, along with information on their use. These changes would provide flexibility and potentially reduce costs for signing bicycle routes in urban areas where multiple routes intersect or overlap. A State DOT, an NCUTCD member, two associations, and a citizen all agreed with the changes. While a city generally supported the signs, it questioned whether the details of the Bike Route Designation signs needed to be required through the use of STANDARD statements. The FHWA believes that the level of detail is needed to make sure that agencies design the signs properly and consistently. A State DOT recommended that these signs be used only on shared use paths, not on roadways. The FHWA believes that the bicycle symbol on the signs distinguishes them from destination signs for motorists, however to be clear, in this final rule the FHWA adopts a recommendation that the smaller bike designation signs should not be used as a substitute for the larger vehicular destination signs when the message is also intended to be seen by motorists. Along with additional text regarding the use of the Alternative Bike Route Guide (D11–1c) and Bicycle Destination signs (D1–1b, D1–1c, D1–2b, D1–2c, D1–3b, and D1–3c), the FHWA adopts the various new signs to Table 9B–1 and Figure 9B–4. The FHWA received many comments from NCUTCD members, ATSSA, State and local DOTs, associations, and citizens in support of the signs in Figure 9B–4.

602. In Section 9B.21 Bicycle Route Signs (M1–8, M1–8a, M1–9) (numbered Section 9B.20 in the 2003 MUTCD), the FHWA in this final rule adopts the NPA proposed Bicycle Route (M1–8a) sign that retains the clear, simple, and uniform design of the M1–8 sign, but provides an area near the top of the panel to include a pictograph or words that are associated with the route or with the agency that has jurisdiction over the route. The M1–8 sign remains in the MUTCD for use when agencies do not wish to use a distinctive pictograph, symbol, or wording.

In addition, the FHWA adopts the proposed change of paragraph 04 to a GUIDANCE to recommend, rather than merely permit, that a U.S. Bicycle Route number designation be requested from AASHTO for a designated bicycle route that extends through two or more States. The FHWA also adopts in this GUIDANCE the text relocated from the definition of ''designated bicycle route'' in Section 9A.03 regarding continuous routing of bicycle routes, as discussed above in item 593.

Finally, the FHWA adopts the revised design of the U.S. Bike Route Sign in Figure 9B–4 so that a larger bicycle is shown on the top part of the sign with a smaller number below it. The reason for the change is to present an immediate impression of a ''bicycle numbered route'' rather than a ''highway numbered route which can also be used by bicyclists'' and to provide consistency with AASHTO's recommended design for the sign. The FHWA received two comments in support of the proposed changes to this section; however a State DOT commented that they preferred the old M1–9 sign with the route number larger than the bicycle symbol and above the symbol. The FHWA believes that the larger bike symbol with smaller route number will deter motorists from mistaking the sign for a vehicle route number when observing the sign from a distance and adopts in this final rule the image as proposed in the NPA.

603. The FHWA in this final rule revises the content of Section 9B.22 Bicycle Route Sign Auxiliary Plaques (numbered and titled in the 2003 MUTCD as Section 9B.21 Destination Arrow and Supplemental Plaque Signs for Bicycle Route Signs) considerably. As part of the changes, the FHWA revises the size and design of the M4–11 BEGIN plaque to be consistent with similar M4 series auxiliary signs in Part 9. The FHWA also deletes the M4–12 and M4–13 plaques from this section and Figure 9B–4 because these duplicate the M4–6 and M4–5 auxiliary signs. In addition, the FHWA deletes the M7 series arrow plaques from this section and Figure 9B–4 because these duplicate the new sizes of the M5 and M6 auxiliary signs. The FHWA also adds a size of 12 x 6 inches for selected M3 and M4 series auxiliary signs, and a size of 12 x 9 inches for all M5 and M6 series auxiliary signs, and refers to these smaller sizes in this section, Table 9B–1, and Figure 9B–4. These changes will ensure that route auxiliary designations are consistent between Part 2 and Part 9. The FHWA received a comment from an NCUTCD member in support of the changes to this section proposed in the NPA. A State DOT recommended that supplementary plaques be restricted from exceeding the width of the sign they supplement, however the FHWA feels that this restriction is not necessary, because agencies do not tend to use plaques that are wider than the sign that they accompany as long as the available plaque sizes enable choosing a plaque of equal or less width.

604. The FHWA adopts in this final rule the three new sections proposed in the NPA following Section 9B.23 Bicycle Parking Area Sign (D4–3) (Section 9B.22 in the 2003 MUTCD). New Section 9B.24 Reference Location Signs (D10–1 through D10–3) and Intermediate Reference Location Signs (D10–1a through D10–3a) contains information regarding the use of these signs on shared-use paths. Reference Location signs (formerly called mileposts) have been defined in Chapter 2D of the MUTCD since 1971, and have proven extraordinarily valuable for traveler information, maintenance and operations, emergency response, and numerous other applications. The linear nature of many shared-use paths also naturally lends itself to the application of Reference Location signs. Defining a standard and uniform design provides more uniform traveler guidance, reduces the proliferation of non-standard reference location signs, and encourages the use of these signs where desirable and appropriate. The signs are proportionately sized for the lower operating speeds of shared-use paths, using a 6-inch wide panel with 4.5 inch numerals. The text is adapted directly from Section 2H.05 defining the use of these signs for conventional roadways. Although the FHWA received comments from ATSSA, an NCUTCD member, and a citizen in support of this proposed new section, the NCUTCD, several

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bicycle associations, a city and a citizen opposed paragraph 10 that recommended that the zero distance should begin at the south and west terminus points, because it does not allow for needed flexibility for local agencies in setting up reference marker systems on paths. Because deviations from a recommendation are permitted if there is a good engineering reason to do so, the FHWA adopts the language regarding the zero distance in this final rule. A city suggested that placing the details for the design of the reference location in a STANDARD statement was excessive; however, the FHWA believes that these requirements are necessary to make sure that agencies design the signs properly. In addition to adopting revisions the text, the FHWA adopts revisions to Figure 9B–4 and Table 9B–1 to include the use of these signs.

605. The FHWA adopts in this final rule a second new section, Section 9B.25 Mode-Specific Guide Signs for Shared-Use Paths (D11–1a, D11–2, D11–3, D11–4), that contains information regarding the use of signs to guide different types of users to separate pathways where they are available. The 2003 MUTCD provided tools only to prohibit user types, not to show which user types are permitted. As a result, jurisdictions commonly installed varied non-standard mode permission signs. The changes adopted are intended to provide clarity and uniformity for mode-specific guide signs on shared-use paths by adding four new signs to the MUTCD. The FHWA received comments from an NCUTCD member and a citizen in support of this proposed new section. In addition to adopting the new signs in Figure 9B–4 and Table 9B–1, the FHWA adopts the proposed Figure 9B–8 ''Example of Mode-Specific Guide Signing on a Shared-Use Path'' to illustrate the use of the proposed signs.

606. The FHWA adopts in this final rule a new Section 9B.26 Object Markers. This section contains relocated text and figures from Section 9C.03 of the 2003 MUTCD, to be consistent with a similar move of object markers from Part 3 to Part 2. The FHWA received a comment from an NCUTCD member in favor of this change. The NCUTCD and a State DOT suggested that the object markers be included in a figure so in this final rule the FHWA includes them in Figure 9B–3 and adds the smaller size object markers to Table 9B–1. Based on comments from the NCUTCD and a State DOT, the FHWA also adopts an option to use a proportionately smaller (6 x 18 inches) version of the Type 3 object marker for use on shared-use paths. This smaller size will be more useful and appropriate than the standard size of 12 & 36 inches for many applications, and will provide adequate visibility and target value at pathway speeds.

607. The FHWA adopts several changes to Table 9B–1 in this final rule based on comments to the docket. The NCUTCD, a State DOT, a city, bicycle associations, and citizens provided comments regarding the R3–17 sign and R3–17a and R3–17b plaques. As a result, the FHWA changes the name of the sign to ''Bike Lane'' to be consistent with the actual wording on the sign and changes the minimum size of the roadway size for the R3–17 sign to 24 x 18 inches and the sizes of the corresponding R3–17aP and R3–17bP plaques to 24 x 8 inches.

Based on comments from the NCUTCD, a State DOT, and a bicycle association, the FHWA changes the minimum shared-use path size for the R5–6 sign to 18 x 18 inches. The FHWA does not agree with comments to reduce the size of the roadway size of this sign, because there are more distractions from other signs and traffic control devices in a roadway environment, and therefore retains the minimum size of 24 x 24 inches for roadway uses in this final rule.

The NCUTCD and several associations suggested that the name of the W10–1 sign be changed to ''Grade Crossing Advance Warning'' to be consistent with the description of the W10–1 sign in Chapter 8B. The FHWA agrees and adopts this change in this final rule. In addition, the NCUTCD, a State DOT, two cities, and several associations and citizens suggested that the size of the W10–1 on shared-use paths be reduced. The FHWA agrees and changes the diameter of the W10–1 sign to 24 inches for use on shared-use paths.

Based on comments from the NCUTCD and several associations, the FHWA adopts a row for the W10–9P No Train Horn plaque (12 x 9 inches) and a row for the W16–2aP XX Feet plaque (18 x 9 inches) for use on shared-use paths.

The NCUTCD and several associations suggested that the name of the M1–8 and M1–8a signs be changed to ''Numbered Bicycle Route'' to be consistent with the intended application of these signs and to reduce confusion with other non-numbered bicycle route signs. The FHWA agrees and adopts the name change in this final rule. In addition, based on comments from the NCUTCD, a State DOT, and several associations, the FHWA revises the size of the roadway M1–8 and M1–8a signs to 18 x 24 inches for greater visibility.

Finally, based on comments from the NCUTCD, a State DOT, and several associations, the FHWA revises the size of the U.S. Bicycle Route (M1–9) sign to 12 x 18 inches for use on paths to make the size of this sign consistent with the M1–8 and M1–8a signs.

608. In Section 9C.03 Marking Patterns and Colors on Shared-Use Paths, the FHWA in this final rule relocates the last five paragraphs that were in this section in the 2003 MUTCD to new Section 9B.26, as discussed in item 606 above.

In the NPA, the FHWA proposed to expand paragraph 05 to describe that a solid white line may be used on shared-use paths to separate different types of users traveling in the same direction. Because pedestrian use in designated portions of shared-use paths is typically bi-directional, the NCUTCD, a State DOT, two cities, and several bicycle associations and citizens opposed the expanded description. The FHWA agrees and does not adopt the phrase ''traveling in the same direction'' in this final rule.

609. In Section 9C.04 Markings for Bicycle Lanes, the FHWA in this final rule incorporates several changes to this Section to correspond with changes to the definition of ''bicycle lane'' in Section 1A.13 and signs and plaques for bike lanes in Section 9B.04 (item 595 above). A State DOT, a city, and an NCUTCD member all supported the changes to this section that indicate that bike lane signs are optional.

Based on a comment from a State DOT, the FHWA adopts expanded paragraphs 06 and 07 to include information regarding the marking of bike lanes in the vicinity of left-turn lanes as well as right-turn lanes, for consistency with other provisions in Part 9.

In the NPA, the FHWA proposed to expand the last STANDARD statement to include ''other circular intersections'' as locations where bicycle lanes are prohibited. Although the FHWA's intent was to clarify that in addition to being prohibited on the circular roadway of a roundabout, bicycle lanes are not to be provided on the circular roadway of other circular intersections, the NCUTCD and several bicycle associations objected to the statement, since there are certain types of larger circular intersections (such as ones with significant distances between exits and entrances) where bike lanes may be appropriate based on engineering judgment. The FHWA agrees and does not adopt the phrase ''other circular intersections'' in this final rule.

610. The FHWA in this final rule adopts the proposed new section at the end of Chapter 9C numbered and titled Section 9C.07 Shared Lane Marking. This section contains OPTION,

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GUIDANCE, and STANDARD statements regarding the use of a proposed new Shared Lane Marking. This pavement marking indicates the appropriate bicyclist line of travel, and cues motorists to pass with sufficient clearance, and is based on field research conducted in San Francisco, CA.[207] The purpose of this marking is to reduce the number and severity of bicycle-vehicular crashes, particularly crashes involving bicycles colliding with suddenly opened doors of parked vehicles. The FHWA received two comments from NCUTCD members, three State DOTs, four local jurisdictions, four bicycle associations, and eight citizens in support of this proposed new section.

Two State DOTs and one bicycle association expressed concern regarding paragraph 02 that recommends that the shared lane marking not be placed on roadways with a speed limit above 35 mph. Because the 35 mph speed limit is a recommendation, agencies may impose a lower maximum speed limit criterion on the use of this marking if there is a good engineering reason to do so, therefore the FHWA adopts the proposed wording in this final rule.

A State DOT, a local DOT, two cities, two bicycle associations, and a citizen expressed concern regarding the proposed requirement in the NPA regarding the placement of the shared lane marking when used in a shared lane with on-street parallel parking. The commenters felt that the measurements should be recommendations, rather than requirements, in order to give agencies flexibility in placement of the marking. The FHWA agrees and in this final rule adopts these measurements as a GUIDANCE statement in paragraph 04. The FHWA reiterates, however, that the text provides a minimum distance from the center of the marking to the face of curb or edge of pavement where there is no curb, so agencies are free to place the markings at a greater distance if there is a good engineering reason to do so.

The FHWA received comments from a State DOT, two cities, a bicycle association and a citizen regarding the recommendation in paragraph 05 that on a street without on-street parking that has an outside travel lane that is less than 14 feet wide, the centers of the Shared Lane Markings should be at least 4 feet from the face of the curb, or from the edge of the pavement where there is no curb. Some commenters felt that the 4-foot distance was too close to the curb, while others stated that it is preferable to install the marking closer to the curb. The FHWA in this final rule adopts the language as proposed in the NPA, because it is a recommendation for minimum lateral clearances, therefore engineering judgment can be used if slightly reduced lateral distances are more appropriate, while larger lateral clearances can also be implemented.

The FHWA also received comments from three cities and from a transportation consultant regarding the recommended spacing interval between the Shared Lane Markings. Some commenters felt that a 250-foot spacing was too close and some felt that there should not be a recommended spacing interval at all. The FHWA believes that it is important to space the markings no more than 250 feet apart so that users can see the next marking from the previous one, so the FHWA adopts the recommended 250-foot interval spacing in this final rule. Since this is a recommended maximum spacing, agencies are free to space the markings at closer intervals if they feel it is appropriate.

Finally, several commenters expressed confusion on the need for clarity between the use of the Shared Lane Marking and the Bicycles May Use Full Lane (R4–11) sign. The marking and the sign are two separate devices, however the FHWA adopts a SUPPORT statement in this final rule providing a cross reference to the Bicycles May Use Full Lane sign and clarifies that the two devices are not required to be used together. In addition to the text, the FHWA in this final rule illustrates the appropriate design of the marking in adopted Figure 9C–9 Shared Lane Marking.

Discussion of Amendments to Appendix

611. As previously discussed in this preamble under General Amendments to the MUTCD, in this final rule the FHWA places information in a new Appendix A2, with metric equivalent values for all English unit values used in the MUTCD.

Rulemaking Analysis 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 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. In addition these changes do not create a serious inconsistency with any other agency's action or materially alter the budgetary impact of any entitlements, grants, user fees, or loan programs. 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 these changes 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, 109 Stat. 48, March 22, 1995). 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 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 $128.1 million or more in any one year (2 U.S.C. 1532).

Executive Order 13132 (Federalism)

This action has been analyzed in accordance with the principles and criteria contained in Executive Order 13132 dated August 4, 1999, and the FHWA has determined that this action does not have sufficient federalism

[207] ''San Francisco's Shared Lane Pavement Markings: Improving Bicycle Safety,'' Final Report, February 2004, prepared for the City of San Francisco Department of Traffic and Parking by Alta Planning and Design can be viewed at the following Internet Web site: *http://www.sfmta.com/cms/uploadedfiles/dpt/bike/Bike_Plan/Shared%20Lane%20Marking%20Full%20Report-052404.pdf.*

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implications to warrant the preparation of a federalism assessment. The FHWA has also determined that this rulemaking will not preempt any State law or State regulation or affect the States' ability to discharge traditional State governmental functions. 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 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 it 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.

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 for each collection of information they conduct, sponsor, or require through regulations. The FHWA has determined that this action does not contain collection information requirements for 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. The FHWA certifies that this action does not concern an environmental risk to health or safety that may disproportionately affect children.

Executive Order 12630 (Taking of Private Property)

The FHWA does not anticipate that this action will affect a taking of private property or otherwise have taking implications under Executive Order 12630, Governmental Actions and Interference with Constitutionally Protected Property Rights.

National Environmental Policy Act

The agency has analyzed this final rule for the purpose of the National Environmental Policy Act of 1969 (42 U.S.C. 4321–4347) and has determined that it does not have any effect on the quality of the environment.

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 18, 2009.

Jeffrey F. Paniati,

Executive Director.

■ In consideration of the foregoing, under the authority of 23 U.S.C 101(a), 104, 109(d), 114(a), 217, 315, and 402(a), and as discussed in the preamble, the FHWA amends title 23, Code of Federal Regulations as follows:

PART 634—[REMOVED AND RESERVED]

■ 1. Remove Part 634 .

PART 655—TRAFFIC OPERATIONS

■ 2. 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).

■ 3. Revise paragraph (a) of § 655.601, to read as follows:

§ 655.601 Purpose.

* * * * *

(a) Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD), 2009 Edition, FHWA, dated November 4, 2009. 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 National Archives and Records Administration (NARA). For information on the availability of this material at NARA call (202) 741–6030, or go to *http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html.* It is available for inspection and copying at the Federal Highway Administration, 1200 New Jersey Avenue, SE., Washington, DC 20590, telephone 202–366–1993, as provided in 49 CFR part 7. The text is also available from the FHWA Office of Operations Web site at: *http//mutcd.fhwa.dot.gov.*

* * * * *

■ 4. In § 655.603, revise paragraph (a) to read as follows:

§ 655.603 Standards.

(a) National MUTCD. The MUTCD approved by the Federal Highway Administrator is the national standard for all traffic control devices installed on any street, highway, or bicycle trail open to public travel in accordance with 23 U.S.C. 109(d) and 402(a). For the purpose of MUTCD applicability, open to public travel includes toll roads and roads within shopping centers, airports, sports arenas, and other similar business and/or recreation facilities that are privately owned but where the public is allowed to travel without access restrictions. Except for gated toll roads, roads within private gated properties where access is restricted at all times are not included in this definition. Parking areas, driving aisles within parking areas, and private highway-rail grade

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crossings are also not included in this definition.

* * * * *

Appendix to Subpart F of Part 655—[Amended]

■ 5. In Table 1 is amended by revising the daytime chromaticity coordinates for the color Purple as follows:

TABLE 1 TO APPENDIX TO PART 655, SUBPART F—DAYTIME COLOR SPECIFICATION LIMITS FOR RETROREFLECTIVE MATERIAL WITH CIE 2° STANDARD OBSERVER AND 45/0 (0/45) GEOMETRY AND CIE STANDARD ILLUMINANT D_{65}

Color	1		2		3		4	
	x	y	x	y	x	y	x	y
* * *	*		*		*		*	
Purple	0.302	0.064	0.310	0.210	0.380	0.255	0.468	0.140

* * * * *

■ 6. Table 2 is amended by adding the nighttime chromaticity coordinates for the color Purple as follows:

TABLE 2 TO APPENDIX TO PART 655, SUBPART F—NIGHTTIME COLOR SPECIFICATION LIMITS FOR RETROREFLECTIVE MATERIAL WITH CIE 2° STANDARD OBSERVER AND OBSERVATION ANGLE OF 0.33°, ENTRANCE ANGLE OF +5° AND CIE STANDARD ILLUMINANT A

Color	1		2		3		4	
	x	y	x	y	x	y	x	y
* * *	*		*		*		*	
Purple	0.355	0.088	0.385	0.288	0.500	0.350	0.635	0.221

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■ 7. Table 3 is amended by revising the daytime chromaticity coordinates for the color Fluorescent Pink, and by adding after Fluorescent Pink the color Fluorescent Red and its daytime chromaticity coordinates, for retroreflective sign material as follows:

TABLE 3 TO APPENDIX TO PART 655, SUBPART F—DAYTIME COLOR SPECIFICATION LIMITS FOR FLUORESCENT RETROREFLECTIVE MATERIAL WITH CIE 2° STANDARD OBSERVER AND 45/0 (0/45) GEOMETRY AND CIE STANDARD ILLUMINANT D_{65}

Color	1		2		3		4		5	
	x	y	x	y	x	y	x	y	x	y
* * *	*		*		*		*		*	
Fluorescent Pink	0.600	0.340	0.450	0.332	0.430	0.275	0.536	0.230	0.644	0.221
Fluorescent Red	0.666	0.334	0.613	0.333	0.671	0.275	9.735	0.265	.....	.....

■ 8. Table 3A is amended by adding after Fluorescent Pink the color Fluorescent Red and its daytime luminance factor limits for retroreflective sign material as follows:

Table 3A to Appendix to Part 655, Subpart F—Daytime Luminance Factors (%) for Fluorescent Retroreflective Material with CIE 2° Standard Observer and 45/0 (0/45) Geometry and CIE Standard Illuminant D_{65}.

Color	Min	Max	Y_F
* * *	*	*	*
Fluorescent Red	20	30	15

■ 9. Table 4 is amended by adding after Fluorescent Green the color Fluorescent Red and its nighttime chromaticity coordinates for retroreflective sign material as follows:

TABLE 4 TO APPENDIX TO PART 655, SUBPART F—NIGHTTIME COLOR SPECIFICATION LIMITS FOR FLUORESCENT RETROREFLECTIVE MATERIAL WITH CIE 2° STANDARD OBSERVER AND OBSERVATION ANGLE OF 0.33°, ENTRANCE ANGLE OF +5° AND CIE STANDARD ILLUMINANT A

Color	1		2		3		4	
	x	y	x	y	x	y	x	y
* * *	*		*		*		*	
Fluorescent Red	0.680	0.320	0.645	0.320	0.712	0.253	0.735	0.265

■ 10. Table 5 is amended by adding after the color Blue the daytime chromaticity coordinates for Purple retroreflective pavement marking material as follows:

TABLE 5 TO APPENDIX TO PART 655, SUBPART F—DAYTIME COLOR SPECIFICATION LIMITS FOR RETROREFLECTIVE PAVEMENT MARKING MATERIAL WITH CIE 2° STANDARD OBSERVER AND 45/0 (0/45) GEOMETRY AND CIE STANDARD ILLUMINANT D_{65}

Color	1		2		3		4	
	x	y	x	y	x	y	x	y
* * *	*		*		*		*	
Purple	0.300	0.064	0.309	0.260	0.362	0.295	0.475	0.144

■ 11. Table 5A is amended by adding after the color Blue the daytime luminance factors for Purple retroreflective pavement marking material as follows:

TABLE 5A TO PART 655, SUBPART F—DAYTIME LUMINANCE FACTORS (%) FOR RETROREFLECTIVE PAVEMENT MARKING MATERIAL WITH CIE 2° STANDARD OBSERVER AND 45/0 (0/45) GEOMETRY AND CIE STANDARD ILLUMINANT D_{65}

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Color	Min	Max
* * *	*	*
Purple	5	15

■ 12. Table 6 is amended by adding after the color Yellow, the nighttime chromaticity coordinates for Purple retroreflective pavement marking material as follows:

TABLE 6 TO APPENDIX TO PART 655, SUBPART F—NIGHTTIME COLOR SPECIFICATION LIMITS FOR RETROREFLECTIVE PAVEMENT MARKING MATERIAL WITH CIE 2° STANDARD OBSERVER, OBSERVATION ANGLE OF 1.05°, ENTRANCE ANGLE OF +88.76° AND CIE STANDARD ILLUMINANT A

Color	1		2		3		4	
	x	y	x	y	x	y	x	y
* * *	*		*		*		*	
Purple	0.338	0.080	0.425	0.365	0.470	0.385	0.635	0.221

[FR Doc. E9–28322 Filed 12–15–09; 8:45 am]
BILLING CODE 4910–22–P